

# Calibration Guide

## Agilent Technologies EMC Analyzers

This manual provides documentation for the following instruments:

E7401A(9 kHz - 1.5 GHz)  
E7402A(9 kHz - 3.0 GHz)  
E7403A(9 kHz - 6.7 GHz)  
E7404A(9 kHz - 13.2 GHz)  
E7405A(9 kHz - 26.5 GHz)

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**Agilent Technologies**

**Manufacturing Part Number: E7401-90078**

**Supersedes E7401-90054**

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The following safety symbols are used throughout this manual. Familiarize yourself with the symbols and their meaning before operating this instrument.

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|                |  |
|----------------|--|
| <b>WARNING</b> | <b><i>Warning</i> denotes a hazard. It calls attention to a procedure which, if not correctly performed or adhered to, could result in injury or loss of life. Do not proceed beyond a warning note until the indicated conditions are fully understood and met.</b> |
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|                |  |
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| <b>CAUTION</b> | <i>Caution</i> denotes a hazard. It calls attention to a procedure that, if not correctly performed or adhered to, could result in damage to or destruction of the instrument. Do not proceed beyond a caution sign until the indicated conditions are fully understood and met. |
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|                |   |
|----------------|---|
| <b>WARNING</b> | <b>This is a Safety Class 1 Product (provided with a protective earthing ground incorporated in the power cord. The mains plug shall only be inserted in a socket outlet provided with a protective earth contact. Any interruption of the protective conductor inside or outside of the product is likely to make the product dangerous. Intentional interruption is prohibited.</b> |
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| <b>WARNING</b> | <b>If this product is not used as specified, the protection provided by the equipment could be impaired. This product must be used in a normal condition (in which all means for protection are intact) only.</b> |
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| <b>CAUTION</b> | Always use the three-prong ac power cord supplied with this product. Failure to ensure adequate earth grounding by not using this cord may cause product damage. |
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| <b>CAUTION</b> | This instrument has autoranging line voltage input, be sure the supply voltage is within the specified range. |
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## **Where to Find the Latest Information**

Documentation is updated periodically. For the latest information about Agilent EMC Analyzers, including firmware upgrades and application information, please visit the following Internet URL:

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# **1      Calibrating**

Calibration verifies that the analyzer performance is within all specifications. It is time consuming and requires extensive test equipment. Calibration consists of *all* the performance tests. For a complete listing of the performance tests, see the performance verification tests table for your specific analyzer.

Allow the analyzer to warm up in accordance with the temperature stability specifications before performing the tests in this chapter.

None of these test procedures involve removing the cover of the analyzer.

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## Calibration Cycle

The performance tests in chapter 2 should be used to check the analyzer against its specifications once every year. Specifications are listed in the *Specifications Guide*.

### Performance Verification Test Tables

The tables on the following pages list the performance tests in [Chapter 2](#), “Performance Verification Tests,” required for each model number. Perform all the tests marked with a dot in the “Std” (standard) column. If any options are installed in the analyzer, also perform all tests marked with a dot in the appropriate option column.

**Table 1-1 Agilent E7401A Performance Verification Tests**

| Performance Test Name |  | Calibration for Instrument Option: |     |     |     |     |
|-----------------------|--|------------------------------------|-----|-----|-----|-----|
|                       |  | Std <sup>a</sup>                   | 1DN | 1D5 | 1D6 | AYX |
| 1.                    | 10 MHz Reference Output Accuracy <sup>b</sup>              | •                                  |     |     |     |     |
| 2.                    | 10 MHz High-Stability Frequency Reference Output Accuracy  |                                    |     | •   |     |     |
| 3.                    | Frequency Readout and Marker Frequency Count Accuracy      | •                                  |     |     |     |     |
| 5.                    | Frequency Span Accuracy                                    | •                                  |     |     |     |     |
| 7.                    | Noise Sidebands  | •                                  |     |     |     |     |
| 9.                    | System-Related Sidebands                                   | •                                  |     |     |     |     |
| 10.                   | Residual FM  | •                                  |     |     |     |     |
| 11.                   | Sweep Time Accuracy  | •                                  |     |     |     |     |
| 12.                   | Display Scale Fidelity                                     | •                                  |     |     |     |     |
| 13.                   | Input Attenuation Switching Uncertainty                    | •                                  |     |     |     |     |
| 14.                   | Reference Level Accuracy                                   | •                                  |     |     |     |     |
| 16.                   | Resolution Bandwidth Switching Uncertainty                 | •                                  |     |     |     |     |
| 17.                   | Absolute Amplitude Accuracy (Reference Settings)           | •                                  |     |     |     |     |
| 19.                   | Overall Absolute Amplitude Accuracy                        | •                                  |     |     |     |     |
| 21.                   | Resolution Bandwidth Accuracy                              | •                                  |     |     |     |     |
| 22.                   | Frequency Response   | •                                  |     |     |     |     |
| 25.                   | Frequency Response (Preamp On)                             | •                                  |     |     |     |     |
| 28.                   | Other Input-Related Spurious Responses                     | •                                  |     |     |     |     |
| 30.                   | Spurious Responses   | •                                  |     |     |     |     |
| 33.                   | Gain Compression   | •                                  |     |     |     |     |
| 35.                   | Displayed Average Noise Level                              | •                                  |     |     |     |     |
| 39.                   | Residual Responses   | •                                  |     |     |     |     |
| 40.                   | Fast Time Domain Amplitude Accuracy                        |                                    |     |     |     | •   |
| 41.                   | Tracking Generator Absolute Amplitude and Vernier Accuracy |                                    | •   |     |     |     |
| 43.                   | Tracking Generator Level Flatness                          |                                    | •   |     |     |     |
| 45.                   | Tracking Generator Harmonic Spurious Outputs               |                                    | •   |     |     |     |
| 47.                   | Tracking Generator Non-Harmonic Spurious Outputs           |                                    | •   |     |     |     |
| 50.                   | Gate Delay Accuracy and Gate Length Accuracy               |                                    |     |     | •   |     |
| 51.                   | Gate Mode Additional Amplitude Error                       |                                    |     |     | •   |     |

a. Perform these tests for all E7401A analyzers.

b. Perform this test only on analyzers not equipped with Option 1D5.



**Table 1-2 Agilent E7402A Performance Verification Tests**

| Performance Test Name |  | Calibration for Instrument Option: |     |     |     |     |
|-----------------------|--|------------------------------------|-----|-----|-----|-----|
|                       |  | Std <sup>a</sup>                   | 1DN | 1D5 | 1D6 | AYX |
| 1.                    | 10 MHz Reference Output Accuracy <sup>b</sup>              | •                                  |     |     |     |     |
| 2.                    | 10 MHz High-Stability Frequency Reference Output Accuracy  |                                    |     | •   |     |     |
| 3.                    | Frequency Readout and Marker Frequency Count Accuracy      | •                                  |     |     |     |     |
| 6.                    | Frequency Span Accuracy                                    | •                                  |     |     |     |     |
| 7.                    | Noise Sidebands  | •                                  |     |     |     |     |
| 8.                    | Noise Sidebands - Wide Offsets                             | •                                  |     |     |     |     |
| 9.                    | System-Related Sidebands                                   | •                                  |     |     |     |     |
| 10.                   | Residual FM  | •                                  |     |     |     |     |
| 11.                   | Sweep Time Accuracy  | •                                  |     |     |     |     |
| 12.                   | Display Scale Fidelity                                     | •                                  |     |     |     |     |
| 13.                   | Input Attenuation Switching Uncertainty                    | •                                  |     |     |     |     |
| 15.                   | Reference Level Accuracy                                   | •                                  |     |     |     |     |
| 16.                   | Resolution Bandwidth Switching Uncertainty                 | •                                  |     |     |     |     |
| 18.                   | Absolute Amplitude Accuracy (Reference Settings)           | •                                  |     |     |     |     |
| 20.                   | Overall Absolute Amplitude Accuracy                        | •                                  |     |     |     |     |
| 21.                   | Resolution Bandwidth Accuracy                              | •                                  |     |     |     |     |
| 23.                   | Frequency Response   | •                                  |     |     |     |     |
| 26.                   | Frequency Response (Preamplifier On)                       | •                                  |     |     |     |     |
| 29.                   | Other Input-Related Spurious Responses                     | •                                  |     |     |     |     |
| 31.                   | Spurious Responses   | •                                  |     |     |     |     |
| 33.                   | Gain Compression   | •                                  |     |     |     |     |
| 36.                   | Displayed Average Noise Level                              | •                                  |     |     |     |     |
| 39.                   | Residual Responses   | •                                  |     |     |     |     |
| 40.                   | Fast Time Domain Amplitude Accuracy                        |                                    |     |     |     | •   |
| 42.                   | Tracking Generator Absolute Amplitude and Vernier Accuracy |                                    | •   |     |     |     |
| 44.                   | Tracking Generator Level Flatness                          |                                    | •   |     |     |     |
| 46.                   | Tracking Generator Harmonic Spurious Outputs               |                                    | •   |     |     |     |
| 48.                   | Tracking Generator Non-Harmonic Spurious Outputs           |                                    | •   |     |     |     |
| 49.                   | Tracking Generator L.O. Feedthrough                        |                                    | •   |     |     |     |
| 50.                   | Gate Delay Accuracy and Gate Length Accuracy               |                                    |     |     | •   |     |
| 51.                   | Gate Mode Additional Amplitude Error                       |                                    |     |     | •   |     |

a. Perform these tests for all E7402A analyzers.

b. Perform this test only on analyzers not equipped with Option 1D5.

**Table 1-3 Agilent E7403A Performance Verification Tests**

| Performance Test Name |  | Calibration for Instrument Option: |     |     |     |     |
|-----------------------|--|------------------------------------|-----|-----|-----|-----|
|                       |  | Std <sup>a</sup>                   | 1DN | 1D5 | 1D6 | AYX |
| 1.                    | 10 MHz Reference Output Accuracy <sup>b</sup>              | •                                  |     |     |     |     |
| 2.                    | 10 MHz High-Stability Frequency Reference Output Accuracy  |                                    |     | •   |     |     |
| 4.                    | Frequency Readout and Marker Frequency Count Accuracy      | •                                  |     |     |     |     |
| 6.                    | Frequency Span Accuracy                                    | •                                  |     |     |     |     |
| 7.                    | Noise Sidebands  | •                                  |     |     |     |     |
| 8.                    | Noise Sidebands - Wide Offsets                             | •                                  |     |     |     |     |
| 9.                    | System-Related Sidebands                                   | •                                  |     |     |     |     |
| 10.                   | Residual FM  | •                                  |     |     |     |     |
| 11.                   | Sweep Time Accuracy  | •                                  |     |     |     |     |
| 12.                   | Display Scale Fidelity                                     | •                                  |     |     |     |     |
| 13.                   | Input Attenuation Switching Uncertainty                    | •                                  |     |     |     |     |
| 15.                   | Reference Level Accuracy                                   | •                                  |     |     |     |     |
| 16.                   | Resolution Bandwidth Switching Uncertainty                 | •                                  |     |     |     |     |
| 18.                   | Absolute Amplitude Accuracy (Reference Settings)           | •                                  |     |     |     |     |
| 20.                   | Overall Absolute Amplitude Accuracy                        | •                                  |     |     |     |     |
| 21.                   | Resolution Bandwidth Accuracy                              | •                                  |     |     |     |     |
| 24.                   | Frequency Response   | •                                  |     |     |     |     |
| 27.                   | Frequency Response (Preamp On)                             | •                                  |     |     |     |     |
| 29.                   | Other Input-Related Spurious Responses                     | •                                  |     |     |     |     |
| 32.                   | Spurious Responses   | •                                  |     |     |     |     |
| 34.                   | Gain Compression   | •                                  |     |     |     |     |
| 37.                   | Displayed Average Noise Level                              | •                                  |     |     |     |     |
| 39.                   | Residual Responses   | •                                  |     |     |     |     |
| 40.                   | Fast Time Domain Amplitude Accuracy                        |                                    |     |     |     | •   |
| 42.                   | Tracking Generator Absolute Amplitude and Vernier Accuracy |                                    | •   |     |     |     |
| 44.                   | Tracking Generator Level Flatness                          |                                    | •   |     |     |     |
| 46.                   | Tracking Generator Harmonic Spurious Outputs               |                                    | •   |     |     |     |
| 48.                   | Tracking Generator Non-Harmonic Spurious Outputs           |                                    | •   |     |     |     |
| 49.                   | Tracking Generator L.O. Feedthrough                        |                                    | •   |     |     |     |
| 50.                   | Gate Delay Accuracy and Gate Length Accuracy               |                                    |     |     | •   |     |
| 51.                   | Gate Mode Additional Amplitude Error                       |                                    |     |     | •   |     |

a. Perform these tests on all Agilent E7403A analyzers.

b. Perform this test only on analyzers not equipped with Option 1D5.

**Table 1-4 Agilent E7404A Performance Verification Tests**

| Performance Test Name |  | Calibration for Instrument Option: |     |     |     |     |
|-----------------------|--|------------------------------------|-----|-----|-----|-----|
|                       |  | Std <sup>a</sup>                   | 1DN | 1D5 | 1D6 | AYX |
| 1.                    | 10 MHz Reference Output Accuracy <sup>b</sup>              | •                                  |     |     |     |     |
| 2.                    | 10 MHz High-Stability Frequency Reference Output Accuracy  |                                    |     | •   |     |     |
| 4.                    | Frequency Readout and Marker Frequency Count Accuracy      | •                                  |     |     |     |     |
| 6.                    | Frequency Span Accuracy                                    | •                                  |     |     |     |     |
| 7.                    | Noise Sidebands  | •                                  |     |     |     |     |
| 8.                    | Noise Sidebands - Wide Offsets                             | •                                  |     |     |     |     |
| 9.                    | System-Related Sidebands                                   | •                                  |     |     |     |     |
| 10.                   | Residual FM  | •                                  |     |     |     |     |
| 11.                   | Sweep Time Accuracy  | •                                  |     |     |     |     |
| 12.                   | Display Scale Fidelity                                     | •                                  |     |     |     |     |
| 13.                   | Input Attenuation Switching Uncertainty                    | •                                  |     |     |     |     |
| 15.                   | Reference Level Accuracy                                   | •                                  |     |     |     |     |
| 16.                   | Resolution Bandwidth Switching Uncertainty                 | •                                  |     |     |     |     |
| 18.                   | Absolute Amplitude Accuracy (Reference Settings)           | •                                  |     |     |     |     |
| 20.                   | Overall Absolute Amplitude Accuracy                        | •                                  |     |     |     |     |
| 21.                   | Resolution Bandwidth Accuracy                              | •                                  |     |     |     |     |
| 24.                   | Frequency Response   | •                                  |     |     |     |     |
| 27.                   | Frequency Response (Preamp On)                             | •                                  |     |     |     |     |
| 29.                   | Other Input-Related Spurious Responses                     | •                                  |     |     |     |     |
| 32.                   | Spurious Responses   | •                                  |     |     |     |     |
| 34.                   | Gain Compression   | •                                  |     |     |     |     |
| 37.                   | Displayed Average Noise Level                              | •                                  |     |     |     |     |
| 39.                   | Residual Responses   | •                                  |     |     |     |     |
| 40.                   | Fast Time Domain Amplitude Accuracy                        |                                    |     |     |     | •   |
| 42.                   | Tracking Generator Absolute Amplitude and Vernier Accuracy |                                    | •   |     |     |     |
| 44.                   | Tracking Generator Level Flatness                          |                                    | •   |     |     |     |
| 46.                   | Tracking Generator Harmonic Spurious Outputs               |                                    | •   |     |     |     |
| 48.                   | Tracking Generator Non-Harmonic Spurious Outputs           |                                    | •   |     |     |     |
| 49.                   | Tracking Generator L.O. Feedthrough                        |                                    | •   |     |     |     |
| 50.                   | Gate Delay Accuracy and Gate Length Accuracy               |                                    |     |     | •   |     |
| 51.                   | Gate Mode Additional Amplitude Error                       |                                    |     |     | •   |     |

a. Perform these tests on all E7404A analyzers.

b. Perform this test only if the analyzer is not equipped with Option 1D5.

**Table 1-5 Agilent E7405A Performance Verification Tests**

| Performance Test Name |  | Calibration for Instrument Option: |     |     |     |     |
|-----------------------|--|------------------------------------|-----|-----|-----|-----|
|                       |  | Std <sup>a</sup>                   | 1DN | 1D5 | 1D6 | AYX |
| 1.                    | 10 MHz Reference Output Accuracy <sup>b</sup>              | •                                  |     |     |     |     |
| 2.                    | 10 MHz High-Stability Frequency Reference Output Accuracy  |                                    |     | •   |     |     |
| 4.                    | Frequency Readout and Marker Frequency Count Accuracy      | •                                  |     |     |     |     |
| 6.                    | Frequency Span Accuracy                                    | •                                  |     |     |     |     |
| 7.                    | Noise Sidebands  | •                                  |     |     |     |     |
| 8.                    | Noise Sidebands - Wide Offsets                             | •                                  |     |     |     |     |
| 9.                    | System-Related Sidebands                                   | •                                  |     |     |     |     |
| 10.                   | Residual FM  | •                                  |     |     |     |     |
| 11.                   | Sweep Time Accuracy  | •                                  |     |     |     |     |
| 12.                   | Display Scale Fidelity                                     | •                                  |     |     |     |     |
| 13.                   | Input Attenuation Switching Uncertainty                    | •                                  |     |     |     |     |
| 15.                   | Reference Level Accuracy                                   | •                                  |     |     |     |     |
| 16.                   | Resolution Bandwidth Switching Uncertainty                 | •                                  |     |     |     |     |
| 18.                   | Absolute Amplitude Accuracy (Reference Settings)           | •                                  |     |     |     |     |
| 20.                   | Overall Absolute Amplitude Accuracy                        | •                                  |     |     |     |     |
| 21.                   | Resolution Bandwidth Accuracy                              | •                                  |     |     |     |     |
| 24.                   | Frequency Response   | •                                  |     |     |     |     |
| 27.                   | Frequency Response (Preamp On)                             | •                                  |     |     |     |     |
| 29.                   | Other Input-Related Spurious Responses                     | •                                  |     |     |     |     |
| 32.                   | Spurious Responses   | •                                  |     |     |     |     |
| 34.                   | Gain Compression   | •                                  |     |     |     |     |
| 38.                   | Displayed Average Noise Level                              | •                                  |     |     |     |     |
| 39.                   | Residual Responses   | •                                  |     |     |     |     |
| 40.                   | Fast Time Domain Amplitude Accuracy                        |                                    |     |     |     | •   |
| 42.                   | Tracking Generator Absolute Amplitude and Vernier Accuracy |                                    | •   |     |     |     |
| 44.                   | Tracking Generator Level Flatness                          |                                    | •   |     |     |     |
| 46.                   | Tracking Generator Harmonic Spurious Outputs               |                                    | •   |     |     |     |
| 48.                   | Tracking Generator Non-Harmonic Spurious Outputs           |                                    | •   |     |     |     |
| 49.                   | Tracking Generator L.O. Feedthrough                        |                                    | •   |     |     |     |
| 50.                   | Gate Delay Accuracy and Gate Length Accuracy               |                                    |     |     | •   |     |
| 51.                   | Gate Mode Additional Amplitude Error                       |                                    |     |     | •   |     |

a. Perform these tests on all E7405 analyzers.

b. Perform this test only on analyzers not equipped with Option 1D5.

## Before You Start

This brief procedure should be performed before starting the performance verification tests:

1. Switch the analyzer on and let it warm up for five minutes.
2. If the analyzer is an Agilent E7402, E7403, E7404, or E7405, connect a cable from AMPTD REF OUT to the 50  $\Omega$  Input.
3. Press **System, Alignments, Align Now, All**, and wait for the auto alignments to finish.
4. Read the remainder of this section before you start any of the tests, and make a copy of the Performance Verification Test Record described below in "Recording the test results."

## Recording the test results

Performance verification test records, for each analyzer, are provided in the chapter following the tests.

Each test result is identified as a *TR Entry* in the performance tests and on the performance verification test record. We recommend that you make a copy of the performance verification test record, record the test results on the copy, and keep the copy for your calibration test record. This record could prove valuable in tracking gradual changes in test results over long periods of time.

## Performing Self-Alignment

Perform a complete self-alignment at least once per day, or if the analyzer fails a verification test. To perform a self-alignment, press **System, Alignment, Align Now, All**. The instrument must be up to operating temperature in order for this test to be valid. If the analyzer continuously fails one or more specifications, complete any remaining tests and record all test results on a copy of the test record. Then refer to [Chapter 4 , "If You Have a Problem,"](#) for instructions on how to solve the problem.

## Periodic verification of operation

The analyzer requires periodic verification of operation. Under most conditions of use, you should test the analyzer at least once a year with the complete set of performance verification tests.

## Test equipment you will need

The following tables list the recommended test equipment for the performance tests. The tables also list recommended equipment for the analyzer adjustment procedures which are located in the *Agilent EMC Analyzers Service Guide*. Any equipment that meets the critical specifications given in the table can be substituted for the recommended model.

**Table 1-6 Recommended Test Equipment**

| Equipment          | Critical Specifications for Equipment Substitution   | Recommended HP/Agilent Model | Use <sup>a</sup> |
|--------------------|--|------------------------------|------------------|
| Digital Multimeter | Input Resistance $\geq 10$ megohms<br>Accuracy: $\pm 10$ mV on 100 V range   | 3458A                        | P,A,T            |
| DVM Test Leads     | For use with HP/Agilent 3458A Digital Multimeter   | 34118B                       | T                |
| Universal Counter  | Frequency Range: 10 MHz $\pm 100$ Hz<br>Time Interval Range: 25 ms to 100 ms Single Trigger Operation<br>Range: 2.5 Vdc to $-2.5$ Vdc<br>External Reference Input<br>Gate Time: $\geq 10$ seconds<br>Frequency Resolution: 0.01 Hz                                       | 53132A                       | P,A,T            |
| Frequency Standard | Frequency: 10 MHz<br>Timebase Accuracy<br>(Aging): $< 1 \times 10^{-9}$ /day   | 5071A                        | P,A              |
| Oscilloscope       | Bandwidth: dc to 100 MHz<br>Vertical Scale Factor of 0.5 V to 5 V/Div<br>Two channels<br>Minimum Timebase Setting: $< 100$ ns<br>Digitizing display with pulse width and time interval measurement functions<br>Delta-T measurement accuracy in 200 ns / div: $< 450$ ps | 54820A                       | T                |

**Table 1-6 Recommended Test Equipment**

| Equipment                                | Critical Specifications for Equipment Substitution   | Recommended HP/Agilent Model | Use <sup>a</sup> |
|--|--|------------------------------|------------------|
| Power Meter                              | Compatible with HP/Agilent 8480 series power sensors.<br>dB relative mode.<br>Resolution: 0.01 dB<br>Reference Accuracy: $\pm 1.2\%$   | E4419B                       | P,A,T            |
| RF Power Sensor<br>(2 required)          | Frequency Range: 100 kHz to 3 GHz<br>Maximum SWR:<br>1.60 (100 kHz to 300 kHz)<br>1.20 (300 kHz to 1 MHz)<br>1.1 (1 MHz to 2.0 GHz)<br>1.18 (2.0 GHz to 3.0 GHz)<br>Amplitude range: -25 dBm to 10 dBm   | 8482A                        | P,A,T            |
| Microwave Power Sensor                   | Frequency Range: 50 MHz to 26.5 GHz<br>Maximum SWR:<br>1.15 (50 MHz to 100 MHz)<br>1.10 (100 MHz to 2 GHz)<br>1.15 (2 GHz to 12.4 GHz)<br>1.20 (12.4 GHz to 18 GHz)<br>1.25 (18 GHz to 26.5 GHz)<br>Amplitude range: -25 dBm to 0 dBm                              | 8485A                        | P,A,T            |
| Power Sensor, Low Power                  | Frequency Range: 50 MHz to 3.0 GHz<br>Amplitude Range: -20 dBm to -70 dBm<br>Maximum SWR:<br>1.4 (10 MHz to 30 MHz)<br>1.15 (30 MHz to 3.0 GHz)  | 8481D                        | P,A,T            |
| Synthesized Signal Generator             | Frequency Range: 100 kHz to 1500 MHz<br>Amplitude Range: -35 to 16 dBm<br>SSB Noise: $< -120$ dBc/Hz at 20 kHz offset  | 8663A                        | P,A              |
| Wide Offset Phase Noise Signal Generator | Frequency Range: 1 GHz $\pm 1$ MHz<br>Amplitude Range: 0 dBm $\pm 5$ dB<br>Phase Noise:<br>$< -131$ dBc/Hz typical @ 100 kHz offset<br>$< -145$ dBc/Hz typical @ 1 MHz offset<br>$< -147$ dBc/Hz typical @ 5 MHz offset<br>$< -149$ dBc/Hz typical @ 10 MHz offset | 8665B                        | P                |

**Table 1-6 Recommended Test Equipment**

| Equipment                           | Critical Specifications for Equipment Substitution   | Recommended HP/Agilent Model             | Use <sup>a</sup> |
|-------------------------------------|--|--|------------------|
| Spectrum Analyzer, Microwave        | Frequency Range: 100 kHz to 7 GHz<br>Relative Amplitude Accuracy:<br>100 kHz to 3.0 GHz: $\leq \pm 1.8$ dB<br>Frequency Accuracy: $\leq \pm 10$ kHz at 7 GHz   | 8563E                                    | P,T              |
| Synthesized Sweeper<br>(2 required) | Frequency Range:<br>E7405A: 10 MHz to 26.5 GHz<br>All others: 10 MHz to 13.2 GHz<br>Frequency Accuracy (CW): $\pm 0.02\%$<br>Leveling Modes: Internal and External<br>Modulation Modes: AM<br>Power Level Range: $-40$ to 16 dBm   | 83630/40/50B<br><br>83620/30/B<br>40/50B | P,A,T            |
| Function Generator                  | Frequency Range: 0.1 Hz to 15 MHz<br>Frequency Accuracy: $\pm 0.02\%$<br>Waveform: Triangle, Square, Sine  | 33120A or<br>3325B                       | P,A,T            |
| Attenuator/Switch Driver            | Compatible with HP/Agilent 8494G and 8496G Programmable step attenuators   | 11713A                                   | P                |
| Attenuator, 1 dB Step               | Attenuation Range: 0 to 11 dB<br>Frequency Range: 50 MHz $\pm 1$ MHz<br>Connectors: Type-N female<br>Calibrated at 50 MHz with accuracy of 1 to 11 dB attenuation: $\pm 0.010$ dB.   | 8494A/G                                  | P                |
| Attenuator, 10 dB Step              | Attenuation Range: 0 to 110 dB<br>Frequency Range: 50 MHz $\pm 1$ MHz<br>Connectors: Type-N female<br>Calibrated at 50 MHz with accuracy of:<br>0 to 40 dB attenuation: $\pm 0.020$ dB<br>50 to 100 dB attenuation: $\pm 0.065$ dB<br>110 dB attenuation: $\pm 0.075$ dB | 8496A/G                                  | P                |
| Attenuator, 10 dB Fixed             | Nominal attenuation: 10 dB<br>Frequency Range: dc to 3 GHz<br>Connectors: Type-N(m) and Type-N(f)  | 8491A<br>Option 010                      | P                |



**Table 1-6 Recommended Test Equipment**

| Equipment                              | Critical Specifications for Equipment Substitution   | Recommended HP/Agilent Model | Use <sup>a</sup> |
|--|--|------------------------------|------------------|
| Attenuator, 6 dB Fixed<br>(2 required) | Nominal attenuation: 6 dB<br>Frequency Range: 50 MHz $\pm$ 1 MHz<br>VSWR: <1.1: 1 at 50 MHz      | 8491A<br>Option 006          | P                |
| Attenuator, 20 dB Fixed                | Nominal attenuation: 20 dB<br>Frequency Range: 100 kHz to 3 GHz<br>VSWR: <1.2: 1 at $\leq$ 3 GHz | 8491A<br>Option 020          | P                |
| Attenuator Interconnect<br>Kit         | Mechanically and electrically connects<br>HP/Agilent 8494A/G and HP/Agilent<br>8496A/G           | 11716 Series                 |                  |

a. P = Performance Test, A = Adjustment, T = Troubleshooting

**Table 1-7 Recommended Accessories**

| Equipment                                   | Critical Specifications for Accessory Substitution   | Recommended HP/Agilent Model | Use <sup>a</sup> |
|---|--|------------------------------|------------------|
| Directional Bridge                          | Frequency Range: 5 MHz to 3 GHz<br>Directivity: >40 dB<br>Coupling factor: 16 dB nominal<br>Insertion Loss: 2 dB maximum                                       | 86205A                       | P                |
| Power Splitter<br>(for E7401A/02A)          | Frequency Range: 9 kHz to 13.2 GHz<br>Insertion Loss: 6 dB nominal<br>Output Tracking: <0.25 dB<br>Equivalent Output SWR: <1.22:1                              | 11667A                       | P,A              |
| Power Splitter<br>(for E7403A/04A/05A)      | Frequency Range: 9 kHz to 26.5 GHz<br>Insertion Loss: 6 dB nominal<br>Output Tracking: <0.25 dB<br>Equivalent Output SWR: <1.22:1                              | 11667B                       |                  |
| Directional Coupler<br>(for E7403A/04A/05A) | Frequency Range: 2 GHz to 15 GHz<br>Directivity: >16 dB<br>Max.VSWR: 1.35:1<br>Transmission Arm Loss: <1.5 dB (nominal)<br>Coupled Arm Loss: ~ 10 dB (nominal) | 87300B                       |                  |

**Table 1-7 Recommended Accessories**

| Equipment   | Critical Specifications for Accessory Substitution                                      | Recommended HP/Agilent Model      | Use <sup>a</sup> |
|---|---|-----------------------------------|------------------|
| Termination, 50 $\Omega$<br>(2 required for Option 1DN) | Impedance: 50 $\Omega$ nominal<br>Connector: Type-N (m)                                 | 909A                              | P,T              |
| Termination, 50 $\Omega$                                | Impedance: 50 $\Omega$ (nominal) Connector: BNC (m)                                     | 11593A                            | P,A              |
| 50 MHz Low Pass Filter                                  | Cutoff Frequency: 50 MHz<br>Rejection at 65 MHz: >40 MHz<br>Rejection at 75 MHz: >60 dB | 0955-0306                         | P                |
| 300 MHz Low Pass Filter                                 | Cutoff Frequency: 300 MHz<br>Rejection at >435 MHz: >45 dB                              | 0955-0455                         | P                |
| 1 GHz Low Pass Filter                                   | Cutoff Frequency: 1 GHz<br>Rejection at >2 GHz: >60 dB                                  | 0955-0487                         | P                |
| 1.8 GHz Low Pass Filter (for E7403A/04A/05A)            | Cutoff Frequency: 1.8 GHz<br>Rejection at >3 GHz: >45 dB                                | 0955-0491<br>(2 required)         | P                |
| 4.4 GHz Low Pass Filter (for E7403A/04A/05A)            | Cutoff Frequency: 4.4 GHz<br>Rejection at >5.5 GHz: >42 dB                              | 9135-0005 or 360D<br>(2 required) | P                |

a. P = Performance Test, A = Adjustment, T = Troubleshooting

**Table 1-8 Recommended Adapters**

| <b>Critical Specifications for Adapter Substitution</b> | <b>Recommended HP/Agilent Model</b> | <b>Use <sup>a</sup></b> |
|---|-------------------------------------|-------------------------|
| BNC (m) to BNC (m)                                      | 1250-0216                           | P,T                     |
| BNC tee (f,m,f)   | 1250-0781                           | A,T                     |
| Type-N (f) to APC 3.5 (f)                               | 1250-1745                           | P,A,T                   |
| Type-N (f) to BNC (m)                                   | 1250-1477                           | P,T                     |
| Type-N (m) to BNC (f) (4 required)                      | 1250-1476                           | P,A,T                   |
| Type-N (m) to BNC (m) (2 required)                      | 1250-1473                           | P,T                     |
| Type-N (m) to Type-N (m)                                | 1250-1472                           | P,T                     |
| Type-N (m) to Type-N (m)                                | 1250-1475                           | P,A,T                   |
| Type-N (m) to SMA (m)                                   | 1250-1636                           | P                       |
| Type N(f) to Type N(f)                                  | 1250-0777                           |                         |
| Type N (m) to APC 3.5 (f) (3 required)                  | 1250-1744                           |                         |
| APC 3.5 (f) to APC 3.5 (f)                              | 1250-1749                           |                         |
| Dual Banana to BNC (f)                                  | 1251-2277                           | P,A,T                   |
| Type N (m) to BNC (f) (2 required)                      | 1250-0780                           |                         |

a. P = Performance Test, A = Adjustment, T = Troubleshooting

**Table 1-9 Recommended Cables**

| <b>Critical Specifications for Cable Substitution</b>   | <b>Recommended HP /Agilent Model</b> | <b>Use <sup>a</sup></b> |
|---|--------------------------------------|-------------------------|
| Frequency Range: dc to 1 GHz<br>Length: ≥122 cm (48 in)<br>Connectors: BNC (m) both ends (4 required)           | 10503A                               | P,A,T                   |
| Type-N, 62 cm (24 in)   | 11500C                               | P,T                     |
| Type-N, 152 cm (60 in) (2 required)   | 11500D                               | P,A,T                   |
| Frequency Range: dc to 310 MHz<br>Length: 23 cm (9 in)<br>Connectors: BNC (m) both ends                         | 10502A                               | P,T                     |
| Cable, Test<br>Length: ≥91 cm (36 in)<br>Connectors: SMB (f) to BNC (m) (2 required)                            | 85680-60093                          | T                       |
| APC 3.5 Cable<br>Frequency: 9 kHz to 26.5 GHz<br>Connectors: APC 3.5 (m)<br>Length: >92 cm (36 in) (2 required) | 8120-4921                            | P,A,T                   |

a. P = Performance Test, A = Adjustment, T = Troubleshooting

## Performance Verification Tests

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## **Tests included in this section:**

1. 10 MHz Reference Output Accuracy
2. 10 MHz High-Stability Frequency Reference Output Accuracy: Agilent E7401A, E7402A, E7403A, E7404A, and E7405A (Option 1D5)
3. Frequency Readout and Marker Frequency Count Accuracy: Agilent E7401A and E7402A
4. Frequency Readout and Marker Frequency Count Accuracy: Agilent E7403A, E7404A, and E7405A
5. Frequency Span Accuracy: Agilent E7401A
6. Frequency Span Accuracy: Agilent E7402A, E7403A, E7404A, and E7405A
7. Noise Sidebands
8. Noise Sidebands - Wide Offsets: Agilent E7402A, E7403A, E7404A, and E7405A
9. System-Related Sidebands
10. Residual FM
11. Sweep Time Accuracy
12. Display Scale Fidelity
13. Input Attenuation Switching Uncertainty
14. Reference Level Accuracy: Agilent E7401A
15. Reference Level Accuracy: Agilent E7402A, E7403A, E7404A, and E7405A.
16. Resolution Bandwidth Switching Uncertainty
17. Absolute Amplitude Accuracy (Reference Settings): Agilent E7401A
18. Absolute Amplitude Accuracy (Reference Settings): Agilent E7402A, E7403A, E7404A, and E7405A
19. Overall Absolute Amplitude Accuracy: Agilent E7401A
20. Overall Absolute Amplitude Accuracy: Agilent E7402A, E7403A, E7404A, and E7405A
21. Resolution Bandwidth Accuracy
22. Frequency Response: Agilent E7401A
23. Frequency Response, Agilent E7402A
24. Frequency Response, Agilent E7403A, E7404A, and E7405A
25. Frequency Response (Preamp On): Agilent E7401A

26. Frequency Response (Preamp On): Agilent E7402A
27. Frequency Response (Preamp On): Agilent E7403A, E7404A, and E7405A
28. Other Input-Related Spurious Responses: Agilent E7401A
29. Other Input-Related Spurious Responses: Agilent E7402A, E7403A, E7404A, and E7405A
30. Spurious Responses: Agilent E7401A
31. Spurious Responses: Agilent E7402A
32. Spurious Responses: Agilent E7403A, E7404A, and E7405A
33. Gain Compression: Agilent E7401A and E7402A
34. Gain Compression: Agilent E7403A, E7404A, and E7405A
35. Displayed Average Noise Level: Agilent E7401A
36. Displayed Average Noise Level: Agilent E7402A
37. Displayed Average Noise Level: Agilent E7403A and E7404A
38. Displayed Average Noise Level: Agilent E7405A
39. Residual Responses
40. Fast Time Domain Amplitude Accuracy: Agilent E7401A, E7402A, E7403A, E7404A, E7405A (Option AXX)
41. Tracking Generator Absolute Amplitude and Vernier Accuracy: Agilent E7401A (Option 1DN)
42. Tracking Generator Absolute Amplitude and Vernier Accuracy: Agilent E7402A, E7403A, E7404A, and E7405A (Option 1DN)
43. Tracking Generator Level Flatness: Agilent E7401A (Option 1DN)
44. Tracking Generator Level Flatness: Agilent E7402A, E7403A, E7404A, and E7405A (Option 1DN)
45. Tracking Generator Harmonic Spurious Outputs: Agilent E7401A (Option 1DN)
46. Tracking Generator Harmonic Spurious Outputs: Agilent E7402A, E7403A, E7404A, and E7405A (Option 1DN)
47. Tracking Generator Non-Harmonic Spurious Outputs: Agilent E7401A (Option 1DN)
48. Tracking Generator Non-Harmonic Spurious Outputs: Agilent E7402A, E7403A, E7404A, and E7405A (Option 1DN)
49. Tracking Generator LO Feedthrough: Agilent E7402A, E7403A, E7404A, and E7405A (Option 1DN)
50. Gate Delay Accuracy and Gate Length Accuracy: Agilent E7401A, E7402A, E7403A, E7404A, and E7405A (Option 1D6)

Performance Verification Tests  
**Tests included in this section:**

51. Gate Mode Additional Amplitude Error: Agilent E7401A, E7402A, E7403A, E7404A, and E7405A (Option 1D6)



## Calibration

To perform calibration:

1. Run all performance verification tests listed in Column 1 of [Table 2-1](#) that are applicable to the analyzer being calibrated and the installed options. Refer to the Performance Verification test tables in Chapter 1 for a list of the tests that are applicable to the analyzer being calibrated.
2. If any of the performance verification tests fail, perform the appropriate calibration adjustments listed in Column 2 of [Table 2-1](#) which corresponds to the failure.
3. Repeat all of the performance verification tests listed in Column 1 of [Table 2-1](#) if any calibration adjustments were made in [step 2](#). This will confirm that there is no interaction between adjustments which could negatively impact analyzer performance.

[Table 2-1](#) lists the performance verification tests and adjustments needed for calibration. The performance tests are located in the following pages of this chapter. Adjustment information is located in the service guide.

Performance Verification Tests  
Tests included in this section:

**Table 2-1 Calibration Requirements**

| Test # | Performance Verification Tests                            | Calibration Adjustments               |
|--------|---|---------------------------------------|
| 1.     | 10 MHz Reference Output Accuracy                          | 10 MHz Frequency Reference Adjustment |
| 2.     | 10 MHz High-Stability Frequency Reference Output Accuracy | 10 MHz Frequency Reference Adjustment |
| 3.     | Frequency Readout and Marker Frequency Count Accuracy     | None                                  |
| 4.     | Frequency Readout and Marker Frequency Count Accuracy     | None                                  |
| 5.     | Frequency Span Accuracy                                   | None                                  |
| 6.     | Frequency Span Accuracy                                   | None                                  |
| 7.     | Noise Sidebands   | None                                  |
| 8.     | Noise Sidebands - Wide Offsets                            | None                                  |
| 9.     | System-Related Sidebands                                  | IF Amplitude                          |
| 10.    | Residual FM   | None                                  |
| 11.    | Sweep Time Accuracy                                       | None                                  |
| 12.    | Display Scale Fidelity                                    | IF Amplitude                          |
| 13.    | Input Attenuation Switching Uncertainty                   | 50 MHz Amplitude Reference            |
| 14.    | Reference Level Accuracy                                  | IF Amplitude                          |
| 15.    | Reference Level Accuracy                                  | IF Amplitude                          |
| 16.    | Resolution Bandwidth Switching Uncertainty                | IF Amplitude                          |
| 17.    | Absolute Amplitude Accuracy (Reference Settings)          | None                                  |
| 18.    | Absolute Amplitude Accuracy (Reference Settings)          | None                                  |
| 19.    | Overall Absolute Amplitude Accuracy                       | Frequency Response Adjustment         |
| 20.    | Overall Absolute Amplitude Accuracy                       | None                                  |
| 21.    | Resolution Bandwidth Accuracy                             | IF Amplitude                          |
| 22.    | Frequency Response  | Frequency Response                    |
| 23.    | Frequency Response  | Frequency Response                    |
| 24.    | Frequency Response  | Frequency Response                    |
| 25.    | Frequency Response (Preamp On)                            | Frequency Response                    |

**Table 2-1 Calibration Requirements**

| Test # | Performance Verification Tests                             | Calibration Adjustments                                       |
|--------|--|---|
| 26.    | Frequency Response (Preamp On)                             | Frequency Response  |
| 27.    | Frequency Response (Preamp On)                             | Frequency Response  |
| 28.    | Other Input-Related Spurious Responses                     | None  |
| 29.    | Other Input-Related Spurious Responses                     | None  |
| 30.    | Spurious Responses   | None  |
| 31.    | Spurious Responses   | None  |
| 32.    | Spurious Responses   | None  |
| 33.    | Gain Compression   | None  |
| 34.    | Gain Compression   | None  |
| 35.    | Displayed Average Noise Level                              | Frequency Response  |
| 36.    | Displayed Average Noise Level                              | Frequency Response  |
| 37.    | Displayed Average Noise Level                              | Frequency Response  |
| 38.    | Displayed Average Noise Level                              | Frequency Response  |
| 39.    | Residual Responses   | None  |
| 40.    | Fast Time Domain Amplitude Accuracy                        | None  |
| 41.    | Tracking Generator Absolute Amplitude and Vernier Accuracy | Tracking Generator ALC and Tracking Generator Frequency Slope |
| 42.    | Tracking Generator Absolute Amplitude and Vernier Accuracy | Tracking Generator ALC and Tracking Generator Frequency Slope |
| 43.    | Tracking Generator Level Flatness                          | Tracking Generator ALC and Tracking Generator Frequency Slope |
| 44.    | Tracking Generator Level Flatness                          | Tracking Generator ALC and Tracking Generator Frequency Slope |
| 45.    | Tracking Generator Harmonic Spurious Outputs               | None  |
| 46.    | Tracking Generator Harmonic Spurious Outputs               | None  |
| 47.    | Tracking Generator Non-Harmonic Spurious Outputs           | None  |
| 48.    | Tracking Generator Non-Harmonic Spurious Outputs           | None  |
| 49.    | Tracking Generator L.O. Feedthrough                        | LO Power  |

**Table 2-1 Calibration Requirements**

| Test # | Performance Verification Tests               | Calibration Adjustments |
|--------|--|-------------------------|
| 50.    | Gate Delay Accuracy and Gate Length Accuracy | None                    |
| 51.    | Gate Mode Additional Amplitude Error         | None                    |

**Manual use of Agilent 8494G and Agilent 8496G Attenuators with the Agilent 11713A**

When using the programmable versions of the 1 dB and 10 dB step attenuator (Agilent 8494G and Agilent 8496G), the Agilent 11713A Attenuator/ Switch Driver must be used to control the attenuators. The Agilent 8494G 1 dB step attenuator should be connected as Attenuator X and the Agilent 8496G 10 dB step attenuator should be connected as Attenuator Y.

Use [Table 2-2](#) to determine which of the Attenuator X and Attenuator Y settings are used to set the step attenuators to the desired value. In the columns labeled Attenuator X and Attenuator Y, a “1” indicates that section is on (the LED in the button will be lit), while a “0” indicates that section is off. For example, if the 1 dB step attenuator should be set to 2 dB and the 10 dB step attenuator should be set to 60 dB, sections 2, 6, and 7 should be on (lit) and all other sections should be off.

**Table 2-2 Agilent 11713A Settings for Agilent 8494G and Agilent 8496G**

| 1 dB Step Atten (dB) | Attenuator X |   |   |   | 10 dB Step Atten (dB) | Attenuator Y |   |   |   |
|----------------------|--------------|---|---|---|-----------------------|--------------|---|---|---|
|                      | 1            | 2 | 3 | 4 |                       | 5            | 6 | 7 | 8 |
| 0                    | 0            | 0 | 0 | 0 | 0                     | 0            | 0 | 0 | 0 |
| 1                    | 1            | 0 | 0 | 0 | 10                    | 1            | 0 | 0 | 0 |
| 2                    | 0            | 1 | 0 | 0 | 20                    | 0            | 1 | 0 | 0 |
| 3                    | 1            | 1 | 0 | 0 | 30                    | 1            | 1 | 0 | 0 |
| 4                    | 0            | 0 | 1 | 0 | 40                    | 0            | 0 | 1 | 0 |
| 5                    | 1            | 0 | 1 | 0 | 50                    | 1            | 0 | 1 | 0 |
| 6                    | 0            | 1 | 1 | 0 | 60                    | 0            | 1 | 1 | 0 |
| 7                    | 1            | 1 | 1 | 0 | 70                    | 1            | 1 | 1 | 0 |
| 8                    | 0            | 0 | 1 | 1 | 80                    | 0            | 0 | 1 | 1 |
| 9                    | 1            | 0 | 1 | 1 | 90                    | 1            | 0 | 1 | 1 |
| 10                   | 0            | 1 | 1 | 1 | 100                   | 0            | 1 | 1 | 1 |
| 11                   | 1            | 1 | 1 | 1 | 110                   | 1            | 1 | 1 | 1 |

## 1. 10 MHz Reference Output Accuracy

The setability is measured by changing the settings of the digital-to-analog converter (DAC), which controls the frequency of the timebase. The difference in frequency for each DAC step is calculated and compared to the specification.

The related adjustment for this performance verification test is the “10 MHz Reference Frequency Adjustment.”

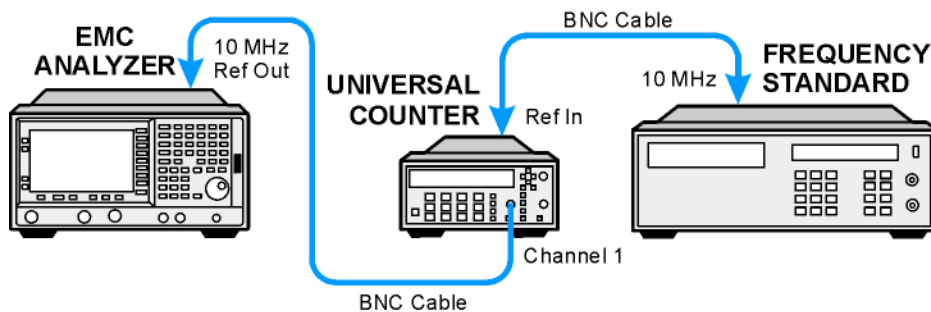
### Equipment Required

Universal counter (Instructions are for Agilent 53132A. For Agilent 5316B, refer to its user documentation.)

Frequency standard

Cable, BNC, 122-cm (48-in) (2 *required*)

Figure 2-1 10 MHz Reference Test Setup



wb91a\_wl73a

### Procedure

1. Connect the equipment as shown in [Figure 2-1](#). The frequency standard provides the reference for the universal counter.
2. Check that the analyzer is not in external reference mode. If **Ext Ref** appears on the screen, the analyzer is in external reference mode. If the analyzer is in external reference mode, disconnect the external reference.
3. *Ensure that the analyzer has been on and in internal frequency mode for at least five minutes before proceeding.*
4. Set the universal counter controls as follows:
  - a. Press **Gate & ExtArm**.
  - b. Press any one of the arrow keys until **TIME** is displayed.
  - c. Press **Gate & ExtArm** again. Using the arrow keys, set the time to 10 s.
  - d. Press **Enter**.

**1. 10 MHz Reference Output Accuracy**

- e. On Channel 1, press **50 Ω/1 MΩ** until the LED is lit.
  - f. On Channel 1, press **x10 Attenuator** until the LED is extinguished.
  - g. On Channel 1, press **AC/DC** until the LED next to DC is extinguished.
  - h. On Channel 1, press **100 kHz Filter** until the LED is extinguished.
  - i. On Channel 1, press **Trigger/Sensitivity** until Auto Trig is displayed.
  - j. Use the arrow keys to toggle to off.
  - k. Press **Freq & Ratio**.
5. Wait for the universal counter reading to stabilize. Record the universal counter reading in [Table 2-3](#) as Counter Reading 1 with 0.1 Hz resolution.
  6. Set the analyzer by pressing the following keys:

**System, Alignments, Timebase, Fine**

7. Record the number in the active function block of the analyzer in [Table 2-3](#) as Timebase Fine.
8. Press the ↑ (up arrow) key on the analyzer.
9. Wait for the frequency counter reading to stabilize. Record the frequency counter reading in [Table 2-3](#) as Counter Reading 2 with 0.1 Hz resolution.
10. Press the ↓ (down arrow) key on the analyzer 2 times.
11. Wait for the frequency counter reading to stabilize. Record the frequency counter reading in [Table 2-3](#) as Counter Reading 3 with 0.1 Hz resolution.
12. Press **Preset** on the analyzer to return the DAC settings to their initial values. Press the **Factory Preset** softkey, if it is displayed.
13. Subtract Counter Reading 1 from Counter Reading 2 and record the difference in [Table 2-3](#) as the Positive Frequency Change.

$$\text{Positive Frequency Change} = \text{Counter Reading 2} - \text{Counter Reading 1}$$

14. Subtract Counter Reading 3 from Counter Reading 1 and record the difference in [Table 2-3](#) as the Positive Frequency Change.

$$\text{Negative Frequency Change} = \text{Counter Reading 1} - \text{Counter Reading 3}$$

15. Of the Positive Frequency Change and negative frequency change values recorded in [Table 2-3](#), record the largest value in [Table 2-3](#) as the maximum frequency change.
16. Divide the maximum frequency change by two and record the result as the settability.

**Table 2-3****10 MHz Reference Accuracy Worksheet**

| Description       | Measurement |
|-------------------|-------------|
| Counter Reading 1 | _____ Hz    |

Table 2-3

10 MHz Reference Accuracy Worksheet

| Description               | Measurement |
|---------------------------|-------------|
| Timebase Fine DAC         | _____ Hz    |
| Counter Reading 2         | _____ Hz    |
| Counter Reading 3         | _____ Hz    |
| Positive Frequency Change | _____ Hz    |
| Negative Frequency Change | _____ Hz    |
| Maximum Frequency Change  | _____ Hz    |
| Settability               | _____ Hz    |

## 2. 10 MHz High-Stability Frequency Reference Output Accuracy: Agilent E7401A, E7402A, E7403A, E7404A, and E7405A (Option 1D5)

This test applies only to analyzers equipped with the high-stability frequency reference, Option 1D5. If your analyzer does not have Option 1D5, perform the “10 MHz Reference Output Accuracy” test instead.

This test measures the warmup characteristics of the 10 MHz reference oscillator. The ability of the 10 MHz oscillator to meet its warmup characteristics gives a high level of confidence that it will also meet its yearly aging specification.

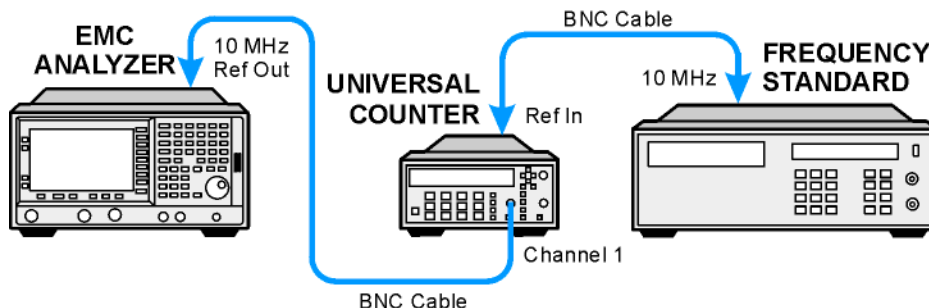
The universal counter is connected to the 10 MHz REF OUT. After the analyzer has been allowed to cool for at least 60 minutes, the analyzer is powered on. A frequency measurement is made five minutes after power is applied and the frequency is recorded. Another frequency measurement is made 10 minutes later (15 minutes after power is applied) and the frequency is recorded. A final frequency measurement is made 60 minutes after power is applied. The difference between each of the first two frequency measurements and the last frequency measurement is calculated and recorded.

The related adjustment for this performance verification test is the “10 MHz Reference Frequency Adjustment.”

### Equipment Required

- ☐ Universal counter (Instructions are for Agilent 53132A. For Agilent 5316B, refer to its user documentation.)
- ☐ Frequency standard
- ☐ Cable, BNC, 122-cm (48-in) (2 *required*)

**Figure 2-2**      **Frequency Reference Test Setup**



wb91a



## 2. 10 MHz High-Stability Frequency Reference Output Accuracy: Agilent E7401A, E7402A, E7403A, E7404A, and E7405A (Option 1D5)

### Procedure

The analyzer must have been allowed to sit with the power off for at least 60 minutes before performing this procedure. This adequately simulates a cold start.

1. *Allow the analyzer to sit with the power off for at least 60 minutes before proceeding.*
2. Switch the power to the analyzer on. Record the Power On Time below.  
Power On Time \_\_\_\_\_
3. Connect the equipment as shown in [Figure 2-2](#). The frequency standard provides the reference for the universal counter. Disconnect any cable to the 10 MHz REF INPUT of the analyzer.
4. Check that the analyzer is not in external reference mode. Ext Ref will appear on the display if the analyzer is in external reference mode. If the analyzer is in external reference mode, disconnect the external reference.
5. Set the universal counter controls as follows:
  - a. Press **Gate & ExtArm**.
  - b. Press any one of the arrow keys until TIME is displayed.
  - c. Press **Gate & ExtArm** again. Using the arrow keys, set the TIME to 10s.
  - d. Press **Enter**
  - e. On Channel 1, press **50  $\Omega$ /1 M $\Omega$**  to light the LED next to 50  $\Omega$ .
  - f. On Channel 1, press **AC/DC** to extinguish the LED next to DC.
  - g. On Channel 1, press **x10 Attenuator** to extinguish the LED next to x10 Attenuator.
  - h. On Channel 1, press **100 kHz Filter** to extinguish the LED next to 100 kHz Filter.
  - i. On Channel 1, press **Trigger/Sensitivity** until Auto Trig is displayed.
  - j. Use the arrows keys to toggle to off.
  - k. Press **Freq & Ratio**
6. Continue with the next step 5 minutes after the Power On Time noted in [step 2](#).
7. Wait for the universal counter reading to make at least two readings. Record the universal counter reading in [Table 2-3](#) as Counter Reading 1 with 0.001 Hz resolution.
8. Continue with next step 15 minutes after the Power On Time noted in [step 2](#).
9. Wait for the universal counter reading to make at least two readings. Record the universal counter reading in [Table 2-3](#) as Counter Reading 2 with 0.001 Hz resolution.
10. Continue with next step 60 minutes after the Power On Time noted in [step 2](#).

## Performance Verification Tests

### 2. 10 MHz High-Stability Frequency Reference Output Accuracy: Agilent E7401A, E7402A, E7403A, E7404A, and E7405A (Option 1D5)

11. Wait for the universal counter reading to make at least two readings. Record the universal counter reading in Table 2-3 as Counter Reading 3 with 0.001 Hz resolution.

12. Calculate the 5 Minute Warm-up Error (in ppm) by subtracting Counter Reading 3 from Counter Reading 1 and dividing the result by 10.

$$5 \text{ Minute Warm-up Error} = (\text{Counter Reading 1} - \text{Counter Reading 3}) / 10$$

---

**NOTE**

Dividing the frequency by 10 is equivalent to dividing the difference first by 10 MHz (to normalize the difference to the reference frequency) and then multiplying by  $1 \times 10^6$  to convert the result to parts-per-million (ppm).

---

13. Record the 5 Minute Warm-up Error (in ppm) in the performance verification test record as Test Record entry 1.

14. Calculate the 15 Minute Warm-up Error (in ppm) by subtracting Counter Reading 3 from Counter Reading 2 and dividing the result by 10.

$$15 \text{ Minute Warm-up Error} = (\text{Counter Reading 2} - \text{Counter Reading 3}) / 10$$

15. Record the 15 Minute Warm-up Error in the performance verification test record as Test Record entry 2.

**Table 2-4**

**10 MHz Reference Accuracy Worksheet**

| Description       | Measurement |
|-------------------|-------------|
| Counter Reading 1 | _____ Hz    |
| Counter Reading 2 | _____ Hz    |
| Counter Reading 3 | _____ Hz    |

## 3. Frequency Readout and Marker Frequency Count Accuracy: Agilent E7401A and E7402A

The frequency readout accuracy of the analyzer is tested with an input signal of known frequency. By using the same frequency standard for the analyzer and the synthesized sweeper, the frequency reference error is eliminated.

There are no related adjustment procedures for this performance test.

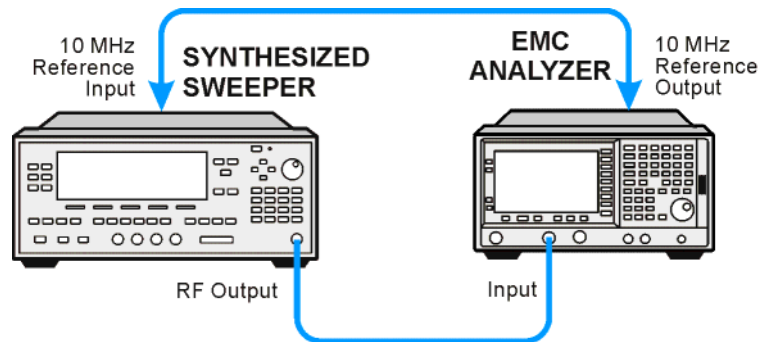
### Equipment Required

Synthesized sweeper  
 Adapter, Type N (f) to APC 3.5 (m)  
 Cable, Type N, 183 cm (72 in)  
 Cable, BNC, 122 cm (48 in)

### Procedure

**Figure 2-3**

**Frequency Readout and Marker Frequency Accuracy Test Setup**



wb99a

This performance test consists of two parts:

- “Part 1: Frequency Readout Accuracy”
- “Part 2: Marker Count Accuracy”

Perform “Part 1: Frequency Readout Accuracy” before “Part 2: Marker Count Accuracy”.

### Part 1: Frequency Readout Accuracy

1. Connect the equipment as shown in [Figure 2-3](#). Remember to connect the 10

## Performance Verification Tests

### 3. Frequency Readout and Marker Frequency Count Accuracy: Agilent E7401A and E7402A

MHz REF OUT of the analyzer to the 10 MHz REF INPUT of the synthesized sweeper.

2. Perform the following steps to set up the equipment:

- a. Press **INSTRUMENT PRESET** on the synthesized sweeper, then set the controls as follows:

**CW, 1.490 GHz** (*Agilent E7401A*)

**CW, 1.5 GHz** (*Agilent E7402A*)

**POWER LEVEL, -10 dBm**

- b. Press **Preset** on the analyzer. Press the **Factory Preset** softkey, if it is displayed. Set the analyzer by pressing the following keys:

**FREQUENCY, Center Freq, 1.5 GHz**

**SPAN, 20 MHz**

3. Press **Peak Search** (or **Search**) on the analyzer to measure the frequency readout accuracy.
4. Record the marker frequency reading in the performance verification test record.
5. Repeat [step 3](#) and [step 4](#) above for the remaining spans listed in [Table 2-5](#).

**Table 2-5**

**Frequency Readout Accuracy**

| Analyzer Span (MHz) | Test Record Entry,<br>Actual<br>Marker Frequency |
|---------------------|--|
| 20                  | 1)   |
| 10                  | 2)   |
| 1                   | 3)   |

## Part 2: Marker Count Accuracy

Perform "Part 1: Frequency Readout Accuracy" before performing this procedure.

1. Press **Preset** on the analyzer. Press the **Factory Preset** softkey, if it is displayed. Set the analyzer to measure the marker count accuracy by pressing the following keys:

**FREQUENCY, Center Freq, 1.490 GHz** (*Agilent E7401A*)

**FREQUENCY, Center Freq, 1.5 GHz** (*Agilent E7402A*)

**SPAN, 10 MHz**

**BW/Avg, Res BW, 100 kHz** (Man)

**Freq Count, Marker Count** (On)

**Resolution** (Man), **1 Hz**

2. Press **Peak Search** (or **Search**), then wait for a count be taken (it may take several seconds).

### 3. Frequency Readout and Marker Frequency Count Accuracy: Agilent E7401A and E7402A

3. Record the counter (Cntr1) frequency reading as Test Record entry 4 of the performance verification test record.
4. On the analyzer, press **SPAN, 1 MHz**.
5. Press **Peak Search** (or **Search**), then wait for a count be taken (it may take several seconds).
6. Record the counter (Cntr1) frequency reading as Test Record entry 5 of the performance verification test record.

## 4. Frequency Readout and Marker Frequency Count Accuracy: Agilent E7403A, E7404A, and E7405A

The frequency readout accuracy of the analyzer is tested with an input signal of known frequency. By using the same frequency standard for the analyzer and the synthesized sweeper, the frequency reference error is eliminated.

There are no related adjustment procedures for this performance test.

### Equipment Required

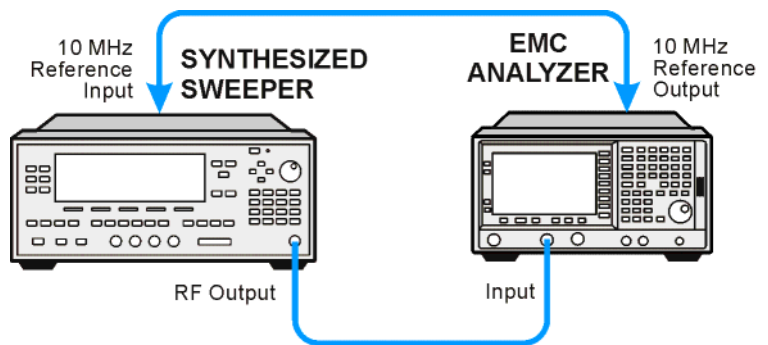
- Synthesized sweeper
- Adapter, Type N (m) to APC 3.5 (f)
- Adapter, APC 3.5 (f) to APC 3.5 (f)
- Cable, APC 3.5, 91 cm (36 in)
- Cable, BNC, 122 cm (48 in)

### Additional Equipment for Option BAB

- Adapter, APC 3.5 (f) to APC 3.5 (f)

Figure 2-4

Frequency Readout and Marker Count Accuracy Test Setup



wb99a

### Procedure

This performance verification test consists of two parts:

- “Part 1: Frequency Readout Accuracy”
- “Part 2: Marker Count Accuracy”

#### 4. Frequency Readout and Marker Frequency Count Accuracy: Agilent E7403A, E7404A, and E7405A

Perform “Part 1: Frequency Readout Accuracy” before “Part 2: Marker Count Accuracy.”

##### Part 1: Frequency Readout Accuracy

1. Connect the equipment as shown in [Figure 2-4](#). Remember to connect the 10 MHz REF OUT of the analyzer to the 10 MHz REF INPUT of the synthesized sweeper.

*Option BAB only:* Use the APC 3.5 adapter to connect the cable to the analyzer input.

2. Perform the following steps to set up the equipment:
  - a. Press **INSTRUMENT PRESET** on the synthesized sweeper, then set the controls as follows:

**CW, 1.5 GHz**  
**POWER LEVEL, –10 dBm**

- b. Press **Preset** on the analyzer. Press the **Factory Preset** softkey, if it is displayed. Set the analyzer by pressing the following keys:

**FREQUENCY, Center Freq, 1.5 GHz**  
**SPAN, 20 MHz**  
**BW/Avg, Res BW SA**

3. Press **Peak Search** (or **Search**) on the analyzer to measure the frequency readout accuracy.
4. Record the marker (Mkr1) frequency reading in the performance verification test record as indicated in [Table 2-6](#).
5. Change to the next analyzer span setting listed in [Table 2-6](#).
6. Repeat [step 3](#) through [step 5](#) for each analyzer frequency and span setting and synthesized sweeper CW frequency setting listed in [Table 2-6](#) for the analyzer being tested.

**Table 2-6**

**Frequency Readout Accuracy**

| Synthesized Sweeper<br>CW Frequency<br>(MHz) | Analyzer Span<br>(MHz) | Analyzer Center<br>Frequency<br>(GHz) | Test Record<br>Entry<br>Frequency<br>(GHz) |
|--|------------------------|---------------------------------------|--|
| 1500   | 20                     | 1.5                                   | 1)   |
| 1500   | 10                     | 1.5                                   | 2)   |
| 1500   | 1                      | 1.5                                   | 3)   |
| 4000   | 20                     | 4.0                                   | 4)   |
| 4000   | 10                     | 4.0                                   | 5)   |

#### 4. Frequency Readout and Marker Frequency Count Accuracy: Agilent E7403A, E7404A, and E7405A

Table 2-6

Frequency Readout Accuracy

| Synthesized Sweeper<br>CW Frequency<br>(MHz) | Analyzer Span<br>(MHz) | Analyzer Center<br>Frequency<br>(GHz) | Test Record<br>Entry<br>Frequency<br>(GHz) |
|--|------------------------|---------------------------------------|--|
| 4000   | 1                      | 4.0                                   | 6)   |
| Stop here for Agilent E7403A.                |                        |                                       |  |
| 9000   | 20                     | 9.0                                   | 7)   |
| 9000   | 10                     | 9.0                                   | 8)   |
| 9000   | 1                      | 9.0                                   | 9)   |
| Stop here for Agilent E7404A.                |                        |                                       |  |
| 16000  | 20                     | 16.0                                  | 10)  |
| 16000  | 10                     | 16.0                                  | 11)  |
| 16000  | 1                      | 16.0                                  | 12)  |
| 21000  | 20                     | 21.0                                  | 13)  |
| 21000  | 10                     | 21.0                                  | 14)  |
| 21000  | 1                      | 21.0                                  | 15)  |

#### Part 2: Marker Count Accuracy

Perform "Part 1: Frequency Readout Accuracy" before performing this procedure.

1. Press **Preset** on the analyzer. Press the **Factory Preset** softkey, if it is displayed. Set the analyzer to measure the marker count accuracy by pressing the following keys:

**FREQUENCY, Center Freq, 1.5 GHz**  
**SPAN, 20 MHz**  
**BW/Avg, Res BW, 100 kHz (Man)**  
**Freq Count, Marker Count (On)**  
**Resolution (Man)**

2. Press **Peak Search** (or **Search**), then wait for a count be taken (it may take several seconds).
3. Record the counter (Cnt1) frequency reading in the performance verification test record as indicated in [Table 2-7](#).
4. Repeat [step 2](#) and [step 3](#) for each analyzer center frequency and span setting and synthesized sweeper CW frequency setting listed in [Table 2-7](#) for the analyzer being tested.

Performance verification test "Frequency Readout Accuracy and Marker Count Accuracy" is now complete.



#### 4. Frequency Readout and Marker Frequency Count Accuracy: Agilent E7403A, E7404A, and E7405A

Table 2-7

Marker Count Accuracy

| Synthesized Sweeper CW Frequency | Analyzer Center Frequency | Analyzer Span | Counter Frequency (Cntr1) |
|----------------------------------|---------------------------|---------------|---------------------------|
| MHz                              | GHz                       | MHz           | Test Record Entry         |
| 1500                             | 1.5                       | 20            | 16)                       |
| 1500                             | 1.5                       | 1             | 17)                       |
| 4000                             | 4.0                       | 20            | 18)                       |
| 4000                             | 4.0                       | 1             | 19)                       |
| Stop here for Agilent E7403A.    |                           |               |                           |
| 9000                             | 9.0                       | 20            | 20)                       |
| 9000                             | 9.0                       | 1             | 21)                       |
| Stop here for Agilent E7404A.    |                           |               |                           |
| 16000                            | 16.0                      | 20            | 22)                       |
| 16000                            | 16.0                      | 1             | 23)                       |
| 21000                            | 21.0                      | 20            | 24)                       |
| 21000                            | 21.0                      | 1             | 25)                       |

## 5. Frequency Span Accuracy: Agilent E7401A

For testing each frequency span, two synthesized sources are used to provide two precisely-spaced signals. The analyzer marker functions are used to measure this frequency difference.

There are no related adjustment procedures for this performance test.

### Equipment Required

Synthesized sweeper  
Synthesized signal generator  
Power splitter  
Adapter, Type-N (m) to Type-N (m)  
Adapter, Type-N (f) to APC 3.5 (f)  
Cable, Type-N, 152-cm (60-in) (*2 required*)  
Cable, BNC, 122-cm (48-in)

### Procedure

#### Full Span Frequency Span Readout Accuracy

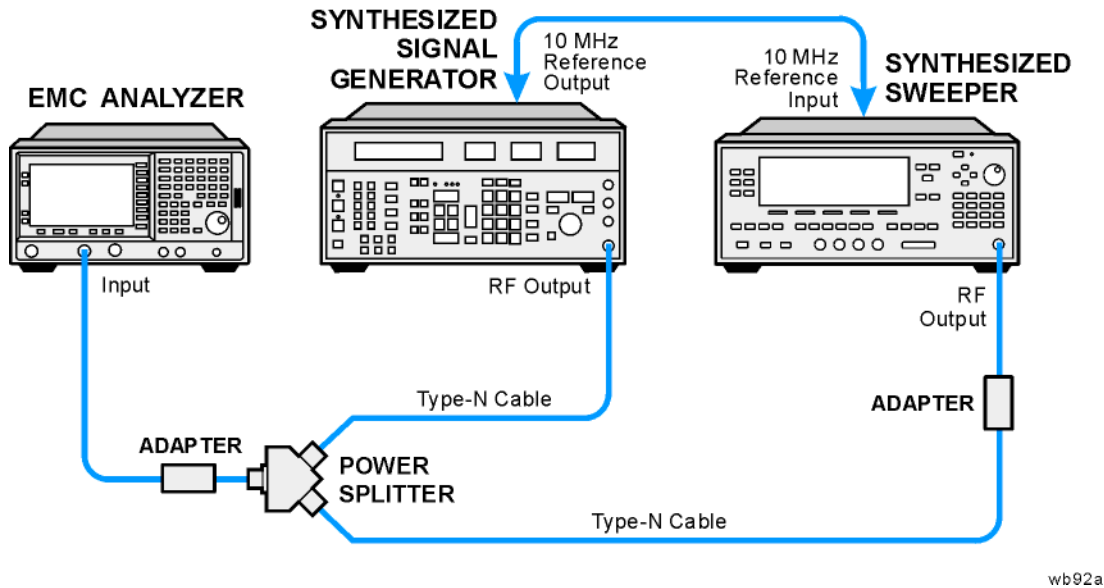
1. Connect the equipment as shown in [Figure 2-5](#). Note that the power splitter is used as a combiner. The synthesized signal generator provides the frequency reference for the synthesized sweeper.
2. Press **Preset** on the analyzer. Press the **Factory Preset** softkey, if it is displayed.
3. Press **PRESET** on the synthesized sweeper and set the controls as follows:

**CW, 1350 MHz**  
**POWER LEVEL, -5 dBm**

4. On the synthesized signal generator, set the controls as follows:

**FREQUENCY, 150 MHz**  
**AMPLITUDE, 0 dBm**

Figure 2-5 Frequency Span Readout Accuracy Test Setup



5. Adjust the analyzer center frequency, if necessary, to place the lower frequency on the second vertical graticule line (one division from the left-most graticule line).
6. On the analyzer, press **Single**. Wait for the completion of a new sweep, then press the following keys:
  - Peak Search** (or **Search**)
  - Marker, Delta**
  - Peak Search** (or **Search**)
  - Next Peak**

The two markers should be on the signals near the second and tenth vertical graticule lines (the first graticule line is the left-most).

7. If necessary, continue pressing **Next Peak** until the active marker is on the right-most signal (1350 MHz).
8. Record the marker delta ( $\Delta \text{Mkr1}$ ) frequency reading as Test Record entry 1 of the performance verification test record.

### 100 kHz and 100 MHz Frequency Span Readout Accuracy

1. Set the analyzer by pressing the following keys:
  - FREQUENCY, Start Freq, 10 MHz**
  - Stop Freq, 110 MHz**
  - Sweep, Sweep (Cont)**
2. On the synthesized sweeper set the controls as follows:
  - CW, 100 MHz**

## 5. Frequency Span Accuracy: Agilent E7401A

**POWER LEVEL, –5 dBm**

- Set the synthesized signal generator controls as follows:

**FREQUENCY, 20 MHz****AMPLITUDE, 0 dBm**

- Adjust the analyzer center frequency to center the two signals on the display.
- On the analyzer, press **Single**. Wait for the completion of a new sweep, then press the following keys:

**Peak Search** (or **Search**)**Marker, Delta****Peak Search** (or **Search**)**Next Peak**

The two markers should be on the signals near the second and tenth vertical graticule lines (the first graticule line is the left-most).

- If necessary, continue pressing **Next Peak** until the active marker is on the right-most signal (100 MHz). Record the marker delta ( $\Delta \text{Mkr}1$ ) frequency reading in the performance test record as Test Record entry 2.
  - Press **Marker, More, Marker All Off** on the analyzer.
  - Change to the next equipment settings listed in [Table 2-8](#).
  - On the analyzer, press **Single**. Wait for the completion of a newsweep, then press the following keys:
- Peak Search** (or **Search**)  
**Marker, Delta**  
**Peak Search** (or **Search**)  
**Next Peak**
- If necessary, continue pressing **Next Peak** until the marker delta is on the right-most signal. Record the marker delta ( $\Delta \text{Mkr}1$ ) frequency reading in the performance test record.
  - Repeat [step 7](#) through [step 10](#) for the remaining analyzer span settings listed in [Table 2-8](#).

**Table 2-8**                      **Frequency Span Readout Accuracy**

| <b>Analyzer<br/>Start<br/>Frequency<br/><br/>(MHz)</b> | <b>Analyzer<br/>Stop<br/>Frequency<br/><br/>(MHz)</b> | <b>Synthesized<br/>Signal<br/>Generator<br/>Frequency<br/>(MHz)</b> | <b>Synthesized<br/>Sweeper<br/>Frequency<br/>(MHz)</b> | <b>Test<br/>Record<br/>Entry</b> | <b>Analyzer<br/>Span<br/><br/>(MHz)</b> |
|--|---|---|--|----------------------------------|---|
| 0  | 1500  | 150   | 1350   | 1)                               | 1500                                    |
| 10   | 110   | 20  | 100  | 2)                               | 100                                     |
| 10   | 10.1  | 10.01   | 10.09  | 3)                               | 0.1                                     |

**Table 2-8                      Frequency Span Readout Accuracy**

| <b>Analyzer<br/>Start<br/>Frequency<br/><br/>(MHz)</b> | <b>Analyzer<br/>Stop<br/>Frequency<br/><br/>(MHz)</b> | <b>Synthesized<br/>Signal<br/>Generator<br/>Frequency<br/>(MHz)</b> | <b>Synthesized<br/>Sweeper<br/>Frequency<br/><br/>(MHz)</b> | <b>Test<br/>Record<br/>Entry</b> | <b>Analyzer<br/>Span<br/><br/>(MHz)</b> |
|--|---|---|---|----------------------------------|---|
| 800  | 900   | 810   | 890   | 4)                               | 100                                     |
| 800  | 800.1   | 800.01  | 800.09  | 5)                               | 0.1                                     |
| 1400   | 1500  | 1410  | 1490  | 6)                               | 100                                     |
| 1499   | 1499.1  | 1499.01   | 1499.09   | 7)                               | 0.1                                     |

---

## 6. Frequency Span Accuracy: Agilent E7402A, E7403A, E7404A, and E7405A

For testing each frequency span, two synthesized sources are used to provide two precisely-spaced signals. The analyzer marker functions are used to measure this frequency difference.

There are no related adjustment procedures for this performance test.

### Equipment Required

- Synthesized sweeper
- Synthesized signal generator
- Power splitter
- Adapter, Type-N (m) to Type-N (m)
- Adapter, Type-N (f) to APC 3.5 (f)
- Cable, Type-N, 152-cm (60-in) (*2 required*)
- Cable, BNC, 122-cm (48-in)

### Additional Equipment for Option BAB

- Adapter, Type-N (m), to APC 3.5 (f)

### Procedure

#### Full Span Frequency Span Readout Accuracy

1. Connect the equipment as shown in [Figure 2-6](#). Note that the power splitter is used as a combiner. The synthesized signal generator provides the frequency reference for the synthesized sweeper.
2. Press **Preset** on the analyzer. Press the **Factory Preset** softkey, if it is displayed. Set the analyzer by pressing the following keys:

**FREQUENCY, Stop Freq, 3 GHz**

3. Press **PRESET** on the synthesized sweeper and set the controls as follows:

**CW, 2700 MHz**

**POWER LEVEL, -5 dBm**

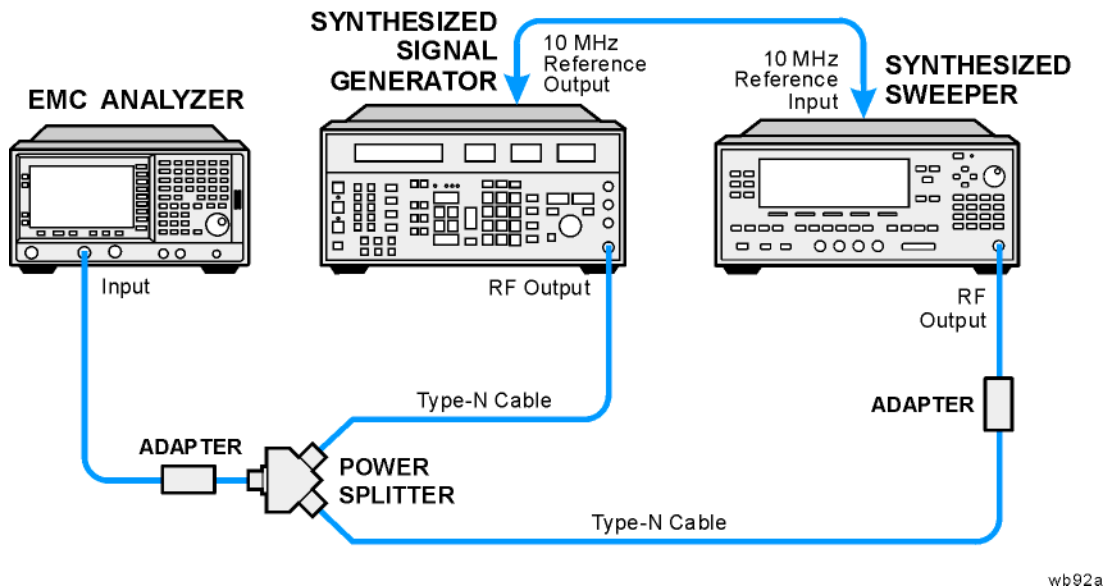
4. On the synthesized signal generator, set the controls as follows:

**FREQUENCY, 300 MHz**

**AMPLITUDE, 0 dBm**

## 6. Frequency Span Accuracy: Agilent E7402A, E7403A, E7404A, and E7405A

Figure 2-6 Frequency Span Readout Accuracy Test Setup



5. Adjust the analyzer center frequency, if necessary, to place the lower frequency on the second vertical graticule line (one division from the left-most graticule line).
6. On the analyzer, press **Single**. Wait for the completion of a new sweep, then press the following keys:
  - Peak Search** (or **Search**)
  - Marker, Delta**
  - Peak Search** (or **Search**)
  - Next Peak**

**NOTE**

The two markers should be on the signals near the second and tenth vertical graticule lines (the first graticule line is the left-most).

7. If necessary, continue pressing **Next Peak** until the active marker is on the right-most signal (2700 MHz).
8. Record the marker delta ( $\Delta \text{Mkr1}$ ) frequency reading as Test Record entry 1 of the performance verification test record.

**100 kHz and 100 MHz Frequency Span Readout Accuracy**

1. Set the analyzer by pressing the following keys:

**FREQUENCY, Start Freq, 10 MHz**  
**Stop Freq, 110 MHz**  
**Sweep, Sweep** (Cont)

2. On the synthesized sweeper set the controls as follows:

**CW, 100 MHz**

**6. Frequency Span Accuracy: Agilent E7402A, E7403A, E7404A, and E7405A****POWER LEVEL, –5 dBm**

- Set the synthesized signal generator controls as follows:

**FREQUENCY, 20 MHz****AMPLITUDE, 0 dBm**

- Adjust the analyzer center frequency to center the two signals on the display.
- On the analyzer, press **Single**. Wait for the completion of a new sweep, then press the following keys:

**Peak Search (or Search)****Marker, Delta****Peak Search (or Search)****Next Peak**

The two markers should be on the signals near the second and tenth vertical graticule lines (the first graticule line is the left-most).

- If necessary, continue pressing **Next Peak** until the active marker is on the right-most signal (100 MHz). Record the marker delta ( $\Delta \text{Mkr}1$ ) frequency reading in the performance test record as Test Record entry 2.
  - Press **Marker, More, Marker Off** on the analyzer.
  - Change to the next equipment settings listed in [Table 2-9](#).
  - On the analyzer, press **Single**. Wait for the completion of a new sweep, then press the following keys:
- Peak Search (or Search)**  
**Marker, Delta**  
**Peak Search (or Search)**  
**Next Peak**
- If necessary, continue pressing **Next Peak** until the marker delta is on the right-most signal. Record the marker delta ( $\Delta \text{Mkr}1$ ) frequency reading in the performance test record.
  - Repeat [step 7](#) through [step 10](#) for the remaining analyzer span settings listed in [Table 2-9](#).

**Table 2-9 Frequency Span Readout Accuracy**

| <b>Analyzer Start Frequency<br/>(MHz)</b> | <b>Analyzer Stop Frequency<br/>(MHz)</b> | <b>Synthesized Signal Generator Frequency<br/>(MHz)</b> | <b>Synthesized Sweeper Frequency<br/>(MHz)</b> | <b>Test Record Entry</b> | <b>Analyzer Span<br/>(MHz)</b> |
|---|--|---|--|--------------------------|--------------------------------|
| 0   | 3000                                     | 300   | 2700   | 1)                       | 3000                           |



**6. Frequency Span Accuracy: Agilent E7402A, E7403A, E7404A, and E7405A****Table 2-9                      Frequency Span Readout Accuracy**

| <b>Analyzer<br/>Start<br/>Frequency<br/><br/>(MHz)</b> | <b>Analyzer Stop<br/>Frequency<br/><br/>(MHz)</b> | <b>Synthesized<br/>Signal<br/>Generator<br/>Frequency<br/>(MHz)</b> | <b>Synthesized<br/>Sweeper<br/>Frequency<br/><br/>(MHz)</b> | <b>Test<br/>Record<br/>Entry</b> | <b>Analyzer<br/>Span<br/><br/>(MHz)</b> |
|--|---|---|---|----------------------------------|---|
| 10   | 110   | 20  | 100   | 2)                               | 100                                     |
| 10   | 10.1  | 10.01   | 10.09   | 3)                               | 0.1                                     |
| 800  | 900   | 810   | 890   | 4)                               | 100                                     |
| 800  | 800.1   | 800.01  | 800.09  | 5)                               | 0.1                                     |
| 1400   | 1500  | 1410  | 1490  | 6)                               | 100                                     |
| 1499   | 1499.1  | 1499.01   | 1499.09   | 7)                               | 0.1                                     |

## 7. Noise Sidebands

A 1 GHz CW signal is applied to the input of the analyzer. The marker functions are used to measure the amplitude of the carrier and the noise level at 10 kHz, 20 kHz, and 30 kHz above and below the carrier. The 100 kHz offset from the carrier is also tested on Agilent E7401A analyzers. For all other analyzers, the 100 kHz offset from the carrier is tested in performance test [8. Noise Sidebands - Wide Offsets: Agilent E7402A, E7403A, E7404A, and E7405A](#).

There are no related adjustment procedures for this performance test.

### Equipment Required

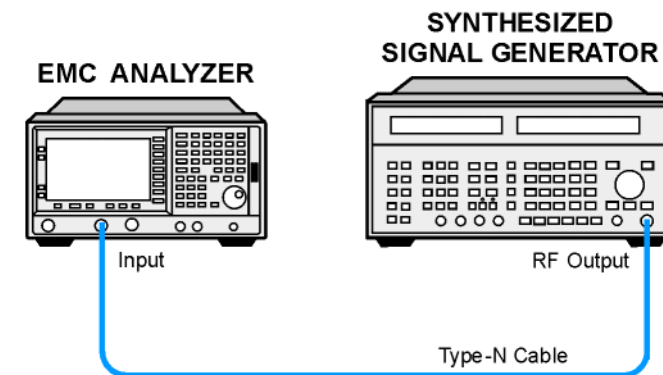
Synthesized signal generator  
Cable, Type-N, 152-cm (60-in)

### Additional Equipment for Option BAB

Adapter, Type-N (f), to APC 3.5 (f)

Figure 2-7

Noise Sidebands Test Setup



wb93a

### Procedure

This performance test consists of four parts:

- Part 1: Noise Sideband Suppression at 10 kHz
- Part 2: Noise Sideband Suppression at 20 kHz
- Part 3: Noise Sideband Suppression at 30 kHz
- Part 4: Noise Sideband Suppression at 100 kHz (Agilent E7401A only)

Perform part 1 before performing parts 2 through 4 of this procedure. Part 4 applies only to Agilent E7401A analyzers.

A worksheet is provided at the end of this procedure for calculating the noise sideband suppression.

### Part 1: Noise Sideband Suppression at 10 kHz

1. Perform the following steps to set up the equipment:

Set the synthesized signal generator controls as follows:

**FREQUENCY, 1000 MHz**  
**AMPLITUDE, 0 dBm**  
**AM OFF**  
**FM OFF**

2. Connect the equipment as shown in [Figure 2-7](#).
3. Press **Preset** on the analyzer. Press the **Factory Preset** softkey, if it is displayed. Set the analyzer by pressing the following keys:

**FREQUENCY, Center Freq, 1 GHz**  
**SPAN, 10 MHz**  
**AMPLITUDE, Attenuation 10 dB (Man)**  
**AMPLITUDE, More, Y Axis Units (or Amptd Units), dBm**

4. Press the following analyzer keys to measure the carrier amplitude:

**Peak Search (or Search)**  
**FREQUENCY, Signal Track (On)**  
**SPAN, 50 kHz**  
**BW/Avg, 1 kHz**  
**Video BW, 30 Hz (Man)**  
**FREQUENCY, Signal Track (Off)**  
**Det/Demod, Detector, Sample**  
**Sweep, Sweep Time, 5 sec**  
**Single**

Wait for the completion of a sweep, then press **Peak Search** (or **Search**).

5. Press the following analyzer keys to measure the noise sideband level at 10 kHz:

**Marker, Delta**  
**More, Function, Marker Noise (or Noise)**  
**AMPLITUDE, -10 dBm**  
**FREQUENCY, CF Step, 10 kHz**  
**Center Freq, ↑**  
**SPAN, Zero Span**  
**Single**

Record the marker amplitude noise reading in [Table 2-10](#) as the Upper Sideband Noise Level at 10 kHz.

6. Press the following analyzer keys to measure the noise sideband level at -10 kHz:

## 7. Noise Sidebands

**FREQUENCY, Center Freq, ↓, ↓**  
**Single**

Record the marker amplitude noise reading in [Table 2-10](#) as the Lower Sideband Noise Level at –10 kHz.

7. Press **FREQUENCY, Center Freq, ↑**

### Part 2: Noise Sideband Suppression at 20 kHz

1. Press the following analyzer keys to measure the noise sideband level at 20 kHz:

**FREQUENCY, CF Step, 20 kHz**  
**Center Freq, ↑**  
**Single**

Record the marker amplitude noise reading in [Table 2-10](#) as the Upper Sideband Noise Level at 20 kHz.

2. Press the following analyzer keys to measure the noise sideband level at –20 kHz:

**FREQUENCY, Center Freq, ↓, ↓**  
**Single**

Record the marker amplitude noise reading in [Table 2-10](#) as the Lower Sideband Noise Level at –20 kHz.

3. Press ↑.

### Part 3: Noise Sideband Suppression at 30 kHz

1. Press the following analyzer keys to measure the noise sideband level at 30 kHz:

**FREQUENCY, CF Step, 30 kHz**  
**Center Freq, ↑**  
**Single**

Record the marker amplitude noise reading in [Table 2-10](#) as the Upper Sideband Noise Level at 30 kHz.

2. Press the following analyzer keys to measure the noise sideband level at –30 kHz:

**FREQUENCY, Center Freq, ↓, ↓**  
**Single**

Record the marker amplitude noise reading in [Table 2-10](#) as the Lower Sideband Noise Level at –30 kHz.

3. Press ↑.

4. If the analyzer is an Agilent E7401A, continue with [Part 4: Noise Sideband Suppression at 100 kHz \(Agilent E7401A only\)](#). Otherwise, continue with the next step.
5. In [Table 2-10](#), record the more positive values (either Upper Noise Sideband Level, or Lower Noise Sideband Level) at the three offset frequencies and record them in the table as the Worst-Case offsets. Record these Worst-Case offset values in the performance verification test record in locations 1, 2 and 3 respectively.
6. This completes the Noise Sidebands test for the Agilent E7402A, E7403A, E7404A, and E7405A analyzers.

#### Part 4: Noise Sideband Suppression at 100 kHz (Agilent E7401A only)

1. Press the following analyzer keys to measure the noise sideband level at 100 kHz:

**CF Step, 98 kHz**  
**Center Freq, ↑**  
**Single**

2. Press **Peak Search** (or **Search**) and record the marker amplitude noise reading in [Table 2-10](#) as the Upper Sideband Noise Level at 100 kHz.

---

#### NOTE

A spur may exist at 100 kHz offset from the carrier. Measuring at  $\pm 98$  kHz offset from the carrier will yield a noise sideband level worse than the reading at  $\pm 100$  kHz offset.

---

3. Press the following analyzer keys to measure the noise sideband level at  $-100$  kHz:

**FREQUENCY, Center Freq, ↓, ↓**  
**Single**

4. Press **Peak Search** (or **Search**) and record the marker amplitude noise reading in [Table 2-10](#) as the Lower Sideband Noise Level at  $-100$  kHz.
5. In [Table 2-10](#), record the more positive values (either Upper Noise Sideband Level, or Lower Noise Sideband Level) at the four offset frequencies and record them in the table as the Worst-Case offsets. Record these Worst-Case offset values in the performance verification test record in locations 1, 2, 3 and 4 respectively.
6. This completes the Noise Sidebands test for the Agilent E7401A analyzer.

**7. Noise Sidebands****Table 2-10****Noise Sidebands Worksheet**

| <b>Offset<br/>(kHz)</b> | <b>Noise Sideband Amplitude</b> |                           |                           |                              |
|-------------------------|---------------------------------|---------------------------|---------------------------|------------------------------|
|                         | <b>Upper<br/>(dBc/Hz)</b>       | <b>Lower<br/>(dBc/Hz)</b> | <b>Worst<br/>(dBc/Hz)</b> | <b>Test Record<br/>Entry</b> |
| 10 kHz                  |                                 |                           |                           | <b>1)</b>                    |
| 20 kHz                  |                                 |                           |                           | <b>2)</b>                    |
| 30 kHz                  |                                 |                           |                           | <b>3)</b>                    |
| 100 kHz <sup>a</sup>    |                                 |                           |                           | <b>4)</b>                    |

- a. This offset frequency is tested on Agilent E7402A, E7403A, E7404A, and E7405A analyzers as part of performance test 8.  
[Noise Sidebands - Wide Offsets: Agilent E7402A, E7403A, E7404A, and E7405A.](#)

---

## 8. Noise Sidebands - Wide Offsets: Agilent E7402A, E7403A, E7404A, and E7405A

A 1 GHz CW signal is applied to the input of the analyzer. The marker functions are used to measure the amplitude of the carrier and the noise level at 100 kHz, 1 MHz, 5 MHz, and 10 MHz above and below the carrier.

There are no related adjustment procedures for this performance test.

### Equipment Required

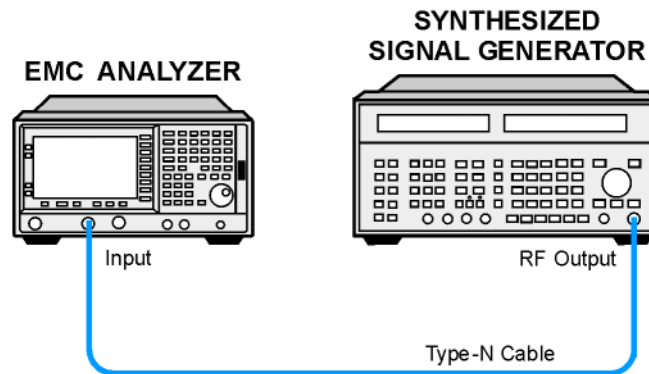
Wide offset phase noise signal generator  
Cable, Type-N, 152-cm (60-in)

### Additional Equipment for Option BAB

Adapter, Type-N (f), to APC 3.5 (f)

**Figure 2-8**

**Noise Sidebands Test Setup**



wb93a

### Procedure

This performance test consists of four parts:

- Part 1: Noise Sideband Suppression at 100 kHz
- Part 2: Noise Sideband Suppression at 1 MHz
- Part 3: Noise Sideband Suppression at 5 MHz
- Part 4: Noise Sideband Suppression at 10 MHz

Perform part 1 before performing parts 2-4 of this procedure.

A worksheet is provided at the end of this procedure for calculating the noise sideband suppression.

## 8. Noise Sidebands - Wide Offsets: Agilent E7402A, E7403A, E7404A, and E7405A

### Part 1: Noise Sideband Suppression at 100 kHz

1. Perform the following steps to set up the equipment:

Set the synthesized signal generator controls as follows:

**FREQUENCY, 1 GHz**  
**AMPLITUDE, 0 dBm**  
**AM OFF**  
**FM OFF**

2. Connect the equipment as shown in [Figure 2-8](#).
3. Press **Preset** on the analyzer. Press the **Factory Preset** softkey, if it is displayed. Press the following keys on the analyzer:

**FREQUENCY, Center Freq, 1 GHz**  
**SPAN, 1 MHz**

4. Press the following analyzer keys to measure the carrier amplitude:

**Peak Search** (or **Search**)  
**FREQUENCY, Signal Track** (On)  
**SPAN, 10 kHz**  
**FREQUENCY, Signal Track** (Off)  
**Det/Demod, Detector, Sample**  
**BW/Avg, 1 kHz**

5. Adjust the signal generator **AMPLITUDE** to place the signal peak within 0.5 dB of the reference level on the analyzer. Press **Single** and then press **Peak Search** (or **Search**).

6. Press the following analyzer keys:

**Marker, Delta**  
**More, Function, Marker Noise** (or **Noise**)  
**AMPLITUDE, More, Y Axis Units** (or **Amptd Units**), **dBm**  
**AMPLITUDE, -40 dBm**  
**SPAN, Zero Span**

7. Press **BW/Avg, Average On 10, Enter** to set the analyzer to video average 10 sweeps.

8. Press the following analyzer keys to measure the noise sideband level at 100 kHz:

**FREQUENCY, CF Step, 99.8 kHz**  
**Center Freq, ↑**  
**Single**

Wait for the analyzer to average ten sweeps.

9. Press **Peak Search** (or **Search**) and record the marker amplitude noise reading in [Table 2-11](#) as the Upper Sideband Noise Level at 100 kHz.

---

#### NOTE

A spur may exist at 100 kHz offset from the carrier. Measuring at  $\pm 98$  kHz offset



## 8. Noise Sidebands - Wide Offsets: Agilent E7402A, E7403A, E7404A, and E7405A

from the carrier will yield a noise sideband level worse than the reading at  $\pm 100$  kHz offset.

Press the following analyzer keys to measure the noise sideband level at  $-100$  kHz:

**FREQUENCY, Center Freq, ↓, ↓**  
**Single**

Wait for the analyzer to average ten sweeps.

10. Press **Peak Search** (or **Search**) and record the marker amplitude noise reading in [Table 2-11](#) as the Lower Sideband Noise Level at  $-100$  kHz.
11. Press **↑**.

### Part 2: Noise Sideband Suppression at 1 MHz

1. Press the following analyzer keys to measure the noise sideband level at 1 MHz:

**FREQUENCY, CF Step, 980 kHz**  
**Center Freq, ↑**  
**Single**

Wait for the analyzer to average ten sweeps.

2. Press **Peak Search** (or **Search**) and record the marker amplitude noise reading in [Table 2-11](#) as the Upper Sideband Noise Level at 1 MHz.

#### NOTE

A spur may exist at 1 MHz offset from the carrier. Measuring at  $\pm 980$  kHz offset from the carrier will yield a noise sideband level worse than the reading at  $\pm 1$  MHz offset.

Press the following analyzer keys to measure the noise sideband level at  $-1$  MHz:

**FREQUENCY, Center Freq, ↓, ↓**  
**Single**

Wait for the analyzer to average ten sweeps.

3. Press **Peak Search** (or **Search**) and record the marker amplitude noise reading in [Table 2-11](#) as the Lower Sideband Noise Level at  $-1$  MHz.
4. Press **↑**.

### Part 3: Noise Sideband Suppression at 5 MHz

1. Press the following analyzer keys to measure the noise sideband level at 5 MHz:

**8. Noise Sidebands - Wide Offsets: Agilent E7402A, E7403A, E7404A, and E7405A**

**FREQUENCY, CF Step, 5 MHz**  
**Center Freq, ↑**  
**Single**

Wait for the analyzer to average ten sweeps.

2. Press **Peak Search** (or **Search**) and record the marker amplitude noise reading in [Table 2-11](#) as the Upper Sideband Noise Level at 5 MHz.
3. Press the following analyzer keys to measure the noise sideband level at –5 MHz:

**FREQUENCY, Center Freq, ↓, ↓**  
**Single**

Wait for the analyzer to average ten sweeps.

4. Press **Peak Search** (or **Search**) and record the marker amplitude noise reading in [Table 2-11](#) as the Lower Sideband Noise Level at –5 MHz.
5. Press ↑.

**Part 4: Noise Sideband Suppression at 10 MHz**

1. Press the following analyzer keys to measure the noise sideband level at 10 MHz:

**FREQUENCY, CF Step, 9.99 MHz**  
**Center Freq, ↑**  
**Single**

Wait for the analyzer to average ten sweeps.

2. Press **Peak Search** (or **Search**) and record the marker amplitude noise reading in [Table 2-11](#) as the Upper Sideband Noise Level at 10 MHz.

---

**NOTE**

A spur may exist at 10 MHz offset from the carrier. Measuring at  $\pm 9.99$  MHz offset from the carrier will yield a noise sideband level worse than the reading at  $\pm 10$  MHz offset.

Press the following analyzer keys to measure the noise sideband level at –10 MHz:

**FREQUENCY, Center Freq, ↓, ↓**  
**Single**

Wait for the analyzer to average ten sweeps.

3. Press **Peak Search** (or **Search**) and record the marker amplitude noise reading in [Table 2-11](#) as the Lower Sideband Noise Level at –10 MHz.
4. In [Table 2-11](#), record the more positive values (either Upper Noise Sideband Level, or Lower Noise Sideband Level) at the four offset frequencies and record them in the table as the Worst-Case offsets. Record these Worst-Case

## 8. Noise Sidebands - Wide Offsets: Agilent E7402A, E7403A, E7404A, and E7405A

offset values in the performance verification test record in locations 1, 2, 3 and 4 respectively.

**Table 2-11**

**Noise Sidebands Worksheet**

| Offset<br>(kHz) | Noise Sideband Amplitude |                   |                   |                      |
|-----------------|--------------------------|-------------------|-------------------|----------------------|
|                 | Upper<br>(dBc/Hz)        | Lower<br>(dBc/Hz) | Worst<br>(dBc/Hz) | Test Record<br>Entry |
| 100 kHz         |                          |                   |                   | 1)                   |
| 1 MHz           |                          |                   |                   | 2)                   |
| 5 MHz           |                          |                   |                   | 3)                   |
| 10 MHz          |                          |                   |                   | 4)                   |

## 9. System-Related Sidebands

A 500 MHz CW signal is applied to the input of the analyzer. The marker functions are used to measure the amplitude of the carrier and the amplitude of any system-related sidebands more than 30 kHz away from the carrier. System-related sidebands are any internally generated sidebands related to the line, power supply or local oscillator.

There are no related adjustment procedures for this performance test.

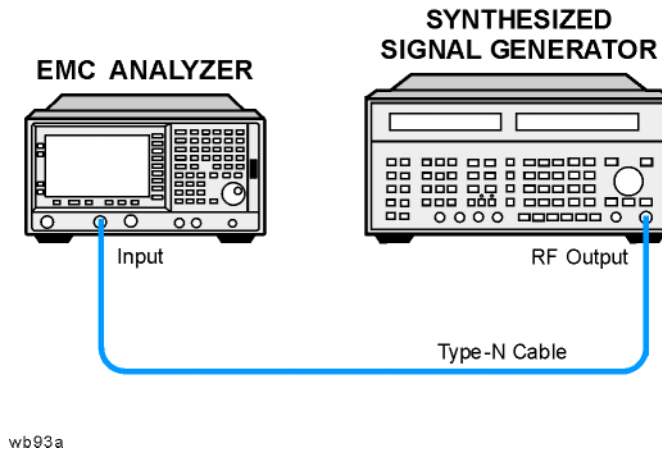
### Equipment Required

Synthesized signal generator  
Cable, Type-N, 152-cm (60-in)

### Additional Equipment for Option BAB

Adapter, Type-N (f), to APC 3.5 (f)

**Figure 2-9** System-related Sidebands Test Setup



### Procedure

1. Perform the following steps to set up the equipment:
  - a. Set the synthesized signal generator controls as follows:

**FREQUENCY, 500 MHz**  
**AMPLITUDE, 0 dBm**  
**AM Off**  
**FM Off**
  - b. Connect the equipment as shown in [Figure 2-9](#).
  - c. Press **Preset** on the analyzer. Press the **Factory Preset** softkey, if it is

displayed. Set the analyzer by pressing the following keys:

**FREQUENCY, Center Freq, 500 MHz**  
**SPAN, 10 MHz**

2. Set the analyzer to measure the system-related sideband above the signal by performing the following steps:
  - a. Press the following keys:

**Peak Search** (or **Search**)  
**FREQUENCY, Signal Track** (On)  
**SPAN, 200 kHz**  
**BW/Avg, 1 kHz**  
**Video BW, 30 Hz** (Man)

Allow the analyzer to take two complete sweeps. Then press the following keys:

**FREQUENCY, Signal Track** (Off)  
**CF Step, 130 kHz** (Man)

- b. Press **Single** and wait for the completion of the sweep. Press **Peak Search** (or **Search**), then **Marker, Delta**.
  - c. Press the following keys:

**FREQUENCY, Center Freq**  
↑(step-up key)

3. Measure the system-related sideband above the signal by pressing **Single** on the analyzer. Wait for the completion of a new sweep, then press **Peak Search** (or **Search**).
4. Record the marker delta amplitude as Test Record entry 1 of the performance verification test record.
5. Set the analyzer to measure the system-related sideband below the signal by pressing the following keys:

**FREQUENCY, Center Freq**  
↓ (step-down key)  
↓ (step-down key)

6. Measure the system-related sideband below the signal by pressing **Single**. Wait for the completion of a new sweep, then press **Peak Search** (or **Search**).

Record the marker delta amplitude as Test Record entry 2 of the performance verification test record.

## 10. Residual FM

This test measures the inherent short-term instability of the analyzer LO system. With the analyzer in zero span, a stable signal is applied to the input and slope detected on the linear portion of the IF bandwidth filter skirt. Any instability in the LO transfers to the IF signal in the mixing process. The test determines the slope of the IF filter in Hz/dB and then measures the signal amplitude variation caused by the residual FM. Multiplying these two values yields the residual FM in Hz.

Since the 10 Hz resolution bandwidth filter is digitally implemented, its slope is well known. The measured amplitude variation is simply multiplied by the known slope to yield the residual FM in a 10 Hz resolution bandwidth.

There are no related adjustment procedures for this performance test.

### Equipment Required

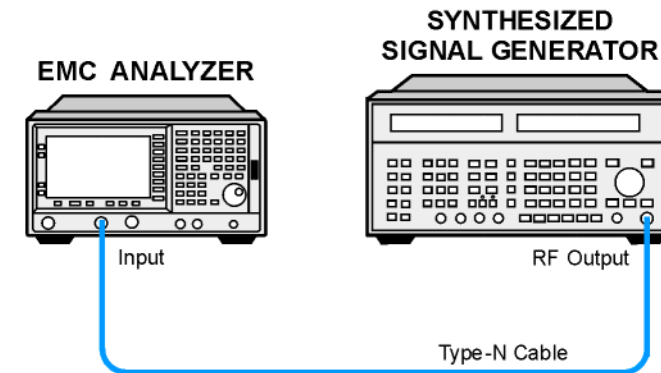
Synthesized signal generator  
Cable, Type-N, 152-cm (60-in)

### Additional Equipment for Option BAB

Adapter, Type-N (f), to APC 3.5 (f)

Figure 2-10

Residual FM Test Setup



wb93a

### Procedure

This performance test consists of two parts:

“Part 1: Residual FM”

“Part 2: Residual FM for Option 1D5”

Perform “Part 2: Residual FM for Option 1D5” in addition to Part 1, only if your

analyzer is equipped with Option 1D5.

## **Part 1: Residual FM**

### **Determining the IF Filter Slope**

1. Connect the equipment as shown in [Figure 2-10](#).
2. Set the synthesized signal generator controls as follows:

**FREQUENCY, 1000 MHz**  
**AMPLITUDE, -10 dBm**  
**AM OFF**  
**FM OFF**

3. Press **Preset** on the analyzer. Press the **Factory Preset** softkey, if it is displayed. Set the analyzer by pressing the following keys:

**FREQUENCY, Center Freq, 1 GHz**  
**SPAN, 1 MHz**  
**AMPLITUDE, Ref Level, 98 dB $\mu$ V**  
**Scale/Div, 2 dB**  
**BW/Avg, Res BW, 1 kHz**

4. On the analyzer, press the following keys:

**Peak Search (or Search)**  
**SPAN, Span Zoom, 5 kHz**

Wait for the Span 5kHz message to appear, then press:

**Peak Search (or Search), Marker →, Marker → Ref Lvl, Marker, Off**

5. On the analyzer, press the following keys:

**Single** (Wait for the sweep to finish)  
**Peak Search (or Search)**  
**Meas Tools, Delta**

6. On the analyzer, rotate knob counterclockwise until the marker delta ( $\Delta$  Mkr1) amplitude reads  $-8 \text{ dB} \pm 0.3 \text{ dB}$ .
7. Press **Delta**, then rotate the knob counterclockwise until the marker delta ( $\Delta$  Mkr1) reads  $-4 \text{ dB} \pm 0.3 \text{ dB}$ .

If you have difficulty achieving the  $\pm 0.3 \text{ dB}$  setting, then make the following analyzer settings:

**Sweep, Sweep (Cont)**  
**SPAN, 2 kHz**  
**BW/Avg, Video BW, 30 Hz (Man)**  
Repeat [step 5](#) through [step 7](#).

8. Divide the marker delta ( $\Delta$  Mkr1) frequency in Hertz by the marker delta ( $\Delta$  Mkr1) amplitude in dB to obtain the slope of the resolution bandwidth filter.

**10. Residual FM**

For example, if the marker delta ( $\Delta \text{Mkr1}$ ) frequency is 275 Hz and the marker delta ( $\Delta \text{Mkr1}$ ) amplitude is 3.92 dB, the slope would be equal to 70.15 Hz/dB. Record the result below:

Slope \_\_\_\_\_ Hz/ dB

**Measuring the Residual FM**

9. On the analyzer, press:

**Marker, Off**  
**Peak Search** (or **Search**)  
 Meas Tools  
 Delta

10. Rotate the knob counterclockwise until the marker delta ( $\Delta \text{Mkr1}$ ) amplitude reads  $-10 \text{ dB} \pm 0.3 \text{ dB}$ .

11. On the analyzer, press the following keys:

**Marker, Normal**  
**Marker** →, **Mkr** → **CF**  
**Single**  
**BW/Avg, Video BW (Man), 1 kHz**  
**SPAN, Zero Span**  
**Sweep, Sweep Time**  
**100 ms, Single**

The displayed trace should be about five divisions below the reference level. If it is not, press **Sweep, Sweep** (Cont), **FREQUENCY**, and use the knob to place the displayed trace about five divisions below the reference level. Press **Single**.

12. On the analyzer, press **Peak Search** (or **Search**), **Pk-Pk Search**. Read the marker delta ( $\Delta \text{Mkr1}$ ) amplitude, take its absolute value, and record the result as the Deviation.

Deviation \_\_\_\_\_ dB

13. Calculate the Residual FM by multiplying the Slope recorded in [step 8](#) by the Deviation recorded in [step 12](#).

Record this value as Test Record entry 1 (Residual FM, 1 kHz Res BW) in the performance verification test record.

**Part 2: Residual FM for Option 1D5**

Perform this additional procedure only if Option 1D5 is present. Perform “Part 1: Residual FM” before performing this procedure.

1. Press **Preset** on the analyzer. Press the **Factory Preset** softkey, if it is displayed. Set the analyzer by pressing the following keys:

**FREQUENCY, Center Freq, 1 GHz**  
**SPAN, 1 MHz**  
**AMPLITUDE, Ref Level, 98 dB $\mu$ V**



**Scale/Div, 2 dB**

2. On the analyzer press the following keys:

**Peak Search** (or **Search**)  
**SPAN, Span Zoom, 5 kHz**

Wait for the “Span 5 kHz” message to appear. Press the following keys:

**BW/Avg, Res BW, 10 Hz (Man)**  
**SPAN, 100 Hz**

3. On the analyzer, press the following keys:

**Peak Search** (or **Search**)  
**Marker →, Mkr → Ref Lvl**  
**Marker, Off**  
**Peak Search** (or **Search**)  
**Meas Tools**  
**Delta**

4. On the analyzer, rotate the knob counterclockwise until the marker delta ( $\Delta$  Mkr1) amplitude reads  $-10 \text{ dB} \pm 0.3 \text{ dB}$ .
5. On the analyzer, press the following keys:

**Marker, Normal**  
**Marker →, Mkr → CF**  
**Single**  
**BW/Avg, Video BW, 10 Hz (Man)**  
**SPAN, Zero Span**  
**Sweep, Sweep Time, 20 ms**  
**Single**

The displayed trace should be about five divisions below the reference level. If it is not, press **Sweep, Sweep (Cont), FREQUENCY, Center Freq**, and use the knob to place the displayed trace about five divisions below the reference level. Press **Single**.

6. On the analyzer, press **Peak Search** (or **Search**), **Pk-Pk Search**. Read the marker delta ( $\Delta$  Mkr1) amplitude, take its absolute value, and record the result as the Deviation.

Deviation \_\_\_\_\_ dB

7. Calculate the Residual FM by multiplying the deviation recorded in [step 6](#) by 0.426 Hz/dB. This is the slope of the 10 Hz Res BW filter at 10 dB below the peak of the filter.

Record this value as Test Record entry 2 (Residual FM (10 Hz RBW)) in the performance verification test record.

## 11. Sweep Time Accuracy

This test uses a function generator to amplitude-modulate a 500 MHz CW signal from another signal generator. The analyzer demodulates this signal in zero span to display the response in the time domain. The marker  $\Delta$  function on the analyzer is used to read out the sweep time accuracy.

If the analyzer is equipped with Option AYX, also perform “Fast Time Domain Amplitude Accuracy” in addition to this procedure.

There are no related adjustment procedures for this performance test.

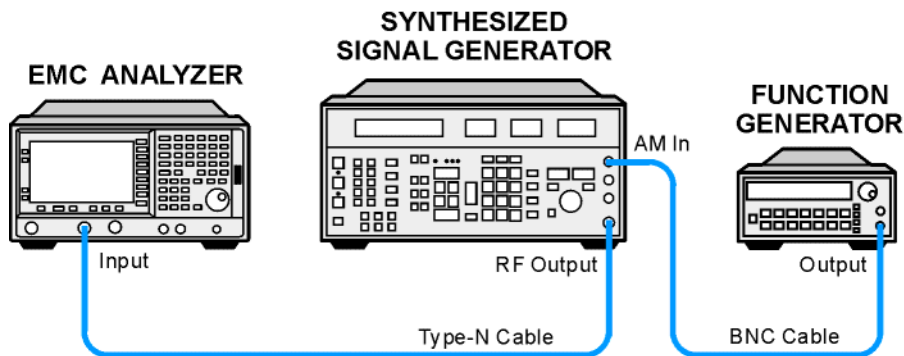
### Equipment Required

Function generator  
Synthesized signal generator  
Cable, Type-N, 152-cm (60-in)  
Cable, BNC, 120-cm (48-in)

### Additional Equipment for Option BAB

Adapter, Type-N (f), to APC 3.5 (f)

**Figure 2-11** Sweep Time Accuracy Test Setup



wb94a

### Procedure

1. Set the synthesized signal generator to output a 500 MHz, -10 dBm, CW signal. Set the AM and FM controls to off.
2. Set the function generator to output a 2 kHz, 1.14 Vp-p triangle waveform signal.

3. Connect the equipment as shown in [Figure 2-11](#).
4. Press **Preset** on the analyzer. Press the **Factory Preset** softkey, if it is displayed. Set the analyzer by pressing the following keys:

**FREQUENCY, Center Freq, 500 MHz**  
**SPAN, 10 MHz**  
**SPAN, Span Zoom, 50 kHz**

5. Wait for the Span 50 kHz message to appear. Set **Signal Track** (Off).
6. Set the span to 0 Hz and set the analyzer as follows:

**BW/Avg, Res BW, 3 MHz**  
**Sweep, Sweep Time, 5 ms**  
**AMPLITUDE, Scale Type (Lin)**  
**Peak Search (or Search)**  
**More, Search Parameters (or Search Criteria)**  
**Peak Excursion, 3 dB**

Adjust the synthesized signal generator amplitude as necessary for a mid-screen display (marker amplitude should read approximately 100.8 dBμV).

7. Set the synthesized signal generator modulation source to EXT DC. Set AM ON at 90% modulation.
8. On the analyzer, press **Trig** then **Video**. Set the video trigger level to 100.8 dBμV (mid-screen).
9. On the analyzer, press **Single**. After the completion of the sweep, press **Peak Search** (or **Search**), **0, s, Meas Tools, Next Pk Right**. This is the marked signal.
10. Press **Marker, Delta**, then **Peak Search** (or **Search**) and press **Next Pk Right** eight times so the delta marker is on the eighth signal peak from the marked signal.
11. Read the marker delta ( $\Delta \text{Mkr1}$ ) time. Calculate the sweeptime accuracy as follows:

$$\text{Sweep Time Accuracy} = 100 \times \frac{\Delta \text{Mkr1} - (0.8 \times \text{Sweep Time})}{\text{Sweep Time}}$$

#### NOTE

The sweep time accuracy is defined as a percentage of the indicated sweep time, not of the indicated signal separation. Therefore, it is appropriate to divide the difference between the marker delta ( $\Delta \text{Mkr1}$ ) reading and the nominal signal separation by the sweep time, rather than dividing by the nominal signal separation.

12. Record the calculated sweeptime accuracy in [Table 2-12](#).
13. If the analyzer is not equipped with Option AXX, fast time domain sweeps, repeat [step 9](#) through [step 12](#) only for sweeptime settings between 5 ms and 10

**11. Sweep Time Accuracy**

s as indicated in [Table 2-12](#). For each sweep time setting, set the function generator to the frequency indicated in [Table 2-12](#).

14. If the analyzer is equipped with Option AXX, fast time domain sweeps, repeat [step 9](#) through [step 12](#) for all sweep time settings as indicated in [Table 2-12](#). For each sweep time setting, set the function generator to the frequency indicated in [Table 2-12](#).

**Table 2-12**                      **Sweep Time Accuracy**

| Analyzer Sweep Time Setting   | Synthesizer Function Generator Frequency | Marker Delta ( $\Delta$ Mkr1) Reading | Sweep Time Accuracy (%) | Test Record Entry |
|---|--|---------------------------------------|-------------------------|-------------------|
| 5 ms  | 2.0 kHz                                  |                                       |                         | 1)                |
| 20 ms   | 500.0 Hz                                 |                                       |                         | 2)                |
| 100 ms  | 100.0 Hz                                 |                                       |                         | 3)                |
| 1 s   | 10.0 Hz                                  |                                       |                         | 4)                |
| 10 s  | 1.0 Hz                                   |                                       |                         | 5)                |
| The following entries only apply to analyzers equipped with Option AXX. |  |                                       |                         |                   |
| 1 ms  | 10.0 kHz                                 |                                       |                         | 6)                |
| 500 $\mu$ s   | 20.0 kHz                                 |                                       |                         | 7)                |
| 100 $\mu$ s   | 100.0 kHz                                |                                       |                         | 8)                |

## 12. Display Scale Fidelity

A 50 MHz CW signal is applied to the input of the analyzer through two calibrated step attenuators. The attenuators are the amplitude reference standard. The source is adjusted for a response at the reference level. The attenuators are then set to achieve a nominal amplitude below the reference level. The analyzer amplitude marker is compared to the actual total attenuation to determine the scale fidelity error.

The test is performed in both log and linear amplitude scales.

The related adjustment for this performance test is “IF Amplitude.”

### Equipment Required

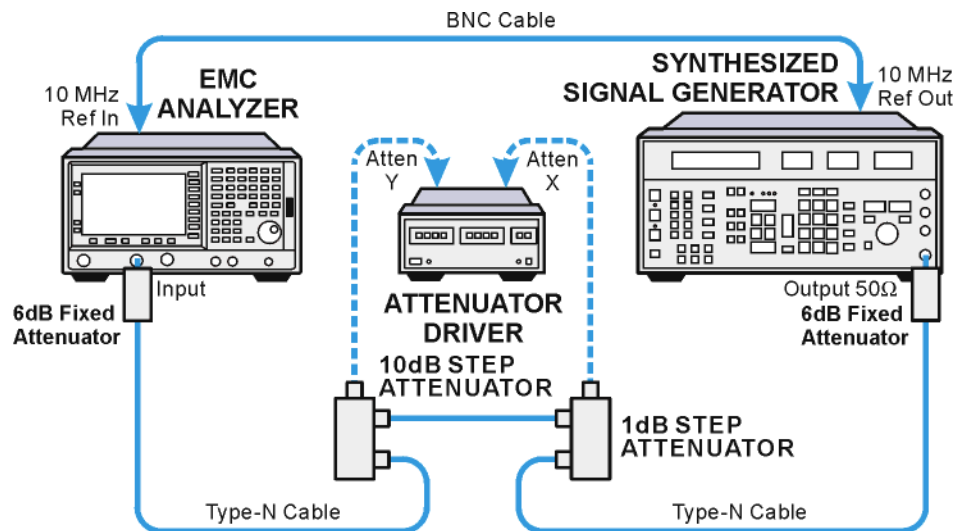
- Synthesized signal generator
- 1 dB step attenuator
- 10 dB step attenuator
- 6 dB fixed attenuator (2 *required*)
- Attenuator switch driver (if programmable step attenuators are used)
- Cable, Type-N 152-cm (60-in) (2 *required*)
- Cable, BNC 122-cm (48-in)
- Attenuator interconnect kit

### Additional Equipment for Option BAB

- Adapter, Type-N (f), to APC 3.5 (f)

Figure 2-12

Scale Fidelity Test Setup



wb95a

## Procedure

### Calculate the Actual Attenuation Errors

1. From the calibration data supplied with the 10 dB step attenuator, enter into Column 4 of [Table 2-13](#) through [Table 2-17](#) the actual attenuation for the corresponding nominal attenuation settings.

If the calibration data does not indicate an actual attenuation value for the 0 dB setting, enter 0 dB.

---

**NOTE**

The Agilent 8496G programmable attenuator has four attenuator sections consisting of 10 dB, 20 dB, and 40 dB attenuators. If using the Agilent 8496G programmable attenuator, enter the calibration data for the section three, 40 dB step, rather than the section four, 40 dB step.

---

2. From the calibration data supplied with the 1 dB step attenuator, enter into Column 5 of [Table 2-13](#) through [Table 2-17](#) the actual attenuation for the corresponding nominal attenuation settings.

If the calibration data does not indicate an actual attenuation value for the 0 dB setting, enter 0 dB.

---

**NOTE**

The Agilent 8494G programmable attenuator has four attenuator sections consisting of 1 dB, 2 dB, 4 dB, and 4 dB attenuators. If using the Agilent 8494G programmable attenuator, enter the calibration data for the section three, 4 dB step, rather than the section four, 4 dB step.

---

3. For each row in [Table 2-13](#) and [Table 2-14](#), add the 10 dB and the 1 dB Step Attenuator Actual Attenuation values (Columns 4 and 5) and place the results into the Total Actual Attenuation (Column 6).

$$\text{Total Actual Attenuation} = 1 \text{ dB Step Attenuator Actual Attenuation} + 10 \text{ dB Step Attenuator Actual Attenuation}$$

Example for -36 dB from REF LVL setting:

$$1 \text{ dB Step Attenuator Actual Attenuation (6 dB)} = 5.998 \text{ dB}$$

$$10\text{dB Step Attenuator Actual Attenuation (30 dB)} = 30.012 \text{ dB}$$

$$\text{Total Actual Attenuation} = 5.998\text{dB} + 30.012 \text{ dB} = 36.010 \text{ dB}$$

4. Enter the total actual attenuation (0 dB from the reference level) below:

Total actual attenuation (0 dB from Ref Level) = \_\_\_\_\_ dB

## Part 1: Log Display Scale Fidelity, Analog Bandwidths

### Setup for Log Scale Measurement

1. Connect the equipment as indicated in [Figure 2-12](#).
2. Press **Preset** on the analyzer. Press the **Factory Preset** softkey, if it is displayed. Set the analyzer by pressing the following keys:  
**System, Alignments, Auto Align, Off**  
**FREQUENCY, Center Freq, 50 MHz**  
**SPAN, 45 kHz**  
**BW/Avg, 3 kHz**  
**BW/Avg, Video BW, 1 kHz**  
**Det/Demod, Detector, Peak**
3. **Preset** the synthesized signal generator, then press **Blue Key, Special, 0.0**. Press the following keys:  
**FREQUENCY, 50 MHz**  
**AMPLITUDE, +9 dBm**
4. Set the 1 dB step attenuator to 0 dB.
5. Set the 10 dB step attenuator to 0 dB.
6. Press **Peak Search** (or **Search**) on the analyzer.
7. Adjust the synthesized signal generator amplitude until the analyzer marker amplitude reads 107 dB $\mu$ V  $\pm$ 0.1 dB.

---

**NOTE**

Do not adjust the synthesized signal generator amplitude after the reference is established.

---

8. On the analyzer, press **Marker, Delta**.

### Measure the Cumulative Log Fidelity

1. Perform [step 2](#) to [step 4](#) for each measurement value in [Table 2-13](#).
2. Set the 1 dB and 10 dB step attenuators as indicated in Column 2 and Column 3 of [Table 2-13](#) for the various dB from REF LVL settings.

For settings of  $-64$  dB and lower, press the following keys:

**BW/Avg, Average (On)**  
**5, Enter**

3. Press **Peak Search** (or **Search**) on the analyzer and record the marker delta ( $\Delta$  Mkr1) reading in Column 7 of [Table 2-13](#).
4. Calculate the Cumulative Log Fidelity Error (CLFE) as follows, and record the result in the performance verification test record as indicated in Column 8 of

Performance Verification Tests  
12. Display Scale Fidelity

Table 2-13:

CLFE = Total Actual Attenuation + MkrΔ Reading – Total Actual Atten (0 dB from Ref Level)

**Table 2-13 Cumulative and Incremental Log Scale Fidelity Worksheet, Analog Resolution Bandwidths Measured at 3 kHz**

| Column 1        | Column 2                             | Column 3                            | Column 4                            | Column 5                           | Column 6                 | Column 7                      | Column 8                 | Column 9                 |
|-----------------|--------------------------------------|-------------------------------------|-------------------------------------|------------------------------------|--------------------------|-------------------------------|--------------------------|--------------------------|
| dB from REF LVL | 10 dB Step Atten Nominal Attenuation | 1 dB Step Atten Nominal Attenuation | 10 dB Step Atten Actual Attenuation | 1 dB Step Atten Actual Attenuation | Total Actual Attenuation | Marker Delta (Δ Mkr1) Reading | Test Record Entry – CLFE | Test Record Entry – ILFE |
| (dB)            | (dB)                                 | (dB)                                | (dB)                                | (dB)                               | (dB)                     | (dB)                          | (dB)                     | (dB)                     |
| 0 (Ref)         | 0                                    | 0                                   |                                     |                                    |                          | 0 (Ref)                       | 0 (Ref)                  | NA                       |
| –4              | 0                                    | 4                                   |                                     |                                    |                          |                               | 1)                       | 22)                      |
| –8              | 0                                    | 8                                   |                                     |                                    |                          |                               | 2)                       | 23)                      |
| –12             | 10                                   | 2                                   |                                     |                                    |                          |                               | 3)                       | 24)                      |
| –16             | 10                                   | 6                                   |                                     |                                    |                          |                               | 4)                       | 25)                      |
| –20             | 20                                   | 0                                   |                                     |                                    |                          |                               | 5)                       | 26)                      |
| –24             | 20                                   | 4                                   |                                     |                                    |                          |                               | 6)                       | 27)                      |
| –28             | 20                                   | 8                                   |                                     |                                    |                          |                               | 7)                       | 28)                      |
| –32             | 30                                   | 2                                   |                                     |                                    |                          |                               | 8)                       | 29)                      |
| –36             | 30                                   | 6                                   |                                     |                                    |                          |                               | 9)                       | 30)                      |
| –40             | 40                                   | 0                                   |                                     |                                    |                          |                               | 10)                      | 31)                      |
| –44             | 40                                   | 4                                   |                                     |                                    |                          |                               | 11)                      | 32)                      |
| –48             | 40                                   | 8                                   |                                     |                                    |                          |                               | 12)                      | 33)                      |
| –52             | 50                                   | 2                                   |                                     |                                    |                          |                               | 13)                      | 34)                      |
| –56             | 50                                   | 6                                   |                                     |                                    |                          |                               | 14)                      | 35)                      |
| –60             | 60                                   | 0                                   |                                     |                                    |                          |                               | 15)                      | 36)                      |
| –64             | 60                                   | 4                                   |                                     |                                    |                          |                               | 16)                      | 37)                      |
| –68             | 60                                   | 8                                   |                                     |                                    |                          |                               | 17)                      | 38)                      |
| –72             | 70                                   | 2                                   |                                     |                                    |                          |                               | 18)                      | 39)                      |
| –76             | 70                                   | 6                                   |                                     |                                    |                          |                               | 19)                      | 40)                      |
| –80             | 80                                   | 0                                   |                                     |                                    |                          |                               | 20)                      | 41)                      |



**Table 2-13 Cumulative and Incremental Log Scale Fidelity Worksheet, Analog Resolution Bandwidths Measured at 3 kHz**

| Column 1        | Column 2                             | Column 3                            | Column 4                            | Column 5                           | Column 6                 | Column 7                              | Column 8                 | Column 9                 |
|-----------------|--------------------------------------|-------------------------------------|-------------------------------------|------------------------------------|--------------------------|---------------------------------------|--------------------------|--------------------------|
| dB from REF LVL | 10 dB Step Atten Nominal Attenuation | 1 dB Step Atten Nominal Attenuation | 10 dB Step Atten Actual Attenuation | 1 dB Step Atten Actual Attenuation | Total Actual Attenuation | Marker Delta ( $\Delta$ Mkr1) Reading | Test Record Entry – CLFE | Test Record Entry – ILFE |
| (dB)            | (dB)                                 | (dB)                                | (dB)                                | (dB)                               | (dB)                     | (dB)                                  | (dB)                     | (dB)                     |
| –84             | 80                                   | 4                                   |                                     |                                    |                          |                                       | 21)                      | NA                       |

### Calculate Incremental Log Fidelity

1. Calculate the Incremental Log Fidelity Error (ILFE) for dB from REF LVL settings of –4 dB to –80 dB using the current and previous Cumulative Log Fidelity Errors (CLFEs):

$$\text{ILFE} = \text{CLFE}(\text{current}) - \text{CLFE}(\text{previous})$$

Example Calculation for ILFE at –20 dB from REFLVL setting:

$$\text{Previous CLFE}(-16 \text{ dB from REF LVL}) = -0.07 \text{ dB}$$

$$\text{Current CLFE}(-20 \text{ dB from REF LVL}) = 0.02 \text{ dB}$$

$$\text{ILFE}(-20 \text{ dB}) = 0.02 \text{ dB} - (-0.07 \text{ dB}) = 0.09 \text{ dB}$$

2. Record the result in the performance verification test record as indicated in Column 9 of [Table 2-13](#).

## Part 2: Log Display Scale Fidelity, Digital Bandwidths

### Setup for Log Scale Measurement

1. Set the following parameters on the analyzer:  
**SPAN, 150 Hz**  
**BW/Avg, 10 Hz**  
**BW/Avg, Video BW, 3 Hz**  
**Det/Demod, Detector, Peak**
2. Press **Peak Search** (or **Search**) on the analyzer.
3. Adjust the amplitude of the synthesized signal generator until the analyzer marker amplitude reads 107 dB $\mu$ V $\pm$ 0.1 dB.
4. Set the 1 dB and the 10 dB step attenuators to 0 dB.

## 12. Display Scale Fidelity

**NOTE**

Do not adjust the synthesized signal generator amplitude after the reference is established.

- On the analyzer, press **Marker, Delta**.

**Measure the Cumulative Log Fidelity**

- Perform [step 2](#) to [step 4](#) for each measurement value in [Table 2-14](#).
- Set the 1 dB and 10 dB step attenuators as indicated in [Table 2-14](#) for the various dB from REF LVL settings.

For settings of –84 dB and lower, press the following keys:

**BW/Avg, Average (On)**

**5, Enter**

- Press **Peak Search** (or **Search**) on the analyzer and record the marker delta ( $\Delta \text{Mkr1}$ ) reading in Column 7 of [Table 2-14](#).
- Calculate the Cumulative Log Fidelity Error (CLFE) as follows and record the result in the performance verification test record as indicated in Column 8 of [Table 2-14](#):

$$\text{CLFE} = \text{Total Actual Attenuation} + \text{Mkr}\Delta\text{Reading} - \text{Total Actual Atten}(0 \text{ dB from Ref Level})$$

**Table 2-14 Cumulative and Incremental Log Scale Fidelity Worksheet, Narrow Resolution Bandwidths**

| Column 1                       | Column 2   | Column 3  | Column 4   | Column 5  | Column 6  | Column 7   | Column 8                                      | Column 9                                      |
|--------------------------------|--|---|--|---|---|--|---|---|
| dB from<br>REF LVL<br><br>(dB) | 10 dB<br>Step Atten<br>Nominal<br>Attenu-<br>ation<br><br>(dB) | 1 dB<br>Step Atten<br>Nominal<br>Attenu-<br>ation<br><br>(dB) | 10 dB<br>Step<br>Atten<br>Actual<br>Attenu-<br>ation<br><br>(dB) | 1 dB<br>Step<br>Atten<br>Actual<br>Attenu-<br>ation<br><br>(dB) | Total<br>Actual<br>Attenu-<br>ation<br><br>(dB) | Marker<br>Delta<br>( $\Delta \text{Mkr1}$ )<br>Reading<br><br>(dB) | Test<br>Record<br>Entry –<br>CLFE<br><br>(dB) | Test<br>Record<br>Entry –<br>ILFE<br><br>(dB) |
| 0 (Ref)                        | 0  | 0   |  |   |   | 0 (Ref)  | 0 (Ref)                                       | NA  |
| –4                             | 0  | 4   |  |   |   |  | 43)   | 68)   |
| –8                             | 0  | 8   |  |   |   |  | 44)   | 69)   |
| –12                            | 10   | 2   |  |   |   |  | 45)   | 70)   |

**Table 2-14** Cumulative and Incremental Log Scale Fidelity Worksheet, Narrow Resolution Bandwidths

| Column 1                       | Column 2   | Column 3  | Column 4   | Column 5  | Column 6  | Column 7   | Column 8                                      | Column 9                                      |
|--------------------------------|--|---|--|---|---|--|---|---|
| dB from<br>REF LVL<br><br>(dB) | 10 dB<br>Step Atten<br>Nominal<br>Attenu-<br>ation<br><br>(dB) | 1 dB<br>Step Atten<br>Nominal<br>Attenu-<br>ation<br><br>(dB) | 10 dB<br>Step<br>Atten<br>Actual<br>Attenu-<br>ation<br><br>(dB) | 1 dB<br>Step<br>Atten<br>Actual<br>Attenu-<br>ation<br><br>(dB) | Total<br>Actual<br>Attenu-<br>ation<br><br>(dB) | Marker<br>Delta<br>( $\Delta$ <del>Mkr</del> 1)<br>Reading<br><br>(dB) | Test<br>Record<br>Entry –<br>CLFE<br><br>(dB) | Test<br>Record<br>Entry –<br>ILFE<br><br>(dB) |
| -16                            | 10   | 6   |  |   |   |  | 46)   | 71)   |
| -20                            | 20   | 0   |  |   |   |  | 47)   | 72)   |
| -24                            | 20   | 4   |  |   |   |  | 48)   | 73)   |
| -28                            | 20   | 8   |  |   |   |  | 49)   | 74)   |
| -32                            | 30   | 2   |  |   |   |  | 50)   | 75)   |
| -36                            | 30   | 6   |  |   |   |  | 51)   | 76)   |
| -40                            | 40   | 0   |  |   |   |  | 52)   | 77)   |
| -44                            | 40   | 4   |  |   |   |  | 53)   | 78)   |
| -48                            | 40   | 8   |  |   |   |  | 54)   | 79)   |
| -52                            | 50   | 2   |  |   |   |  | 55)   | 80)   |
| -56                            | 50   | 6   |  |   |   |  | 56)   | 81)   |
| -60                            | 60   | 0   |  |   |   |  | 57)   | 82)   |
| -64                            | 60   | 4   |  |   |   |  | 58)   | 83)   |
| -68                            | 60   | 8   |  |   |   |  | 59)   | 84)   |
| -72                            | 70   | 2   |  |   |   |  | 60)   | 85)   |
| -76                            | 70   | 6   |  |   |   |  | 61)   | 86)   |
| -80                            | 80   | 0   |  |   |   |  | 62)   | 87)   |
| -84                            | 80   | 4   |  |   |   |  | 63)   | NA  |
| -88                            | 80   | 8   |  |   |   |  | 64)   | NA  |
| -92                            | 90   | 2   |  |   |   |  | 65)   | NA  |
| -96                            | 90   | 6   |  |   |   |  | 66)   | NA  |
| -98                            | 90   | 8   |  |   |   |  | 67)   | NA  |

**Calculate incremental log fidelity:**

Calculate the Incremental Log Fidelity Error (ILFE) for dB from REF LVL settings of -4 dB to -80 dB using the current and previous Cumulative Log Fidelity Errors (CLFEs):

$$\text{ILFE} = \text{CLFE}(\text{current}) - \text{CLFE}(\text{previous})$$

Record the result in the performance verification test record as indicated in Column 9 of [Table 2-14](#).

**Part 3: Linear Display Scale Fidelity, Analog Bandwidths**

**Setup for linear scale measurement:**

1. Press **Preset** on the analyzer. Press the **Factory Preset** softkey, if it is displayed. Set the analyzer by pressing the following keys:

**System, Alignments, Auto Align, Off**

**FREQUENCY, Center Freq, 50 MHz**

**SPAN, 10 kHz**

**BW/Avg, 3 kHz**

**AMPLITUDE, Scale Type (Lin), More,  
Y Axis Units (Volts)**

2. Preset the synthesized signal generator, by pressing **Blue Key, Special, 0, 0**. Press the following keys:

**FREQUENCY, 50 MHz**

**AMPLITUDE, -3 dBm**

3. Set the 1 dB step attenuator to 0 dB.
4. Set the 10 dB step attenuator to 0 dB.
5. Press **Peak Search** (or **Search**) on the analyzer.
6. Adjust the synthesized signal generator amplitude until the analyzer marker amplitude reads 223.6 mV  $\pm$  4 mV.

---

**NOTE**

Do not adjust the amplitude of the synthesized signal generator after the reference is established.

---

**Calculate ideal marker amplitude:**

7. Considering Total Actual Attenuation at the 0 dB from REF LVL setting to be ATref, and the Total Actual Attenuation at any other dB from REF LVL setting to be ATmeas, calculate the Ideal Mkr Reading, in millivolts, as follows, and enter the result in Column 7 of [Table 2-15](#).

$$\text{Ideal Mkr Reading(mV)} = 1000\sqrt{0.05 \times 10^{(-\text{ATmeas} + \text{ATref})/10}}$$

For example, if ATref = 0.012 dB and ATmeas = 7.982, the Ideal Mkr Reading for the -8 dB from Ref Level setting would be:

$$\text{Ideal Mkr Reading(mV)} = 1000\sqrt{0.05 \times 10^{(-7.982 + 0.012)/10}} = 89.3 \text{ mV}$$

**Measure Linear Fidelity:**

8. Perform [step 9](#) to [step 11](#) for each measurement value in [Table 2-15](#).
9. Set the 1 dB and 10 dB step attenuators as indicated in Column 2 and Column 3 of [Table 2-15](#) for the dB from REF LVL settings.
10. Press **Peak Search** (or **Search**) on the analyzer and record the marker delta ( $\Delta$  Mkr1) amplitude reading as the actual Mkr reading in Column 8 of [Table 2-15](#).
11. Calculate the Linear Fidelity Error (LFE) as a percentage of reference level (RL), and record the result in the performance verification test record as indicated in Column 9 of [Table 2-15](#).

$$\text{LFE}(\% \text{ of RL}) = 100 \times \frac{\text{Actual Mkr Reading} - \text{Ideal Mkr Reading}}{223.6 \text{ mV}}$$

Example calculation for LFE(% of RL):

$$\text{Actual Mkr Reading} = 85.0 \text{ mV}$$

$$\text{Ideal Mkr Reading} = 89.3 \text{ mV}$$

$$\text{LFE}(\% \text{ of RL}) = 100 \times \frac{85.0 - 89.3}{223.6}$$

$$\text{LFE}(\% \text{ of RL}) = 1.92\% \text{ of RL}$$

**Table 2-15**      **Linear Scale Fidelity Worksheet, Analog Resolution Bandwidths Measured at 3 kHz**

| Column 1                   | Column 2  | Column 3   | Column 4   | Column 5  | Column 6                                      | Column 7                     | Column 8                          | Column 9                                   |
|----------------------------|---|--|--|---|---|------------------------------|-----------------------------------|--|
| <b>dB from<br/>REF LVL</b> | <b>10 dB<br/>Step Atten<br/>Nominal<br/>Attenu-<br/>ation</b> | <b>1 dB<br/>Step Atten<br/>Nominal<br/>Attenu-<br/>ation</b> | <b>10 dB<br/>Step<br/>Atten<br/>Actual<br/>Attenu-<br/>ation</b> | <b>1 dB<br/>Step<br/>Atten<br/>Actual<br/>Attenu-<br/>ation</b> | <b>Total<br/>Actual<br/>Attenu-<br/>ation</b> | <b>Ideal Mkr<br/>Reading</b> | <b>Actual<br/>Mkr<br/>Reading</b> | <b>Test<br/>Record<br/>Entry –<br/>LFE</b> |
| (dB)                       | (dB)  | (dB)   | (dB)   | (dB)  | (dB)  | (mV)                         | (mV)                              | (% of<br>RL)                               |
| 0 (Ref)                    | 0   | 0  |  |   |   | 0 (Ref)                      | 0 (Ref)                           | 0 (Ref)                                    |
| –4                         | 0   | 4  |  |   |   |                              |                                   | 93)  |
| –8                         | 0   | 8  |  |   |   |                              |                                   | 94)  |
| –12                        | 10  | 2  |  |   |   |                              |                                   | 95)  |
| –16                        | 10  | 6  |  |   |   |                              |                                   | 96)  |
| –20                        | 20  | 0  |  |   |   |                              |                                   | 97)  |

#### Part 4: Linear Display Scale Fidelity, Digital Bandwidths

##### Setup for linear scale measurement:

1. Set the following parameters on the analyzer:  
**SPAN, 30, Hz**  
**BW/Avg, 10 Hz**  
**Video BW, 1 Hz**
2. Press **Peak Search** (or **Search**) on the analyzer.
3. Set the 1 dB and 10 dB step attenuators to 0 dB.
4. Adjust the synthesized signal generator amplitude until the analyzer marker amplitude reads 223.6 mV  $\pm$ 4 mV.

##### NOTE

Do not adjust the synthesized signal generator amplitude after the reference is established.

**Calculate ideal marker amplitude:**

- Considering Total Actual Attenuation at the 0 dB from REF LVL setting to be ATref and the Total Actual Attenuation at any other dB from REF LVL setting to be ATmeas, calculate the Ideal Mkr Reading, in millivolts, as follows and enter the result in Column 7 of [Table 2-16](#).

$$\text{Ideal Mkr Reading(mV)} = 1000\sqrt{0.05 \times 10^{(-\text{ATmeas} + \text{ATref})/10}}$$

**Measure linear fidelity:**

- Perform [step 7](#) to [step 9](#) for each measurement value in [Table 2-16](#).
- Set the 1 dB and 10 dB step attenuators as indicated in [Table 2-16](#) for the dB from REF LVL settings.
- Press **Peak Search** (or **Search**) on the analyzer and record the marker delta ( $\Delta$  Mkr1) amplitude reading as the actual Mkr reading in Column 8 of [Table 2-16](#).
- Calculate the Linear Fidelity Error (LFE) as a percentage of reference level (RL), and record the result in the performance verification test record as indicated in Column 9 of [Table 2-16](#).

$$\text{LFE(\% of RL)} = 100 \times \frac{\text{Actual Mkr Reading} - \text{Ideal Mkr Reading}}{223.6 \text{ mV}}$$

**Table 2-16 Linear Scale Fidelity Worksheet, Narrow Resolution Bandwidths**

| Column 1           | Column 2   | Column 3  | Column 4  | Column 5   | Column 6                            | Column 7             | Column 8                 | Column 9                         |
|--------------------|--|---|---|--|-------------------------------------|----------------------|--------------------------|----------------------------------|
| dB from<br>REF LVL | 10 dB<br>Step Atten<br>Nominal<br>Attenu-<br>ation | 1 dB<br>Step Atten<br>Nominal<br>Attenu-<br>ation | 10 dB<br>Step Atten<br>Actual<br>Attenu-<br>ation | 1 dB<br>Step Atten<br>Actual<br>Attenu-<br>ation | Total<br>Actual<br>Attenu-<br>ation | Ideal Mkr<br>Reading | Actual<br>Mkr<br>Reading | Test<br>Record<br>Entry –<br>LFE |
| (dB)               | (dB)   | (dB)  | (dB)  | (dB)   | (dB)                                | (mV)                 | (mV)                     | (% of RL)                        |
| 0 (Ref)            | 0  | 0   |   |  |                                     | 0 (Ref)              | 0 (Ref)                  | 0 (Ref)                          |
| –4                 | 0  | 4   |   |  |                                     |                      |                          | 98)                              |
| –8                 | 0  | 8   |   |  |                                     |                      |                          | 99)                              |
| –12                | 10   | 2   |   |  |                                     |                      |                          | 100)                             |
| –16                | 10   | 6   |   |  |                                     |                      |                          | 101)                             |
| –20                | 20   | 0   |   |  |                                     |                      |                          | 102)                             |

Zero Span Log Fidelity, Digital Bandwidths

Setup for zero span measurements

10. Set the 1 dB step attenuator to 11 dB and the 10 dB step attenuator to 110 dB.
11. Press **Preset** on the analyzer. Press the **Factory Preset** softkey, if it is displayed. Set the analyzer by pressing the following keys:  

**System, Alignments**  
**Align Now, All** (wait for the alignment sequence to complete)
12. Set the 1 dB and 10 dB step attenuators to 0 dB.
13. Set the following parameters on the analyzer:  

**FREQUENCY, Center Freq, 50 MHz**  
**SPAN, 100 Hz**  
**BW/Avg, 10 Hz**  
**Det/Demod, Detector, Peak**
14. On the analyzer press **Peak Search** (or **Search**), **Marker →**, and **Marker → CF**.
15. Press **SPAN, Zero Span** on the analyzer.
16. Adjust the synthesized signal generator amplitude until the analyzer marker amplitude reads 107 dBμV ± 0.1 dB.

|             |  |
|-------------|--|
| <b>NOTE</b> | Do not adjust the synthesized signal generator amplitude after the reference is established. |
|-------------|--|

17. On the analyzer, press **Marker, Delta**.

Measure the Cumulative Log Fidelity

18. On the analyzer, press **Single, BW/Avg, Average, 5, Enter**.
19. Perform [step 21](#) to [step 23](#) for each measurement value in [Table 2-17](#).
20. Set the 1 dB and 10 dB step attenuators as indicated in Column 2 and Column 3 of [Table 2-16](#) for the various dB from REF LVL settings.
21. Press **Single** and wait for “VAvg 5” to be displayed to the right of the graticule area.
22. Record the marker delta (Δ Mkr1) amplitude reading in Column 7 of [Table 2-16](#).
23. Calculate the Cumulative Log Fidelity Error (CLFE) as follows, and record the result in the performance verification test record as indicated in Column 8 of [Table 2-16](#).  
  
CLFE = Total Actual Attenuation + ΔMkr Reading – Total Actual Atten (0 dB from Ref Level)



**Table 2-17 Zero Span Cumulative Log Fidelity Worksheet, Narrow Resolution Bandwidths**

| Column 1           | Column 2   | Column 3  | Column 4  | Column 5   | Column 6                            | Column 7        | Column 8                         |
|--------------------|--|---|---|--|-------------------------------------|-----------------|----------------------------------|
| dB from<br>REF LVL | 10 dB<br>Step Atten<br>Nominal<br>Attenu-<br>ation | 1 dB<br>Step Atten<br>Nominal<br>Attenu-<br>ation | 10 dB<br>Step Atten<br>Actual<br>Attenu-<br>ation | 1 dB<br>Step Atten<br>Actual<br>Attenu-<br>ation | Total<br>Actual<br>Attenu-<br>ation | DMkr<br>Reading | Test<br>Record<br>Entry-<br>CLFE |
| (dB)               | (dB)   | (dB)  | (dB)  | (dB)   | (dB)                                | (dB)            | (dB)                             |
| 0 (Ref)            | 0  | 0   |   |  |                                     | 0 (Ref)         | 0 (Ref)                          |
| -4                 | 0  | 4   |   |  |                                     |                 | 103)                             |
| -8                 | 0  | 8   |   |  |                                     |                 | 104)                             |
| -12                | 10   | 2   |   |  |                                     |                 | 105)                             |
| -16                | 10   | 6   |   |  |                                     |                 | 106)                             |
| -20                | 20   | 0   |   |  |                                     |                 | 107)                             |
| -24                | 20   | 4   |   |  |                                     |                 | 108)                             |
| -28                | 20   | 8   |   |  |                                     |                 | 109)                             |
| -32                | 30   | 2   |   |  |                                     |                 | 110)                             |
| -36                | 30   | 6   |   |  |                                     |                 | 111)                             |
| -40                | 40   | 0   |   |  |                                     |                 | 112)                             |
| -44                | 40   | 4   |   |  |                                     |                 | 113)                             |
| -48                | 40   | 8   |   |  |                                     |                 | 114)                             |
| -52                | 50   | 2   |   |  |                                     |                 | 115)                             |
| -56                | 50   | 6   |   |  |                                     |                 | 116)                             |
| -60                | 60   | 0   |   |  |                                     |                 | 117)                             |
| -64                | 60   | 4   |   |  |                                     |                 | 118)                             |
| -68                | 60   | 8   |   |  |                                     |                 | 119)                             |
| -70                | 70   | 0   |   |  |                                     |                 | 120)                             |

**Post-Test Instrument Restoration**

24. Remove the RF cable from the analyzer input connector.
25. On the analyzer, press the following keys:

**Preset  
System, Alignments, Auto Align, All**

---

## 13. Input Attenuation Switching Uncertainty

A 50 MHz CW signal is applied to the input of the analyzer through two calibrated step attenuators. The attenuators are the amplitude reference standard. The source is adjusted for a response at the reference level. The internal attenuators are then varied between settings and the external attenuators are changed accordingly to maintain the same input level at the mixer. The analyzer marker functions are used to measure the amplitude differences. The actual attenuation values of the step attenuators are used to correct the marker amplitude readings yielding the input attenuation switching error.

The related adjustment for this performance test is “Frequency Response.”

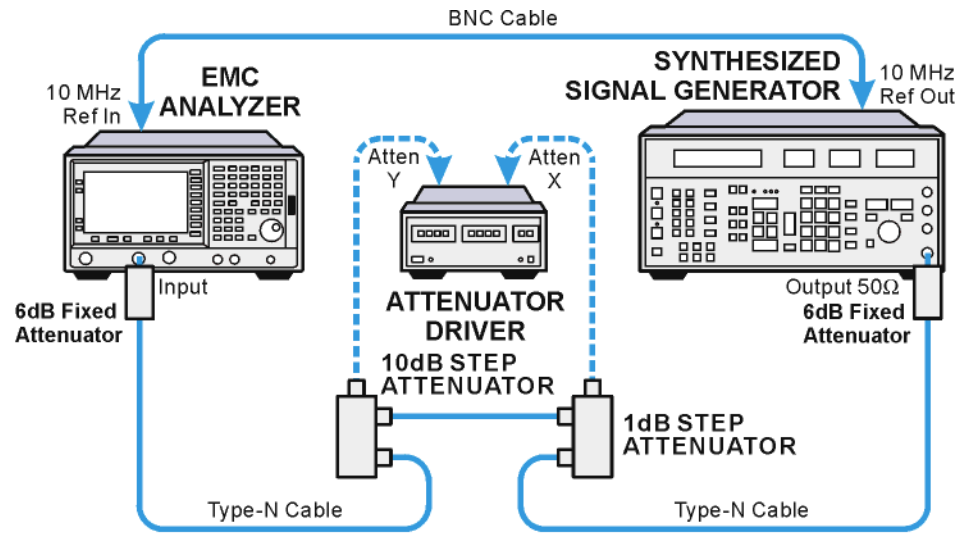
### Equipment Required

- Synthesized signal generator
- 1 dB step attenuator
- 10 dB step attenuator
- Attenuator switch driver (if programmable step attenuators are used)
- 6 dB fixed attenuator (2 *required*)
- Cable, Type-N 152-cm (60-in) (2 *required*)
- Cable, BNC 122-cm (48-in)
- Attenuator interconnect kit

### Additional Equipment for Option BAB

- Adapter, Type-N (f), to APC 3.5 (f)

Figure 2-13 Input Attenuator Switching Uncertainty Test Setup



wb95a

## Procedure

### Calculate Actual Attenuation Values

1. From the calibration data supplied with the 1 dB step attenuator, enter into Column 2 of [Table 2-18](#) the actual attenuation for the corresponding nominal attenuation settings. If the calibration data does not indicate an actual attenuation value for the 0 dB setting, enter 0 dB.

#### NOTE

The Agilent 8494G programmable attenuator has four attenuator sections consisting of 1 dB, 2 dB, 4 dB, and 4 dB attenuators. If using the Agilent 8494G programmable attenuator, enter the calibration data for the section three 4 dB step rather than the section four 4 dB step.

2. From the calibration data supplied with the 10 dB step attenuator, enter into Column 4 of [Table 2-18](#) the actual attenuation for the corresponding nominal attenuation settings. If the calibration data does not indicate an actual attenuation value for the 0 dB setting, enter 0 dB.

#### NOTE

The Agilent 8496G programmable attenuator has four attenuator sections consisting of 10 dB, 20 dB, 40 dB, and 40 dB attenuators. If using the Agilent 8496G programmable attenuator, enter the calibration data for the section three 40 dB step rather than the section four 40 dB step.

3. For each Total Nominal Attenuation setting indicated in [Table 2-18](#), calculate the Total Actual Attenuation from the actual attenuation Columns for the 1 dB

**13. Input Attenuation Switching Uncertainty**

and the 10 dB step attenuators and enter the result into Column 6 of [Table 2-18](#).

$$\text{Total Actual Attenuation} = 1 \text{ dB Step Attenuator Actual Attenuation} + 10 \text{ dB Step Attenuator Actual Attenuation}$$

Example for 35 dB total nominal attenuation setting:

$$1 \text{ dB Step Attenuator Actual Attenuation (5 dB)} = 5.021 \text{ dB}$$

$$10 \text{ dB Step Attenuator Actual Attenuation (30 dB)} = 29.981 \text{ dB}$$

$$\text{Total Actual Attenuation} = 5.998 \text{ dB} + 30.012 \text{ dB} = 35.002 \text{ dB}$$

**Table 2-18 Actual Attenuation Worksheet**

| Column 1                                      | Column 2                                     | Column 3                                       | Column 4                                      | Column 5                       | Column 6                      |
|---|--|--|---|--------------------------------|-------------------------------|
| 1 dB step Attenuator Nominal Attenuation (dB) | 1 dB step Attenuator Actual Attenuation (dB) | 10 dB step Attenuator Nominal Attenuation (dB) | 10 dB step Attenuator Actual Attenuation (dB) | Total Nominal Attenuation (dB) | Total Actual Attenuation (dB) |
| 0   |  | 0  |   | 0                              |                               |
| 5   |  | 0  |   | 5                              |                               |
| 0   |  | 10   |   | 10                             |                               |
| 5   |  | 10   |   | 15                             |                               |
| 0   |  | 20   |   | 20                             |                               |
| 5   |  | 20   |   | 25                             |                               |
| 0   |  | 30   |   | 30                             |                               |
| 5   |  | 30   |   | 35                             |                               |
| 0   |  | 40   |   | 40                             |                               |
| 5   |  | 40   |   | 45                             |                               |
| 0   |  | 50   |   | 50                             |                               |
| 5   |  | 50   |   | 55                             |                               |
| 0   |  | 60   |   | 60                             |                               |
| 5   |  | 60   |   | 65                             |                               |

- For each attenuation error value in Column 4 of [Table 2-19](#), calculate the attenuation errors by subtracting the difference between the [Table 2-18](#) Total Actual Attenuation and Total Nominal Attenuation from the difference between the Total Actual Attenuation and Total Nominal Attenuation at 55 dB. Note that the total nominal attenuations listed in [Table 2-19](#) are in a different order than those listed in [Table 2-18](#).

## 13. Input Attenuation Switching Uncertainty

$$\text{AttenErr} = (\text{ActAtten}(55 \text{ dB}) - 55 \text{ dB}) - (\text{ActAtten}(X \text{ dB}) - \text{NomAtten}(X \text{ dB}))$$

Where:

AttenErr = Attenuator Error between the X dB and 55 dB settings

ActAtten(55 dB) = Actual Attenuation of the 55 dB setting

ActAtten(X dB) = Actual Attenuation of the X dB setting

NomAtten(X dB) = Nominal Attenuation of the X dB setting

Example of attenuation error calculation for 35 dB nominal attenuation:

$$\text{ActAtten}(55 \text{ dB}) = 55.15 \text{ dB}$$

$$\text{ActAtten}(35 \text{ dB}) = 35.002 \text{ dB}$$

$$\text{NomAtten}(35 \text{ dB}) = 35 \text{ dB}$$

$$\text{AttenErr} = (55.15 - 55) - (35.002 - 35)$$

$$\text{AttenErr} = 0.15 - 0.002$$

$$\text{AttenErr} = 0.148 \text{ dB}$$

### Setup for Switching Uncertainty Measurement

5. Connect the equipment as indicated in [Figure 2-13](#). The 6 dB fixed attenuator should be connected directly to the input connector of the analyzer.
6. Press **Preset** on the analyzer. Press the **Factory Preset** softkey, if it is displayed. Press **System, Alignments, Auto Align, Off**. Set the controls as follows:

**FREQUENCY, Center Freq, 50 MHz**

**SPAN, 100 kHz**

**AMPLITUDE, More, Y Axis Units (or Amptd Units), dBm**

**AMPLITUDE, -55 dBm**

**AMPLITUDE, Attenuation, 10 dB**

**AMPLITUDE, Scale/Div, 2 dB**

**BW/Avg, 30 kHz**

**BW/Avg, Video BW, 100 Hz**

7. Preset the synthesized signal generator (**Blue Key, Special, 0, 0**) and set the controls as follows:

**FREQUENCY, 50 MHz**

**AMPLITUDE, 12 dBm**

8. Set the 1 dB step attenuator to 5 dB attenuation. Set the 10 dB step attenuator to 50 dB. Refer to the Agilent 11713A attenuator switch driver manual for information on manually controlling a programmable step attenuator.
9. Press **Peak Search** (or **Search**) on the analyzer.
10. Adjust the amplitude of the synthesized signal generator until the marker

Performance Verification Tests  
**13. Input Attenuation Switching Uncertainty**

amplitude of the analyzer reads  $\pm 0.1$  dB.

**NOTE**

Do not adjust the amplitude of the synthesized signal generator after the reference is established.

11. On the analyzer, press **Peak Search** (or **Search**), **Marker**, **Delta**.

**Table 2-19**      **Input Attenuation Switching Uncertainty Worksheet**

| Column 1                              | Column 2                                    | Column 3                          | Column 4               | Column 5                   | Column 6                  | Column 7                                 |
|---------------------------------------|---|-----------------------------------|------------------------|----------------------------|---------------------------|--|
| Analyzer Internal Attenuation Setting | Analyzer Reference Level Setting 50 W Input | Total Nominal Attenuation Setting | Attenuation Error (dB) | Ideal Marker Delta Reading | Marker Delta Reading (dB) | Test Record Entry – Switching Error (dB) |
| 10 dB                                 | –55 dBm                                     | 55 dB                             | 0                      | 0 dB                       | 0                         | Ref                                      |
| 0 dB                                  | –65 dBm                                     | 65 dB                             |                        | –10 dB                     |                           | 1)                                       |
| 5 dB                                  | –60 dBm                                     | 60 dB                             |                        | –5 dB                      |                           | 2)                                       |
| 15 dB                                 | –50 dBm                                     | 50 dB                             |                        | 5 dB                       |                           | 3)                                       |
| 20 dB                                 | –45 dBm                                     | 45 dB                             |                        | 10 dB                      |                           | 4)                                       |
| 25 dB                                 | –40 dBm                                     | 40 dB                             |                        | 15 dB                      |                           | 5)                                       |
| 30 dB                                 | –35 dBm                                     | 35 dB                             |                        | 20 dB                      |                           | 6)                                       |
| 35 dB                                 | –30 dBm                                     | 30 dB                             |                        | 25 dB                      |                           | 7)                                       |
| 40 dB                                 | –25 dBm                                     | 25 dB                             |                        | 30 dB                      |                           | 8)                                       |
| 45 dB                                 | –20 dBm                                     | 20 dB                             |                        | 35 dB                      |                           | 9)                                       |
| 50 dB                                 | –15 dBm                                     | 15 dB                             |                        | 40 dB                      |                           | 10)                                      |
| 55 dB                                 | –10 dBm                                     | 10 dB                             |                        | 45 dB                      |                           | 11)                                      |
| 60 dB                                 | –5 dBm                                      | 5 dB                              |                        | 50 dB                      |                           | 12)                                      |
| 65 dB <sup>a</sup>                    | 0 dBm                                       | 0 dB                              |                        | 55 dB                      |                           | 13)                                      |

a. Does not apply to Agilent E7401A.

**Measure Switching Uncertainty**

Perform [step 12](#) to [step 15](#) for each measurement value in [Table 2-19](#).

12. Set the 1 dB and 10 dB step attenuators to the Total Nominal Attenuation setting value as indicated in Column 3 of [Table 2-19](#) for the various analyzer attenuation settings for each measurement. [Table 2-18](#) may be used as a reference for setting the step attenuators to achieve the desired total nominal attenuation.

**13. Input Attenuation Switching Uncertainty**

13. Similarly, set the corresponding analyzer attenuation and reference level settings as indicated in Column 1 and Column 2 of [Table 2-19](#).
14. Press **Single**, then **Peak Search** (or **Search**) and record the marker amplitude reading as the Marker Delta Reading in Column 6 of [Table 2-19](#).
15. Calculate the Switching Error ([Table 2-19](#), Column 7) by subtracting the Ideal Marker Delta Reading and the Attenuation Error from the Marker Delta Reading. Record the result in the performance verification test record.

$$\text{Switching Error} = \text{Marker Delta Reading} - \text{Ideal Marker Delta Reading} - \text{Attenuat}$$

Example for 25 dB analyzer internal attenuation setting:

$$\text{Marker Delta Reading} = 14.790 \text{ dB}$$

$$\text{Ideal Marker Delta Reading} = 15 \text{ dB}$$

$$\text{Attenuation Error} = -0.148 \text{ dB}$$

$$\text{Switching Error} = 14.790 - 15 - (-0.148) = -0.062 \text{ dB}$$

**Post-test Instrument Restoration**

16. Remove the RF cable from the analyzer input connector.
17. On the analyzer, press **Preset, System, Alignments, Auto Align, All**.

## 14. Reference Level Accuracy: Agilent E7401A

A 50 MHz CW signal is applied to the 50  $\Omega$  input of the analyzer through two step attenuators. The amplitude of the source is decreased in 10 dB steps and the analyzer marker functions are used to measure the amplitude difference between steps. The external attenuator is used as the reference standard. The test is performed in both log and linear amplitude scales.

It is only necessary to test reference levels as low as  $-90$  dBm (with 10 dB internal attenuation) since lower reference levels are a function of the analyzer microprocessor manipulating the trace data. There is no error associated with the trace data manipulation.

The related adjustment for this performance test is “IF Amplitude.”

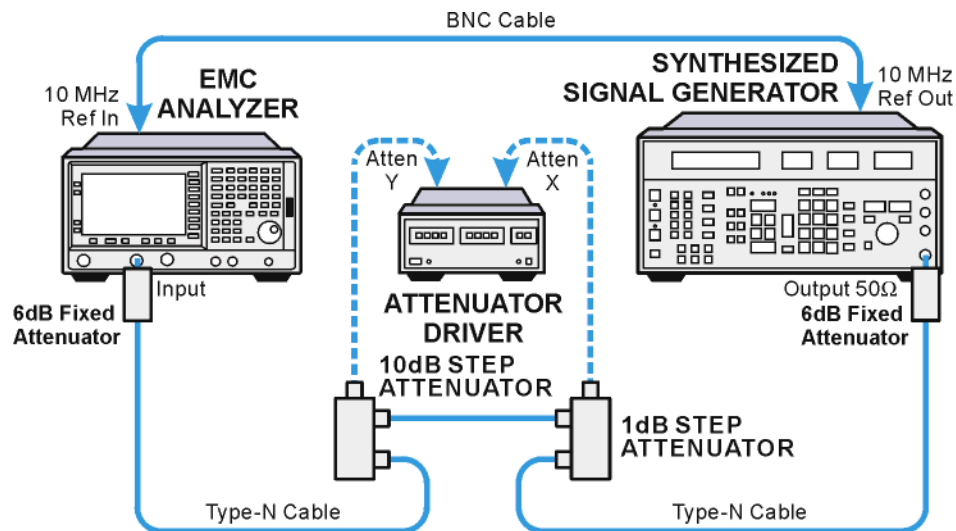
### Equipment Required

- Synthesized signal generator
- 1 dB step attenuator
- 10 dB step attenuator
- 6 dB fixed attenuator (2 *required*)
- Attenuator switch driver (if programmable step attenuators are used)
- Cable, Type-N 152-cm (60-in) (2 *required*)
- Cable, BNC 122-cm (48-in)
- Attenuator interconnect kit

### Procedure

Figure 2-14

Reference Level Accuracy Test Setup



wb95a



### Calculate the Actual Attenuation Errors

1. From the calibration data supplied with the 10 dB step attenuator, enter into Column 2 of [Table 2-20](#) through [Table 2-23](#) the actual attenuation for the corresponding nominal attenuation settings. If no calibration data is supplied for 0 dB, enter zero.

#### NOTE

The Agilent 8496G programmable attenuator has four attenuator sections consisting of 10 dB, 20 dB, 40 dB and 40 dB attenuators. If using the Agilent 8496G programmable attenuator, enter the calibration data for the section three 40 dB step rather than the section four 40 dB step.

2. To calculate the Actual Attenuation Step, subtract the 10dB Actual Attenuation Error at all settings from the 10dB Actual Attenuation (20 dB) and enter the result in Column 3 of [Table 2-20](#) through [Table 2-23](#).

$$\text{Actual Attenuator Step (X dB)} = (\text{Actual Attenuation(20 dB)} - \text{Actual Attenuation (X dB)})$$

Example for 50 dB attenuator setting:

$$\text{Actual Attenuation (50 dB)} = 50.08 \text{ dB}$$

$$\text{Actual Attenuation (20 dB)} = 19.85 \text{ dB}$$

$$\begin{aligned} \text{Actual Attenuator Step (50 dB)} &= (19.85 \text{ dB} - 50.08 \text{ dB}) \\ &= -30.23 \text{ dB} \end{aligned}$$

### Log Scale, Analog Bandwidths

1. Set the synthesized signal generator controls as follows:

**FREQUENCY, 50 MHz**

**AMPLITUDE, 12 dBm**

2. Connect the equipment as shown in [Figure 2-14](#). Set the 10 dB step attenuator to 20 dB attenuation and the 1 dB step attenuator to 5 dB attenuation.
3. Press **Preset** on the analyzer. Press the **Factory Preset** softkey, if it is displayed. Press **System, Alignments, Auto Align, Off**. Set the analyzer by pressing the following keys:

**FREQUENCY, Center Freq, 50 MHz**

**Attenuation, 10 dB (Man)**

**AMPLITUDE, More, Y Axis Units (or Amptd Units), dBm**

**AMPLITUDE, -25 dBm**

**Scale/Div, 1 dB**

**SPAN, 50 kHz**

**BW/Avg, 3 kHz**

**Video BW, 30 Hz**

4. Set the 1 dB step attenuator to place the signal peak 1 to 3 dB (1 to 3 divisions)

**14. Reference Level Accuracy: Agilent E7401A**

below the reference level.

5. On the analyzer, press the following keys:

**Single**

**Peak Search** (or **Search**)

**Marker, Delta**

6. Set the 10 dB step attenuator and analyzer reference level according to Column 1 and Column 4 of [Table 2-20](#). At each setting, do the following:

- a. Press **Single** on the analyzer.
- b. Press **Peak Search** (or **Search**).
- c. Record the marker delta amplitude reading in Column 5 of [Table 2-20](#).
- d. Add the Actual Attenuation Step to the analyzer marker delta amplitude and enter the result as the Test Record entry in the performance test record.

The following is an example for –35 dBm reference level:

Analyzer marker  $\Delta$  amplitude = (–10.17) dB

Actual Attenuator Step (30 dB) = (–10.07) dB

Test Record Entry = (–10.17) dB – (–10.07) dB = (–0.10) dB

**Table 2-20 Log Scale, Analog Bandwidths**

| Column 1                                  | Column 2                                 | Column 3                    | Column 4                       | Column 5                             | Column 6          |
|---|--|-----------------------------|--------------------------------|--------------------------------------|-------------------|
| 10 dB Attenuator Nominal Attenuation (dB) | 10 dB Attenuator Actual Attenuation (dB) | Actual Attenuator Step (dB) | Analyzer Reference Level (dBm) | Analyzer Marker Delta Amplitude (dB) | Test Record Entry |
| 20  |  | 0 (Ref)                     | –25                            | 0 (Ref)                              | (Ref)             |
| 10  |  |                             | –15                            |                                      | 1)                |
| 0   |  |                             | –5                             |                                      | 2)                |
| 30  |  |                             | –35                            |                                      | 3)                |
| 40  |  |                             | –45                            |                                      | 4)                |
| 50  |  |                             | –55                            |                                      | 5)                |
| 60  |  |                             | –65                            |                                      | 6)                |
| 70  |  |                             | –75                            |                                      | 7)                |

**Log Scale, Digital Bandwidths**

- On the analyzer, press the following keys:  
**SPAN, 150 Hz**  
**BW/Avg, 10 Hz**  
**Video BW, 1 Hz**
- Set the 1 dB step attenuator to place the signal peak 1 to 3 dB (1 to 3 divisions) below the reference level.
- On the analyzer, press the following keys:  
**Single**  
**Peak Search (or Search)**  
**Marker, Delta**
- Set the 10 dB step attenuator and analyzer reference level according to Column 1 and Column 4 of [Table 2-21](#). At each setting, do the following:
  - Press **Single** on the analyzer.
  - Press **Peak Search (or Search)**.
  - Record the Marker Delta Amplitude reading in Column 5 of [Table 2-21](#).
  - Add the Actual Attenuator Step to the Analyzer Marker Delta Amplitude and enter the result as the Test Record entry in the performance test record.

Table 2-21 Log Mode, Digital Bandwidths Worksheet

| Column 1                                  | Column 2                                 | Column 3                    | Column 4                       | Column 5                             | Column 6          |
|---|--|-----------------------------|--------------------------------|--------------------------------------|-------------------|
| 10 dB Attenuator Nominal Attenuation (dB) | 10 dB Attenuator Actual Attenuation (dB) | Actual Attenuator Step (dB) | Analyzer Reference Level (dBm) | Analyzer Marker Delta Amplitude (dB) | Test Record Entry |
| 20  |  | 0 (Ref)                     | –25                            | 0 (Ref)                              | (Ref)             |
| 10  |  |                             | –15                            |                                      | 8)                |
| 0   |  |                             | –5                             |                                      | 9)                |
| 30  |  |                             | –35                            |                                      | 10)               |
| 40  |  |                             | –45                            |                                      | 11)               |
| 50  |  |                             | –55                            |                                      | 12)               |
| 60  |  |                             | –65                            |                                      | 13)               |
| 70  |  |                             | –75                            |                                      | 14)               |

**Linear Scale, Analog Bandwidths**

1. Set the 10 dB step attenuator to 20 dB attenuation.
2. Set the 1 dB step attenuator to 5 dB attenuation.
3. Set the analyzer by pressing the following keys:

**AMPLITUDE,**  
**AMPLITUDE, Scale Type (Lin)**  
**AMPLITUDE, More, Y Axis Units (or Amptd Units), dBm**

**SPAN, 50 kHz**  
**BW/Avg, 3 kHz**  
**Video BW, 30 Hz**  
**Sweep, Sweep Cont**  
**Marker, Off**

4. Set the 1 dB step attenuator to place the signal peak one to three divisions below the reference level.

5. On the analyzer, press the following keys:

**Single**  
**Peak Search (or Search)**  
**Marker, Delta**

6. Set the 10 dB step attenuator and analyzer reference level according to Column 1 and Column 4 of [Table 2-22](#). At each setting, do the following:
  - a. Press **Single** on the analyzer.

**14. Reference Level Accuracy: Agilent E7401A**

- b. Press **Peak Search** (or **Search**).
- c. Record the marker delta amplitude reading in Column 5 of [Table 2-22](#).
- d. Add the Actual Attenuator Step to the Analyzer Marker Delta Amplitude and enter the result in the performance test record.

**Table 2-22 Linear Mode, Analog Bandwidths Worksheet**

| Column 1                                  | Column 2                                 | Column 3                    | Column 4                       | Column 5                             | Column 6          |
|---|--|-----------------------------|--------------------------------|--------------------------------------|-------------------|
| 10 dB Attenuator Nominal Attenuation (dB) | 10 dB Attenuator Actual Attenuation (dB) | Actual Attenuator Step (dB) | Analyzer Reference Level (dBm) | Analyzer Marker Delta Amplitude (dB) | Test Record Entry |
| 20  |  | 0 (Ref)                     | –25                            | 0 (Ref)                              | (Ref)             |
| 10  |  |                             | –15                            |                                      | 15)               |
| 0   |  |                             | –5                             |                                      | 16)               |
| 30  |  |                             | –35                            |                                      | 17)               |
| 40  |  |                             | –45                            |                                      | 18)               |
| 50  |  |                             | –55                            |                                      | 19)               |
| 60  |  |                             | –65                            |                                      | 20)               |
| 70  |  |                             | –75                            |                                      | 21)               |

**Linear Scale, Digital Bandwidths**

- On the analyzer, press the following keys:  
**SPAN, 150 Hz**  
**BW/Avg, 10 Hz**  
**Video BW, 1 Hz**
- Set the 1 dB step attenuator to place the signal peak 1 to 3 divisions below the reference level.
- On the analyzer, press the following keys:  
**Single**  
**Peak Search (or Search)**  
**Marker, Delta**
- Set the 10 dB step attenuator and analyzer reference level according to Column 1 and Column 4 of [Table 2-23](#). At each setting, do the following:
  - Press **Single** on the analyzer.
  - Press **Peak Search (or Search)**.
  - Record the marker delta amplitude reading in Column 5 of [Table 2-23](#).
  - Add the Actual Attenuator Step to the Analyzer Marker Delta Amplitude

and enter the result as the Test Record entry in the performance test record.

**Table 2-23 Linear Mode, Digital Bandwidths**

| Column 1                                  | Column 2                                 | Column 3                    | Column 4                       | Column 5                             | Column 6          |
|---|--|-----------------------------|--------------------------------|--------------------------------------|-------------------|
| 10 dB Attenuator Nominal Attenuation (dB) | 10 dB Attenuator Actual Attenuation (dB) | Actual Attenuator Step (dB) | Analyzer Reference Level (dBm) | Analyzer Marker Delta Amplitude (dB) | Test Record Entry |
| 20  |  | 0 (Ref)                     | –25                            | 0 (Ref)                              | (Ref)             |
| 10  |  |                             | –15                            |                                      | 22)               |
| 0   |  |                             | –5                             |                                      | 23)               |
| 30  |  |                             | –35                            |                                      | 24)               |
| 40  |  |                             | –45                            |                                      | 25)               |
| 50  |  |                             | –55                            |                                      | 26)               |
| 60  |  |                             | –65                            |                                      | 27)               |
| 70  |  |                             | –75                            |                                      | 28)               |

#### Post-test Instrument Restoration

1. Remove the RF cable from the analyzer input connector.
2. To restore the default settings on the analyzer, press **Preset, System, Alignments, Auto Align, All.**

## **15. Reference Level Accuracy: Agilent E7402A, E7403A, E7404A, and E7405A.**

A 50 MHz CW signal is applied to the 50  $\Omega$  Input of the analyzer through two step attenuators. The amplitude of the source is decreased in 10 dB steps and the analyzer marker functions are used to measure the amplitude difference between steps. The external attenuator is used as the reference standard. The test is performed in both log and linear amplitude scales.

It is only necessary to test reference levels as low as +17 dB $\mu$ v (with 10 dB internal attenuation) since lower reference levels are a function of the analyzer microprocessor manipulating the trace data. There is no error associated with the trace data manipulation.

The related adjustment for this performance test is “IF Amplitude.”

### **Equipment Required**

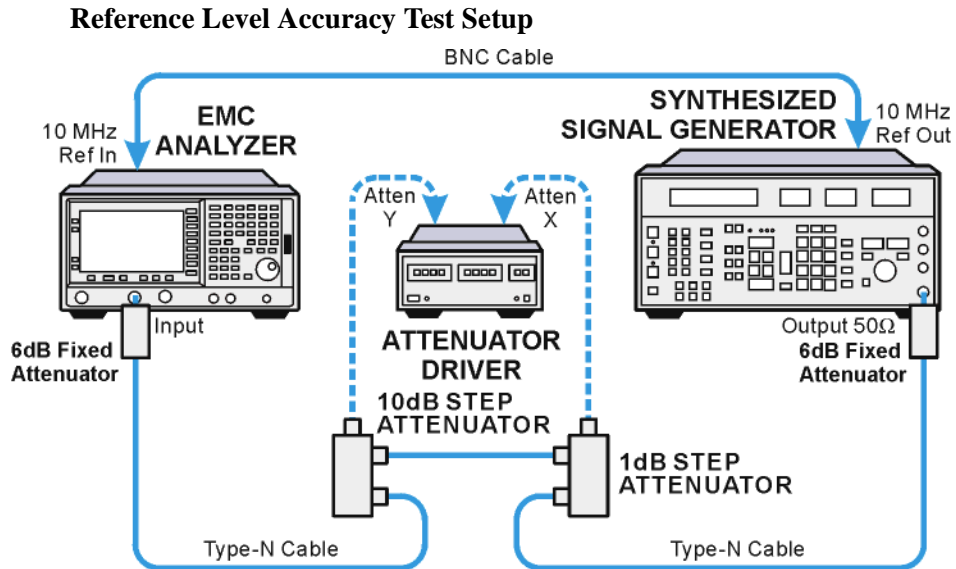
- Synthesized signal generator
- 1 dB step attenuator
- 10 dB step attenuator
- 6 dB fixed attenuator (*2 required*)
- Attenuator switch driver (if programmable step attenuators are used)
- Cable, Type-N 152-cm (60-in) (*2 required*)
- Cable, BNC 122-cm (48-in)
- Attenuator interconnect kit

### **Additional Equipment for Option BAB**

- Adapter, Type-N (f) to APC 3.5 (f)



**Figure 2-15**



wb95a

## Procedure

### Calculate the Actual Attenuation Errors

1. From the calibration data supplied with the 10 dB step attenuator, enter into Column 2 of [Table 2-24](#) through [Table 2-27](#) the actual attenuation for the corresponding nominal attenuation settings. If no calibration data is supplied for 0 dB, enter zero.

#### NOTE

The Agilent 8496G programmable attenuator has four attenuator sections consisting of 10 dB, 20 dB, 40 dB and 40 dB attenuators. If using the Agilent 8496G programmable attenuator, enter the calibration data for the section three 40 dB step rather than the section four 40 dB step.

2. To calculate the attenuation error at other nominal attenuator settings, subtract the attenuation error at the other settings from the reference attenuator error and enter the result in Column 3 of [Table 2-24](#) through [Table 2-27](#).

$$\text{Actual Attenuator Step (X dB)} = (\text{Actual Attenuation (20 dB)} - \text{Actual Attenuation (X dB)})$$

Example for 50 dB attenuator setting:

$$\text{Actual Attenuation (50 dB)} = 50.08 \text{ dB}$$

$$\text{Actual Attenuation (20 dB)} = 19.85 \text{ dB}$$

$$\begin{aligned} \text{Actual Attenuator Step (50 dB)} &= (19.85 \text{ dB} - 50.08 \text{ dB}) \\ &= -30.23 \text{ dB} \end{aligned}$$

**15. Reference Level Accuracy: Agilent E7402A, E7403A, E7404A, and E7405A.**

**Log Scale, Analog Bandwidths**

1. Set the synthesized signal generator controls as follows:

**FREQUENCY, 50 MHz**

**AMPLITUDE, 12 dBm**

2. Connect the equipment as shown in [Figure 2-15](#). Set the 10 dB step attenuator to 20 dB attenuation and the 1 dB step attenuator to 5 dB attenuation.
3. Press **Preset** on the analyzer. Press the Factory Preset softkey, if it is displayed. Press **System, Alignments, Auto Align, Off**. Set the analyzer by pressing the following keys:

**FREQUENCY, Center Freq, 50 MHz**

**AMPLITUDE, -20 dBm**

**AMPLITUDE, More, Y Axis Units (or Amptd Units), dBm**

**Attenuation, 10 dB**

**Scale/Div, 1 dB**

**SPAN, 50 kHz**

**BW/Avg, 3 kHz**

**Video BW, 30 Hz**

4. Set the 1 dB step attenuator to place the signal peak 1 to 3 divisions below the reference level.
5. On the analyzer, press the following keys:

**Single**

**Peak Search (or Search)**

**Marker, Delta**

6. Set the 10 dB step attenuator and analyzer reference level according to Column 1 and Column 4 of [Table 2-24](#). At each setting, do the following:
  - a. Press **Single** on the analyzer.
  - b. Press **Peak Search (or Search)**.
  - c. Record the marker delta amplitude reading in Column 5 of [Table 2-24](#).
  - d. Add the Actual Attenuator Step to the analyzer marker delta amplitude and enter the result as the Test Record entry in the performance test record.

The following is an example for -30 dBm reference level:

Analyzer marker  $\Delta$  amplitude = (-10.17) dB

Actual Attenuator Step (30 dB) = (-10.07) dB

Test Record Entry = (-10.17) dB - (-10.07) dB = (-0.10) dB

**Table 2-24 Log Mode, Analog Bandwidths Worksheet**

| Column 1                                  | Column 2                                 | Column 3                    | Column 4                       | Column 5                             | Column 6          |
|---|--|-----------------------------|--------------------------------|--------------------------------------|-------------------|
| 10 dB Attenuator Nominal Attenuation (dB) | 10 dB Attenuator Actual Attenuation (dB) | Actual Attenuator Step (dB) | Analyzer Reference Level (dBm) | Analyzer Marker Delta Amplitude (dB) | Test Record Entry |
| 20  |  | 0 (Ref)                     | –20                            | 0 (Ref)                              | (Ref)             |
| 10  |  |                             | –10                            |                                      | 1)                |
| 0   |  |                             | 0                              |                                      | 2)                |
| 30  |  |                             | –30                            |                                      | 3)                |
| 40  |  |                             | –40                            |                                      | 4)                |
| 50  |  |                             | –50                            |                                      | 5)                |
| 60  |  |                             | –60                            |                                      | 6)                |
| 70  |  |                             | –70                            |                                      | 7)                |
| 80  |  |                             | –80                            |                                      | 8)                |

**Log Scale, Digital Bandwidths**

7. On the analyzer, press the following keys:

**SPAN, 150 Hz**  
**BW/Avg, 10 Hz**  
**Video BW, 1 Hz**

8. Set the 1 dB step attenuator to set the signal peak 1 to 3 divisions below the reference level.

9. On the analyzer, press the following keys:

**Single**  
**Peak Search (or Search)**  
**Marker, Delta**

10. Set the 10 dB step attenuator and analyzer reference level according to Column 1 and Column 4 of [Table 2-25](#). At each setting, do the following:

- a. Press **Single** on the analyzer.
- b. Press **Peak Search (or Search)**.
- c. Record the marker delta amplitude reading in Column 5 of [Table 2-25](#).
- d. Add the Actual Attenuator Step to the analyzer marker delta amplitude and

**15. Reference Level Accuracy: Agilent E7402A, E7403A, E7404A, and E7405A.**

enter the result as the Test Record entry in the performance test record.

**Table 2-25 Log Mode, Digital Bandwidths Worksheet**

| Column 1                                  | Column 2                                  | Column 3                    | Column 4                       | Column 5                             | Column 6          |
|---|---|-----------------------------|--------------------------------|--------------------------------------|-------------------|
| 10 dB Attenuator Nominal Attenuation (dB) | 10 dB Attenuator Actual Attenuation, (dB) | Actual Attenuator Step (dB) | Analyzer Reference Level (dBm) | Analyzer Marker Delta Amplitude (dB) | Test Record Entry |
| 20  |   | 0 (Ref)                     | -20                            | 0 (Ref)                              | (Ref)             |
| 10  |   |                             | -10                            |                                      | 9)                |
| 0   |   |                             | 0                              |                                      | 10)               |
| 30  |   |                             | -30                            |                                      | 11)               |
| 40  |   |                             | -40                            |                                      | 12)               |
| 50  |   |                             | -50                            |                                      | 13)               |
| 60  |   |                             | -60                            |                                      | 14)               |
| 70  |   |                             | -70                            |                                      | 15)               |
| 80  |   |                             | -80                            |                                      | 16)               |

**Linear Scale, Analog Bandwidths**

1. Set the 10 dB step attenuator to 20 dB attenuation.
2. Set the 1 dB step attenuator to 5 dB attenuation.
3. Set the analyzer by pressing the following keys:

**AMPLITUDE, Scale Type (Lin)**  
**AMPLITUDE, More, Y Axis Units (or Amptd Units), dBm**  
**AMPLITUDE, -20 dBm**  
**SPAN, 50 kHz**  
**BW/Avg, 3 kHz**  
**Video BW, 30 Hz**  
**Sweep, Sweep Cont**  
**Marker, Off**

4. Set the 1 dB step attenuator to place the signal peak 1 to 3 divisions below the reference level.
5. On the analyzer, press the following keys:

**Single**  
**Peak Search (or Search)**  
**Marker, Delta**

6. Set the 10 dB step attenuator and analyzer reference level according to Column

**15. Reference Level Accuracy: Agilent E7402A, E7403A, E7404A, and E7405A.**

1 and Column 4 of [Table 2-26](#). At each setting, do the following:

- a. Press **Single** on the analyzer.
- b. Press **Peak Search** (or **Search**).
- c. Record the marker delta amplitude reading in Column 5 of [Table 2-26](#).
- d. Add the Actual Attenuator Step to the Analyzer Marker Delta Amplitude and enter the result as the Test Record entry in the performance test record.

Table 2-26 Linear Mode, Analog Bandwidths Worksheet

| Column 1                                  | Column 2                                 | Column 3                    | Column 4                       | Column 5                             | Column 6          |
|---|--|-----------------------------|--------------------------------|--------------------------------------|-------------------|
| 10 dB Attenuator Nominal Attenuation (dB) | 10 dB Attenuator Actual Attenuation (dB) | Actual Attenuator Step (dB) | Analyzer Reference Level (dBm) | Analyzer Marker Delta Amplitude (dB) | Test Record Entry |
| 20  |  | 0 (Ref)                     | –20                            | 0 (Ref)                              | (Ref)             |
| 10  |  |                             | –10                            |                                      | 17)               |
| 0   |  |                             | 0                              |                                      | 18)               |
| 30  |  |                             | –30                            |                                      | 19)               |
| 40  |  |                             | –40                            |                                      | 20)               |
| 50  |  |                             | –50                            |                                      | 21)               |
| 60  |  |                             | –60                            |                                      | 22)               |
| 70  |  |                             | –70                            |                                      | 23)               |
| 80  |  |                             | –80                            |                                      | 24)               |

**Linear Scale, Digital Bandwidths**

1. On the analyzer, press the following keys:

**SPAN, 150 Hz**  
**BW/Avg, 10 Hz**  
**Video BW, 1 Hz**

2. Set the 1 dB step attenuator to place the signal peak 1 to 3 divisions below the reference level.
3. On the analyzer, press the following keys:

**Single**  
**Peak Search** (or **Search**)  
**Marker, Delta**

4. Set the 10 dB step attenuator and analyzer reference level according to Column 1 and Column 4 of [Table 2-27](#). At each setting, do the following:
  - a. Press **Single** on the analyzer.
  - b. Press **Peak Search** (or **Search**).
  - c. Record the marker delta amplitude reading in Column 5 of [Table 2-27](#).
  - d. Add the Actual Attenuator Step to the analyzer marker delta amplitude and

## 15. Reference Level Accuracy: Agilent E7402A, E7403A, E7404A, and E7405A.

enter the result as the Test Record entry in the performance test record.

**Table 2-27 Linear Mode, Digital Bandwidths Worksheet**

| Column 1  | Column 2   | Column 3                             | Column 4                                | Column 5                                      | Column 6             |
|---|--|--------------------------------------|---|---|----------------------|
| 10 dB<br>Attenuator<br>Nominal<br>Attenuation<br>(dB) | 10 dB<br>Attenuator<br>Actual<br>Attenuation<br>(dB) | Actual<br>Attenuator<br>Step<br>(dB) | Analyzer<br>Reference<br>Level<br>(dBm) | Analyzer<br>Marker Delta<br>Amplitude<br>(dB) | Test Record<br>Entry |
| 20  |  | 0 (Ref)                              | –20                                     | 0 (Ref)                                       | (Ref)                |
| 10  |  |                                      | –10                                     |   | 25)                  |
| 0   |  |                                      | 0                                       |   | 26)                  |
| 30  |  |                                      | –30                                     |   | 27)                  |
| 40  |  |                                      | –40                                     |   | 28)                  |
| 50  |  |                                      | –50                                     |   | 29)                  |
| 60  |  |                                      | –60                                     |   | 30)                  |
| 70  |  |                                      | –70                                     |   | 31)                  |
| 80  |  |                                      | –80                                     |   | 32)                  |

### Post-test Instrument Restoration

1. Remove the RF cable from the analyzer input connector.
2. To restore the default settings on the analyzer, press **Preset, System, Alignments, Auto Align, All**.

## 16. Resolution Bandwidth Switching Uncertainty

To measure the resolution bandwidth switching uncertainty an amplitude reference is taken with the resolution bandwidth set to 3 kHz using the marker delta function. The resolution bandwidth is changed to settings between 5 MHz and 1 Hz and the amplitude variation is measured at each setting and compared to the specification. The span is changed as necessary to maintain approximately the same aspect ratio.

The related adjustment for this performance test is “IF Amplitude.”

### Equipment Required for Agilent E7402A, E7403A, E7404A, and E7405A

BNC Cable: Agilent (E7402A, E7403A, E7404A, E7405A)

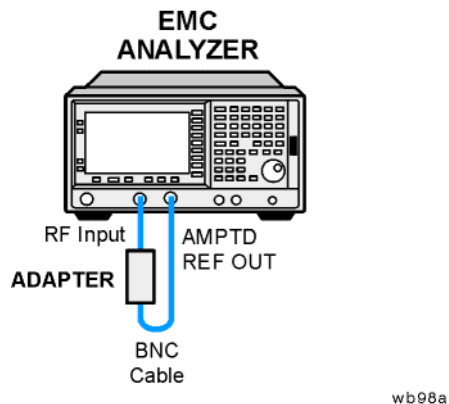
Adapter, Type-N (m) to BNC (f): Agilent (E7402A, E7403A, E7404A, E7405A)

### Additional Equipment for Option BAB

Adapter, Type-N (f) to APC 3.5 (f)

Figure 2-16

Resolution Bandwidth Switching Test Setup



### Procedure

1. On the Agilent E7402A, E7403A, E7404A, or E7405A, connect a BNC cable from the AMPTD REF OUT to the 50  $\Omega$  Input using adapters as necessary. Refer to [Figure 2-16](#).
2. Press **Preset** on the analyzer. Press the **Factory Preset** softkey, if it is displayed. Set the analyzer controls by pressing the following keys:

**Input/Output** (or **Input**), **Amptd Ref** (On) (Agilent E7401A)

**Input/Output** (or **Input**), **Amptd Ref Out** (On) (Agilent E7402A, E7403A,



## 16. Resolution Bandwidth Switching Uncertainty

*E7404A, E7405A)***FREQUENCY, Center Freq, 50 MHz****SPAN, 5 kHz****AMPLITUDE, More, Y Axis Units (or Amptd Units), dBm****AMPLITUDE, –25 dBm (Agilent E7401A)****AMPLITUDE, –19 dBm (Agilent E7402A, E7403A, E7404A, E7405A)****AMPLITUDE, Scale/Div, 1 dB****BW/Avg, 1 kHz****BW/Avg, Video BW, 300 Hz**

- Press **AMPLITUDE** and use the knob to adjust the reference level until the signal appears five divisions below the reference level, then press the following keys:

**Peak Search (or Search)****Marker→, Mkr →CF****Marker, Delta**

- Set the analyzer span and resolution bandwidth according to [Table 2-28](#).
- Press **Peak Search (or Search)**, **Marker→, Mkr →CF**, **Peak Search (or Search)** then record the marker delta amplitude reading in the performance verification test record as indicated in [Table 2-28](#).
- Repeat [step 4](#) and [step 5](#) for each of the remaining resolution bandwidth and span settings listed in [Table 2-28](#).

Table 2-28

**Resolution Bandwidth Switching Uncertainty**

| Analyzer Settings    |         | Marker Delta Amplitude Reading |
|----------------------|---------|--------------------------------|
| RES BW               | SPAN    | Test Record Entry              |
| 1 kHz                | 5 kHz   | 0 (Ref)                        |
| 3 kHz                | 10 kHz  | 1)                             |
| 9 kHz <sup>a</sup>   | 50 kHz  | 2)                             |
| 10 kHz               | 50 kHz  | 3)                             |
| 30 kHz               | 100 kHz | 4)                             |
| 100 kHz              | 500 kHz | 5)                             |
| 120 kHz <sup>a</sup> | 500 kHz | 6)                             |
| 300 kHz              | 1 MHz   | 7)                             |
| 1 MHz                | 5 MHz   | 8)                             |
| 3 MHz                | 10 MHz  | 9)                             |
| 5 MHz                | 25 MHz  | 10)                            |

**16. Resolution Bandwidth Switching Uncertainty**

- a. These Res BW Settings must be entered from the keypad; they cannot be accessed from the step keys or knob.
7. Press **FREQUENCY**, **Center Freq**, **50 MHz**, **SPAN 10 kHz**.
8. Set the resolution bandwidth and span according to [Table 2-29](#).
9. Press **Peak Search** (or **Search**), **Marker**→, Mkr →CF, Peak Search (or **Search**) then record the Marker Delta Amplitude Reading in the performance verification test record as indicated in [Table 2-29](#).
10. Repeat [step 8](#) and [step 9](#) for all the Res BW settings listed in [Table 2-29](#).

**Table 2-29****Resolution Bandwidth Switching Uncertainty for Narrow Resolution Bandwidths**

| Analyzer Settings   |        | Marker Delta Amplitude Reading |
|---------------------|--------|--------------------------------|
| RES BW              | SPAN   | Test Record Entry              |
| 300 Hz              | 1 kHz  | 11)                            |
| 200 Hz <sup>a</sup> | 1 kHz  | 12)                            |
| 100 Hz              | 500 Hz | 13)                            |
| 30 Hz               | 100 Hz | 14)                            |
| 10 Hz               | 100 Hz | 15)                            |
| 3 Hz <sup>b</sup>   | 100 Hz | 16)                            |
| 1 Hz <sup>b</sup>   | 100 Hz | 17)                            |

- a. These Res BW settings must be entered from the keypad; they cannot be accessed from the step keys or knob.
- b. These resolution bandwidths are available only on analyzers having option 1D5 (High-Stability Frequency Reference) and firmware revision A.08.00 and later.

## **17. Absolute Amplitude Accuracy (Reference Settings): Agilent E7401A**

A power sensor (the “buried sensor”), power splitter, and attenuator combination is characterized at 50 MHz using a second power sensor (the “reference sensor”). The attenuator is then connected to the input of the analyzer and the signal generator power level is adjusted for the appropriate level at 50 MHz. A complete auto alignment is performed. The 50 MHz signal is then measured with the spectrum analyzer. The difference between the power meter reading (corrected for the splitter/attenuator tracking error) and spectrum analyzer readings is calculated.

### **Equipment Required**

- Synthesized signal generator
- Power meter
- RF power sensor (2 required)
- Power splitter
- 20 dB attenuator
- Cable, Type-N, 152-cm (60-in)
- Adapter, Type-N (m) to Type-N (m)

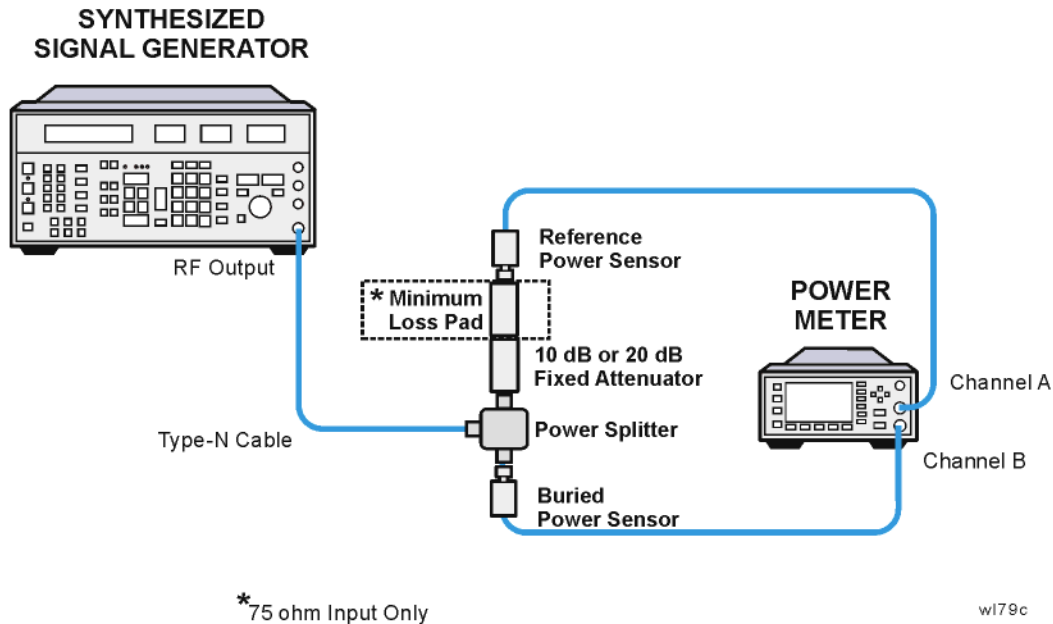
### **Procedure**

This performance test consists of three parts:

- [Part 1. Splitter/Attenuator Characterization](#)
- [Part 2. Absolute Amplitude Accuracy, Preamp Off](#)
- [Part 3. Absolute Amplitude Accuracy, Preamp On](#)

## Part 1. Splitter/Attenuator Characterization

Figure 2-17 Power Splitter/Attenuator Characterization Setup



1. Refer to Figure 2-17. Connect one RF power sensor to Channel A of the power meter. This will be the “reference” sensor. Connect the other RF power sensor to Channel B of the power meter. This will be the “buried” sensor.
2. Zero and calibrate both power sensors.
3. On the power meter, set the Channel A calibration factor to the reference sensor’s reference calibration factor.
4. On the power meter, set the Channel B calibration factor to 100%. Do not change this calibration factor during this test.
5. Connect the equipment as shown in Figure 2-17, “Power Splitter/Attenuator Characterization Setup.”
6. Set the synthesized signal generator frequency to 50 MHz and amplitude to +12 dBm
7. Adjust the synthesized signal generator amplitude to obtain a Channel A power meter reading of  $-14 \text{ dBm} \pm 0.1 \text{ dB}$ .
8. Record the Channel A and Channel B power meter readings below:
 

Channel A (reference sensor): \_\_\_\_\_ dBm

Channel B (buried sensor): \_\_\_\_\_ dBm
9. Calculate the splitter/attenuator tracking error as follows and record the result below:

## 17. Absolute Amplitude Accuracy (Reference Settings): Agilent E7401A

Tracking Error = Channel A Power – Channel B Power

For example, if Channel A Power is –14.07 dBm and Channel B power is +6.23 dBm, the splitter tracking error is –20.30 dB.

Tracking Error: \_\_\_\_\_ dB

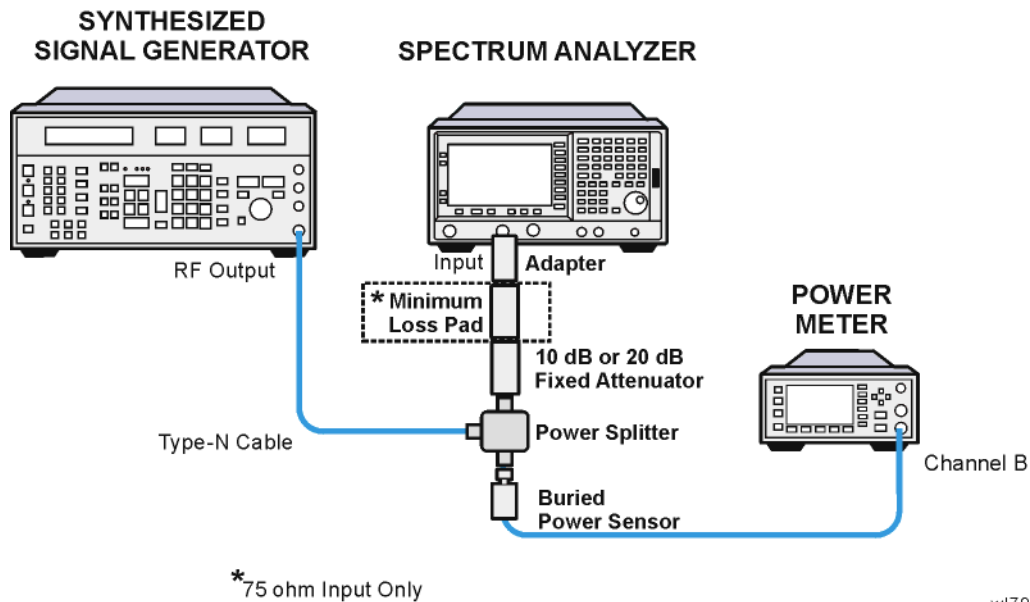
### NOTE

NOTE: Tracking errors when using the minimum loss pad will be nominally –15.7 dB

10. Proceed to Part 2: Absolute Amplitude Accuracy, Preamp Off.

### Part 2. Absolute Amplitude Accuracy, Preamp Off

Figure 2-18 Absolute Amplitude Accuracy Test Setup



1. On the synthesized signal generator set the controls as follows:

**FREQUENCY, 50 MHz**  
**AMPLITUDE, –1 dBm**  
**RF ON**  
**AM OFF**  
**FM OFF**

2. Press **Preset** on the analyzer. (Press the **Factory Preset** softkey, if it is displayed.)

3. Press **System, Alignments, Align Now, All**. Wait for the auto alignment to finish. Press **System, Alignments, Auto Align, Off**.

**17. Absolute Amplitude Accuracy (Reference Settings): Agilent E7401A**

4. Refer to [Figure 2-18](#). Disconnect the reference sensor from the fixed attenuator. Connect the fixed attenuator or minimum loss pad to the input of the analyzer using an adapter. Do not use a cable.
5. Calculate the ideal buried sensor reading by subtracting the Tracking Error recorded in [step 9](#) of Part 1 from the ideal input level to the analyzer, as indicated in the table below:

| Input Impedance | Ideal Input Level | Tracking Error from Part 1, <a href="#">step 9</a> | Ideal Buried Sensor Reading |
|-----------------|-------------------|--|-----------------------------|
| 50Ω             | −27 dBm           |  |                             |

$$\text{Ideal Buried Sensor Reading} = \text{Ideal Input Level} - \text{Tracking Error}$$

6. Adjust the synthesized signal generator to obtain the Ideal Buried Sensor Reading calculated above  $\pm 0.1$  dB.
7. Calculate the Corrected Power Meter Reading by adding the current power meter reading to the Tracking Error recorded in Part 1, [step 9](#) and record the result below:

$$\text{Corrected Power Meter Reading} = \text{Power Meter Reading} + \text{Tracking Error}$$

Example: If the Power Meter Reading is 0.24 dBm and the Tracking Error is −20.3 dB, the Corrected Power Meter Reading is −20.06 dBm

Corrected Power Meter Reading \_\_\_\_\_ dBm

8. Set the analyzer by pressing the following keys:

**FREQUENCY, Center Freq, 50 MHz**  
**SPAN, 2 kHz**  
**BW/ Avg, Resolution BW, 1 kHz (Man)**  
**BW/Avg, Video BW, 1 kHz (Man)**  
**AMPLITUDE, More, Y Axis Units, dBm**  
**AMPLITUDE, Ref Level, −25 dBm**  
**AMPLITUDE, Attenuation, 10 dB**  
**AMPLITUDE, Scale Type (Log)**  
**Det/Demod, Detector, Sample**

9. Press **AMPLITUDE, More, Y Axis Units** (or Amptd Units), **Volts**.
10. Press **Peak Search** (or Search).
11. Convert the marker amplitude reading from Volts to dBm using the appropriate equation below:

$$50\Omega \text{ Input Marker Amptd (dBm)} = 10 \times \log_{10} \left( \text{Mkr} \left( \frac{\text{V}^2}{0.05} \right) \right)$$

Marker Amptd (dBm) \_\_\_\_\_ dBm

12. Subtract the Corrected Power Meter Reading noted in [step 7](#) from the Marker

**17. Absolute Amplitude Accuracy (Reference Settings): Agilent E7401A**

Amptd (dBm) recorded in [step 11](#). Record the difference, Absolute Amplitude Accuracy (Log), as TR Entry 1 in the performance verification test record:

Absolute Amplitude Accuracy (Log) = Marker Amptd (dBm) – Corrected Power Meter Reading (dBm)

13. Press **AMPLITUDE, Scale Type (Lin), More, Y-Axis Units (or Amptd Units), Volts**.
14. Press **Peak Search (or Search)**.
15. Convert the marker amplitude reading from Volts to dBm using the appropriate equation below:

$$50\Omega \text{ Input Marker Amptd (dBm)} = 10 \times \log_{10} \left( \text{Mkr} \left( \frac{V^2}{0.05} \right) \right)$$

Marker Amptd (dBm) \_\_\_\_\_ dBm

16. Subtract the Corrected Power Meter Reading noted in [step 7](#) from the Marker Amptd (dBm) recorded in [step 15](#). Record the difference, Absolute Amplitude Accuracy (Lin), as TR Entry 2 in the performance verification test record:
- Absolute Amplitude Accuracy (Lin) = Marker Amptd (dBm) – Corrected Power Meter Reading (dBm)

**Part 3. Absolute Amplitude Accuracy, Preamp On**

1. On the synthesized signal generator set the controls as follows:

**FREQUENCY, 50 MHz**  
**AMPLITUDE, –4 dBm**  
**RF ON**  
**AM OFF**  
**FM OFF**

2. Calculate the ideal buried sensor reading by subtracting the Tracking Error recorded in [step 9](#) of Part 1 from –30 dBm, the ideal input level to the analyzer, as indicated below:

Ideal Buried Sensor Reading = –30 dBm – Tracking Error

3. Adjust the synthesized signal generator to obtain the Ideal Buried Sensor Reading calculated above  $\pm 0.1$  dB.
4. Calculate the Corrected Power Meter Reading by adding the current power meter reading to the Tracking Error recorded in Part 1, [step 9](#) and record the result below:

Corrected Power Meter Reading = Power Meter Reading + Tracking Error

Example: If the Power Meter Reading is –9.74 dBm and the Tracking Error is –20.3 dB, the Corrected Power Meter Reading is –30.04 dBm

Corrected Power Meter Reading \_\_\_\_\_ dBm

**17. Absolute Amplitude Accuracy (Reference Settings): Agilent E7401A**

5. Set the analyzer by pressing the following keys:

**FREQUENCY, Center Freq**, 50 MHz  
**SPAN**, 2 kHz  
**BW/ Avg, Resolution BW**, 1 kHz (Man)  
**BW/Avg, Video BW**, 1 kHz (Man)  
**AMPLITUDE, Scale Type** (Log)  
**AMPLITUDE, More, Y Axis Units**, dBm  
**AMPLITUDE, Ref Level**, -30 dBm  
**AMPLITUDE, Attenuation**, 0 dB  
**AMPLITUDE, More, Int Preamp** (On)  
**Det/Demod, Detector, Sample**

6. Press **AMPLITUDE, More, Y Axis Units** (or Amptd Units), **Volts**.  
 7. Press **Peak Search** (or Search).  
 8. Convert the marker amplitude reading from Volts to dBm using the appropriate equation below:

$$50\Omega \text{ Input Marker Amptd (dBm)} = 10 \times \log_{10} \left( \text{Mkr} \left( \frac{V^2}{0.05} \right) \right)$$

Marker Amptd (dBm) \_\_\_\_\_ dBm

9. Subtract the Corrected Power Meter Reading noted in [step 4](#) from the Marker Amptd (dBm) recorded in [step 8](#). Record the difference, Absolute Amplitude Accuracy (Log), as TR Entry 3 in the performance verification test record:

Absolute Amplitude Accuracy (Log) = Marker Amptd (dBm) - Corrected Power Meter Reading (dBm)

10. Press **AMPLITUDE, Scale Type** (Lin), **More, Y-Axis Units** (or Amptd Units), **Volts**.  
 11. Press **Peak Search** (or Search).  
 12. Convert the marker amplitude reading from Volts to dBm using the appropriate equation below:

$$50\Omega \text{ Input Marker Amptd (dBm)} = 10 \times \log_{10} \left( \text{Mkr} \left( \frac{V^2}{0.05} \right) \right)$$

Marker Amptd (dBm) \_\_\_\_\_ dBm

13. Subtract the Corrected Power Meter Reading noted in [step 4](#) from the Marker Amptd (dBm) recorded in [step 12](#). Record the difference, Absolute Amplitude Accuracy (Lin), as TR Entry 4 in the performance verification test record:

Absolute Amplitude Accuracy (Lin) = Marker Amptd (dBm) - Corrected Power Meter Reading (dBm)

14. Press **Preset** and wait for the preset routine to finish. Press **System, Alignments, Auto Align, All**.



---

## **18. Absolute Amplitude Accuracy (Reference Settings): Agilent E7402A, E7403A, E7404A, and E7405A**

A power sensor (the “buried sensor”), power splitter, and attenuator combination is characterized at 50 MHz using a second power sensor (the “reference sensor”). The attenuator is then connected to the input of the analyzer and the signal generator power level is adjusted for the appropriate level at 50 MHz. A complete auto alignment is performed. The 50 MHz signal is then measured with the spectrum analyzer. The difference between the power meter reading (corrected for the splitter/attenuator tracking error) and spectrum analyzer readings is calculated.

### **Equipment Required**

- Synthesized signal generator
- Power meter
- RF power sensor (2 required)
- Power splitter
- 20 dB attenuator
- Cable, Type-N, 152-cm (60 in)
- Adapter, Type-N (m to Type-N (m))

### **Additional Equipment for Option BAB**

- Adapter, Type-N (m) to APC 3.5 (f)

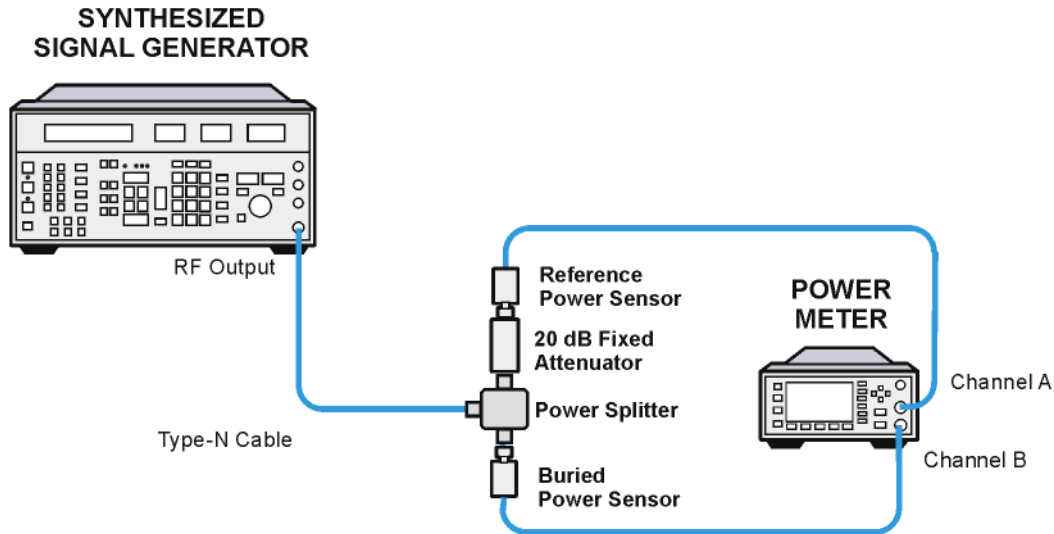
### **Procedure**

This performance test consists of three parts:

- [Part 1. Splitter/Attenuator Characterization](#)
- [Part 2. Absolute Amplitude Accuracy, Preamp Off](#)
- [Part 3. Absolute Amplitude Accuracy, Preamp On](#)

Part 1. Splitter/Attenuator Characterization

Figure 2-19 Power Splitter/Attenuator Characterization Setup



WI710c

1. Refer to [Figure 2-19](#). Connect one RF power sensor to Channel A of the power meter. This will be the “reference” sensor. Connect the other RF power sensor to Channel B of the power meter. This will be the “buried” sensor.
2. Zero and calibrate both power sensors.
3. On the power meter, set the Channel A calibration factor to the reference sensor’s reference calibration factor.
4. On the power meter, set the Channel B calibration factor to 100%. Do not change this calibration factor during this test.
5. Connect the equipment as shown in [Figure 2-19](#), “Power Splitter/Attenuator Characterization Setup.”
6. Set the synthesized signal generator frequency to 50 MHz and amplitude to +12 dBm
7. Adjust the synthesized signal generator amplitude to obtain a Channel A power meter reading of  $-14 \text{ dBm} \pm 0.1 \text{ dB}$ .
8. Record the Channel A and Channel B power meter readings below:
 

Channel A (reference sensor): \_\_\_\_\_ dBm  
 Channel B (buried sensor): \_\_\_\_\_ dBm
9. Calculate the splitter/attenuator tracking error as follows and record the result below:

$$\text{Tracking Error} = \text{Channel A Power} - \text{Channel B Power}$$

## 18. Absolute Amplitude Accuracy (Reference Settings): Agilent E7402A, E7403A, E7404A, and E7405A

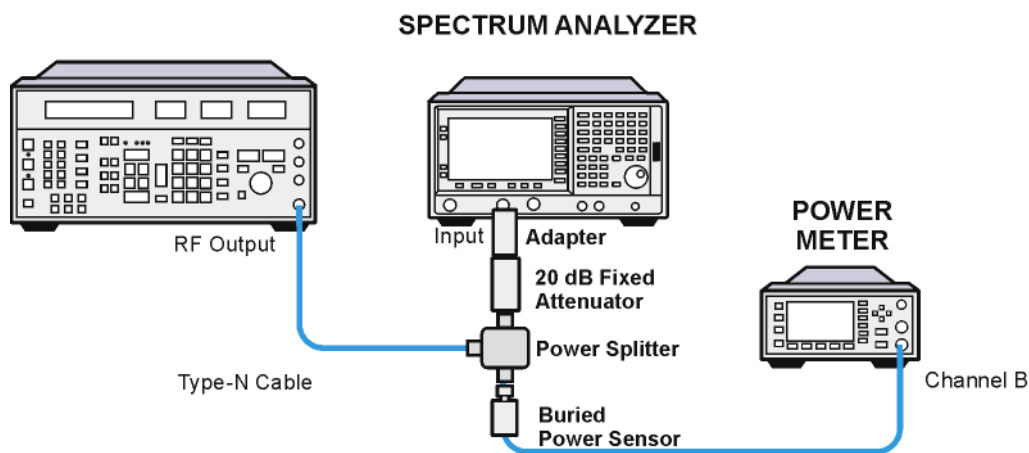
For example, if Channel A Power is  $-14.07$  dBm and Channel B power is  $+6.23$  dBm, the splitter tracking error is  $-20.30$  dB.

Tracking Error: \_\_\_\_\_ dB

10. Proceed to Part 2: Absolute Amplitude Accuracy, Preamp Off.

### Part 2. Absolute Amplitude Accuracy, Preamp Off

**Figure 2-20** Absolute Amplitude Accuracy Test Setup



WI710d

1. On the synthesized signal generator set the controls as follows:

**FREQUENCY, 50 MHz**  
**AMPLITUDE, +6 dBm**  
**RF ON**  
**AM OFF**  
**FM OFF**

2. Press **Preset** on the analyzer. (Press the Factory Preset softkey, if it is displayed.)
3. Use a BNC cable and adapter to connect the AMPTD REF OUT to the INPUT 50Ω.
4. Press **System, Alignments, Align Now, All**. Wait for the auto alignment to finish. Press **System, Alignments, Auto Align, Off**.
5. Refer to [Figure 2-20](#). Disconnect the reference sensor from the fixed attenuator. Connect the fixed attenuator to the input of the analyzer using an adapter. Do

**18. Absolute Amplitude Accuracy (Reference Settings): Agilent E7402A, E7403A, E7404A, and E7405A**

not use a cable.

6. Calculate the ideal buried sensor reading by subtracting the Tracking Error recorded in [step 9](#) of Part 1 from –20 dBm, the ideal input level to the analyzer.

$$\text{Ideal Buried Sensor Reading} = -20 \text{ dBm} - \text{Tracking Error}$$

7. Adjust the synthesized signal generator to obtain the Ideal Buried Sensor Reading calculated above  $\pm 0.1$  dB.
8. Calculate the Corrected Power Meter Reading by adding the current power meter reading to the Tracking Error recorded in Part 1, [step 9](#) and record the result below:

$$\text{Corrected Power Meter Reading} = \text{Power Meter Reading} + \text{Tracking Error}$$

Example: If the Power Meter Reading is 0.24 dBm and the Tracking Error is –20.3 dB, the Corrected Power Meter Reading is –20.06 dBm

Corrected Power Meter Reading \_\_\_\_\_ dBm

9. Set the analyzer by pressing the following keys:

**FREQUENCY, Center Freq, 50 MHz**  
**SPAN, 2 kHz**  
**BW/ Avg, Resolution BW, 1 kHz (Man)**  
**BW/Avg, Video BW, 1 kHz (Man)**  
**AMPLITUDE, More, Y Axis Units, dBm**  
**AMPLITUDE, Ref Level, –20 dBm**  
**AMPLITUDE, Attenuation, 10 dB**  
**AMPLITUDE, Scale Type (Log)**  
**Det/Demod, Detector, Sample**

10. Press **AMPLITUDE, More, Y Axis Units** (or Amptd Units), **Volts**.
11. Press **Peak Search** (or Search).
12. Convert the marker amplitude reading from Volts to dBm using the equation below:

$$50\Omega \text{ Input Marker Amptd (dBm)} = 10 \times \log_{10} \left( \text{Mkr} \left( \frac{\text{V}^2}{0.05} \right) \right)$$

Marker Amptd (dBm) \_\_\_\_\_ dBm

13. Subtract the Corrected Power Meter Reading noted in [step 8](#) from the Marker Amptd (dBm) recorded in [step 12](#). Record the difference, Absolute Amplitude Accuracy (Log), as TR Entry 1 in the performance verification test record:

$$\text{Absolute Amplitude Accuracy (Log)} = \text{Marker Amptd (dBm)} - \text{Corrected Power Meter Reading (dBm)}$$

14. Press **AMPLITUDE, Scale Type (Lin), More, Y-Axis Units** (or Amptd Units), **Volts**.
15. Press **Peak Search** (or Search).

## 18. Absolute Amplitude Accuracy (Reference Settings): Agilent E7402A, E7403A, E7404A, and E7405A

16. Convert the marker amplitude reading from Volts to dBm using the equation below:

$$50\Omega \text{ Input Marker Amptd (dBm)} = 10 \times \log_{10} \left( \text{Mkr} \left( \frac{V^2}{0.05} \right) \right)$$

Marker Amptd (dBm) \_\_\_\_\_ dBm

17. Subtract the Corrected Power Meter Reading noted in [step 8](#) from the Marker Amptd (dBm) recorded in [step 16](#). Record the difference, Absolute Amplitude Accuracy (Lin), as TR Entry 2 in the performance verification test record:

Absolute Amplitude Accuracy (Lin) = Marker Amptd (dBm) – Corrected Power Meter Reading (dBm)

### Part 3. Absolute Amplitude Accuracy, Preamp On

1. On the synthesized signal generator set the controls as follows:

**FREQUENCY, 50 MHz**  
**AMPLITUDE, –4 dBm**  
**RF ON**  
**AM OFF**  
**FM OFF**

2. Calculate the ideal buried sensor reading by subtracting the Tracking Error recorded in [step 9](#) of Part 1 from –30dBm, the ideal input level to the analyzer, as indicated below:

Ideal Buried Sensor Reading = –30 dBm – Tracking Error

3. Adjust the synthesized signal generator to obtain the Ideal Buried Sensor Reading calculated above  $\pm 0.1$  dB.
4. Calculate the Corrected Power Meter Reading by adding the current power meter reading to the Tracking Error recorded in Part 1, [step 9](#) and record the result below:

Corrected Power Meter Reading = Power Meter Reading + Tracking Error

Example: If the Power Meter Reading is –9.74 dBm and the Tracking Error is –20.3 dB, the Corrected Power Meter Reading is –30.04 dBm

Corrected Power Meter Reading \_\_\_\_\_ dBm

5. Set the analyzer by pressing the following keys:

**FREQUENCY, Center Freq, 50 MHz**  
**SPAN, 2 kHz**  
**BW/ Avg, Resolution BW, 1 kHz (Man)**  
**BW/Avg, Video BW, 1 kHz (Man)**  
**AMPLITUDE, Scale Type (Log)**  
**AMPLITUDE, More, Y Axis Units, dBm**  
**AMPLITUDE, Ref Level, –30 dBm**  
**AMPLITUDE, Attenuation, 0 dB**

**18. Absolute Amplitude Accuracy (Reference Settings): Agilent E7402A, E7403A, E7404A, and E7405A**

**AMPLITUDE, More, Int Preamp (On)**  
**Det/Demod, Detector, Sample**

6. Press **AMPLITUDE, More, Y Axis Units** (or Amptd Units), **Volts**.
7. Press **Peak Search** (or Search).
8. Convert the marker amplitude reading from Volts to dBm using the equation below:

$$50\Omega \text{ Input Marker Amptd (dBm)} = 10 \times \log_{10} \left( \text{Mkr} \left( \frac{V^2}{0.05} \right) \right)$$

Marker Amptd (dBm) \_\_\_\_\_ dBm

9. Subtract the Corrected Power Meter Reading noted in [step 4](#) from the Marker Amptd (dBm) recorded in [step 8](#). Record the difference, Absolute Amplitude Accuracy (Log), as TR Entry 3 in the performance verification test record:

Absolute Amplitude Accuracy (Log) = Marker Amptd (dBm) - Corrected Power Meter Reading (dBm)

10. Press **AMPLITUDE, Scale Type (Lin), More, Y-Axis Units** (or Amptd Units), **Volts**.

11. Press **Peak Search** (or Search).

12. Convert the marker amplitude reading from Volts to dBm using the equation below:

$$50\Omega \text{ Input Marker Amptd (dBm)} = 10 \times \log_{10} \left( \text{Mkr} \left( \frac{V^2}{0.05} \right) \right)$$

Marker Amptd (dBm) \_\_\_\_\_ dBm

13. Subtract the Corrected Power Meter Reading noted in [step 4](#) from the Marker Amptd (dBm) recorded in [step 12](#). Record the difference, Absolute Amplitude Accuracy (Lin), as TR Entry 4 in the performance verification test record:

Absolute Amplitude Accuracy (Lin) = Marker Amptd (dBm) - Corrected Power Meter Reading (dBm)

14. Press **Preset** and wait for the preset routine to finish. Press **System, Alignments, Auto Align, All**.

## 19. Overall Absolute Amplitude Accuracy: Agilent E7401A

This test measures the absolute amplitude of the analyzer at 50 MHz. A synthesized signal generator and attenuators are used as the signal source to the analyzer. A power meter is used to measure this signal source with the attenuators set to 0 dB. The value measured is recorded as the source amplitude. The attenuators are used to adjust the signal levels applied to the analyzer between the initial signal amplitude (set with the power meter) and +57 dB $\mu$ V. The amplitude measured by the analyzer is compared to the actual signal level and the amplitude error is calculated.

There are no related adjustment procedures for this performance test.

### Equipment Required

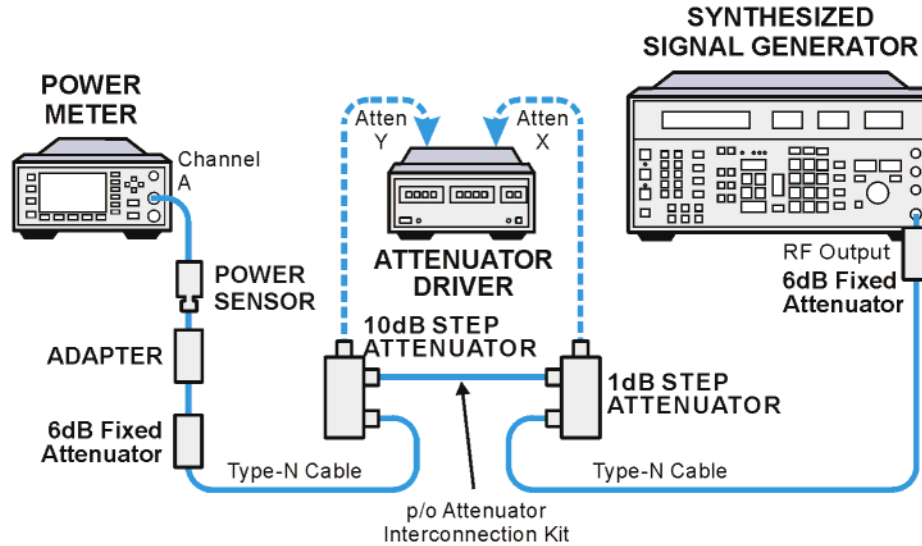
- Synthesized signal generator
- 10 dB step attenuator
- 1 dB step attenuator
- Attenuator interconnection kit
- Attenuator driver (if programmable step attenuators are used)
- 6 dB fixed attenuator (2 *required*)
- Power meter
- Power sensor
- Cable, Type-N, 62-cm (24 in.) (m) (2 *required*)
- Cable, BNC
- Adapter, Type-N (f) to Type-N (f)

### Procedure

#### Measuring 0 dBm Reference Level

1. Press **Preset** on the analyzer. Press the **Factory Preset** softkey, if it is displayed.
2. Perform a complete self-alignment and set Auto Align Off. Press **System, Alignments, Align Now, All**, and wait for the alignment routine to finish. Then, press **Return, Auto Align, Off**.
3. Zero and calibrate the power meter and power sensor connected to Channel A of the power meter.

Figure 2-21 Measure Source Test Setup



wb912a

4. Connect the equipment as shown in Figure 2-21. The power sensor should connect directly to the 6 dB fixed attenuator using an adapter.
5. Preset the synthesized signal generator. Manually press **Blue Key, Special, 0, 0**. Set the signal generator as follows:

**FREQUENCY, 50 MHz**  
**AMPLITUDE, 12 dBm**

6. Set the 10 dB and 1 dB step attenuators to 0 dB.
7. Obtain the actual attenuation for the 0 dB setting of each attenuator at 50 MHz from the metrology data for the step attenuators. In some cases this value might be zero, by definition. Add the two actual attenuations to obtain the 0 dB reference attenuation.

$$\text{RefAtten}_{0\text{dB}} = 10 \text{ dB Actual}_{0\text{dB}} + 1 \text{ dB Actual}_{0\text{dB}}$$

For example, if the actual attenuation for the 10 dB step attenuator is 0.03 dB, 10 dB Actual<sub>0dB</sub> is 0.03 dB. If the actual attenuation for the 1 dB step attenuator is 0.02 dB, 1 dB Actual<sub>0dB</sub> is 0.02 dB. In this case RefAtten<sub>0dB</sub> is 0.05 dB.

8. Obtain the metrology data for the step attenuators at 50 MHz. Enter the actual attenuation values for each attenuator setting as indicated in Table 2-30. If using a programmable attenuator, the section three 40 dB step should be used for the 40 dB setting on the 10 dB step attenuator. Similarly, the section three 4



## 19. Overall Absolute Amplitude Accuracy: Agilent E7401A

dB step should be used for the 4 dB setting on the 1 dB step attenuator.

Table 2-30

Amplitude Accuracy Worksheet, 0 dBm Reference Level

| 1 dB Step Attenuator |        | 10 dB Step Attenuator |        | Total Attenuation |        | Nominal Amptd. | Meas. Amptd. | Amptd. Accuracy Test Record Entry |
|----------------------|--------|-----------------------|--------|-------------------|--------|----------------|--------------|-----------------------------------|
| Setting              | Actual | Setting               | Actual | Setting           | Actual |                |              |                                   |
| 0 dB                 |        | 0 dB                  |        | 0 dB              |        | 0 dBm          |              | 1)                                |
| 0 dB                 |        | 10 dB                 |        | 10 dB             |        | -10 dBm        |              | 2)                                |
| 0 dB                 |        | 20 dB                 |        | 20 dB             |        | -20 dBm        |              | 3)                                |
| 0 dB                 |        | 30 dB                 |        | 30 dB             |        | -30 dBm        |              | 4)                                |
| 0 dB                 |        | 40 dB                 |        | 40 dB             |        | -40 dBm        |              | 5)                                |
| 0 dB                 |        | 50 dB                 |        | 50 dB             |        | -50 dBm        |              | 6)                                |

9. Calculate the actual total attenuation by adding the actual attenuation for the 1 dB step attenuator to the actual attenuation for the 10 dB step attenuator for each total attenuation setting listed in [Table 2-30](#).

**NOTE**

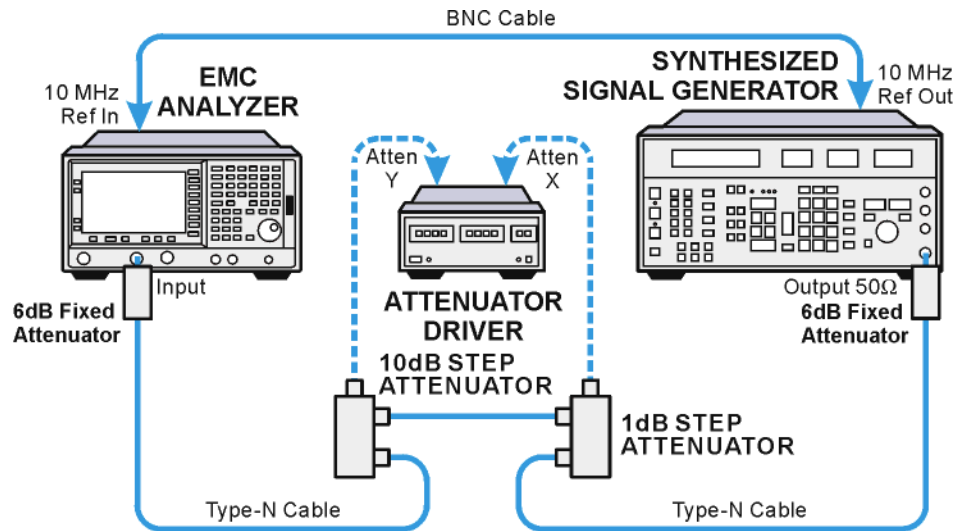
The external attenuators and cables are now part of the “source.”

10. Adjust the signal generator amplitude for a power meter reading of 0 dBm  $\pm 0.2$  dB. Record the power meter reading here:

Amptd<sub>0dBm</sub> = \_\_\_\_\_ dBm

11. Connect the equipment as indicated in [Figure 2-22](#). The fixed attenuator must connect directly to the analyzer input.

Figure 2-22 Amplitude Accuracy Test Setup



wb95a

12. Set the analyzer as follows:

**FREQUENCY, Center Freq, 50 MHz**

**SPAN, 6 kHz**

**BW/Avg, Res BW, 1 kHz**

**AMPLITUDE, More, Y Axis Units (or Amptd Units), dBm**

**AMPLITUDE, Ref Level, 0 dBm**

**Attenuation, 10 dB (Man)**

13. Perform the following steps for each of the nominal amplitude values listed in Table 2-30:

- Set the 1 dB step attenuator as indicated in Table 2-30.
- Set the 10 dB step attenuator as indicated in Table 2-30.
- Press **Single** and wait for the sweep to finish.
- Press **Peak Search** (or **Search**). Even though the signal may be slightly above the reference level for the first nominal amplitude setting, the marker can still make a valid measurement.
- Record the marker (Mkr1) amplitude value as the measured amplitude in Table 2-30.
- If the nominal amplitude is 0 dBm, calculate the amplitude accuracy as follows:

$$\text{Amplitude Accuracy} = \text{Measured Amplitude} - \text{Amptd}_{0\text{dBm}}$$

- If the amplitude is less than 0 dBm, calculate the amplitude accuracy as follows:

$$\text{Amplitude Accuracy} = \text{Measured Amplitude} - (\text{Amptd}_{0\text{dBm}} - \text{ActualTotalAtten} + \text{RefAtten}_{0\text{dB}})$$

- Record the amplitude accuracy in the performance verification test record as indicated in Table 2-30.

## 19. Overall Absolute Amplitude Accuracy: Agilent E7401A

## Measuring –20 dBm Reference Level

1. Press **AMPLITUDE, Ref Level, –20 dBm**.
2. Copy the actual total attenuation values from [Table 2-30](#) into the actual total attenuation column in [Table 2-31](#). Not all values in [Table 2-30](#) will be required in [Table 2-31](#).

Table 2-31 Amplitude Accuracy Worksheet, –20 dBm Reference Level

| 1 dB Step Attenuator | 10 dB Step Attenuator | Total Attenuation |        | Nominal Amplitude | Measured Amplitude | Amplitude Accuracy |
|----------------------|-----------------------|-------------------|--------|-------------------|--------------------|--------------------|
| Setting              | Actual                | Setting           | Actual |                   |                    | Test Record Entry  |
| 0 dB                 | 20 dB                 | 20 dB             |        | –20 dBm           |                    | 7)                 |
| 0 dB                 | 30 dB                 | 30 dB             |        | –30 dBm           |                    | 8)                 |
| 0 dB                 | 40 dB                 | 40 dB             |        | –40 dBm           |                    | 9)                 |
| 0 dB                 | 50 dB                 | 50 dB             |        | –50 dBm           |                    | 10)                |

3. Perform the following steps for each of the nominal amplitude values listed in [Table 2-31](#):
  - a. Set the 1 dB step attenuator as indicated in [Table 2-31](#).
  - b. Set the 10 dB step attenuator as indicated in [Table 2-31](#).
  - c. Press **Single** and wait for the sweep to finish.
  - d. Press **Peak Search** (or **Search**). Even though the signal may be slightly above the reference level for the first nominal amplitude setting, the marker can still make a valid measurement.
  - e. Record the marker (Mkr1) amplitude value as the measured amplitude in [Table 2-31](#).
  - f. Calculate the amplitude accuracy as follows:

$$\text{Amplitude Accuracy} = \text{Measured Amplitude} - (\text{Amptd}_{0\text{dBm}} - \text{ActualTotalAtten} + \text{RefAtten}_{0\text{dB}})$$

- g. Record the amplitude accuracy in the performance verification test record as indicated in [Table 2-31](#).

## Measuring –40 dBm Reference Level

1. Press **AMPLITUDE, Ref Level, –40 dBm**.
2. Copy the actual total attenuation values from [Table 2-31](#) into the actual total attenuation column in [Table 2-32](#). Not all values in [Table 2-31](#) will be required in [Table 2-32](#).

## 19. Overall Absolute Amplitude Accuracy: Agilent E7401A

Table 2-32 Amplitude Accuracy Worksheet, –40 dBm Reference Level

| 1 dB Step Attenuator | 10 dB Step Attenuator | Total Attenuation |        | Nominal Amplitude | Measured Amplitude | Amplitude Accuracy |
|----------------------|-----------------------|-------------------|--------|-------------------|--------------------|--------------------|
| Setting              | Actual                | Setting           | Actual |                   |                    | Test Record Entry  |
| 0 dB                 | 40 dB                 | 40 dB             |        | –40 dBm           |                    | 11)                |
| 0 dB                 | 50 dB                 | 50 dB             |        | –50 dBm           |                    | 12)                |

3. Perform the following steps for each of the nominal amplitude values listed in [Table 2-32](#):

- Set the 1 dB step attenuator as indicated in [Table 2-32](#).
- Set the 10 dB step attenuator as indicated in [Table 2-32](#).
- Press **Single** and wait for the sweep to finish.
- Press **Peak Search** (or **Search**). Even though the signal may be slightly above the reference level for the first nominal amplitude setting, the marker can still make a valid measurement.
- Record the marker (Mkr1) amplitude value as the measured amplitude in [Table 2-32](#).
- Calculate the amplitude accuracy as follows:  

$$\text{Amplitude Accuracy} = \text{Measured Amplitude} - (\text{Amptd}_{0\text{dBm}} - \text{ActualTotalAtten} + \text{RefAtten}_{0\text{dB}})$$
- Record the amplitude accuracy in the performance verification test record as indicated in [Table 2-32](#).

## Measuring –50 dBm Reference Level

- Press **AMPLITUDE, Ref Level, –50 dBm**.
- Copy the actual total attenuation values from [Table 2-32](#) into the actual total attenuation column in [Table 2-33](#). Not all values in [Table 2-32](#) will be required in [Table 2-33](#).

Table 2-33 Amplitude Accuracy Worksheet, –50 dBm Reference Level

| 1 dB Step Attenuator | 10 dB Step Attenuator | Total Attenuation |        | Nominal Amplitude | Measured Amplitude | Amplitude Accuracy |
|----------------------|-----------------------|-------------------|--------|-------------------|--------------------|--------------------|
| Setting              | Actual                | Setting           | Actual |                   |                    | Test Record Entry  |
| 0 dB                 | 50 dB                 | 50 dB             |        | –50 dBm           |                    | 13)                |

3. Perform the following steps for each of the nominal amplitude values listed in [Table 2-33](#):

- Set the 1 dB step attenuator as indicated in [Table 2-33](#).
- Set the 10 dB step attenuator as indicated in [Table 2-33](#).
- Press **Single** and wait for the sweep to finish.
- Press **Peak Search** (or **Search**). Even though the signal may be slightly

**19. Overall Absolute Amplitude Accuracy: Agilent E7401A**

above the reference level for the first nominal amplitude setting, the marker can still make a valid measurement.

- e. Record the marker (Mkr1) amplitude value as the measured amplitude in [Table 2-33](#).
- f. Calculate the amplitude accuracy as follows:  
$$\text{Amplitude Accuracy} = \text{Measured Amplitude} - (\text{Amptd}_{\text{dBm}} - \text{ActualTotalAtten} + \text{RefAtten}_{\text{dB}})$$
- g. Record the amplitude accuracy in the performance verification test record as indicated in [Table 2-33](#).

---

## **20. Overall Absolute Amplitude Accuracy: Agilent E7402A, E7403A, E7404A, and E7405A**

This test measures the absolute amplitude of the analyzer at 50 MHz. A synthesized signal generator and attenuators are used as the signal source to the analyzer. A power meter is used to measure this signal source with the attenuators set to 0 dB. The value measured is recorded as the source amplitude. The attenuators are used to adjust the signal levels applied to the analyzer from the initial signal amplitude (set with the power meter) and –50 dBm. The amplitude measured by the analyzer is compared to the actual signal level and the amplitude error is calculated.

There are no related adjustment procedures for this performance test.

### **Equipment Required**

- Synthesized signal generator
- 10 dB step attenuator
- 1 dB step attenuator
- Attenuator interconnection kit
- Attenuator driver (if programmable step attenuators are used)
- 6 dB fixed attenuator (*2 required*)
- Power meter
- RF power sensor
- Cable, Type-N, 62 cm (24 in.) (m) (*2 required*)
- Cable, BNC
- Adapter, Type-N (f) to Type-N (f)

### **Additional Equipment for Option BAB**

- Adapter, Type N (f) to APC 3.5 (f)

### **Procedure**

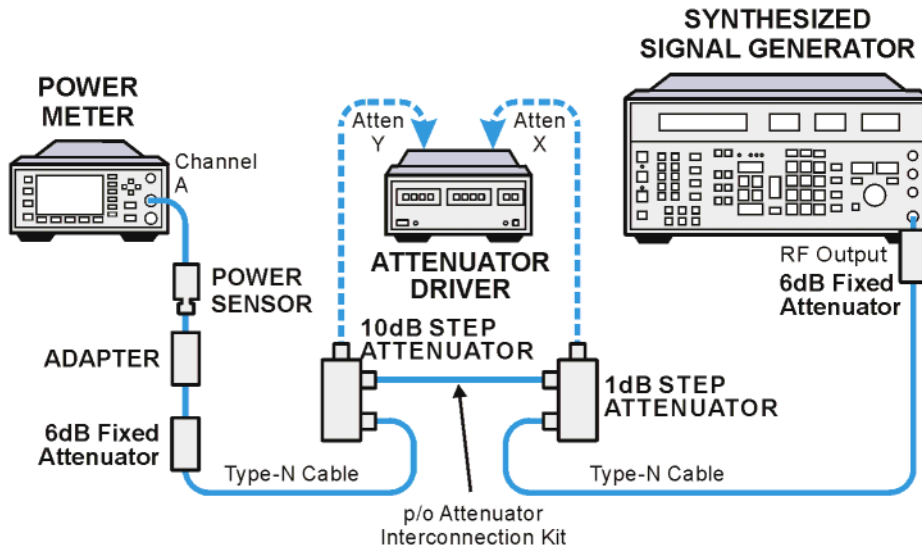
#### **Measuring 0 dBm Reference Level**

1. Press **Preset** on the analyzer. Press the **Factory Preset** softkey, if it is displayed.
2. Connect a BNC cable from AMPTD REF OUT to the 50  $\Omega$  Input connector using a Type N (m) to BNC (f) adapter.
3. Perform a complete self-alignment and set Auto Align Off. Press **System, Alignments, Align Now, All**, and wait for the alignment routine to finish. Then, press **Return, Auto Align, Off**.
4. Zero and calibrate the power meter and power sensor connected to Channel A of the power meter.

## 20. Overall Absolute Amplitude Accuracy: Agilent E7402A, E7403A, E7404A, and E7405A

- Connect the equipment as shown in Figure 2-23. The power sensor should connect directly to the 6 dB fixed attenuator using an adapter.

**Figure 2-23 Measure Source Test Setup**



wb912a

- Preset** the synthesized signal generator. Manually press **Blue Key, Special, 0, 0**. Set the signal generator as follows:

**FREQUENCY, 50 MHz**  
**AMPLITUDE, 12 dBm**

- Set the 10 dB and 1 dB step attenuators to 0 dB.
- Obtain the actual attenuation for the 0 dB setting of each attenuator at 50 MHz from the metrology data for the step attenuators. In some cases this value might be zero, by definition. Add the two actual attenuations to obtain the 0 dB reference attenuation.

$$\text{RefAtten}_{0\text{dB}} = 10 \text{ dB Actual}_{0\text{dB}} + 1 \text{ dB Actual}_{0\text{dB}}$$

For example, if the actual attenuation for the 10 dB step attenuator is 0.03 dB, 10 dB Actual<sub>0dB</sub> is 0.03 dB. If the actual attenuation for the 1 dB step attenuator is 0.02 dB, 1 dB Actual<sub>0dB</sub> is 0.02 dB. In this case RefAtten<sub>0dB</sub> is 0.05 dB.

- Obtain the metrology data for the step attenuators at 50 MHz. Enter the actual attenuation values for each attenuator setting as indicated in Table 2-34. If using a programmable attenuator, the section three 40 dB step should be used for the 40 dB setting on the 10 dB step attenuator. Similarly, the section three 4

**20. Overall Absolute Amplitude Accuracy: Agilent E7402A, E7403A, E7404A, and E7405A**

dB step should be used for the 4 dB setting on the 1 dB step attenuator.

**Table 2-34 Amplitude Accuracy Worksheet, 0 dBm Reference Level**

| 1 dB Step Attenuator |        | 10 dB Step Attenuator |        | Total Attenuation |        | Nominal Amptd. | Meas. Amptd. | Amptd. Accuracy Test Record Entry |
|----------------------|--------|-----------------------|--------|-------------------|--------|----------------|--------------|-----------------------------------|
| Setting              | Actual | Setting               | Actual | Setting           | Actual |                |              |                                   |
| 0 dB                 |        | 0 dB                  |        | 0 dB              |        | 0 dBm          |              | 1)                                |
| 0 dB                 |        | 10 dB                 |        | 10 dB             |        | -10 dBm        |              | 2)                                |
| 0 dB                 |        | 20 dB                 |        | 20 dB             |        | -20 dBm        |              | 3)                                |
| 0 dB                 |        | 30 dB                 |        | 30 dB             |        | -30 dBm        |              | 4)                                |
| 0 dB                 |        | 40 dB                 |        | 40 dB             |        | -40 dBm        |              | 5)                                |
| 0 dB                 |        | 50 dB                 |        | 50 dB             |        | -50 dBm        |              | 6)                                |

10. Calculate the actual total attenuation by adding the actual attenuation for the 1 dB step attenuator to the actual attenuation for the 10 dB step attenuator for each total attenuation setting listed in [Table 2-34](#).

**NOTE**

The external attenuators and cables are now part of the “source.”

11. Adjust the signal generator amplitude for a power meter reading of 0 dBm  $\pm$ 0.2 dB. Record the power meter reading here:

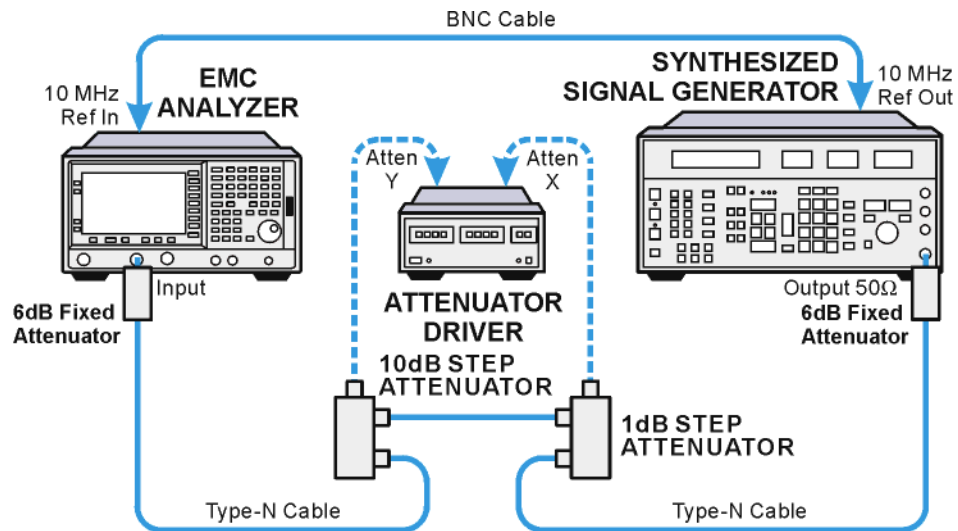
Amptd<sub>0dBm</sub> = \_\_\_\_\_ dBm

12. Connect the equipment as indicated in [Figure 2-24](#). The fixed attenuator must connect directly to the analyzer input.



## 20. Overall Absolute Amplitude Accuracy: Agilent E7402A, E7403A, E7404A, and E7405A

**Figure 2-24 Amplitude Accuracy Test Setup**



wb95a

13. Set the analyzer as follows:

**FREQUENCY, Center Freq, 50 MHz**

**SPAN, 6 kHz**

**BW/Avg, Res BW, 1 kHz**

**AMPLITUDE, More, Y Axis Units (or Amptd Units), dBm**

**AMPLITUDE, Ref Level, 0 dBm**

**Attenuation, 10 dB (Man)**

14. Perform the following steps for each of the nominal amplitude values listed in Table 2-34:

- Set the 1 dB step attenuator as indicated in Table 2-34.
- Set the 10 dB step attenuator as indicated in Table 2-34.
- Press **Single** and wait for the sweep to finish.
- Press **Peak Search** (or **Search**). Even though the signal may be slightly above the reference level for the first nominal amplitude setting, the marker can still make a valid measurement.
- Record the marker (Mkr1) amplitude value as the measured amplitude in Table 2-34.
- If the nominal amplitude is 0 dBm, calculate the amplitude accuracy as follows:  

$$\text{Amplitude Accuracy} = \text{Measured Amplitude} - \text{Amptd}_{0\text{dBm}}$$
- If the amplitude is less than 0 dBm, calculate the amplitude accuracy as follows:  

$$\text{Amplitude Accuracy} = \text{Measured Amplitude} - (\text{Amptd}_{0\text{dBm}} - \text{ActualTotalAtten} + \text{RefAtten}_{0\text{dB}})$$
- Record the amplitude accuracy in the performance verification test record as indicated in Table 2-34.

**20. Overall Absolute Amplitude Accuracy: Agilent E7402A, E7403A, E7404A, and E7405A****Measuring –20 dBm Reference Level**

1. Press **AMPLITUDE, Ref Level, –20 dBm**.
2. Copy the actual total attenuation values from [Table 2-34](#) into the actual total attenuation column in [Table 2-35](#). Not all values in [Table 2-34](#) will be required in [Table 2-35](#).

**Table 2-35 Amplitude Accuracy Worksheet, –20 dBm Reference Level**

| 1 dB Step Attenuator | 10 dB Step Attenuator | Total Attenuation |        | Nominal Amplitude | Measured Amplitude | Amplitude Accuracy<br><br>Test Record Entry |
|----------------------|-----------------------|-------------------|--------|-------------------|--------------------|---|
| Setting              | Actual                | Setting           | Actual |                   |                    |   |
| 0 dB                 | 20 dB                 | 20 dB             |        | –20 dBm           |                    | 7)  |
| 0 dB                 | 30 dB                 | 30 dB             |        | –30 dBm           |                    | 8)  |
| 0 dB                 | 40 dB                 | 40 dB             |        | –40 dBm           |                    | 9)  |
| 0 dB                 | 50 dB                 | 50 dB             |        | –50 dBm           |                    | 10)   |

3. Perform the following steps for each of the nominal amplitude values listed in [Table 2-35](#):
  - a. Set the 1 dB step attenuator as indicated in [Table 2-35](#).
  - b. Set the 10 dB step attenuator as indicated in [Table 2-35](#).
  - c. Press **Single** and wait for the sweep to finish.
  - d. Press **Peak Search** (or **Search**). Even though the signal may be slightly above the reference level for the first nominal amplitude setting, the marker can still make a valid measurement.
  - e. Record the marker (Mkr1) amplitude value as the measured amplitude in [Table 2-35](#).
  - f. Calculate the amplitude accuracy as follows:  

$$\text{Amplitude Accuracy} = \text{Measured Amplitude} - (\text{Amptd}_{0\text{dBm}} - \text{ActualTotalAtten} + \text{RefAtten}_{0\text{dB}})$$
  - g. Record the amplitude accuracy in the performance verification test record as indicated in [Table 2-35](#).

**Measuring –40 dBm Reference Level**

1. Press **AMPLITUDE, Ref Level, –40 dBm**.
2. Copy the actual total attenuation values from [Table 2-34](#) into the actual total attenuation column in [Table 2-36](#). Not all values in

## 20. Overall Absolute Amplitude Accuracy: Agilent E7402A, E7403A, E7404A, and E7405A

Table 2-34 will be required in Table 2-36.

**Table 2-36 Amplitude Accuracy Worksheet, –40 dBm Reference Level**

| 1 dB Step Attenuator | 10 dB Step Attenuator | Total Attenuation |        | Nominal Amplitude | Measured Amplitude | Amplitude Accuracy<br>Test Record Entry |
|----------------------|-----------------------|-------------------|--------|-------------------|--------------------|---|
| Setting              | Actual                | Setting           | Actual |                   |                    |   |
| 0 dB                 | 40 dB                 | 40 dB             |        | –40 dBm           |                    | 11)                                     |
| 0 dB                 | 50 dB                 | 50 dB             |        | –50 dBm           |                    | 12)                                     |

3. Perform the following steps for each of the nominal amplitude values listed in Table 2-36:
  - a. Set the 1 dB step attenuator as indicated in Table 2-36.
  - b. Set the 10 dB step attenuator as indicated in Table 2-36.
  - c. Press **Single** and wait for the sweep to finish.
  - d. Press **Peak Search** (or **Search**). Even though the signal may be slightly above the reference level for the first nominal amplitude setting, the marker can still make a valid measurement.
  - e. Record the marker (Mkr1) amplitude value as the measured amplitude in Table 2-36.
  - f. Calculate the amplitude accuracy as follows:  

$$\text{Amplitude Accuracy} = \text{Measured Amplitude} - (\text{Amptd}_{0\text{dBm}} - \text{ActualTotalAtten} + \text{RefAtten}_{0\text{dB}})$$
  - g. Record the amplitude accuracy in the performance verification test record as indicated in Table 2-36.

### Measuring –50 dBm Reference Level

1. Press **AMPLITUDE, Ref Level, –50 dBm**.
2. Copy the actual total attenuation values from Table 2-34 into the actual total attenuation column in Table 2-37. Not all values in Table 2-34 will be required in Table 2-37.

**Table 2-37 Amplitude Accuracy Worksheet, –50 dBm Reference Level**

| 1 dB Step Attenuator | 10 dB Step Attenuator | Total Attenuation |        | Nominal Amplitude | Measured Amplitude | Amplitude Accuracy<br>Test Record Entry |
|----------------------|-----------------------|-------------------|--------|-------------------|--------------------|---|
| Setting              | Actual                | Setting           | Actual |                   |                    |   |
| 0 dB                 | 50 dB                 | 50 dB             |        | –50 dBm           |                    | 13)                                     |

3. Perform the following steps for each of the nominal amplitude values listed in Table 2-37:
  - a. Set the 1 dB step attenuator as indicated in Table 2-37.
  - b. Set the 10 dB step attenuator as indicated in Table 2-37.

**20. Overall Absolute Amplitude Accuracy: Agilent E7402A, E7403A, E7404A, and E7405A**

- c. Press **Single** and wait for the sweep to finish.
- d. Press **Peak Search** (or **Search**). Even though the signal may be slightly above the reference level for the first nominal amplitude setting, the marker can still make a valid measurement.
- e. Record the marker (Mkr1) amplitude value as the measured amplitude in [Table 2-37](#).
- f. Calculate the amplitude accuracy as follows:  
$$\text{Amplitude Accuracy} = \text{Measured Amplitude} - (\text{Amptd}_{\text{0dBm}} - \text{ActualTotalAtten} + \text{RefAtten}_{\text{0dB}})$$
- g. Record the amplitude accuracy in the performance verification test record as indicated in [Table 2-37](#).

## 21. Resolution Bandwidth Accuracy

The output of a synthesized signal generator is connected to the Input of the analyzer, characterized through a 1 dB step attenuator set to 3 dB. The amplitude of the synthesized signal generator is set to a reference amplitude 5 dB below the top of the screen. A marker reference is set and the attenuator is set to 0 dB.

The markers of the analyzer are then used to measure the 3 dB bandwidth. The first marker is set on the left filter skirt so that the marker delta amplitude is 1 dB plus the attenuator error for the 3 dB setting. The second marker is similarly set on the right filter skirt. The frequency difference between the two markers is the 3 dB bandwidth.

Resolution bandwidth settings  $\leq 300$  Hz are not measured. These bandwidths are digitally derived; therefore, their accuracy is verified by design.

The related adjustment for this performance test is “IF Amplitude.”

### Equipment Required

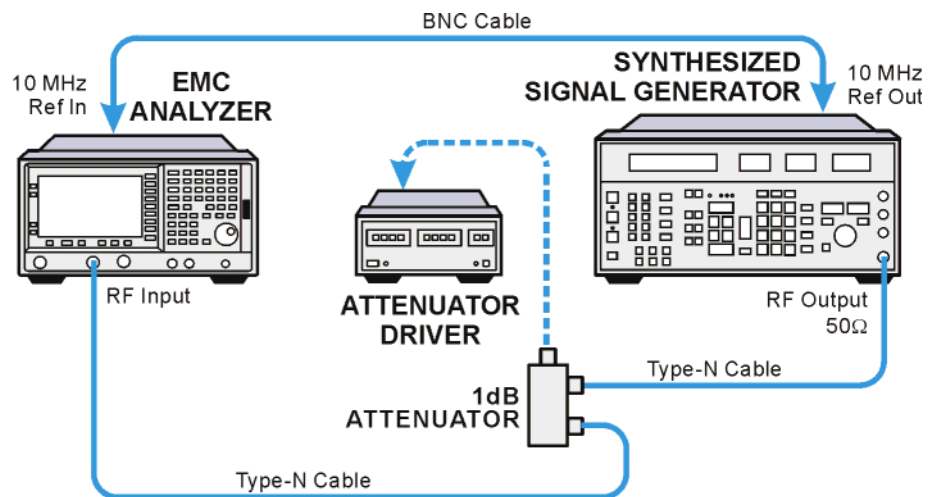
- Synthesized signal generator
- Cable, BNC, 122-cm (48-in)
- Cable, Type-N, 152-cm (60-in) (2 required)
- 1 dB step attenuator
- Attenuator/switch driver (if programmable step attenuators are used)

### Additional Equipment for Option BAB

- Adapter, Type-N (f), to APC 3.5 (f)

Figure 2-25

Resolution Bandwidth Accuracy Test Setup



wb914a

## Procedure

1. Connect the equipment as shown in [Figure 2-25](#).
2. On the synthesized signal generator, press **Blue Key, Special, 0, 0** and set the controls as follows:

**FREQUENCY, 50 MHz**  
**AMPLITUDE, 0 dBm**

3. Press **Preset** on the analyzer. Press the **Factory Preset** softkey, if it is displayed. Press **System, Alignments, Auto Align, Off**. Set the analyzer by pressing the following keys:

**FREQUENCY, Center Freq, 50 MHz**  
**SPAN, 7.5 MHz**  
**AMPLITUDE, Scale/Div 1 dB**  
**BW/Avg, 5 MHz**  
**BW/Avg, Video BW, 30 Hz**

4. Set the 1 dB step attenuator to 3 dB.
5. Note the error of the external 1 dB step attenuator at 3 dB and 6 dB below using its calibration records.

Attenuator Error (3 dB) \_\_\_\_\_ dB

Attenuator Error (6 dB) \_\_\_\_\_ dB

### 3 dB Resolution Bandwidth Accuracy

6. Press **Peak Search** (or **Search**), **Meas Tools, Mkr→ CF** on the analyzer.
7. Adjust the amplitude of the synthesized signal generator for a marker amplitude reading of +102 dBμV ±0.2 dB.
8. Press **Peak Search** (or **Search**), **Marker, Delta** on the analyzer.
9. Set the attenuator to 0 dB.
10. On the analyzer, press **Marker**. Lower the marker frequency by adjusting the knob until the marker delta amplitude is 0 dB plus the attenuator error (3 dB) noted in [step 5](#) to a tolerance of ±0.05 dB.
11. Record the marker frequency readout in Column 3 of [Table 2-38](#).
12. Using the analyzer knob, raise the marker frequency so that the marker delta amplitude is maximum. Continue increasing the marker frequency until the marker reads 0.0 dB plus the attenuator error (3 dB) noted in [step 5](#) to a tolerance of ±0.05 dB.
13. Record the marker frequency readout in Column 4 of [Table 2-38](#).
14. Set the attenuator to 3 dB.
15. Press **Marker, Normal** on the analyzer.
16. Repeat [step 6](#) through [step 15](#) for each of the analyzer Res BW and Analyzer

Span settings listed in [Table 2-38](#). When setting the resolution bandwidth to 1 MHz, press **BW/Avg**, (Res BW), **1 MHz**, **More**, **1 MHz BW Type 3 dB**.

17. Subtract the Lower Marker Frequency from the Upper Marker Frequency. Record the difference as the 3 dB Bandwidth, in the performance verification test record as indicated in [Table 2-38](#).

3 db Bandwidth = Upper Marker Frequency – Lower Marker Frequency

**Table 2-38                      3 dB Resolution Bandwidth Accuracy**

| Column 1        | Column 2      | Column 3               | Column 4               | Column 5                            |
|-----------------|---------------|------------------------|------------------------|-------------------------------------|
| Analyzer Res BW | Analyzer Span | Lower Marker Frequency | Upper Marker Frequency | Test Record Entry<br>3 dB Bandwidth |
| 5 MHz           | 7.5 MHz       |                        |                        | 1)                                  |
| 3 MHz           | 4.5 MHz       |                        |                        | 2)                                  |
| 1 MHz           | 1.5 MHz       |                        |                        | 3)                                  |
| 300 kHz         | 450 kHz       |                        |                        | 4)                                  |
| 100 kHz         | 150 kHz       |                        |                        | 5)                                  |
| 30 kHz          | 45 kHz        |                        |                        | 6)                                  |
| 10 kHz          | 15 kHz        |                        |                        | 7)                                  |
| 3 kHz           | 4.5 kHz       |                        |                        | 8)                                  |
| 1 kHz           | 1.5 kHz       |                        |                        | 9)                                  |

### **6 dB Resolution Bandwidth Accuracy**

18. Set the analyzer Res BW to 120 kHz and the analyzer span to 180 kHz as shown in [Table 2-39](#).
19. On the analyzer, press **Peak Search** (or **Search**), **Meas Tools**, **Mkr→ CF**.
20. Set the external 1 dB step attenuator to 6 dB and adjust the amplitude of the synthesized signal generator for a marker amplitude reading of +100 dBμV ±0.2 dB.
21. Press **Peak Search** (or **Search**), **Marker**, **Delta** on the analyzer.
22. Set the attenuator to 0 dB.
23. On the analyzer, press **Marker**. Lower the marker frequency by adjusting the knob until the marker delta amplitude is 0 dB plus the attenuator error (6 dB) noted in [step 5](#) to tolerance of ±0.05 dB.
24. Record the marker frequency readout in Column 3 of [Table 2-39](#).
25. Using the analyzer knob, raise the marker frequency so that the marker delta amplitude is maximum. Continue increasing the marker frequency until the

Performance Verification Tests  
**21. Resolution Bandwidth Accuracy**

marker reads 0.0 dB plus the attenuator error (6 dB) noted in [step 5](#) to a tolerance of  $\pm 0.05$  dB.

26. Record the marker frequency readout in Column 4 of [Table 2-39](#).
27. Set the attenuator to 6 dB.
28. Press **Marker, Normal** on the analyzer.
29. Repeat [step 19](#) through [step 28](#) for each of the analyzer Res BW and analyzer span settings listed in [Table 2-39](#). When setting the resolution bandwidth to 1 MHz, press **BW/Avg, (Res BW), 1 MHz, More, 1 MHz BW Type 6 dB**.
30. Subtract the Lower Marker Frequency from the Upper Marker Frequency. Record the difference as the 6 dB bandwidth, in the performance verification test record as indicated in [Table 2-39](#).

$$6 \text{ dB Bandwidth} = \text{Upper Marker Frequency} - \text{Lower Marker Frequency}$$

**Table 2-39                      6 dB Resolution Bandwidth Accuracy**

| Column 1        | Column 2      | Column 3               | Column 4               | Column 5                            |
|-----------------|---------------|------------------------|------------------------|-------------------------------------|
| Analyzer Res BW | Analyzer Span | Lower Marker Frequency | Upper Marker Frequency | Test Record Entry<br>3 dB Bandwidth |
| 120 kHz         | 180 kHz       |                        |                        | 10)                                 |
| 9 kHz           | 13.5 kHz      |                        |                        | 11)                                 |
| 1 MHz           | 1.5 MHz       |                        |                        | 12)                                 |

**Post-test Instrument Restoration**

31. Remove the RF cable from the analyzer input connector.
32. Press **Preset** on the analyzer. Press the **Factory Preset** softkey, if it is displayed. Press System, **Alignments, Auto Align, All**.



## 22. Frequency Response: Agilent E7401A

This test measures the amplitude error of the analyzer as a function of frequency. To measure frequencies of 100 kHz and greater, the output of a signal generator is fed through a power splitter to a power sensor and the analyzer.

To measure frequencies below 100 kHz, a digital voltmeter (DVM) with a 50  $\Omega$  load replaces the power sensor and a function generator is used as the source.

For improved amplitude accuracy, the power splitter is characterized using a power sensor (the “reference” sensor) connected to one power splitter output port. The other power splitter output port connects to the “buried” sensor; it is not removed from the power splitter. Once the characterization is done, the reference sensor is removed and replaced by the analyzer.

This procedure does not test frequency response with the internal preamplifier turned on. You must also perform the “Frequency Response, Preamp On” procedure.

The related adjustment for this performance test is “Frequency Response.”

### Equipment Required

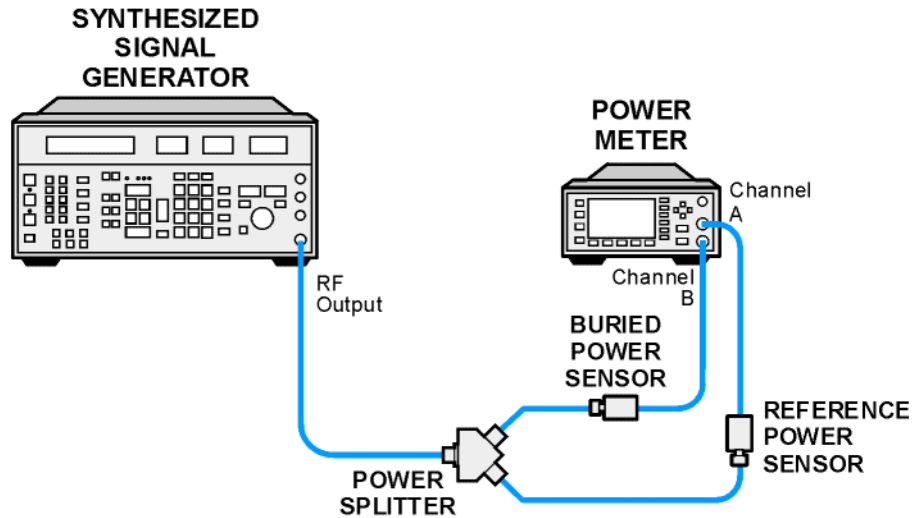
- Synthesized signal generator
- Function generator
- Power meter
- RF power sensor, (2 *required*)
- RF Power splitter
- Digital multimeter
- Adapter, Type-N (m) to Type-N (m)
- Adapter, Type-N (m) to BNC (f)
- Dual banana plug to BNC (f)
- BNC Tee (BNC f,m,f)
- Cable, BNC, 120-cm (48-in) (2 *required*)
- Cable, Type-N, 183-cm (72-in)
- Termination, 50  $\Omega$ , BNC (m)

### Procedure

#### Source/Splitter Characterization

1. Connect the equipment as shown in [Figure 2-26](#). Connect one of the Agilent 8482A power sensors to Channel A of the power meter. This will be the “reference” sensor. Connect the other Agilent 8482A power sensor to Channel B of the power meter. This will be the “buried” sensor.

Figure 2-26 Source/Splitter Characterization Setup



wb915a

2. Zero and calibrate both power sensors.
3. On the power meter, set the Channel A calibration factor to the calibration factor of the reference sensor for 100 kHz.
4. On the power meter, set the Channel B calibration factor to 100%. Do not change this calibration factor during this test.
5. Set the source frequency to 100 kHz and amplitude to  $-4$  dBm.
6. Adjust the source amplitude to obtain a Channel A power meter reading of  $-10$  dBm  $\pm 0.1$  dB.
7. Record the source amplitude setting, and both the Channel A and Channel B power meter readings in Table 2-40.
8. Tune the source to the next frequency in Table 2-40.
9. On the power meter, set the Channel A calibration factor to the calibration factor of the reference sensor for the current source frequency.
10. Adjust the source amplitude to obtain a Channel A power meter reading of  $-10$  dBm  $\pm 0.1$  dB.
11. Record the source amplitude setting, and both the Channel A and Channel B power meter readings in Table 2-40.
12. Repeat step 8 through step 11 for each frequency in Table 2-40.
13. For each entry in Table 2-40, calculate the Splitter Tracking Error as follows:

$$\text{Splitter Tracking Error} = \text{Channel A Power} - \text{Channel B Power}$$

**22. Frequency Response: Agilent E7401A**

For example, if Channel A Power is  $-10.05$  dBm and Channel B Power is  $-10.23$  dBm, the Splitter Tracking Error is  $0.18$  dB.

Table 2-40

Source/Splitter Characterization

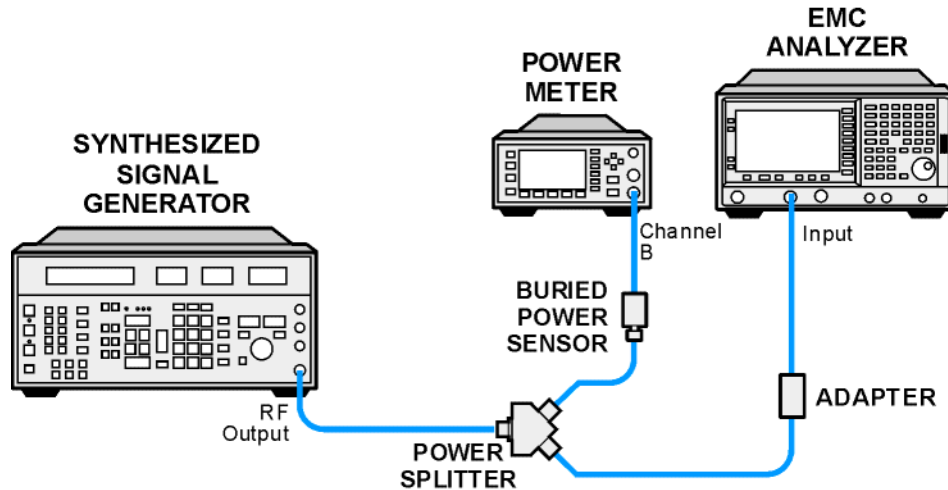
| Frequency | Power Meter Reading |                 | Splitter Tracking Error (dB) | Source Power Setting (dBm) |
|-----------|---------------------|-----------------|------------------------------|----------------------------|
|           | Channel A (dBm)     | Channel B (dBm) |                              |                            |
| 100 kHz   |                     |                 |                              |                            |
| 500 kHz   |                     |                 |                              |                            |
| 1 MHz     |                     |                 |                              |                            |
| 5 MHz     |                     |                 |                              |                            |
| 10 MHz    |                     |                 |                              |                            |
| 20 MHz    |                     |                 |                              |                            |
| 50 MHz    |                     |                 |                              |                            |
| 75 MHz    |                     |                 |                              |                            |
| 175 MHz   |                     |                 |                              |                            |
| 275 MHz   |                     |                 |                              |                            |
| 375 MHz   |                     |                 |                              |                            |
| 475 MHz   |                     |                 |                              |                            |
| 575 MHz   |                     |                 |                              |                            |
| 675 MHz   |                     |                 |                              |                            |
| 775 MHz   |                     |                 |                              |                            |
| 825 MHz   |                     |                 |                              |                            |
| 875 MHz   |                     |                 |                              |                            |
| 925 MHz   |                     |                 |                              |                            |
| 975 MHz   |                     |                 |                              |                            |
| 1025 MHz  |                     |                 |                              |                            |
| 1075 MHz  |                     |                 |                              |                            |
| 1175 MHz  |                     |                 |                              |                            |
| 1275 MHz  |                     |                 |                              |                            |
| 1375 MHz  |                     |                 |                              |                            |
| 1500 MHz  |                     |                 |                              |                            |

**Measuring Frequency Response, 100 kHz to 1.5 GHz**

1. Refer to [Figure 2-27](#). Remove the reference sensor (Channel A sensor) from the power splitter. Connect the power splitter to the analyzer 50  $\Omega$  Input using an

adapter. Do not use a cable.

Figure 2-27 Frequency Response Test Setup, 100 kHz to 1.5 GHz



wb916a

2. Set the source frequency to 100 kHz:
3. Set the source amplitude to the value corresponding to the source power setting in [Table 2-41](#) for the current source frequency (100 kHz or 1 MHz).
4. Press **Preset** on the analyzer. Press the **Factory Preset** softkey, if it is displayed. Set the controls as follows:

**FREQUENCY, Center Freq, 100 kHz**

**CF Step, 100 MHz**

**SPAN, 20 kHz**

**AMPLITUDE, More, Int Preamp (Off)** (*Option 1DS only*)

**AMPLITUDE, More, Y Axis Units (or Amptd Units), dBm**

**AMPLITUDE, Ref Level, -5 dBm**

**Attenuation, 10 dB (Man)**

**Scale/Div, 1 dB**

**BW/Avg, Res BW, 3 kHz (Man)**

**Video BW, 3 kHz (Man)**

5. Adjust the source AMPLITUDE to obtain the Channel B power meter reading recorded in [Table 2-40](#)  $\pm 0.1$  dB.
6. Record the current Channel B power reading in [Table 2-41](#) as the Current Channel B reading.
7. On the analyzer, press **Single** then **Peak Search** (or **Search**).
8. Record the marker (Mkr1) amplitude reading in [Table 2-41](#).

**22. Frequency Response: Agilent E7401A**

9. Set the source to the next frequency listed in [Table 2-41](#).
10. Set the analyzer center frequency to the next frequency listed in [Table 2-41](#).
11. Adjust the source AMPLITUDE to obtain the Channel B power meter reading recorded in [Table 2-40](#)  $\pm 0.1$  dB for the current frequency.
12. Record the current Channel B power meter reading in [Table 2-41](#) as the Current Channel B Reading.
13. On the analyzer, press **Single** then **Peak Search** (or **Search**).
14. Record the marker (Mkr1) amplitude reading in [Table 2-41](#).
15. Repeat [step 9](#) through [step 14](#) for each frequency in [Table 2-41](#).
16. Copy the splitter tracking errors from [Table 2-40](#) into [Table 2-41](#).
17. Calculate the Flatness Error for each frequency in [Table 2-41](#) as follows:

$$\text{Flatness Error} = \text{Mkr1 Amptd}_{\text{dBm}} - \text{Current Channel B}_{\text{dBm}} - \text{Splitter Tracking Error}_{\text{dB}}$$

For example, if marker (Mkr1) Amptd is  $-10.32$  dBm, Current Channel B is  $-10.2$  dBm and Splitter Tracking Error is  $0.18$  dB, Flatness Error would be  $-0.30$  dB.

18. Record the Flatness Error for 50 MHz below as the 50 MHz Ref Amptd:

50 MHz Ref Amptd \_\_\_\_\_

19. Calculate the Flatness Relative to 50 MHz for each frequency in [Table 2-41](#) as follows:

$$\text{Flatness Relative to 50 MHz} = \text{Flatness Error} - 50 \text{ MHz Ref Amptd}$$

For example, if Flatness Error is  $-0.30$  dB and 50 MHz Ref Amptd is  $0.15$  dB, Flatness Relative to 50 MHz would be  $-0.45$  dB.

**Table 2-41**      **Frequency Response Worksheet, 100 kHz to 1.5 GHz**

| Frequency | Current Channel B Reading | Marker (Mkr1) Amplitude | Splitter Tracking Error | Flatness Error | Flatness Relative to 50 MHz |
|-----------|---------------------------|-------------------------|-------------------------|----------------|-----------------------------|
| 100 kHz   |                           |                         |                         |                |                             |
| 500 kHz   |                           |                         |                         |                |                             |
| 1 MHz     |                           |                         |                         |                |                             |
| 5 MHz     |                           |                         |                         |                |                             |
| 10 MHz    |                           |                         |                         |                |                             |
| 20 MHz    |                           |                         |                         |                |                             |
| 50 MHz    |                           |                         |                         |                |                             |
| 75 MHz    |                           |                         |                         |                |                             |

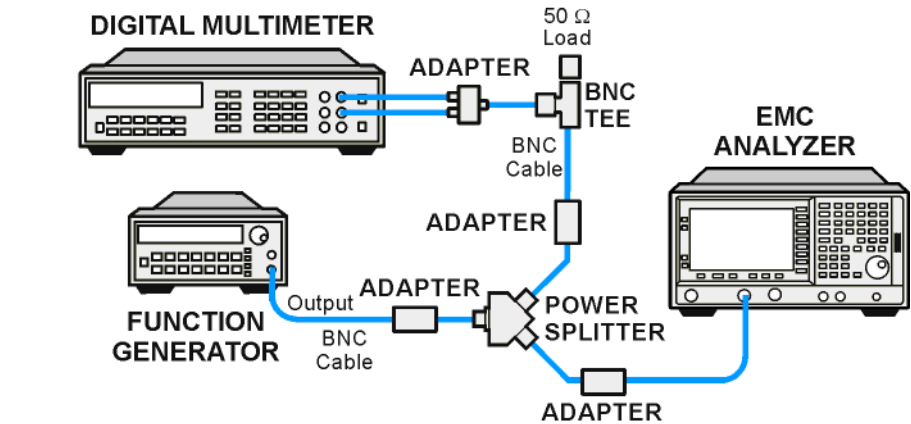
**Table 2-41**                      **Frequency Response Worksheet, 100 kHz to 1.5 GHz**

| Frequency | Current<br>Channel B<br>Reading | Marker<br>(Mkr1)<br>Amplitude | Splitter<br>Tracking<br>Error | Flatness Error | Flatness<br>Relative to 50<br>MHz |
|-----------|---------------------------------|-------------------------------|-------------------------------|----------------|-----------------------------------|
| 175 MHz   |                                 |                               |                               |                |                                   |
| 275 MHz   |                                 |                               |                               |                |                                   |
| 375 MHz   |                                 |                               |                               |                |                                   |
| 475 MHz   |                                 |                               |                               |                |                                   |
| 575 MHz   |                                 |                               |                               |                |                                   |
| 675 MHz   |                                 |                               |                               |                |                                   |
| 775 MHz   |                                 |                               |                               |                |                                   |
| 825 MHz   |                                 |                               |                               |                |                                   |
| 875 MHz   |                                 |                               |                               |                |                                   |
| 925 MHz   |                                 |                               |                               |                |                                   |
| 975 MHz   |                                 |                               |                               |                |                                   |
| 1025 MHz  |                                 |                               |                               |                |                                   |
| 1075 MHz  |                                 |                               |                               |                |                                   |
| 1175 MHz  |                                 |                               |                               |                |                                   |
| 1275 MHz  |                                 |                               |                               |                |                                   |
| 1375 MHz  |                                 |                               |                               |                |                                   |
| 1500 MHz  |                                 |                               |                               |                |                                   |

**Measuring Frequency Response,  $\leq 100$  kHz**

1. Connect the equipment as shown in [Figure 2-28](#).

Figure 2-28      Frequency Response Test Setup,  $\leq 100$  kHz



wb917a

2. Set the function generator controls as follows:

**FREQUENCY, 100 kHz**  
**AMPLITUDE, -4 dBm**

3. Set the DVM as follows:

| Function             | Synchronous ac Volts |
|----------------------|----------------------|
| Math                 | dBm                  |
| RES Register         | 50 $\Omega$          |
| Front/Rear Terminals | Front                |
| Range                | Auto                 |

4. On the analyzer, press **FREQUENCY, Center Freq, 100 kHz**.
5. Adjust the function generator amplitude until the DVM reading is -10 dBm  $\pm 0.1$  dB.
6. Record the actual DVM reading in [Table 2-42](#) as the DVM amplitude reading.
7. On the analyzer, press **Peak Search** (or **Search**), **Marker, Delta**.
8. Set the analyzer center frequency to the next frequency listed in [Table 2-42](#).
9. Set the function generator frequency to the next frequency listed in [Table 2-42](#).
10. On the analyzer, press **Peak Search** (or **Search**).
11. Adjust the function generator amplitude until the marker delta ( $\Delta$  Mkr1) amplitude reads 0 dB  $\pm 0.05$  dB.
12. Record the DVM reading in [Table 2-42](#) as the DVM amplitude reading.
13. Repeat [step 8](#) through [step 12](#) for each frequency in [Table 2-42](#).



14. For each of the frequencies in [Table 2-42](#), subtract the DVM amplitude from the DVM Amplitude at 100 kHz recorded in [step 6](#). Record the result as the Response Relative to 100 kHz in [Table 2-42](#).
15. From [Table 2-41](#), note the Flatness Relative to 50 MHz for the 100 kHz frequency. Record this below as the 100 kHz error relative to 50 MHz:  
 100 kHz Error Relative to 50 MHz \_\_\_\_\_ dB
16. Add the 100 kHz error relative to 50 MHz that was recorded in [step 15](#) above to each of the Response Relative to 100 kHz entries in [Table 2-42](#). Record the results as the Response Relative to 50 MHz in [Table 2-42](#).

**Table 2-42**

**Frequency Response Worksheet,  $\leq 100$  kHz**

| Frequency | DVM Amplitude | Response Relative to 100 kHz | Response Relative to 50 MHz |
|-----------|---------------|------------------------------|-----------------------------|
| 100 kHz   |               | 0 dB (Ref)                   |                             |
| 75 kHz    |               |                              |                             |
| 50 kHz    |               |                              |                             |
| 20 kHz    |               |                              |                             |
| 9 kHz     |               |                              |                             |

**Test Results**

1. Enter the most positive number from the Flatness Relative to 50 MHz column of [Table 2-41](#):  
 \_\_\_\_\_ dB
2. Enter the most positive number from the Response Relative to 50 MHz column of [Table 2-42](#):  
 \_\_\_\_\_ dB
3. Record the more positive of numbers from [step 1](#) and [step 2](#) in [Table 2-43](#) as the Maximum Response for Band 0.
4. Enter the most negative number from the Flatness Relative to 50 MHz column of [Table 2-41](#):  
 \_\_\_\_\_ dB
5. Enter the most negative number from the Response Relative to 50 MHz column of [Table 2-42](#):  
 \_\_\_\_\_ dB
6. Record the more negative of numbers from [step 4](#) and [step 5](#) in [Table 2-43](#) as the Minimum Response for Band 0.
7. Subtract the Minimum Response for Band 0 from the Maximum Response for

Performance Verification Tests

**22. Frequency Response: Agilent E7401A**

Band 0 and record the result as the Peak-to-Peak Response for Band 0 in [Table 2-43](#).

**Table 2-43                      Frequency Response Results**

| Band | Maximum Response |                   | Minimum Response |                   | Peak-to-Peak Response |                   |
|------|------------------|-------------------|------------------|-------------------|-----------------------|-------------------|
|      | dB               | Test Record Entry | dB               | Test Record Entry | dB                    | Test Record Entry |
| 0    |                  | 1)                |                  | 2)                |                       | 3)                |

## 23. Frequency Response, Agilent E7402A

This test measures the amplitude error of the analyzer as a function of frequency. To measure frequencies of 100 kHz and greater, the output of a source is fed through a power splitter to a power sensor and the analyzer. A function generator is used as the source from 100 kHz to 10 MHz, and a synthesized sweeper at 10 MHz and greater. To measure frequencies below 100 kHz, a DVM with a 50  $\Omega$  load replaces the power sensor.

For improved amplitude accuracy the power splitter is characterized using a “reference” sensor connected to one power splitter output port. The other power splitter output port connects to the “buried” sensor; it is not removed from the power splitter. Once the characterization is done, the reference sensor is removed and replaced by the analyzer. Measurements are made at the same frequencies used in the characterization. The analyzer marker amplitude measurements are corrected using the characterization data to determine the absolute flatness error and the flatness error relative to 50 MHz.

This procedure does not test frequency response with the internal preamplifier turned on. You must also perform the “Frequency Response, Preamp On” procedure. Analyzers with Option UKB are tested down to 100 Hz in dc coupled mode. In ac coupled mode, Agilent E7402A analyzers are tested down to 100 kHz.

The related adjustment for this performance test is “Frequency Response.”

### Equipment Required

- Synthesized sweeper
- Function generator
- Power meter
- RF power sensor (2 *required*)
- RF Power splitter
- Digital multimeter
- Adapter, Type-N (m) to Type-N (m)
- Adapter, Type-N (m) to BNC (f)
- Dual banana plug to BNC (f)
- BNC Tee (BNC f,m,f)
- Cable, BNC, 122-cm (48-in) (2 *required*)
- Cable, Type-N, 183-cm (72-in)
- Termination, 50  $\Omega$ , BNC (m)

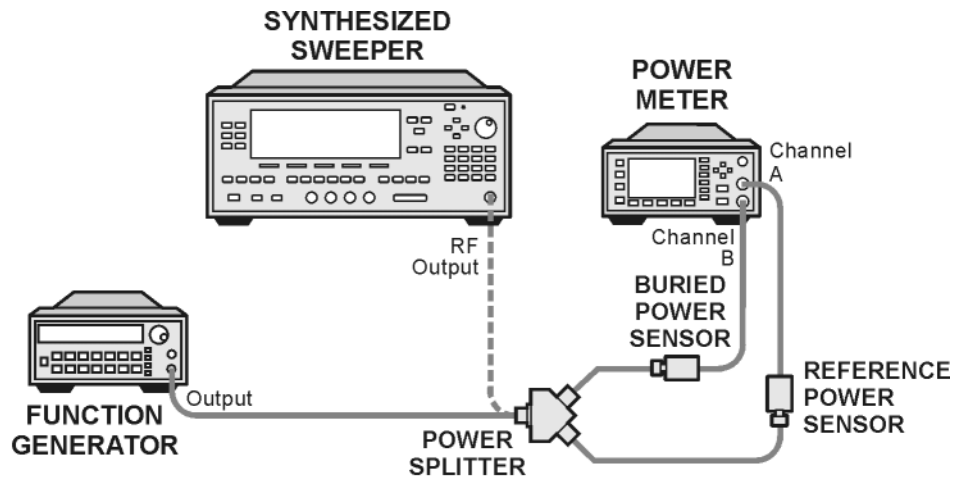
### Procedure

#### Source/Splitter Characterization

1. Connect the equipment as shown in [Figure 2-29](#); use the function generator as the source. Connect one of the Agilent 8482A power sensors to Channel A of the power meter. This will be the “reference” sensor. Connect the other Agilent 8482A power sensor to Channel B of the power meter. This will be the “buried”

sensor.

Figure 2-29 Source/Splitter Characterization Setup



w1713b

2. Zero and calibrate both power sensors.
3. On the power meter, set the Channel A calibration factor to the calibration factor of the reference sensor for 100 kHz.
4. On the power meter, set the Channel B calibration factor to 100%. Do not change this calibration factor during this test.
5. Set the function generator frequency to 100 kHz and amplitude to  $-4$  dBm.
6. Adjust the function generator amplitude to obtain a Channel A power meter reading of  $-10$  dBm  $\pm 0.1$  dB.
7. Record the function generator amplitude setting, and both the Channel A and Channel B power meter readings in [Table 2-44](#).
8. Tune the source to the next frequency in [Table 2-44](#).
9. On the power meter, set the Channel A calibration factor to the calibration factor of the reference sensor for the current source frequency.
10. Adjust the source amplitude to obtain a Channel A power meter reading of  $-10$  dBm  $\pm 0.1$  dB.
11. Record the source amplitude setting, and both the Channel A and Channel B power meter readings in [Table 2-44](#).
12. Repeat [step 8](#) through [step 11](#) for frequencies up through 10 MHz.
13. Replace the function generator with the synthesized sweeper.
14. Set the synthesized sweeper CW frequency to 10 MHz and the amplitude to  $-4$  dBm.

15. Adjust the synthesized sweeper power level to obtain a Channel A power meter reading of  $-10 \text{ dBm} \pm 0.1 \text{ dB}$ .
16. Record the synthesized sweeper power level and both the Channel A and Channel B power meter readings in [Table 2-44](#).
17. Repeat [step 8](#) through [step 11](#) for each remaining frequency in [Table 2-44](#).
18. For each entry in [Table 2-44](#), calculate the Splitter Tracking Error as follows:  
 $\text{Splitter Tracking Error} = \text{Channel A Power} - \text{Channel B Power}$

For example, if Channel A Power is  $-10.05 \text{ dBm}$  and Channel B Power is  $-10.23 \text{ dBm}$ , the Splitter Tracking Error is  $0.18 \text{ dB}$ .

**Table 2-44**

**Source/Splitter Characterization**

| Frequency           | Power Meter Reading |           | Splitter Tracking Error | Source Power Setting |
|---------------------|---------------------|-----------|-------------------------|----------------------|
|                     | Channel A           | Channel B |                         |                      |
| 100 kHz             |                     |           |                         |                      |
| 500 kHz             |                     |           |                         |                      |
| 1 MHz               |                     |           |                         |                      |
| 5 MHz               |                     |           |                         |                      |
| 10 MHz <sup>a</sup> |                     |           |                         |                      |
| 10 MHz <sup>b</sup> |                     |           |                         |                      |
| 20 MHz              |                     |           |                         | 0 dB (Ref)           |
| 50 MHz              |                     |           |                         |                      |
| 75 MHz              |                     |           |                         |                      |
| 175 MHz             |                     |           |                         |                      |
| 275 MHz             |                     |           |                         |                      |
| 375 MHz             |                     |           |                         |                      |
| 475 MHz             |                     |           |                         |                      |
| 575 MHz             |                     |           |                         |                      |
| 675 MHz             |                     |           |                         |                      |
| 775 MHz             |                     |           |                         |                      |
| 825 MHz             |                     |           |                         |                      |
| 875 MHz             |                     |           |                         |                      |
| 925 MHz             |                     |           |                         |                      |
| 975 MHz             |                     |           |                         |                      |

**Table 2-44**

**Source/Splitter Characterization**

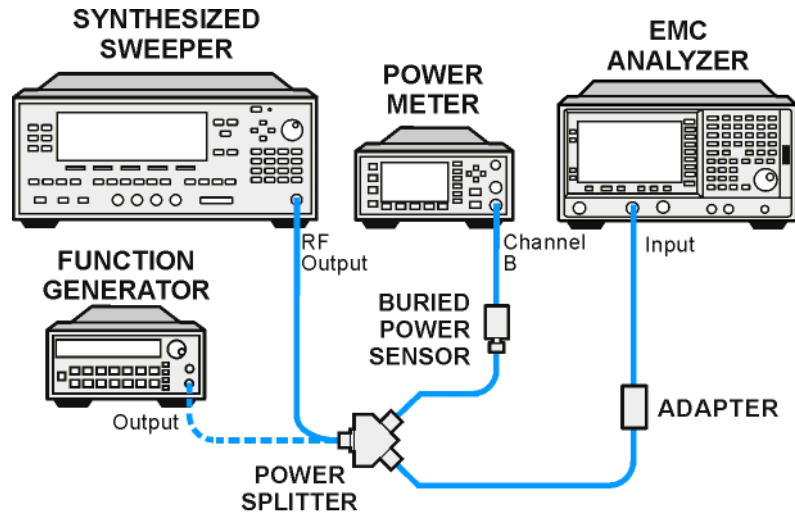
| Frequency | Power Meter Reading |           | Splitter Tracking Error | Source Power Setting |
|-----------|---------------------|-----------|-------------------------|----------------------|
|           | Channel A           | Channel B |                         |                      |
| 1025 MHz  |                     |           |                         |                      |
| 1075 MHz  |                     |           |                         |                      |
| 1175 MHz  |                     |           |                         |                      |
| 1275 MHz  |                     |           |                         |                      |
| 1375 MHz  |                     |           |                         |                      |
| 1500 MHz  |                     |           |                         |                      |
| 1525 MHz  |                     |           |                         |                      |
| 1625 MHz  |                     |           |                         |                      |
| 1675 MHz  |                     |           |                         |                      |
| 1725 MHz  |                     |           |                         |                      |
| 1775 MHz  |                     |           |                         |                      |
| 1825 MHz  |                     |           |                         |                      |
| 1875 MHz  |                     |           |                         |                      |
| 1925 MHz  |                     |           |                         |                      |
| 1975 MHz  |                     |           |                         |                      |
| 2025 MHz  |                     |           |                         |                      |
| 2125 MHz  |                     |           |                         |                      |
| 2325 MHz  |                     |           |                         |                      |
| 2525 MHz  |                     |           |                         |                      |
| 2725 MHz  |                     |           |                         |                      |
| 2925 MHz  |                     |           |                         |                      |
| 2999 MHz  |                     |           |                         |                      |

- a. This entry is for data taken with the function generator as source.
- b. This entry is for data taken with the synthesized sweeper as source.

#### Measuring Frequency Response, 100 kHz to 3.0 GHz

1. Refer to [Figure 2-30](#). Remove the reference sensor (Channel A sensor) from the power splitter. Connect the power splitter to the 50  $\Omega$  Input of the analyzer using an adapter. Do not use a cable.

**Figure 2-30** Frequency Response Test Setup, 100 kHz to 3.0 GHz



wb918a

2. Set the source frequency to 10 MHz.
3. Set the source power level to the value corresponding to the source power setting in [Table 2-44](#) for the current source frequency (10 MHz).
4. Press **Preset** on the analyzer. Press the **Factory Preset** softkey, if it is displayed. Set the controls as follows:
  - FREQUENCY, Center Freq, 10 MHz**
  - CF Step, 100 MHz**
  - SPAN, 20 kHz**
  - Input/Output (or Input), Coupling (DC) (Option UKB only)**
  - AMPLITUDE, More, Int Preamp, (Off)**
  - AMPLITUDE, More, Y Axis Units (or Amptd Units), dBm**
  - AMPLITUDE, Ref Level, -5 dBm**
  - Attenuation, 10 dB (Man)**
  - Scale/Div, 1 dB**
  - BW/Avg, Res BW, 3 kHz (Man)**
  - Video BW, 3 kHz (Man)**
5. Adjust the source power level to obtain the Channel B power meter reading recorded in [Table 2-44](#)  $\pm 0.1$  dB.
6. Record the current Channel B power reading in [Table 2-45](#) as the Current Channel B Reading for dc (coupling).
7. On the analyzer, press **Single** then **Peak Search** (or **Search**).
8. Record the marker (Mkr1) amplitude reading in [Table 2-45](#) for dc (coupling).
9. Set the source to the next frequency listed in [Table 2-45](#).

**23. Frequency Response, Agilent E7402A**

10. Set the analyzer center frequency to the next frequency listed in [Table 2-45](#).
11. Adjust the source power level to obtain the Channel B power meter reading recorded in [Table 2-45](#)  $\pm 0.1$  dB for the current frequency.
12. Record the current Channel B power reading in [Table 2-45](#) as the current Channel B reading.
13. On the analyzer, press **Single** then **Peak Search** (or **Search**).
14. Record the marker (Mkr1) amplitude reading in [Table 2-45](#).
15. Repeat [step 9](#) through [step 14](#) for each remaining frequency in [Table 2-45](#).
16. Replace the synthesized sweeper with the function generator.
17. Set the function generator amplitude to  $-4$  dBm.
18. Set the function generator frequency to 100 kHz.
19. On the analyzer, press **FREQUENCY, Center Freq, 100 kHz**.
20. Adjust the function generator amplitude to obtain the Channel B power meter reading recorded in [Table 2-44](#)  $\pm 0.1$  dB for 100 kHz.
21. Record the current Channel B power reading in [Table 2-45](#) as the current Channel B reading.
22. On the analyzer, press **Single** then **Peak Search** (or **Search**).
23. Record the analyzer marker (Mkr1) Amplitude Reading in [Table 2-45](#) as marker (Mkr1) Amplitude.
24. Repeat [step 18](#) through [step 23](#) for frequencies between 100 kHz and 10 MHz.
25. Copy the Splitter Tracking Errors from [Table 2-44](#) into [Table 2-45](#).
26. Calculate the Flatness Error for each frequency in [Table 2-45](#) as follows:  

$$\text{Flatness Error} = \text{Mkr1 Amptd}_{\text{dBm}} - \text{Current Channel B}_{\text{dBm}} - \text{Splitter Tracking Error}_{\text{dB}}$$

For example, if marker (Mkr1) Amptd is  $-10.32$  dBm, Current Channel B is  $-10.2$  dBm and Splitter Tracking Error is  $0.18$  dB, Flatness Error would be  $-0.30$  dB.
27. Record the Flatness Error for 50 MHz below as the 50 MHz Ref Amptd:  
 50 MHz Ref Amptd: \_\_\_\_\_
28. Calculate the setup change error (error due to changing the test setup from using a synthesized sweeper to using a function generator) as follows:
  - a. Record the Flatness Error from [Table 2-45](#) at 10 MHz using the function generator as FlatError<sub>FG</sub>:  

$$\text{FlatError}_{\text{FG}} = \text{_____ dB}$$
  - b. Record the Flatness Error from [Table 2-45](#) at 10 MHz using the synthesized sweeper as FlatError<sub>SS</sub>:



FlatError<sub>SS</sub>=\_\_\_\_\_ dB

- c. Subtract FlatError<sub>SS</sub> from FlatError<sub>FG</sub> and record the result as the Setup Change Error:

$$\text{Setup Change Error} = \text{FlatError}_{\text{FG}} - \text{FlatError}_{\text{SS}}$$

Setup Change Error =\_\_\_\_\_ dB

29. For frequencies less than 10 MHz calculate the Flatness Relative to 50 MHz for each frequency in [Table 2-45](#) as follows:

$$\text{Flatness Relative to 50 MHz} = \text{Flatness Error} - 50 \text{ MHz Ref Amptd} - \text{Setup Change Error}$$

For example, if Flatness Error is –0.30 dB, 50 MHz Ref Amptd is 0.15 dB and Setup Change Error is –0.19 dB, Flatness Relative to 50 MHz would be –0.26 dB.

30. For frequencies 10 MHz and greater, calculate the Flatness Relative to 50 MHz for each frequency in [Table 2-45](#) as follows:

$$\text{Flatness Relative to 50 MHz} = \text{Flatness Error} - 50 \text{ MHz Ref Amptd}$$

For example, if Flatness Error is –0.30 dB and 50 MHz Ref Amptd is 0.15 dB, Flatness Relative to 50 MHz would be –0.45 dB.

31. If the analyzer has Option UKB, continue with this procedure. Otherwise, perform the procedure in “[Measuring Frequency Response Less Than or Equal to 100 kHz.](#)”
32. Replace the function generator with the synthesized sweeper.
33. Set the source frequency to 10 MHz and the source power level to the value corresponding to the source power setting in [Table 2-44](#) for the current source frequency (10 MHz).
34. Press **Input/Output (or Input), Coupling** (AC) on the analyzer.
35. Repeat [step 5](#) through [step 30](#) for ac coupling.
36. Perform the procedure in “[Measuring Frequency Response Less Than or Equal to 100 kHz.](#)”

**Table 2-45 Frequency Response Worksheet, 100 kHz to 3.0 GHz**

| Freq.<br>(MHz) | Splitter<br>Tracking<br>Error | Current<br>Channel B<br>Reading |    | Marker (Mkr1)<br>Amptd |    | Flatness Error |    | Flatness<br>Relative to<br>50 MHz |    |
|----------------|-------------------------------|---------------------------------|----|------------------------|----|----------------|----|-----------------------------------|----|
|                |                               | dc                              | ac | dc                     | ac | dc             | ac | dc                                | ac |
| 0.1            |                               |                                 |    |                        |    |                |    |                                   |    |
| 0.5            |                               |                                 |    |                        |    |                |    |                                   |    |

Performance Verification Tests  
**23. Frequency Response, Agilent E7402A**

**Table 2-45**      **Frequency Response Worksheet, 100 kHz to 3.0 GHz**

| Freq.<br>(MHz)  | Splitter<br>Tracking<br>Error | Current<br>Channel B<br>Reading |    | Marker (Mkr1)<br>Amptd |    | Flatness Error |    | Flatness<br>Relative to<br>50 MHz |               |
|-----------------|-------------------------------|---------------------------------|----|------------------------|----|----------------|----|-----------------------------------|---------------|
|                 |                               | dc                              | ac | dc                     | ac | dc             | ac | dc                                | ac            |
| 1               |                               |                                 |    |                        |    |                |    |                                   |               |
| 5               |                               |                                 |    |                        |    |                |    |                                   |               |
| 10 <sup>a</sup> |                               |                                 |    |                        |    |                |    |                                   |               |
| 10 <sup>b</sup> |                               |                                 |    |                        |    |                |    |                                   |               |
| 20              |                               |                                 |    |                        |    |                |    |                                   |               |
| 50              |                               |                                 |    |                        |    |                |    | 0 dB<br>(ref)                     | 0 dB<br>(ref) |
| 75              |                               |                                 |    |                        |    |                |    |                                   |               |
| 175             |                               |                                 |    |                        |    |                |    |                                   |               |
| 275             |                               |                                 |    |                        |    |                |    |                                   |               |
| 375             |                               |                                 |    |                        |    |                |    |                                   |               |
| 475             |                               |                                 |    |                        |    |                |    |                                   |               |
| 575             |                               |                                 |    |                        |    |                |    |                                   |               |
| 675             |                               |                                 |    |                        |    |                |    |                                   |               |
| 775             |                               |                                 |    |                        |    |                |    |                                   |               |
| 825             |                               |                                 |    |                        |    |                |    |                                   |               |
| 875             |                               |                                 |    |                        |    |                |    |                                   |               |
| 925             |                               |                                 |    |                        |    |                |    |                                   |               |
| 975             |                               |                                 |    |                        |    |                |    |                                   |               |
| 1025            |                               |                                 |    |                        |    |                |    |                                   |               |
| 1075            |                               |                                 |    |                        |    |                |    |                                   |               |
| 1175            |                               |                                 |    |                        |    |                |    |                                   |               |
| 1275            |                               |                                 |    |                        |    |                |    |                                   |               |
| 1375            |                               |                                 |    |                        |    |                |    |                                   |               |
| 1500            |                               |                                 |    |                        |    |                |    |                                   |               |
| 1525            |                               |                                 |    |                        |    |                |    |                                   |               |
| 1625            |                               |                                 |    |                        |    |                |    |                                   |               |

**Table 2-45**                      **Frequency Response Worksheet, 100 kHz to 3.0 GHz**

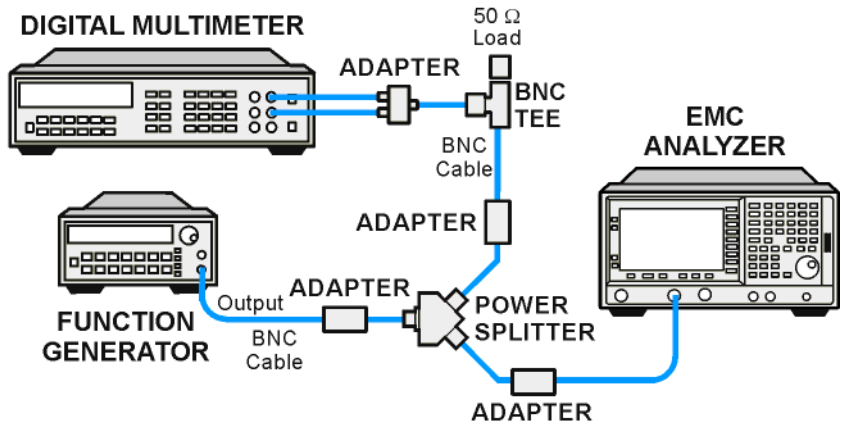
| Freq.<br>(MHz) | Splitter<br>Tracking<br>Error | Current<br>Channel B<br>Reading |    | Marker (Mkr1)<br>Amptd |    | Flatness Error |    | Flatness<br>Relative to<br>50 MHz |    |
|----------------|-------------------------------|---------------------------------|----|------------------------|----|----------------|----|-----------------------------------|----|
|                |                               | dc                              | ac | dc                     | ac | dc             | ac | dc                                | ac |
| 1675           |                               |                                 |    |                        |    |                |    |                                   |    |
| 1725           |                               |                                 |    |                        |    |                |    |                                   |    |
| 1775           |                               |                                 |    |                        |    |                |    |                                   |    |
| 1825           |                               |                                 |    |                        |    |                |    |                                   |    |
| 1875           |                               |                                 |    |                        |    |                |    |                                   |    |
| 1925           |                               |                                 |    |                        |    |                |    |                                   |    |
| 1975           |                               |                                 |    |                        |    |                |    |                                   |    |
| 2025           |                               |                                 |    |                        |    |                |    |                                   |    |
| 2125           |                               |                                 |    |                        |    |                |    |                                   |    |
| 2325           |                               |                                 |    |                        |    |                |    |                                   |    |
| 2525           |                               |                                 |    |                        |    |                |    |                                   |    |
| 2725           |                               |                                 |    |                        |    |                |    |                                   |    |
| 2925           |                               |                                 |    |                        |    |                |    |                                   |    |
| 2999           |                               |                                 |    |                        |    |                |    |                                   |    |

- a. This entry is for data taken with the function generator as source.
- b. This entry is for data taken with the synthesized sweeper as source.

Measuring Frequency Response Less Than or Equal to 100 kHz

1. Connect the equipment as shown in Figure 2-31.

Figure 2-31 Frequency Response Test Setup,  $\leq 100$  kHz



wb917a

2. Set the function generator controls as follows:

**FREQUENCY, 100 kHz**  
**AMPLITUDE, -4 dBm**  
**Amptd Increment, 0.05 dB**

3. Set the DVM as follows:

|                      |                      |
|----------------------|----------------------|
| Function             | Synchronous AC Volts |
| Math                 | dBm                  |
| RES Register         | 50 $\Omega$          |
| Front/Rear Terminals | Front                |
| Range                | Auto                 |

4. On the analyzer, press **FREQUENCY, Center Freq, 100 kHz**.
5. If the analyzer has Option UKB, press **Input/Output (or Input), Coupling (DC)**. Then press **SPAN, 100 Hz, BW/Avg, Res BW, 10 Hz, Video BW, 10 Hz**.
6. Adjust the function generator amplitude until the DVM reading is -10 dBm  $\pm 0.1$  dB.
7. Record the actual DVM reading in Table 2-46 as the DVM Amplitude reading.
8. On the analyzer, press **Peak Search (or Search), Marker, Delta**.
9. Set the analyzer center frequency to the next frequency listed in Table 2-46.
10. Set the function generator frequency to the next frequency listed in Table 2-46. Frequencies less than 9 kHz only apply to analyzers with Option UKB.
11. On the analyzer, press **Peak Search (or Search)**.

12. Adjust the function generator amplitude until the marker delta ( $\Delta \text{Mkr1}$ ) amplitude reads 0 dB  $\pm 0.05$  dB.
13. Record the DVM reading in [Table 2-46](#) as the DVM Amplitude reading.
14. Repeat [step 9](#) through [step 13](#) for each frequency setting listed in [Table 2-46](#).
15. For each of the frequencies in [Table 2-46](#), subtract the DVM Amplitude from the DVM Amplitude at 100 kHz recorded in [step 7](#). Record the result as the Response Relative to 100 kHz in [Table 2-46](#).
16. From [Table 2-45](#), note the Flatness Relative to 50 MHz for the 100 kHz frequency. Record this below as the 100 kHz Error Relative to 50 MHz:  
 100 kHz Error Relative to 50 MHz = \_\_\_\_\_ dB
17. Add the 100 kHz Error Relative to 50 MHz that was recorded in [step 16](#) above to each of the Response Relative to 100 kHz entries in [Table 2-46](#). Record the results as the Response Relative to 50 MHz in [Table 2-46](#).

**Table 2-46**

**Frequency Response Worksheet,  $\leq 100$  kHz**

| Frequency           | DVM Amplitude | Response Relative to 100 kHz | Response Relative to 50 MHz |
|---------------------|---------------|------------------------------|-----------------------------|
| 100 kHz             |               | 0 dB (Ref)                   |                             |
| 75 kHz              |               |                              |                             |
| 50 kHz              |               |                              |                             |
| 20 kHz              |               |                              |                             |
| 9 kHz               |               |                              |                             |
| 5 kHz <sup>a</sup>  |               |                              |                             |
| 2 kHz <sup>a</sup>  |               |                              |                             |
| 1 kHz <sup>a</sup>  |               |                              |                             |
| 500 Hz <sup>a</sup> |               |                              |                             |
| 200 Hz <sup>a</sup> |               |                              |                             |
| 100 Hz <sup>a</sup> |               |                              |                             |

a. These frequencies apply only to analyzers with Option UKB.

### Test Results

Perform the following steps to verify the frequency response of the analyzer.

1. Enter the most positive number from the Flatness Relative to 50 MHz (dc) column of [Table 2-45](#):

\_\_\_\_\_ dB

**23. Frequency Response, Agilent E7402A**

2. Enter the most positive number from the Response Relative to 50 MHz column of [Table 2-46](#):

\_\_\_\_\_ dB

3. Record the most positive of numbers from [step 1](#) and [step 2](#) into [Table 2-47](#) as the Maximum Response for Band 0.

4. Enter the most negative number from the Flatness Relative to 50 MHz (dc) column of [Table 2-45](#):

\_\_\_\_\_ dB

5. Enter the most negative number from the Response Relative to 50 MHz column of [Table 2-46](#):

\_\_\_\_\_ dB

6. Record the most negative of numbers from [step 4](#) and [step 5](#) into [Table 2-47](#) as the Minimum Response for Band 0.

7. For Band 0 in [Table 2-47](#), subtract the Minimum Response value from the Maximum Response value and record the result in the Peak-to-Peak Response column.

8. If the analyzer has Option UKB then perform [step 17](#) through [step 26](#). Otherwise, perform [step 9](#) through [step 15](#).

9. Note the most positive number from the Flatness Relative to 50 MHz (dc) column of [Table 2-45](#) for frequencies between 800 MHz and 1.0 GHz. Record this number in [Table 2-47](#) as the Maximum Response for Band 0A.

10. Note the most negative number from the Flatness Relative to 50 MHz (dc) column of [Table 2-45](#) for frequencies between 800 MHz and 1.0 GHz. Record this number in [Table 2-47](#) as the Minimum Response for Band 0A.

11. For Band 0A in [Table 2-47](#), subtract the Minimum Response value from the Maximum Response value and record the result in the Peak-to-Peak Response column.

12. Note the most positive number from the Flatness Relative to 50 MHz (dc) column of [Table 2-45](#) for frequencies between 1.7 GHz and 2.0 GHz. Record this number in [Table 2-47](#) as the Maximum Response for Band 0B.

13. Note the most negative number from the Flatness Relative to 50 MHz (dc) column of [Table 2-45](#) for frequencies between 1.7 GHz and 2.0 GHz. Record this number in [Table 2-47](#) as the Minimum Response for Band 0B.

14. For Band 0B in [Table 2-47](#), subtract the Minimum Response value from the Maximum Response value and record the result in the Peak-to-Peak Response column.

15. Transfer the values entered in [Table 2-47](#) to the test record in this guide.

16. The frequency response test for analyzers without Option UKB is now complete. The following steps apply only to analyzers having Option UKB.

17. Record the most positive number from the Flatness Relative to 50 MHz (ac) column of [Table 2-45](#) as the Maximum Response for Band 0 in [Table 2-48](#).
18. Record the most negative number from the Flatness Relative to 50 MHz (ac) column of [Table 2-45](#) as the Minimum Response for Band 0 in [Table 2-48](#).
19. For Band 0 in [Table 2-48](#), subtract the Minimum Response value from the Maximum Response value and record the result in the Peak-to-Peak Response column.
20. Note the most positive number from the Flatness Relative to 50 MHz (ac) column of [Table 2-45](#) for frequencies between 800 MHz and 1.0 GHz. Record this number in [Table 2-48](#) as the Maximum Response for Band 0A.
21. Note the most negative number from the Flatness Relative to 50 MHz (ac) column of [Table 2-45](#) for frequencies between 800 MHz and 1.0 GHz. Record this number in [Table 2-48](#) as the Minimum Response for Band 0A.
22. For Band 0A in [Table 2-48](#), subtract the Minimum Response value from the Maximum Response value and record the result in the Peak-to-Peak Response column.
23. Note the most positive number from the Flatness Relative to 50 MHz (ac) column of [Table 2-45](#) for frequencies between 1.7 GHz and 2.0 GHz. Record this number in [Table 2-48](#) as the Maximum Response for Band 0B.
24. Note the most negative number from the Flatness Relative to 50 MHz (ac) column of [Table 2-45](#) for frequencies between 1.7 GHz and 2.0 GHz. Record this number in [Table 2-48](#) as the Minimum Response for Band 0B.
25. For Band 0B in [Table 2-48](#), subtract the Minimum Response value from the Maximum Response value and record the result in the Peak-to-Peak Response column.
26. Transfer the values entered in [Table 2-48](#) to the test record in this guide.
27. The frequency response test for analyzers with Option UKB is now complete.

**Table 2-47                      Frequency Response Results, dc Coupled**

| Band | Maximum Response |                   | Minimum Response |                   | Peak-to-Peak Response |                   |
|------|------------------|-------------------|------------------|-------------------|-----------------------|-------------------|
|      | dB               | Test Record Entry | dB               | Test Record Entry | dB                    | Test Record Entry |
| 0    |                  | 1)                |                  | 2)                |                       | 3)                |
| 0A   |                  | 4)                |                  | 5)                |                       | 6)                |
| 0B   |                  | 7)                |                  | 8)                |                       | 9)                |

**Table 2-48                      Frequency Response Results, ac Coupled**

| Band | Maximum Response |                   | Minimum Response |                   | Peak-to-Peak Response |                   |
|------|------------------|-------------------|------------------|-------------------|-----------------------|-------------------|
|      | dB               | Test Record Entry | dB               | Test Record Entry | dB                    | Test Record Entry |
| 0    |                  | 10)               |                  | 11)               |                       | 12)               |
| 0A   |                  | 13)               |                  | 14)               |                       | 15)               |
| 0B   |                  | 16)               |                  | 17)               |                       | 18)               |



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## 24. Frequency Response, Agilent E7403A, E7404A, and E7405A

This test measures the amplitude error of the analyzer as a function of frequency. To measure frequencies of 100 kHz and greater, the output of a source is fed through a power splitter to a power sensor and the analyzer. A function generator is used as the source from 100 kHz to 10 MHz, and a synthesized sweeper at 10 MHz and greater. To measure frequencies below 100 kHz, a DVM with a 50  $\Omega$  load replaces the power sensor.

For improved amplitude accuracy the power splitter is characterized using a “reference” sensor connected to one power splitter output port. The other power splitter output port connects to the “buried” sensor; it is not removed from the power splitter. Once the characterization is done, the reference sensor is removed and replaced by the analyzer. Measurements are made at the same frequencies used in the characterization. The analyzer marker amplitude measurements are corrected using the characterization data to determine the absolute flatness error and the flatness error relative to 50 MHz.

To measure frequencies greater than 3 GHz, the source power level is adjusted at 50 MHz to place the displayed signal at the analyzer center horizontal graticule line. The power meter is then set to measure dB relative to the power at 50 MHz. At each new source frequency and analyzer center frequency, the source power level is adjusted to place the signal at the center horizontal graticule line. The power meter displays the inverse of the frequency response relative to 50 MHz.

This procedure does not test frequency response with the internal preamplifier turned on. Therefore, also perform the “Frequency Response, Preamp On” procedure. Analyzers with Option UKB are tested down to 100 Hz in dc coupled mode. In ac coupled mode, Agilent E7403A and E7404A analyzers are tested down to 100 kHz. Agilent E7405A analyzers with Option UKB are tested down to 10 MHz in ac coupled mode.

The related adjustment for this performance test is “Frequency Response.”

### Equipment Required

- Synthesized sweeper
- Function generator
- Power meter
- RF Power sensor (2 *required*)
- Microwave power sensor
- Microwave power splitter
- Digital multimeter
- Adapter, APC 3.5 (f) to APC 3.5 (f)
- Adapter, Type-N (m) to Type-N (m)
- Adapter, Type-N (m) to BNC (f)
- Dual banana plug to BNC (f)
- BNC Tee (BNC f,m,f)

**24. Frequency Response, Agilent E7403A, E7404A, and E7405A**

Cable, BNC, 122-cm (48-in) (2 *required*)

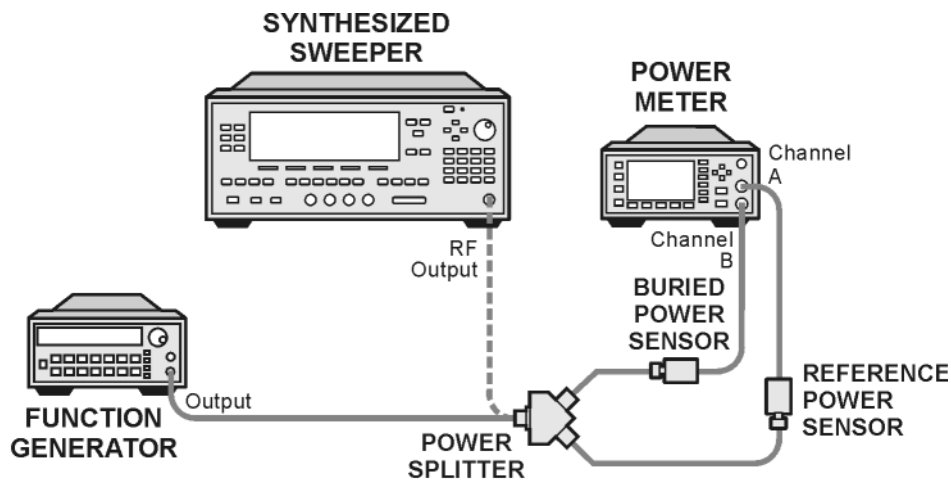
Cable, APC 3.5

Termination, 50  $\Omega$ , BNC (m)

**Procedure****Source/Splitter Characterization**

1. Connect the equipment as shown in [Figure 2-32](#). Use the function generator as the source. Connect one of the Agilent 8482A power sensors to Channel A of the power meter. This will be the “reference” sensor. Connect the other Agilent 8482A power sensor to Channel B of the power meter. This will be the “buried” sensor.

**Figure 2-32**      **Source/Splitter Characterization Setup**



w1713b

2. Zero and calibrate both power sensors.
3. On the power meter, set the Channel A calibration factor to the calibration factor of the reference sensor for 100 kHz.
4. On the power meter, set the Channel B calibration factor to 100%. Do not change this calibration factor during this test.
5. Set the function generator frequency to 100 kHz and amplitude to  $-4$  dBm.
6. Adjust the function generator amplitude to obtain a Channel A power meter reading of  $-10$  dBm  $\pm 0.1$  dB.
7. Record the function generator amplitude setting, and both the Channel A and Channel B power meter readings in [Table 2-49](#).
8. Tune the source to the next frequency in [Table 2-49](#).
9. On the power meter, set the Channel A calibration factor to the calibration

**24. Frequency Response, Agilent E7403A, E7404A, and E7405A**

factor of the reference sensor for the current source frequency.

10. Adjust the source amplitude to obtain a Channel A power meter reading of  $-10 \text{ dBm} \pm 0.1 \text{ dB}$ .
11. Record the source amplitude setting, and both the Channel A and Channel B power meter readings in [Table 2-49](#).
12. Repeat [step 8](#) through [step 11](#) for frequencies up through 10 MHz.
13. Replace the function generator with the synthesized sweeper.
14. Set the synthesized sweeper CW frequency to 10 MHz and the amplitude to  $-4 \text{ dBm}$ .
15. Adjust the synthesized sweeper power level to obtain a Channel A power meter reading of  $-10 \text{ dBm} \pm 0.1 \text{ dB}$ .
16. Record the synthesized sweeper power level and both the Channel A and Channel B power meter readings in [Table 2-49](#).
17. Repeat [step 8](#) through [step 11](#) for each remaining frequency in [Table 2-49](#).
18. For each entry in [Table 2-49](#), calculate the Splitter Tracking Error as follows:  

$$\text{Splitter Tracking Error} = \text{Channel A Power} - \text{Channel B Power}$$

For example, if Channel A Power is  $-10.05 \text{ dBm}$  and Channel B Power is  $-10.23 \text{ dBm}$ , the Splitter Tracking Error is  $0.18 \text{ dB}$ .

**Table 2-49****Source/Splitter Characterization**

| Frequency           | Power Meter Reading |           | Splitter Tracking Error | Source Power Setting |
|---------------------|---------------------|-----------|-------------------------|----------------------|
|                     | Channel A           | Channel B |                         |                      |
| 100 kHz             |                     |           |                         |                      |
| 500 kHz             |                     |           |                         |                      |
| 1 MHz               |                     |           |                         |                      |
| 5 MHz               |                     |           |                         |                      |
| 10 MHz <sup>a</sup> |                     |           |                         |                      |
| 10 MHz <sup>b</sup> |                     |           |                         |                      |
| 20 MHz              |                     |           |                         | 0 dB (Ref)           |
| 50 MHz              |                     |           |                         |                      |
| 75 MHz              |                     |           |                         |                      |
| 175 MHz             |                     |           |                         |                      |
| 275 MHz             |                     |           |                         |                      |
| 375 MHz             |                     |           |                         |                      |

Table 2-49

Source/Splitter Characterization

| Frequency | Power Meter Reading |           | Splitter Tracking Error | Source Power Setting |
|-----------|---------------------|-----------|-------------------------|----------------------|
|           | Channel A           | Channel B |                         |                      |
| 475 MHz   |                     |           |                         |                      |
| 575 MHz   |                     |           |                         |                      |
| 675 MHz   |                     |           |                         |                      |
| 775 MHz   |                     |           |                         |                      |
| 825 MHz   |                     |           |                         |                      |
| 875 MHz   |                     |           |                         |                      |
| 925 MHz   |                     |           |                         |                      |
| 975 MHz   |                     |           |                         |                      |
| 1025 MHz  |                     |           |                         |                      |
| 1075 MHz  |                     |           |                         |                      |
| 1175 MHz  |                     |           |                         |                      |
| 1275 MHz  |                     |           |                         |                      |
| 1375 MHz  |                     |           |                         |                      |
| 1500 MHz  |                     |           |                         |                      |
| 1525 MHz  |                     |           |                         |                      |
| 1625 MHz  |                     |           |                         |                      |
| 1675 MHz  |                     |           |                         |                      |
| 1725 MHz  |                     |           |                         |                      |
| 1775 MHz  |                     |           |                         |                      |
| 1825 MHz  |                     |           |                         |                      |
| 1875 MHz  |                     |           |                         |                      |
| 1925 MHz  |                     |           |                         |                      |
| 1975 MHz  |                     |           |                         |                      |
| 2025 MHz  |                     |           |                         |                      |
| 2125 MHz  |                     |           |                         |                      |
| 2325 MHz  |                     |           |                         |                      |
| 2525 MHz  |                     |           |                         |                      |
| 2725 MHz  |                     |           |                         |                      |

## 24. Frequency Response, Agilent E7403A, E7404A, and E7405A

Table 2-49

Source/Splitter Characterization

| Frequency | Power Meter Reading |           | Splitter Tracking Error | Source Power Setting |
|-----------|---------------------|-----------|-------------------------|----------------------|
|           | Channel A           | Channel B |                         |                      |
| 2925 MHz  |                     |           |                         |                      |
| 2999 MHz  |                     |           |                         |                      |

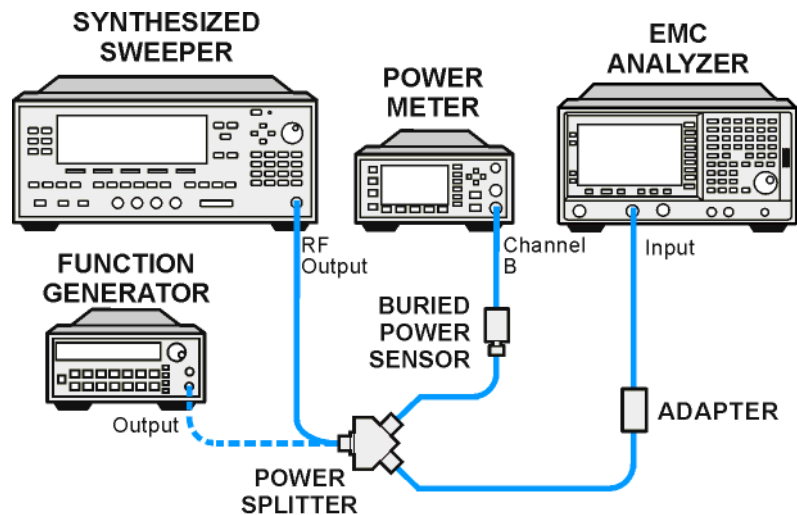
- a. This entry is for data taken with the function generator as source.  
 b. This entry is for data taken with the synthesized sweeper as source.

## Measuring Frequency Response, 100 kHz to 3.0 GHz

1. Refer to Figure 2-33. Remove the reference sensor (Channel A sensor) from the power splitter. Connect the power splitter to the 50  $\Omega$  Input of the analyzer using an adapter. Do not use a cable.

Figure 2-33

Frequency Response Test Setup, 100 kHz to 3.0 GHz



wb918a

2. Set the source frequency to 10 MHz.
3. Set the source power level to the value corresponding to the source power setting in Table 2-49 for the current source frequency (10 MHz).
4. Press **Preset** on the analyzer. Press the **Factory Preset** softkey, if it is displayed. Set the controls as follows:

**FREQUENCY, Center Freq, 10 MHz**  
**CF Step, 100 MHz**  
**SPAN, 20 kHz**

## 24. Frequency Response, Agilent E7403A, E7404A, and E7405A

**Input/Output (or Input), Coupling** (DC) (E7403A,E7404A, or any model with Option UKB)

**AMPLITUDE, More, Int Preamp**, (Off)

**AMPLITUDE, More, Y Axis Units** (or **Amptd Units**), dBm

**AMPLITUDE, Ref Level**, -5 dBm

**Attenuation**, 10 dB (Man)

**Scale/Div**, 1 dB

**BW/Avg, Res BW**, 3 kHz (Man)

**Video BW**, 3 kHz (Man)

5. Adjust the source power level to obtain the Channel B power meter reading recorded in [Table 2-49](#)  $\pm 0.1$  dB.
6. Record the current Channel B power reading in [Table 2-50](#) as the Current Channel B Reading for dc (coupling).
7. On the analyzer, press **Single** then **Peak Search** (or **Search**).
8. Record the marker (Mkr1) amplitude reading in [Table 2-50](#) for dc (coupling).
9. Set the source to the next frequency listed in [Table 2-50](#).
10. Set the analyzer center frequency to the next frequency listed in [Table 2-50](#).
11. Adjust the source power level to obtain the Channel B power meter reading recorded in [Table 2-49](#)  $\pm 0.1$  dB for the current frequency.
12. Record the current Channel B power reading in [Table 2-50](#) as the current Channel B reading.
13. On the analyzer, press **Single** then **Peak Search** (or **Search**).
14. Record the marker (Mkr1) amplitude reading in [Table 2-50](#).
15. Repeat [step 9](#) through [step 14](#) for each remaining frequency in [Table 2-50](#).
16. If the analyzer under test is an Agilent E7405A with Option UKB and is being tested in ac coupled mode, continue with [step 26](#). These analyzers are specified only down to 10 MHz in ac coupled mode.
17. Replace the synthesized sweeper with the function generator.
18. Set the function generator amplitude to -4 dBm.
19. Set the function generator frequency to 100 kHz.
20. On the analyzer, press **FREQUENCY**, **Center Freq**, **100 kHz**.
21. Adjust the function generator amplitude to obtain the Channel B power meter reading recorded in [Table 2-49](#)  $\pm 0.1$  dB for 100 kHz.
22. Record the current Channel B power reading in [Table 2-50](#) as the current Channel B reading.
23. On the analyzer, press **Single** then **Peak Search** (or **Search**).
24. Record the analyzer marker (Mkr1) Amplitude Reading in [Table 2-50](#) as marker (Mkr1) Amplitude.

**24. Frequency Response, Agilent E7403A, E7404A, and E7405A**

25. Repeat [step 19](#) through [step 24](#) for frequencies between 100 kHz and 10 MHz.

26. Copy the Splitter Tracking Errors from [Table 2-49](#) into [Table 2-50](#).

27. Calculate the Flatness Error for each frequency in [Table 2-50](#) as follows:

$$\text{Flatness Error} = \text{Mkr1 Amptd}_{\text{dBm}} - \text{Current Channel B}_{\text{dBm}} - \text{Splitter Tracking Error}_{\text{dB}}$$

For example, if marker (Mkr1) Amptd is  $-10.32$  dBm, Current Channel B is  $-10.2$  dBm and Splitter Tracking Error is  $0.18$  dB, Flatness Error would be  $-0.30$  dB.

28. Record the Flatness Error for 50 MHz below as the 50 MHz Ref Amptd:

50 MHz Ref Amptd: \_\_\_\_\_

29. Continue with [step 31](#) if the analyzer under test is an Agilent E7405A with Option UKB and is being tested in ac coupled mode. Calculate the setup change error (error due to changing the test setup from using a synthesized sweeper to using a function generator) as follows:

- a. Record the Flatness Error from [Table 2-50](#) at 10 MHz using the function generator as FlatError<sub>FG</sub>:

FlatError<sub>FG</sub> = \_\_\_\_\_ dB

- b. Record the Flatness Error from [Table 2-50](#) at 10 MHz using the synthesized sweeper as FlatError<sub>SS</sub>:

FlatError<sub>SS</sub> = \_\_\_\_\_ dB

- c. Subtract FlatError<sub>SS</sub> from FlatError<sub>FG</sub> and record the result as the Setup Change Error:

$$\text{Setup Change Error} = \text{FlatError}_{\text{FG}} - \text{FlatError}_{\text{SS}}$$

Setup Change Error = \_\_\_\_\_ dB

30. For frequencies less than 10 MHz calculate the Flatness Relative to 50 MHz for each frequency in [Table 2-50](#) as follows:

$$\text{Flatness Relative to 50 MHz} = \text{Flatness Error} - 50 \text{ MHz Ref Amptd} - \text{Setup Change Error}$$

For example, if Flatness Error is  $-0.30$  dB, 50 MHz Ref Amptd is  $0.15$  dB and Setup Change Error is  $-0.19$  dB, Flatness Relative to 50 MHz would be  $-0.26$  dB.

31. For frequencies 10 MHz and greater, calculate the Flatness Relative to 50 MHz for each frequency in [Table 2-50](#) as follows:

$$\text{Flatness Relative to 50 MHz} = \text{Flatness Error} - 50 \text{ MHz Ref Amptd}$$

For example, if Flatness Error is  $-0.30$  dB and 50 MHz Ref Amptd is  $0.15$  dB, Flatness Relative to 50 MHz would be  $-0.45$  dB.

**24. Frequency Response, Agilent E7403A, E7404A, and E7405A**

32. If the analyzer under test is an Agilent E7405A with Option UKB, E7403A or E7404A, continue with this procedure. Otherwise, perform the procedure in “[Measuring Frequency Response Less Than or Equal to 100 kHz.](#)”

33. Replace the function generator with the synthesized sweeper.

34. Set the source frequency to 10 MHz and the source power level to the value corresponding to the source power setting in [Table 2-49](#) for the current source frequency (10 MHz).

35. On the analyzer, press **Input/Output (or Input), Coupling (AC)**.

36. Repeat [step 5](#) through [step 31](#) for ac coupling.

37. Perform the procedure in “[Measuring Frequency Response Less Than or Equal to 100 kHz.](#)”

**Table 2-50 Frequency Response Worksheet, 100 kHz to 3.0 GHz**

| Freq.<br>(MHz)   | Splitter<br>Tracking<br>Error | Current<br>Channel B<br>Reading |    | Marker (Mkr1)<br>Amptd |    | Flatness Error |    | Flatness<br>Relative to<br>50 MHz |               |
|------------------|-------------------------------|---------------------------------|----|------------------------|----|----------------|----|-----------------------------------|---------------|
|                  |                               | dc                              | ac | dc                     | ac | dc             | ac | dc                                | ac            |
| 0.1 <sup>a</sup> |                               |                                 |    |                        |    |                |    |                                   |               |
| 0.5 <sup>a</sup> |                               |                                 |    |                        |    |                |    |                                   |               |
| 1 <sup>a</sup>   |                               |                                 |    |                        |    |                |    |                                   |               |
| 5 <sup>a</sup>   |                               |                                 |    |                        |    |                |    |                                   |               |
| 10 <sup>ab</sup> |                               |                                 |    |                        |    |                |    |                                   |               |
| 10 <sup>c</sup>  |                               |                                 |    |                        |    |                |    |                                   |               |
| 20               |                               |                                 |    |                        |    |                |    |                                   |               |
| 50               |                               |                                 |    |                        |    |                |    | 0 dB<br>(ref)                     | 0 dB<br>(ref) |
| 75               |                               |                                 |    |                        |    |                |    |                                   |               |
| 175              |                               |                                 |    |                        |    |                |    |                                   |               |
| 275              |                               |                                 |    |                        |    |                |    |                                   |               |
| 375              |                               |                                 |    |                        |    |                |    |                                   |               |
| 475              |                               |                                 |    |                        |    |                |    |                                   |               |
| 575              |                               |                                 |    |                        |    |                |    |                                   |               |
| 675              |                               |                                 |    |                        |    |                |    |                                   |               |
| 775              |                               |                                 |    |                        |    |                |    |                                   |               |



**Table 2-50                      Frequency Response Worksheet, 100 kHz to 3.0 GHz**

| Freq.<br>(MHz) | Splitter<br>Tracking<br>Error | Current<br>Channel B<br>Reading |    | Marker (Mkr1)<br>Amptd |    | Flatness Error |    | Flatness<br>Relative to<br>50 MHz |    |
|----------------|-------------------------------|---------------------------------|----|------------------------|----|----------------|----|-----------------------------------|----|
|                |                               | dc                              | ac | dc                     | ac | dc             | ac | dc                                | ac |
| 825            |                               |                                 |    |                        |    |                |    |                                   |    |
| 875            |                               |                                 |    |                        |    |                |    |                                   |    |
| 925            |                               |                                 |    |                        |    |                |    |                                   |    |
| 975            |                               |                                 |    |                        |    |                |    |                                   |    |
| 1025           |                               |                                 |    |                        |    |                |    |                                   |    |
| 1075           |                               |                                 |    |                        |    |                |    |                                   |    |
| 1175           |                               |                                 |    |                        |    |                |    |                                   |    |
| 1275           |                               |                                 |    |                        |    |                |    |                                   |    |
| 1375           |                               |                                 |    |                        |    |                |    |                                   |    |
| 1500           |                               |                                 |    |                        |    |                |    |                                   |    |
| 1525           |                               |                                 |    |                        |    |                |    |                                   |    |
| 1625           |                               |                                 |    |                        |    |                |    |                                   |    |
| 1675           |                               |                                 |    |                        |    |                |    |                                   |    |
| 1725           |                               |                                 |    |                        |    |                |    |                                   |    |
| 1775           |                               |                                 |    |                        |    |                |    |                                   |    |
| 1825           |                               |                                 |    |                        |    |                |    |                                   |    |
| 1875           |                               |                                 |    |                        |    |                |    |                                   |    |
| 1925           |                               |                                 |    |                        |    |                |    |                                   |    |
| 1975           |                               |                                 |    |                        |    |                |    |                                   |    |
| 2025           |                               |                                 |    |                        |    |                |    |                                   |    |
| 2125           |                               |                                 |    |                        |    |                |    |                                   |    |
| 2325           |                               |                                 |    |                        |    |                |    |                                   |    |
| 2525           |                               |                                 |    |                        |    |                |    |                                   |    |
| 2725           |                               |                                 |    |                        |    |                |    |                                   |    |
| 2925           |                               |                                 |    |                        |    |                |    |                                   |    |
| 2999           |                               |                                 |    |                        |    |                |    |                                   |    |

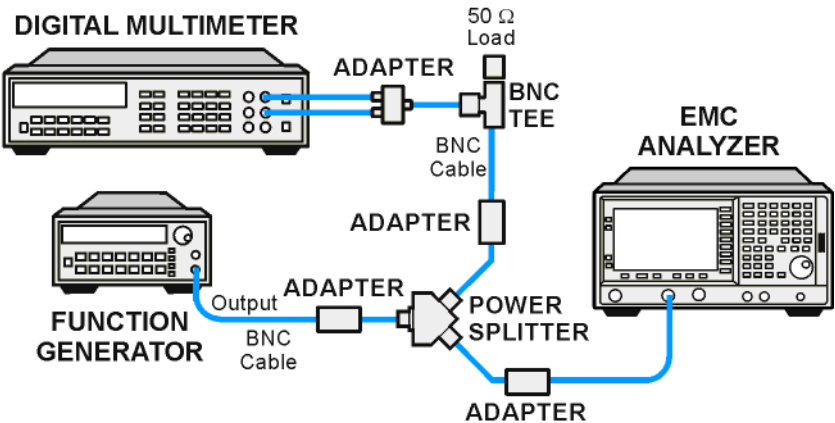
**24. Frequency Response, Agilent E7403A, E7404A, and E7405A**

- a. This frequency is not tested on Agilent E7405A analyzers with Option UKB when in ac coupled mode.
- b. This entry is for data taken with the function generator as source.
- c. This entry is for data taken with the synthesized sweeper as source.

Measuring Frequency Response Less Than or Equal to 100 kHz

1. Connect the equipment as shown in Figure 2-34.

Figure 2-34 Frequency Response Test Setup, ≤100 kHz



wb917a

2. Set the function generator controls as follows:

**FREQUENCY, 100 kHz**  
**AMPLITUDE, -4 dBm**  
**Amptd Increment, 0.05 dB**

3. Set the DVM as follows:

|                      |                      |
|----------------------|----------------------|
| Function             | Synchronous AC Volts |
| Math                 | dBm                  |
| RES Register         | 50 Ω                 |
| Front/Rear Terminals | Front                |
| Range                | Auto                 |

4. On the analyzer, press **FREQUENCY, Center Freq, 100 kHz**.
5. If the analyzer under test is an Agilent E7405A with Option UKB, E7403A or E7404A, press **Input/Output (or Input), Coupling (DC)**.
6. If the analyzer under test has Option UKB then press **SPAN, 100 Hz, BW/Avg, Res BW, 10 Hz, Video BW, 10 Hz**.
7. Adjust the function generator amplitude until the DVM reading is -10 dBm ±0.1 dB.
8. Record the actual DVM reading in Table 2-51 as the DVM Amplitude reading.
9. On the analyzer, press **Peak Search (or Search), Marker, Delta**.
10. Set the analyzer center frequency to the next frequency listed in Table 2-51.

**24. Frequency Response, Agilent E7403A, E7404A, and E7405A**

11. Set the function generator frequency to the next frequency listed in [Table 2-51](#). Frequencies less than 9 kHz only apply to analyzers with Option UKB.
12. On the analyzer, press **Peak Search** (or **Search**).
13. Adjust the function generator amplitude until the marker delta ( $\Delta$  Mkr1) amplitude reads 0 dB  $\pm$ 0.05 dB.
14. Record the DVM reading in [Table 2-51](#) as the DVM Amplitude reading.
15. Repeat [step 10](#) through [step 14](#) for each frequency setting listed in [Table 2-51](#).
16. For each of the frequencies in [Table 2-51](#), subtract the DVM Amplitude from the DVM Amplitude at 100 kHz recorded in [step 8](#). Record the result as the Response Relative to 100 kHz in [Table 2-51](#).
17. From [Table 2-50](#), note the Flatness Relative to 50 MHz for the 100 kHz frequency. Record this below as the 100 kHz Error Relative to 50 MHz:  
100 kHz Error Relative to 50 MHz = \_\_\_\_\_ dB
18. Add the 100 kHz Error Relative to 50 MHz that was recorded in [step 17](#) above to each of the Response Relative to 100 kHz entries in [Table 2-51](#). Record the results as the Response Relative to 50 MHz in [Table 2-51](#).

**Table 2-51****Frequency Response Worksheet,  $\leq 100$  kHz**

| Frequency           | DVM Amplitude | Response Relative to 100 kHz | Response Relative to 50 MHz |
|---------------------|---------------|------------------------------|-----------------------------|
| 100 kHz             |               | 0 dB (Ref)                   |                             |
| 75 kHz              |               |                              |                             |
| 50 kHz              |               |                              |                             |
| 20 kHz              |               |                              |                             |
| 9 kHz               |               |                              |                             |
| 5 kHz <sup>a</sup>  |               |                              |                             |
| 2 kHz <sup>a</sup>  |               |                              |                             |
| 1 kHz <sup>a</sup>  |               |                              |                             |
| 500 Hz <sup>a</sup> |               |                              |                             |
| 200 Hz <sup>a</sup> |               |                              |                             |
| 100 Hz <sup>a</sup> |               |                              |                             |

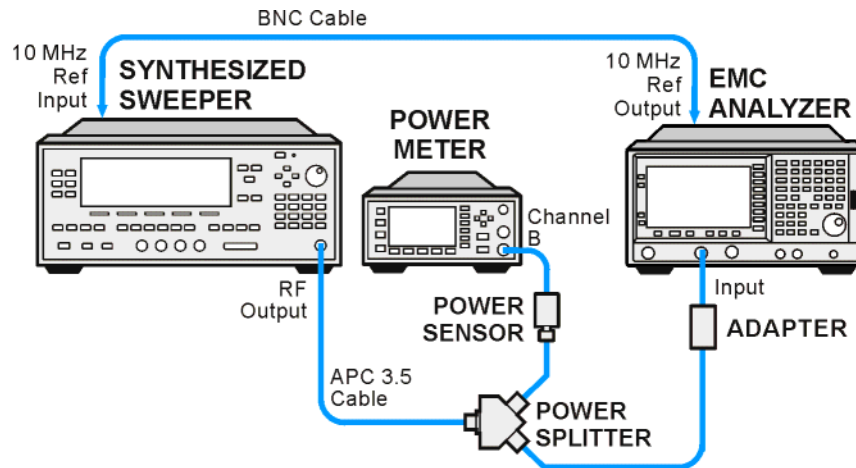
a. These frequencies apply only to analyzers with Option UKB.

## 24. Frequency Response, Agilent E7403A, E7404A, and E7405A

## Measuring Frequency Response, &gt;3 GHz

1. Replace the Channel B power sensor with the microwave power sensor. Zero and calibrate the power sensor and power meter in log mode. Enter the 50 MHz calibration factor of the power sensor into the power meter.
2. Connect the equipment as shown in Figure 2-35.

Figure 2-35 Frequency Response Test Setup, &gt;3 GHz



wb919a

3. If the analyzer is an Agilent E7405A with Option UKB, E7403A or E7404A, then press **Input/Output (or Input), Coupling (DC)**. This sets the analyzer to dc coupled mode.
4. On the analyzer, press **FREQUENCY, Center Freq, 50 MHz, CF Step 250 MHz**.
5. Set the synthesized sweeper CW frequency to 50 MHz and FREQ STEP to 250 MHz.
6. Adjust the synthesized sweeper power level for a power meter reading of  $-10 \text{ dBm} \pm 0.05 \text{ dB}$ .
7. On the analyzer, press **Peak Search (or Search)**.
8. On the analyzer, press **Marker, Delta**.
9. Activate the dB relative mode on the power meter. Power meter readings will now be displayed relative to the power meter reading at 50 MHz.
10. Set the synthesized sweeper CW frequency to the next frequency listed in Table 2-52.
11. Enter the appropriate power sensor calibration factor into the power meter.
12. On the analyzer, press **Peak Search (or Search), Amplitude, Presel Center**.

**24. Frequency Response, Agilent E7403A, E7404A, and E7405A**

13. Adjust the synthesized sweeper power level until the analyzer marker delta ( $\Delta \text{Mkr1}$ ) amplitude reading is 0 dB  $\pm$  0.05 dB.
14. Record the *negative of the* power meter reading in [Table 2-52](#) as the Flatness Relative to 50 MHz for dc coupled mode.

**NOTE**

Record this power meter reading as the negative, or opposite polarity from the measured value. For example, a measured value of  $-0.75$  dB is recorded as  $+0.75$  dB; a measured value of  $+0.25$  dB is recorded as  $-0.25$  dB.

If the analyzer is an Agilent E7405A without Option UKB, make all entries in the dc coupled column.

15. Repeat [step 10](#) through [step 14](#) for frequencies up through 6.699 GHz in [Table 2-52](#). On the analyzer, pressing **FREQUENCY, Center Freq**,  $\uparrow$  will allow you to step through most of the frequencies. Similarly, on the synthesized sweeper, pressing **CW**,  $\uparrow$  will allow you to step through most of the frequencies.
16. If the analyzer is an Agilent E7403A, continue with the next step. Otherwise, continue with [step 20](#).
17. On the analyzer, press **Input/Output (or Input), Coupling (AC)**. This sets the analyzer to ac coupled mode.
18. Repeat [step 4](#) through [step 15](#), making entries in the ac Coupled column of [Table 2-52](#).
19. Continue with “[Agilent E7403A/E7404A Test Results](#)” (for an Agilent E7403A only). The following steps apply to the Agilent E7404A and E7405A only.
20. Set the synthesized sweeper FREQ STEP to 400 MHz.  
Set the analyzer center frequency step size to 400 MHz by manually pressing **FREQUENCY, CF Step, 400 MHz**.
21. Repeat [step 10](#) through [step 14](#) for frequencies up through 13.199 GHz in [Table 2-52](#).
22. If the analyzer is an Agilent E7404A, continue with the next step. If the analyzer is an Agilent E7405A, continue with [step 27](#).
23. On the analyzer, press **Input/Output (or Input), Coupling (AC)**. This sets the analyzer to ac coupled mode.
24. Repeat [step 4](#) through [step 15](#), making entries in the ac Coupled column of [Table 2-52](#).
25. Set the synthesized sweeper FREQ STEP to 400 MHz.  
Set the analyzer center frequency step size to 400 MHz by pressing **FREQUENCY, CF Step, 400 MHz**.
26. Repeat [step 10](#) through [step 14](#) for frequencies up through 13.199 GHz making entries in the ac Coupled column of [Table 2-52](#).
27. Continue with “[Agilent E7403A/E7404A Test Results](#)” (for an Agilent E7404A

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only). The following steps apply to the Agilent E7405A only.

28. Set the synthesized sweeper FREQ STEP to 500 MHz.

Set the analyzer center frequency step size to 500 MHz by pressing **FREQUENCY, CF Step, 500 MHz**.

29. Repeat [step 10](#) through [step 14](#) for the remaining frequencies in [Table 2-52](#). If the analyzer under test is an Agilent E7405A with Option UKB then continue with the next step. Otherwise, continue with “[Agilent E7405A Test Results](#)” (for an Agilent E7405A only).

30. On the analyzer, press **Input/Output (or Input), Coupling (AC)**. This sets the analyzer to ac coupled mode.

31. Repeat [step 4](#) through [step 15](#), making entries in the ac Coupled column of [Table 2-52](#).

32. Set the synthesized sweeper FREQ STEP to 400 MHz.

Set the analyzer center frequency step size by pressing **FREQUENCY, CF Step, 400 MHz**.

33. Repeat [step 10](#) through [step 14](#) for the remaining frequencies in [Table 2-52](#), making entries in the ac Coupled column.

34. Continue with “[Agilent E7405A Test Results](#).”

**Table 2-52**

**Frequency Response Worksheet, >3 GHz**

| Frequency | Flatness Relative to 50 MHz, dB |            |
|-----------|---------------------------------|------------|
|           | dc Coupled                      | ac Coupled |
| 3.05 GHz  |                                 |            |
| 3.25 GHz  |                                 |            |
| 3.5 GHz   |                                 |            |
| 3.75 GHz  |                                 |            |
| 4.0 GHz   |                                 |            |
| 4.25 GHz  |                                 |            |
| 4.5 GHz   |                                 |            |
| 4.75 GHz  |                                 |            |
| 5.0 GHz   |                                 |            |
| 5.25 GHz  |                                 |            |
| 5.5 GHz   |                                 |            |
| 5.75 GHz  |                                 |            |
| 6.0 GHz   |                                 |            |

Table 2-52

Frequency Response Worksheet, &gt;3 GHz

| Frequency                                     | Flatness Relative to 50 MHz, dB |            |
|---|---------------------------------|------------|
|   | dc Coupled                      | ac Coupled |
| 6.25 GHz                                      |                                 |            |
| 6.5 GHz                                       |                                 |            |
| 6.699 GHz                                     |                                 |            |
| End of worksheet recording for Agilent E7403A |                                 |            |
| 6.8 GHz                                       |                                 |            |
| 7.0 GHz                                       |                                 |            |
| 7.4 GHz                                       |                                 |            |
| 7.8 GHz                                       |                                 |            |
| 8.2 GHz                                       |                                 |            |
| 8.6 GHz                                       |                                 |            |
| 9.0 GHz                                       |                                 |            |
| 9.4 GHz                                       |                                 |            |
| 9.8 GHz                                       |                                 |            |
| 10.2 GHz                                      |                                 |            |
| 10.6 GHz                                      |                                 |            |
| 11.0 GHz                                      |                                 |            |
| 11.4 GHz                                      |                                 |            |
| 11.8 GHz                                      |                                 |            |
| 12.2 GHz                                      |                                 |            |
| 12.6 GHz                                      |                                 |            |
| 12.8 GHz                                      |                                 |            |
| 13.199 GHz                                    |                                 |            |
| End of worksheet recording for Agilent E7404A |                                 |            |
| 13.3 GHz                                      |                                 |            |
| 13.5 GHz                                      |                                 |            |
| 14.0 GHz                                      |                                 |            |
| 14.5 GHz                                      |                                 |            |
| 15.0 GHz                                      |                                 |            |



## 24. Frequency Response, Agilent E7403A, E7404A, and E7405A

Table 2-52

Frequency Response Worksheet, &gt;3 GHz

| Frequency | Flatness Relative to 50 MHz, dB |            |
|-----------|---------------------------------|------------|
|           | dc Coupled                      | ac Coupled |
| 15.5 GHz  |                                 |            |
| 16.0 GHz  |                                 |            |
| 16.5 GHz  |                                 |            |
| 17.0 GHz  |                                 |            |
| 17.5 GHz  |                                 |            |
| 18.0 GHz  |                                 |            |
| 18.5 GHz  |                                 |            |
| 19.0 GHz  |                                 |            |
| 19.5 GHz  |                                 |            |
| 20.0 GHz  |                                 |            |
| 20.5 GHz  |                                 |            |
| 21.0 GHz  |                                 |            |
| 21.5 GHz  |                                 |            |
| 22.0 GHz  |                                 |            |
| 22.5 GHz  |                                 |            |
| 23.0 GHz  |                                 |            |
| 23.5 GHz  |                                 |            |
| 24.0 GHz  |                                 |            |
| 24.5 GHz  |                                 |            |
| 25.0 GHz  |                                 |            |
| 25.5 GHz  |                                 |            |
| 26.0 GHz  |                                 |            |
| 26.5 GHz  |                                 |            |

**Agilent E7403A/E7404A Test Results**

Perform the following steps to verify the frequency response of the analyzer.

1. Enter the most positive number from the Flatness Relative to 50 MHz (dc) column of [Table 2-50](#):

\_\_\_\_\_ dB

**24. Frequency Response, Agilent E7403A, E7404A, and E7405A**

2. Enter the most positive number from the Response Relative to 50 MHz column of [Table 2-51](#):

\_\_\_\_\_ dB

3. Record the most positive of numbers from [step 1](#) and [step 2](#) in [Table 2-53](#) as the Maximum Response for Band 0.

4. Enter the most negative number from the Flatness Relative to 50 MHz (dc) column of [Table 2-50](#):

\_\_\_\_\_ dB

5. Enter the most negative number from the Response Relative to 50 MHz column of [Table 2-51](#):

\_\_\_\_\_ dB

6. Record the most negative of numbers from [step 4](#) and [step 5](#) in [Table 2-53](#) as the Minimum Response for Band 0.

7. For Band 0 in [Table 2-53](#), subtract the Minimum Response value from the Maximum Response value and record the result in the Peak-to-Peak Response column.

8. Note the most positive number from the Flatness Relative to 50 MHz (dc) column of [Table 2-52](#) for frequencies between 3.0 GHz and 6.7 GHz. Record this number in [Table 2-53](#) as the Maximum Response for Band 1.

9. Note the most negative number from the Flatness Relative to 50 MHz (dc) column of [Table 2-52](#) for frequencies between 3.0 GHz and 6.7 GHz. Record this number in [Table 2-53](#) as the Minimum Response for Band 1.

10. For Band 1 in [Table 2-53](#), subtract the Minimum Response value from the Maximum Response value and record the result in the Peak-to-Peak Response column.

11. If the analyzer is an Agilent E7403A, then continue with [step 15](#).

12. Note the most positive number from the Flatness Relative to 50 MHz (dc) column of [Table 2-52](#) for frequencies between 6.7 GHz and 13.2 GHz. Record this number in [Table 2-53](#) as the Maximum Response for Band 2.

13. Note the most negative number from the Flatness Relative to 50 MHz (dc) column of [Table 2-52](#) for frequencies between 6.7 GHz and 13.2 GHz. Record this number in [Table 2-53](#) as the Minimum Response for Band 2.

14. For Band 2 in [Table 2-53](#), subtract the Minimum Response value from the Maximum Response value and record the result in the Peak-to-Peak Response column.

15. Record the most positive number from the Flatness Relative to 50 MHz (ac) column of [Table 2-50](#) as the Maximum Response for Band 0 in [Table 2-54](#).

16. Record the most negative number from the Flatness Relative to 50 MHz (ac) column of [Table 2-50](#) as the Minimum Response for Band 0 in [Table 2-54](#).

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17. For Band 0 in [Table 2-54](#), subtract the Minimum Response value from the Maximum Response value and record the result in the Peak-to-Peak Response column.
18. Note the most positive number from the Flatness Relative to 50 MHz (ac) column of [Table 2-50](#) for frequencies between 800 MHz and 1.0 GHz. Record this number in [Table 2-54](#) as the Maximum Response for Band 0A.
19. Note the most negative number from the Flatness Relative to 50 MHz (ac) column of [Table 2-50](#) for frequencies between 800 MHz and 1.0 GHz. Record this number in [Table 2-54](#) as the Minimum Response for Band 0A.
20. For Band 0A in [Table 2-54](#), subtract the Minimum Response value from the Maximum Response value and record the result in the Peak-to-Peak Response column.
21. Note the most positive number from the Flatness Relative to 50 MHz (ac) column of [Table 2-50](#) for frequencies between 1.7 GHz and 2.0 GHz. Record this number in [Table 2-54](#) as the Maximum Response for Band 0B.
22. Note the most negative number from the Flatness Relative to 50 MHz (ac) column of [Table 2-50](#) for frequencies between 1.7 GHz and 2.0 GHz. Record this number in [Table 2-54](#) as the Minimum Response for Band 0B.
23. For Band 0B in [Table 2-54](#), subtract the Minimum Response value from the Maximum Response value and record the result in the Peak-to-Peak Response column.
24. Note the most positive number from the Flatness Relative to 50 MHz (ac) column of [Table 2-52](#) for frequencies between 3.0 GHz and 6.7 GHz. Record this number in [Table 2-54](#) as the Maximum Response for Band 1.
25. Note the most negative number from the Flatness Relative to 50 MHz (ac) column of [Table 2-52](#) for frequencies between 3.0 GHz and 6.7 GHz. Record this number in [Table 2-54](#) as the Minimum Response for Band 1.
26. For Band 1 in [Table 2-54](#), subtract the Minimum Response value from the Maximum Response value and record the result in the Peak-to-Peak Response column.
27. If the analyzer is an Agilent E7403A then the frequency response test is complete; transfer the values entered in [Table 2-54](#) to the test record in this guide. If the analyzer is an Agilent E7404A, continue this procedure.
28. Note the most positive number from the Flatness Relative to 50 MHz (ac) column of [Table 2-52](#) for frequencies between 6.7 GHz and 13.2 GHz. Record this number in [Table 2-54](#) as the Maximum Response for Band 2.
29. Note the most negative number from the Flatness Relative to 50 MHz (ac) column of [Table 2-52](#) for frequencies between 6.7 GHz and 13.2 GHz. Record this number in [Table 2-54](#) as the Minimum Response for Band 2.
30. For Band 2 in [Table 2-54](#), subtract the Minimum Response value from the Maximum Response value and record the result in the Peak-to-Peak Response column.

**24. Frequency Response, Agilent E7403A, E7404A, and E7405A**

31. Transfer the values entered in [Table 2-54](#) to the test record in this guide.

32. The frequency response test for Agilent E7404A analyzers is now complete.

**Table 2-53 Frequency Response Results, Agilent E7403A/E7404A, dc Coupled**

| Band | Maximum Response |                   | Minimum Response |                   | Peak-to-Peak Response |                   |
|------|------------------|-------------------|------------------|-------------------|-----------------------|-------------------|
|      | dB               | Test Record Entry | dB               | Test Record Entry | dB                    | Test Record Entry |
| 0    |                  | 1)                |                  | 2)                |                       | 3)                |
| 1    |                  | 4)                |                  | 5)                |                       | 6)                |
| 2    |                  | 7)                |                  | 8)                |                       | 9)                |

**Table 2-54 Frequency Response Results, Agilent E7403A/E7404A, ac Coupled**

| Band | Maximum Response |                   | Minimum Response |                   | Peak-to-Peak Response |                   |
|------|------------------|-------------------|------------------|-------------------|-----------------------|-------------------|
|      | dB               | Test Record Entry | dB               | Test Record Entry | dB                    | Test Record Entry |
| 0    |                  | 10)               |                  | 11)               |                       | 12)               |
| 0A   |                  | 13)               |                  | 14)               |                       | 15)               |
| 0B   |                  | 16)               |                  | 17)               |                       | 18)               |
| 1    |                  | 19)               |                  | 20)               |                       | 21)               |
| 2    |                  | 22)               |                  | 23)               |                       | 24)               |

**Agilent E7405A Test Results**

Perform the following steps to verify the frequency response of the analyzer.

1. Enter the most positive number from the Flatness Relative to 50 MHz (dc) column of [Table 2-50](#):

\_\_\_\_\_ dB

2. Enter the most positive number from the Response Relative to 50 MHz column of [Table 2-51](#):

\_\_\_\_\_ dB

3. Record the most positive of numbers from [step 1](#) and [step 2](#) in [Table 2-55](#) as the Maximum Response for Band 0.

4. Enter the most negative number from the Flatness Relative to 50 MHz (dc) column of [Table 2-50](#):

\_\_\_\_\_ dB

**24. Frequency Response, Agilent E7403A, E7404A, and E7405A**

5. Enter the most negative number from the Response Relative to 50 MHz column of [Table 2-51](#):

\_\_\_\_\_ dB

6. Record the most negative of numbers from [step 4](#) and [step 5](#) in [Table 2-55](#) as the Minimum Response for Band 0.
7. For Band 0 in [Table 2-55](#), subtract the Minimum Response value from the Maximum Response value and record the result in the Peak-to-Peak Response column.
8. If the analyzer is an Agilent E7405A with Option UKB, continue with [step 15](#).
9. Note the most positive number from the Flatness Relative to 50 MHz (dc) column of [Table 2-50](#) for frequencies between 800 MHz and 1.0 GHz. Record this number in [Table 2-55](#) as the Maximum Response for Band 0A.
10. Note the most negative number from the Flatness Relative to 50 MHz (dc) column of [Table 2-50](#) for frequencies between 800 MHz and 1.0 GHz. Record this number in [Table 2-55](#) as the Minimum Response for Band 0A.
11. For Band 0A in [Table 2-55](#), subtract the Minimum Response value from the Maximum Response value and record the result in the Peak-to-Peak Response column.
12. Note the most positive number from the Flatness Relative to 50 MHz (dc) column of [Table 2-50](#) for frequencies between 1.7 GHz and 2.0 GHz. Record this number in [Table 2-55](#) as the Maximum Response for Band 0B.
13. Note the most negative number from the Flatness Relative to 50 MHz (dc) column of [Table 2-50](#) for frequencies between 1.7 GHz and 2.0 GHz. Record this number in [Table 2-55](#) as the Minimum Response for Band 0B.
14. For Band 0B in [Table 2-55](#), subtract the Minimum Response value from the Maximum Response value and record the result in the Peak-to-Peak Response column.
15. Note the most positive number from the Flatness Relative to 50 MHz (dc) column of [Table 2-52](#) for frequencies between 3.0 GHz and 6.7 GHz. Record this number in [Table 2-55](#) as the Maximum Response for Band 1.
16. Note the most negative number from the Flatness Relative to 50 MHz (dc) column of [Table 2-52](#) for frequencies between 3.0 GHz and 6.7 GHz. Record this number in [Table 2-55](#) as the Minimum Response for Band 1.
17. For Band 1 in [Table 2-55](#), subtract the Minimum Response value from the Maximum Response value and record the result in the Peak-to-Peak Response column.
18. Note the most positive number from the Flatness Relative to 50 MHz (dc) column of [Table 2-52](#) for frequencies between 6.7 GHz and 13.2 GHz. Record this number in [Table 2-55](#) as the Maximum Response for Band 2.
19. Note the most negative number from the Flatness Relative to 50 MHz (dc) column of [Table 2-52](#) for frequencies between 6.7 GHz and 13.2 GHz. Record

**24. Frequency Response, Agilent E7403A, E7404A, and E7405A**

this number in [Table 2-55](#) as the Minimum Response for Band 2.

20. For Band 2 in [Table 2-55](#), subtract the Minimum Response value from the Maximum Response value and record the result in the Peak-to-Peak Response column.
21. Note the most positive number from the Flatness Relative to 50 MHz (dc) column of [Table 2-52](#) for frequencies between 13.2 GHz and 26.5 GHz. Record this number in [Table 2-55](#) as the Maximum Response for Band 3.
22. Note the most negative number from the Flatness Relative to 50 MHz (dc) column of [Table 2-52](#) for frequencies between 13.2 GHz and 26.5 GHz. Record this number in [Table 2-55](#) as the Minimum Response for Band 3.
23. For Band 3 in [Table 2-55](#), subtract the Minimum Response value from the Maximum Response value and record the result in the Peak-to-Peak Response column.
24. Transfer the values entered in [Table 2-55](#) to the test record in this guide.
25. If the analyzer is an Agilent E7405A with Option UKB, continue with this procedure. Otherwise, the frequency response test for Agilent E7405A analyzers is now complete.

**Table 2-55 Frequency Response Results, Agilent E7405A, dc Coupled**

| Band | Maximum Response |                   | Minimum Response |                   | Peak-to-Peak Response |                   |
|------|------------------|-------------------|------------------|-------------------|-----------------------|-------------------|
|      | dB               | Test Record Entry | dB               | Test Record Entry | dB                    | Test Record Entry |
| 0    |                  | 1)                |                  | 2)                |                       | 3)                |
| 0A   |                  | 4)                |                  | 5)                |                       | 6)                |
| 0B   |                  | 7)                |                  | 8)                |                       | 9)                |
| 1    |                  | 10)               |                  | 11)               |                       | 12)               |
| 2    |                  | 13)               |                  | 14)               |                       | 15)               |
| 3    |                  | 16)               |                  | 17)               |                       | 18)               |

**Agilent E7405A, Option UKB Test Results**

Perform the following steps to verify the frequency response of the analyzer.

1. Note the most positive of numbers from the Flatness Relative to 50 MHz (ac) column of [Table 2-50](#). Record this number in [Table 2-56](#) as the Maximum Response for Band 0.
2. Note the most negative of numbers from the Flatness Relative to 50 MHz (ac) column of [Table 2-50](#). Record this number in [Table 2-56](#) as the Minimum Response for Band 0.
3. For Band 0 in [Table 2-56](#), subtract the Minimum Response value from the Maximum Response value and record the result in the Peak-to-Peak Response

**24. Frequency Response, Agilent E7403A, E7404A, and E7405A**

column.

4. Note the most positive number from the Flatness Relative to 50 MHz (ac) column of [Table 2-50](#) for frequencies between 800 MHz and 1.0 GHz. Record this number in [Table 2-56](#) as the Maximum Response for Band 0A.
5. Note the most negative number from the Flatness Relative to 50 MHz (ac) column of [Table 2-50](#) for frequencies between 800 MHz and 1.0 GHz. Record this number in [Table 2-56](#) as the Minimum Response for Band 0A.
6. For Band 0A in [Table 2-56](#), subtract the Minimum Response value from the Maximum Response value and record the result in the Peak-to-Peak Response column.
7. Note the most positive number from the Flatness Relative to 50 MHz (ac) column of [Table 2-50](#) for frequencies between 1.7 GHz and 2.0 GHz. Record this number in [Table 2-56](#) as the Maximum Response for Band 0B.
8. Note the most negative number from the Flatness Relative to 50 MHz (ac) column of [Table 2-50](#) for frequencies between 1.7 GHz and 2.0 GHz. Record this number in [Table 2-56](#) as the Minimum Response for Band 0B.
9. For Band 0B in [Table 2-56](#), subtract the Minimum Response value from the Maximum Response value and record the result in the Peak-to-Peak Response column.
10. Note the most positive number from the Flatness Relative to 50 MHz (ac) column of [Table 2-52](#) for frequencies between 3.0 GHz and 6.7 GHz. Record this number in [Table 2-56](#) as the Maximum Response for Band 1.
11. Note the most negative number from the Flatness Relative to 50 MHz (ac) column of [Table 2-52](#) for frequencies between 3.0 GHz and 6.7 GHz. Record this number in [Table 2-56](#) as the Minimum Response for Band 1.
12. For Band 1 in [Table 2-56](#), subtract the Minimum Response value from the Maximum Response value and record the result in the Peak-to-Peak Response column.
13. Note the most positive number from the Flatness Relative to 50 MHz (ac) column of [Table 2-52](#) for frequencies between 6.7 GHz and 13.2 GHz. Record this number in [Table 2-56](#) as the Maximum Response for Band 2.
14. Note the most negative number from the Flatness Relative to 50 MHz (ac) column of [Table 2-52](#) for frequencies between 6.7 GHz and 13.2 GHz. Record this number in [Table 2-56](#) as the Minimum Response for Band 2.
15. For Band 2 in [Table 2-56](#), subtract the Minimum Response value from the Maximum Response value and record the result in the Peak-to-Peak Response column.
16. Note the most positive number from the Flatness Relative to 50 MHz (ac) column of [Table 2-52](#) for frequencies between 13.2 GHz and 26.5 GHz. Record this number in [Table 2-56](#) as the Maximum Response for Band 3.
17. Note the most negative number from the Flatness Relative to 50 MHz (ac)

**24. Frequency Response, Agilent E7403A, E7404A, and E7405A**

column of [Table 2-52](#) for frequencies between 13.2 GHz and 26.5 GHz. Record this number in [Table 2-56](#) as the Minimum Response for Band 3.

18. For Band 3 in [Table 2-56](#), subtract the Minimum Response value from the Maximum Response value and record the result in the Peak-to-Peak Response column.

19. Transfer the values entered in [Table 2-56](#) to the test record in this guide.

20. The frequency response test for Agilent E7405A analyzers with Option UKB is now complete.

**Table 2-56                      Frequency Response Results, Agilent E7405A Option UKB, ac Coupled**

| Band | Maximum Response |                   | Minimum Response |                   | Peak-to-Peak Response |                   |
|------|------------------|-------------------|------------------|-------------------|-----------------------|-------------------|
|      | dB               | Test Record Entry | dB               | Test Record Entry | dB                    | Test Record Entry |
| 0    |                  | 19)               |                  | 20)               |                       | 21)               |
| 0A   |                  | 22)               |                  | 23)               |                       | 24)               |
| 0B   |                  | 25)               |                  | 26)               |                       | 27)               |
| 1    |                  | 28)               |                  | 29)               |                       | 30)               |
| 2    |                  | 31)               |                  | 32)               |                       | 33)               |
| 3    |                  | 34)               |                  | 35)               |                       | 36)               |



## 25. Frequency Response (Preamp On): Agilent E7401A

This test measures the amplitude error of the analyzer as a function of frequency. The output of a source is fed through a power splitter to a power sensor and the analyzer. The power level of the source is adjusted at 50 MHz to place the displayed signal at approximately  $-32$  dBm. At each new source frequency and analyzer center frequency, the power level of the source is adjusted to place the signal at approximately  $-32$  dBm.

For improved amplitude accuracy the power splitter is characterized using a power sensor (the “reference” sensor) connected to one power splitter output port. The other power splitter output port connects to the “buried” sensor; it is not removed from the power splitter. Once the characterization is done, the reference sensor is removed and replaced by the analyzer.

This procedure only tests frequency response with the internal preamplifier turned on. Perform the “Frequency Response” procedure to test all other frequency response specifications.

The related adjustment for this performance test is “Frequency Response.”

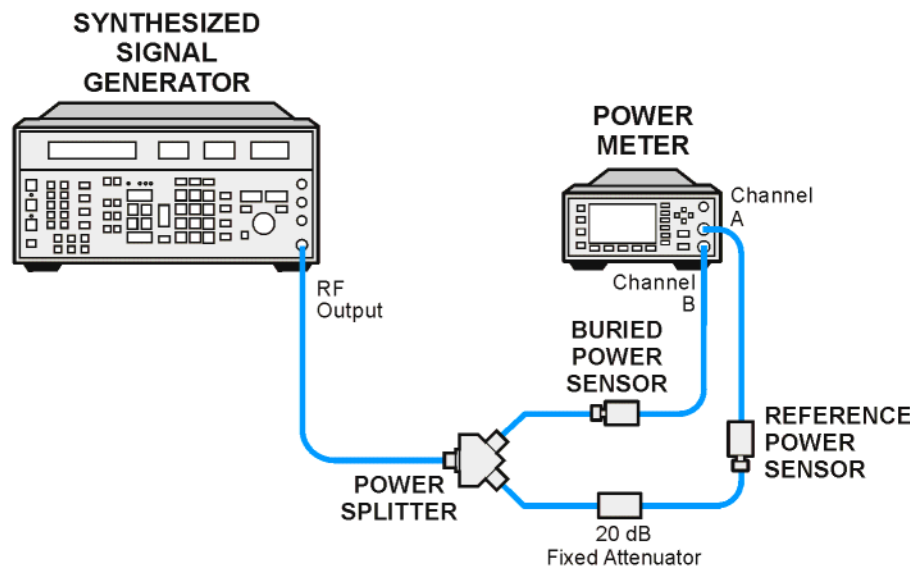
### Equipment Required

- Synthesized signal generator
- Power meter
- RF power sensor (2 *required*)
- 20 dB fixed attenuator
- Power splitter
- Cable, Type-N (m), 183 cm
- Cable, BNC, 120 cm
- Adapter, Type-N (m) to Type-N (m)
- Adapter, Type-N (m) to BNC (f)

### Procedure

#### Source/Splitter Characterization

1. Refer to [Figure 2-36](#). Connect one RF power sensor to Channel A of the power meter. This will be the “reference” sensor. Connect the other RF power sensor to Channel B of the power meter. This will be the “buried” sensor.

**Figure 2-36 Source/Splitter Characterization Setup**

wb920a

2. Zero and calibrate both power sensors.
3. On the power meter, set the Channel A calibration factor to the calibration factor of the reference sensor at 100 kHz.
4. On the power meter, set the Channel B calibration factor to 100%. Do not change this calibration factor during this test.
5. Connect the equipment as shown in [Figure 2-36](#). Note that the reference sensor connects to the 20 dB fixed attenuator.
6. Set the source frequency to 100 kHz and amplitude to 6 dBm.
7. Adjust the source amplitude to obtain a Channel A power meter reading of  $-20 \text{ dBm} \pm 0.1 \text{ dB}$ .
8. Record the Channel A and Channel B power meter readings in [Table 2-57](#).
9. Tune the source to the next frequency in [Table 2-57](#).
10. On the power meter, set the Channel A calibration factor to the calibration factor of the reference sensor for the current source frequency.
11. Adjust the source amplitude to obtain a Channel A power meter reading of  $-20 \text{ dBm} \pm 0.1 \text{ dB}$ .
12. Record the Channel A and Channel B power meter readings in [Table 2-57](#).
13. Repeat [step 9](#) through [step 12](#) for each frequency in [Table 2-57](#).

**25. Frequency Response (Preamp On): Agilent E7401A**

14. For each entry in [Table 2-57](#), calculate the Splitter Tracking Error as follows:  
 Splitter Tracking Error = Channel A Power – Channel B Power

For example, if Channel A Power is –20.3 dBm and Channel B power is –0.23 dBm, the splitter tracking error is –20.07 dB.

**Table 2-57****Source/Splitter Characterization**

| Frequency | Power Meter Reading |           | Splitter Tracking Error |
|-----------|---------------------|-----------|-------------------------|
|           | Channel A           | Channel B |                         |
| 100 kHz   |                     |           |                         |
| 500 kHz   |                     |           |                         |
| 1 MHz     |                     |           |                         |
| 5 MHz     |                     |           |                         |
| 10 MHz    |                     |           |                         |
| 20 MHz    |                     |           |                         |
| 50 MHz    |                     |           |                         |
| 75 MHz    |                     |           |                         |
| 175 MHz   |                     |           |                         |
| 275 MHz   |                     |           |                         |
| 375 MHz   |                     |           |                         |
| 475 MHz   |                     |           |                         |
| 575 MHz   |                     |           |                         |
| 675 MHz   |                     |           |                         |
| 775 MHz   |                     |           |                         |
| 825 MHz   |                     |           |                         |
| 875 MHz   |                     |           |                         |
| 925 MHz   |                     |           |                         |
| 975 MHz   |                     |           |                         |
| 1025 MHz  |                     |           |                         |
| 1075 MHz  |                     |           |                         |
| 1175 MHz  |                     |           |                         |
| 1275 MHz  |                     |           |                         |
| 1375 MHz  |                     |           |                         |

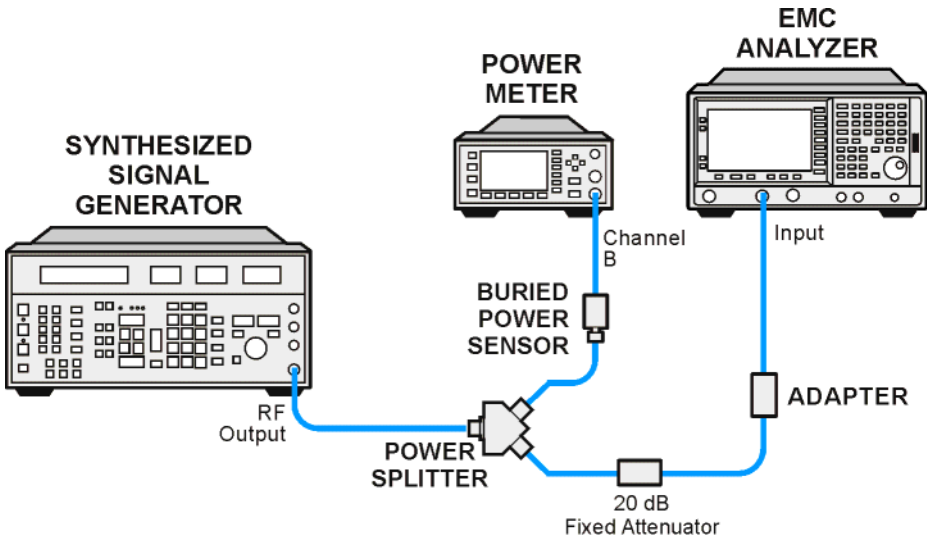
Table 2-57 Source/Splitter Characterization

| Frequency | Power Meter Reading |           | Splitter Tracking Error |
|-----------|---------------------|-----------|-------------------------|
|           | Channel A           | Channel B |                         |
| 1500 MHz  |                     |           |                         |

Measuring Frequency Response, Preamp On

1. Refer to Figure 2-37. Remove the reference sensor (Channel A sensor) from the 20 dB fixed attenuator. Connect the 20 dB fixed attenuator to the analyzer 50  $\Omega$  Input using an adapter. Do not use a cable.

Figure 2-37 Frequency Response Test Setup, Preamp On



wb921a

2. Set the source frequency to 100 kHz:
3. Set the source amplitude to -6 dBm.
4. Press **Preset** on the analyzer. Press the **Factory Preset** softkey, if it is displayed. Set the controls as follows:

**FREQUENCY, Center Freq, 100 kHz**  
**CF Step, 100 MHz**  
**SPAN, 20 kHz**  
**AMPLITUDE, More, Int Preamp (On)**  
**AMPLITUDE, More, Y Axis Units (or Amptd Units), dBm**  
**AMPLITUDE, Ref Level, -30 dBm**  
**Attenuation, 0 dB (Man)**  
**Scale/Div, 2 dB**  
**BW/Avg, Res BW, 3 kHz (Man)**

**Video BW, 3 kHz (Man)**

5. On the analyzer, press **Peak Search** (or **Search**).
6. Adjust the source amplitude to obtain a marker amplitude reading on the analyzer of  $-32.00 \text{ dBm} \pm 0.2 \text{ dB}$ .
7. Record the current Channel B power reading in [Table 2-58](#) as the Current Channel B reading.
8. Record the marker (Mkr1) amplitude reading in [Table 2-58](#).
9. Set the source to the next frequency listed in [Table 2-58](#).
10. Set the analyzer center frequency to the next frequency listed in [Table 2-58](#).
11. On the analyzer, press **Peak Search** (or **Search**).
12. Adjust the source amplitude to obtain a marker amplitude reading on the analyzer of  $-32.00 \text{ dBm} \pm 0.2 \text{ dB}$ .
13. Record the current Channel B power reading in [Table 2-58](#) as the Current Channel B reading.
14. Record the marker (Mkr1) amplitude reading in [Table 2-58](#) as marker (Mkr1) Amptd.
15. Repeat [step 9](#) through [step 14](#) for each frequency in [Table 2-58](#).
16. Copy the splitter tracking errors from [Table 2-57](#) into [Table 2-58](#).
17. Calculate the Flatness Error for each frequency in [Table 2-58](#) as follows:

$$\text{Flatness Error} = \text{Mkr1 Amptd}_{\text{dBm}} - \text{Current Channel B}_{\text{dBm}} - \text{Splitter Tracking Error}_{\text{dB}}$$

For example, if marker (Mkr1) Amptd is  $-33.32 \text{ dBm}$ , Current Channel B is  $-12.4 \text{ dBm}$ , and Splitter Tracking Error is  $-20.07 \text{ dB}$ , Flatness Error would be  $-0.85 \text{ dB}$ .

18. Record the Flatness Error for 50 MHz below as the 50 MHz Ref Amptd:

50 MHz Ref Amptd \_\_\_\_\_

19. Calculate the Flatness Relative to 50 MHz for each frequency in [Table 2-58](#) as follows:

$$\text{Flatness Relative to 50 MHz} = \text{Flatness Error} - 50 \text{ MHz Ref Amptd}$$

For example, if Flatness Error is  $-0.30 \text{ dB}$  and 50 MHz Ref Amptd is  $0.15 \text{ dB}$ , Flatness Relative to 50 MHz would be  $-0.45 \text{ dB}$ .

**Table 2-58      Frequency Response Worksheet, Preamp On**

| Frequency | Current Channel B Reading | Marker (Mkr1) Amptd | Splitter Tracking Error | Flatness Error | Flatness Relative to 50 MHz |
|-----------|---------------------------|---------------------|-------------------------|----------------|-----------------------------|
| 100 kHz   |                           |                     |                         |                |                             |

**Table 2-58**      **Frequency Response Worksheet, Preamp On**

| Frequency            | Current Channel B Reading | Marker (Mkr1) Amptd | Splitter Tracking Error | Flatness Error | Flatness Relative to 50 MHz |
|----------------------|---------------------------|---------------------|-------------------------|----------------|-----------------------------|
| 500 kHz <sup>a</sup> |                           |                     |                         |                |                             |
| 1 MHz                |                           |                     |                         |                |                             |
| 5 MHz                |                           |                     |                         |                |                             |
| 10 MHz               |                           |                     |                         |                |                             |
| 20 MHz               |                           |                     |                         |                |                             |
| 50 MHz               |                           |                     |                         |                | 0 dB (Ref)                  |
| 75 MHz               |                           |                     |                         |                |                             |
| 175 MHz              |                           |                     |                         |                |                             |
| 275 MHz              |                           |                     |                         |                |                             |
| 375 MHz              |                           |                     |                         |                |                             |
| 475 MHz              |                           |                     |                         |                |                             |
| 575 MHz              |                           |                     |                         |                |                             |
| 675 MHz              |                           |                     |                         |                |                             |
| 775 MHz              |                           |                     |                         |                |                             |
| 825 MHz              |                           |                     |                         |                |                             |
| 875 MHz              |                           |                     |                         |                |                             |
| 925 MHz              |                           |                     |                         |                |                             |
| 975 MHz              |                           |                     |                         |                |                             |
| 1025 MHz             |                           |                     |                         |                |                             |
| 1075 MHz             |                           |                     |                         |                |                             |
| 1175 MHz             |                           |                     |                         |                |                             |
| 1275 MHz             |                           |                     |                         |                |                             |
| 1375 MHz             |                           |                     |                         |                |                             |
| 1500 MHz             |                           |                     |                         |                |                             |

**Test Results**

1. Record the most positive number from the Flatness Relative to 50 MHz column of [Table 2-58](#) as the Maximum Response in [Table 2-59](#) and as Entry 1 in the performance verification test record.
2. Record the most negative number from the Flatness Relative to

**25. Frequency Response (Preamp On): Agilent E7401A**

50 MHz column of [Table 2-58](#) as the Minimum Response in [Table 2-59](#) and as Entry 2 in the performance verification test record.

3. In [Table 2-59](#), subtract the Minimum Response value from the Maximum Response value and record the result in the Peak-to-Peak Response column, and as Entry 3 in the performance verification test record.

**Table 2-59**                      **Frequency Response Results**

| Maximum Response |                   | Minimum Response |                   | Peak-to-Peak Response |                   |
|------------------|-------------------|------------------|-------------------|-----------------------|-------------------|
| dB               | Test Record Entry | dB               | Test Record Entry | dB                    | Test Record Entry |
|                  | 1)                |                  | 2)                |                       | 3)                |

---

## 26. Frequency Response (Preamp On): Agilent E7402A

This test measures the amplitude error of the analyzer as a function of frequency. The output of a source is fed through a power splitter to a power sensor and the analyzer. The power level of the source is adjusted at 50 MHz to place the displayed signal at approximately  $-32$  dBm. At each new source frequency and analyzer center frequency, the power level of the source is adjusted to place the signal at approximately  $-32$  dBm.

For improved amplitude accuracy the power splitter is characterized using a power sensor (the “reference” sensor) connected to one power splitter output port. The other power splitter output port connects to the “buried” sensor; it is not removed from the power splitter. Once the characterization is done, the reference sensor is removed and replaced by the analyzer.

This procedure only tests frequency response with the internal preamplifier turned on. Perform the “Frequency Response” procedure to test all other frequency response specifications.

The related adjustment for this performance test is “Frequency Response.”

### Equipment Required

- Function generator
- Synthesized sweeper
- Power meter
- RF power sensor (2 *required*)
- 20 dB fixed attenuator
- Power splitter
- Cable, Type-N (m), 183 cm
- Cable, BNC, 120 cm
- Adapter, Type-N (m) to Type-N (m)
- Adapter, Type-N (m) to BNC (f)

### Procedure

#### Source/Splitter Characterization

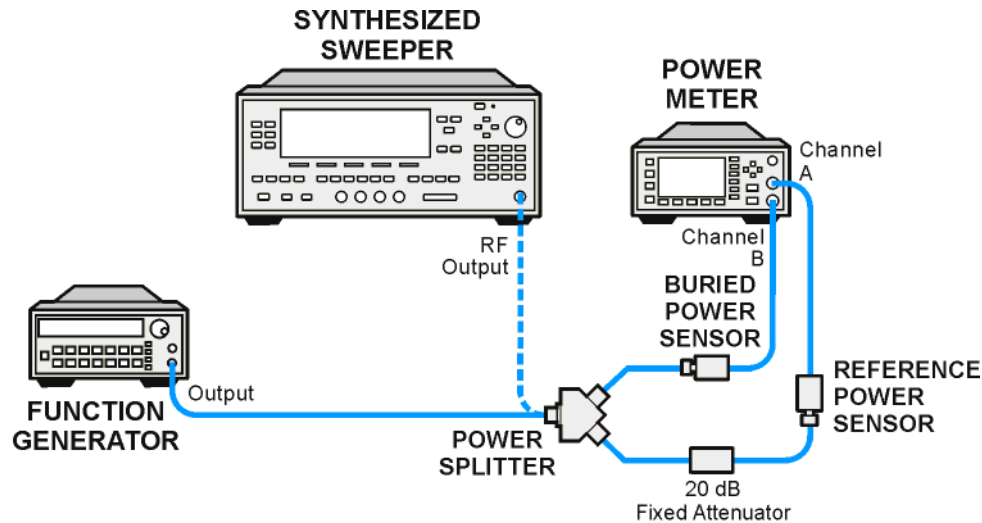
1. Connect one RF power sensor to Channel A of the power meter. This will be the “reference” sensor. Connect the other RF power sensor to Channel B of the power meter. This will be the “buried” sensor.
2. Zero and calibrate both power sensors.
3. On the power meter, set the Channel A calibration factor to the calibration factor of the reference sensor at 1 MHz.
4. On the power meter, set the Channel B calibration factor to 100%. Do not change this calibration factor during this test.



## 26. Frequency Response (Preamp On): Agilent E7402A

5. Connect the equipment as shown in [Figure 2-38](#). Use the function generator as the source. Note that the reference sensor connects to the 20 dB fixed attenuator.

**Figure 2-38** Source/Splitter Characterization Setup



wb922a

6. Set the function generator frequency to 1 MHz and amplitude to 450 mV rms (approximately 6 dBm).
7. Adjust the source amplitude to obtain a Channel A power meter reading of  $-20 \text{ dBm} \pm 0.1 \text{ dB}$ .
8. Record the Channel A and Channel B power meter readings in [Table 2-60](#).
9. Tune the source to the next frequency in [Table 2-60](#).
10. On the power meter, set the Channel A calibration factor to the calibration factor of the reference sensor for the current source frequency.
11. Adjust the source amplitude to obtain a Channel A power meter reading of  $-20 \text{ dBm} \pm 0.1 \text{ dB}$ .
12. Record the Channel A and Channel B power meter readings in [Table 2-60](#).
13. Repeat [step 9](#) through [step 12](#) for frequencies up through 10 MHz.
14. Replace the function generator with the synthesized sweeper.
15. Set the synthesized sweeper CW frequency to 10 MHz and the amplitude to 6 dBm.
16. Adjust the synthesized sweeper power level to obtain a Channel A power meter reading of  $-20 \text{ dBm} \pm 0.1 \text{ dB}$ .
17. Record both Channel A and Channel B power meter readings in [Table 2-60](#).

**26. Frequency Response (Preamp On): Agilent E7402A**

18. Repeat [step 9](#) through [step 12](#) for each remaining frequency in [Table 2-60](#).

19. For each entry in [Table 2-60](#), calculate the Splitter Tracking Error as follows:

$$\text{Splitter Tracking Error} = \text{Channel A Power} - \text{Channel B Power}$$

For example, if Channel A Power is  $-20.3$  dBm and Channel B power is  $-0.23$  dBm, the splitter tracking error is  $-20.07$  dB.

**Table 2-60****Source/Splitter Characterization**

| Frequency           | Power Meter Reading |           | Splitter Tracking Error |
|---------------------|---------------------|-----------|-------------------------|
|                     | Channel A           | Channel B |                         |
| 1 MHz               |                     |           |                         |
| 5 MHz               |                     |           |                         |
| 10 MHz <sup>a</sup> |                     |           |                         |
| 10 MHz <sup>b</sup> |                     |           |                         |
| 20 MHz              |                     |           |                         |
| 50 MHz              |                     |           |                         |
| 75 MHz              |                     |           |                         |
| 175 MHz             |                     |           |                         |
| 275 MHz             |                     |           |                         |
| 375 MHz             |                     |           |                         |
| 475 MHz             |                     |           |                         |
| 575 MHz             |                     |           |                         |
| 675 MHz             |                     |           |                         |
| 775 MHz             |                     |           |                         |
| 825 MHz             |                     |           |                         |
| 875 MHz             |                     |           |                         |
| 925 MHz             |                     |           |                         |
| 975 MHz             |                     |           |                         |
| 1025 MHz            |                     |           |                         |
| 1075 MHz            |                     |           |                         |
| 1175 MHz            |                     |           |                         |
| 1275 MHz            |                     |           |                         |

**Table 2-60**

**Source/Splitter Characterization**

| Frequency | Power Meter Reading |           | Splitter Tracking Error |
|-----------|---------------------|-----------|-------------------------|
|           | Channel A           | Channel B |                         |
| 1375 MHz  |                     |           |                         |
| 1500 MHz  |                     |           |                         |
| 1525 MHz  |                     |           |                         |
| 1675 MHz  |                     |           |                         |
| 1725 MHz  |                     |           |                         |
| 1775 MHz  |                     |           |                         |
| 1825 MHz  |                     |           |                         |
| 1875 MHz  |                     |           |                         |
| 1925 MHz  |                     |           |                         |
| 1975 MHz  |                     |           |                         |
| 2025 MHz  |                     |           |                         |
| 2125 MHz  |                     |           |                         |
| 2325 MHz  |                     |           |                         |
| 2525 MHz  |                     |           |                         |
| 2725 MHz  |                     |           |                         |
| 2925 MHz  |                     |           |                         |
| 2999 MHz  |                     |           |                         |

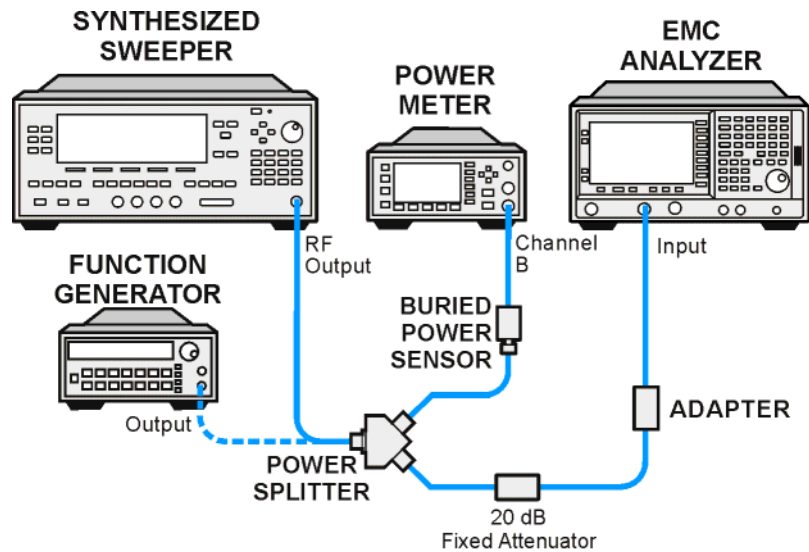
- a. This entry is for data taken with the function generator as source.
- b. This entry is for data taken with the synthesized sweeper as source.

**Measuring Frequency Response, Preamp On**

1. Refer to [Figure 2-39](#). Remove the reference sensor (Channel A sensor) from the 20 dB fixed attenuator. Connect the 20 dB fixed attenuator to the 50  $\Omega$  Input of the analyzer using an adapter. Do not use a cable.
2. Set the source frequency to 10 MHz.
3. Set the source power level to –6 dBm.

## 26. Frequency Response (Preamp On): Agilent E7402A

Figure 2-39 Frequency Response Test Setup, Preamp On



wb923a

- Press **Preset** on the analyzer. Press the **Factory Preset** softkey, if it is displayed. Set the controls as follows:

**FREQUENCY, Center Freq, 10 MHz**  
**CF Step, 100 MHz**  
**SPAN, 20 kHz**  
**Input/Output (or Input), Coupling (DC)(Option UKB only)**  
**AMPLITUDE, More, Int Preamp, On**  
**AMPLITUDE, More, Y Axis Units (or Amptd Units), dBm**  
**AMPLITUDE, Ref Level, -30 dBm**  
**Attenuation, 0 dB (Man)**  
**Scale/Div, 2 dB**  
**BW/Avg, Res BW, 3 kHz (Man)**  
**Video BW, 3 kHz (Man)**

- On the analyzer, press **Peak Search** (or **Search**).
- Adjust the source power level to obtain a marker amplitude reading on the analyzer of  $-32.00 \text{ dBm} \pm 0.2 \text{ dB}$ .
- Record the current Channel B power reading in Table 2-61 as the Current Channel B Reading.
- Record the marker (Mkr1) amplitude reading in Table 2-61.
- Set the source to the next frequency listed in Table 2-61.
- Set the analyzer center frequency to the next frequency listed in Table 2-61.
- On the analyzer, press **Peak Search** (or **Search**).
- Adjust the source power level to obtain a marker amplitude reading on the

**26. Frequency Response (Preamp On): Agilent E7402A**

analyzer of  $-32.00 \text{ dBm} \pm 0.2 \text{ dB}$ .

13. Record the current Channel B power reading in [Table 2-61](#) as the current Channel B reading.
14. Record the marker (Mkr1) amplitude reading in [Table 2-61](#).
15. Repeat [step 9](#) through [step 14](#) for each remaining frequency in [Table 2-61](#).
16. Replace the synthesized sweeper with the function generator.
17. Set the function generator amplitude to 112 mV rms ( $-6 \text{ dBm}$ , or  $-12 \text{ dBm}$  plus nominal power splitter insertion loss).
18. Set the function generator frequency to 1 MHz.
19. Set the analyzer center frequency to 1 MHz.
20. On the analyzer, press **Peak Search** (or **Search**).
21. Adjust the function generator amplitude to obtain a marker amplitude reading of  $-32.00 \text{ dBm} \pm 0.2 \text{ dB}$ .
22. Record the current Channel B power reading in [Table 2-61](#) as the current Channel B reading.
23. Record the analyzer marker (Mkr1) amplitude reading in [Table 2-61](#) as marker (Mkr1) amplitude.
24. Repeat [step 18](#) through [step 23](#) for frequencies between 100 kHz and 10 MHz.
25. Copy the Splitter Tracking Error values from [Table 2-60](#) into [Table 2-61](#).
26. Calculate the Flatness Error for each frequency in [Table 2-61](#) as follows:

$$\text{Flatness Error} = \text{Mkr1 Amptd}_{\text{dBm}} - \text{Current Channel B}_{\text{dBm}} - \text{Splitter Tracking Error}_{\text{dB}}$$

For example, if marker (Mkr1) Amptd is  $-33.32 \text{ dBm}$ , Current Channel B is  $-12.4 \text{ dBm}$ , and Splitter Tracking Error is  $-20.07 \text{ dB}$ , Flatness Error would be  $-0.85 \text{ dB}$ .

27. Record the Flatness Error for 50 MHz below as the 50 MHz Ref Amptd:  
50 MHz Ref Amptd: \_\_\_\_\_ dB
28. Calculate the Setup Change Error (error due to changing the test setup from using a synthesized sweeper to using a function generator) as follows:
  - a. Record the Flatness Error from [Table 2-61](#) at 10 MHz using the function generator as FlatError<sub>FG</sub>:  
FlatError<sub>FG</sub>=\_\_\_\_\_ dB
  - b. Record the Flatness Error from [Table 2-61](#) at 10 MHz using the synthesized sweeper as FlatError<sub>SS</sub>:  
FlatError<sub>SS</sub>=\_\_\_\_\_ dB

**26. Frequency Response (Preamp On): Agilent E7402A**

- c. Subtract  $\text{FlatError}_{\text{SS}}$  from  $\text{FlatError}_{\text{FG}}$  and record the result as the Setup Change Error:

$$\text{Setup Change Error} = \text{FlatError}_{\text{FG}} - \text{FlatError}_{\text{SS}}$$

$$\text{Setup Change Error} = \text{_____ dB}$$

29. For frequencies less than 10 MHz calculate the Flatness Relative to 50 MHz for each frequency in [Table 2-61](#) as follows:

$$\text{Flatness Relative to 50 MHz} = \text{Flatness Error} - 50 \text{ MHz Ref Amptd} - \text{Setup Change Error}$$

For example, if Flatness Error is  $-0.30$  dB, 50 MHz Ref Amptd is  $0.15$  dB, and Setup Change Error is  $-0.19$  dB, Flatness Relative to 50 MHz would be  $-0.26$  dB.

30. For frequencies 10 MHz and greater, calculate the Flatness Relative to 50 MHz for each frequency in [Table 2-61](#) as follows:

$$\text{Flatness Relative to 50 MHz} = \text{Flatness Error} - 50 \text{ MHz Ref Amptd}$$

For example, if Flatness Error is  $-0.30$  dB and 50 MHz Ref Amptd is  $0.15$  dB, Flatness Relative to 50 MHz would be  $-0.45$  dB.

**Table 2-61 Frequency Response Worksheet, Preamp On**

| Frequency           | Current Channel B Reading | Mkr1 Amptd | Splitter Tracking Error | Flatness Error | Flatness Relative to 50 MHz |
|---------------------|---------------------------|------------|-------------------------|----------------|-----------------------------|
| 1 MHz               |                           |            |                         |                |                             |
| 5 MHz               |                           |            |                         |                |                             |
| 10 MHz <sup>a</sup> |                           |            |                         |                |                             |
| 10 MHz <sup>b</sup> |                           |            |                         |                |                             |
| 20 MHz              |                           |            |                         |                |                             |
| 50 MHz              |                           |            |                         |                | 0 dB (Ref)                  |
| 75 MHz              |                           |            |                         |                |                             |
| 175 MHz             |                           |            |                         |                |                             |
| 275 MHz             |                           |            |                         |                |                             |
| 375 MHz             |                           |            |                         |                |                             |
| 475 MHz             |                           |            |                         |                |                             |
| 575 MHz             |                           |            |                         |                |                             |
| 675 MHz             |                           |            |                         |                |                             |
| 775 MHz             |                           |            |                         |                |                             |

**Table 2-61                      Frequency Response Worksheet, Preamp On**

| <b>Frequency</b> | <b>Current<br/>Channel B<br/>Reading</b> | <b>Mkr1 Amptd</b> | <b>Splitter<br/>Tracking<br/>Error</b> | <b>Flatness Error</b> | <b>Flatness<br/>Relative to 50<br/>MHz</b> |
|------------------|--|-------------------|--|-----------------------|--|
| 825 MHz          |  |                   |  |                       |  |
| 875 MHz          |  |                   |  |                       |  |
| 925 MHz          |  |                   |  |                       |  |
| 975 MHz          |  |                   |  |                       |  |
| 1025 MHz         |  |                   |  |                       |  |
| 1075 MHz         |  |                   |  |                       |  |
| 1175 MHz         |  |                   |  |                       |  |
| 1275 MHz         |  |                   |  |                       |  |
| 1375 MHz         |  |                   |  |                       |  |
| 1500 MHz         |  |                   |  |                       |  |
| 1525 MHz         |  |                   |  |                       |  |
| 1675 MHz         |  |                   |  |                       |  |
| 1725 MHz         |  |                   |  |                       |  |
| 1775 MHz         |  |                   |  |                       |  |
| 1825 MHz         |  |                   |  |                       |  |
| 1875 MHz         |  |                   |  |                       |  |
| 1925 MHz         |  |                   |  |                       |  |
| 1975 MHz         |  |                   |  |                       |  |
| 2025 MHz         |  |                   |  |                       |  |
| 2125 MHz         |  |                   |  |                       |  |
| 2325 MHz         |  |                   |  |                       |  |
| 2525 MHz         |  |                   |  |                       |  |
| 2725 MHz         |  |                   |  |                       |  |
| 2925 MHz         |  |                   |  |                       |  |
| 2999 MHz         |  |                   |  |                       |  |

- a. This entry is for data taken with the function generator as source.
- b. This entry is for data taken with the synthesized sweeper as source.

**26. Frequency Response (Preamp On): Agilent E7402A****Test Results**

1. Record the most positive number from the Flatness Relative to 50 MHz column of [Table 2-61](#) as the Maximum Response for Band 0 in [Table 2-62](#).
2. Record the most negative number from the Flatness Relative to 50 MHz column of [Table 2-61](#) as the Minimum Response for Band 0 in [Table 2-62](#).
3. For Band 0 in [Table 2-62](#), subtract the Minimum Response value from the Maximum Response value and record the result in the Peak-to-Peak Response column.
4. Note the most positive number from the Flatness Relative to 50 MHz column of [Table 2-61](#) for frequencies between 800 MHz and 1.0 GHz. Record this number in [Table 2-62](#) as the Maximum Response for Band 0A.
5. Note the most negative number from the Flatness Relative to 50 MHz column of [Table 2-61](#) for frequencies between 800 MHz and 1.0 GHz. Record this number in [Table 2-62](#) as the Minimum Response for Band 0A.
6. For Band 0A in [Table 2-62](#), subtract the Minimum Response value from the Maximum Response value and record the result in the Peak-to-Peak Response column.
7. Note the most positive number from the Flatness Relative to 50 MHz column of [Table 2-61](#) for frequencies between 1.7 GHz and 2.0 GHz. Record this number in [Table 2-62](#) as the Maximum Response for Band 0B.
8. Note the most negative number from the Flatness Relative to 50MHz column of [Table 2-61](#) for frequencies between 1.7 GHz and 2.0 GHz. Record this number in [Table 2-62](#) as the Minimum Response for Band 0B.
9. For Band 0B in [Table 2-62](#), subtract the Minimum Response value from the Maximum Response value and record the result in the Peak-to-Peak Response column.
10. Transfer the values entered in [Table 2-62](#) to the test record in this guide.
11. The frequency response test is now complete.

**Table 2-62 Frequency Response Results**

| Band | Maximum Response |                   | Minimum Response |                   | Peak-to-Peak Response |                   |
|------|------------------|-------------------|------------------|-------------------|-----------------------|-------------------|
|      | dB               | Test Record Entry | dB               | Test Record Entry | dB                    | Test Record Entry |
| 0    |                  | 1)                |                  | 2)                |                       | 3)                |
| 0A   |                  | 4)                |                  | 5)                |                       | 6)                |
| 0B   |                  | 7)                |                  | 8)                |                       | 9)                |



## 27. Frequency Response (Preamp On): Agilent E7403A, E7404A, and E7405A

This test measures the amplitude error of the analyzer as a function of frequency. The output of a source is fed through a power splitter to a power sensor and the analyzer. The power level of the source is adjusted at 50 MHz to place the displayed signal at approximately  $-32$  dBm. At each new source frequency and analyzer center frequency, the power level of the source is adjusted to place the signal at approximately  $-32$  dBm.

For improved amplitude accuracy the power splitter is characterized using a power sensor (the “reference” sensor) connected to one power splitter output port. The other power splitter output port connects to the “buried” sensor; it is not removed from the power splitter. Once the characterization is done, the reference sensor is removed and replaced by the analyzer.

This procedure only tests frequency response with the internal preamplifier turned on. Perform the “Frequency Response” procedure to test all other frequency response specifications.

The related adjustment for this performance test is “Frequency Response.”

### Equipment Required

- Function generator
- Synthesized sweeper
- Power meter
- RF power sensor (2 *required*)
- 20 dB fixed attenuator
- Power splitter
- Cable, Type-N (m), 183 cm
- Cable, BNC, 120 cm
- Adapter, Type-N (m) to Type-N (m)
- Adapter, Type-N (m) to BNC (f)

### Additional Equipment for Option BAB

- Adapter, Type-N (m) to APC 3.5 (f)

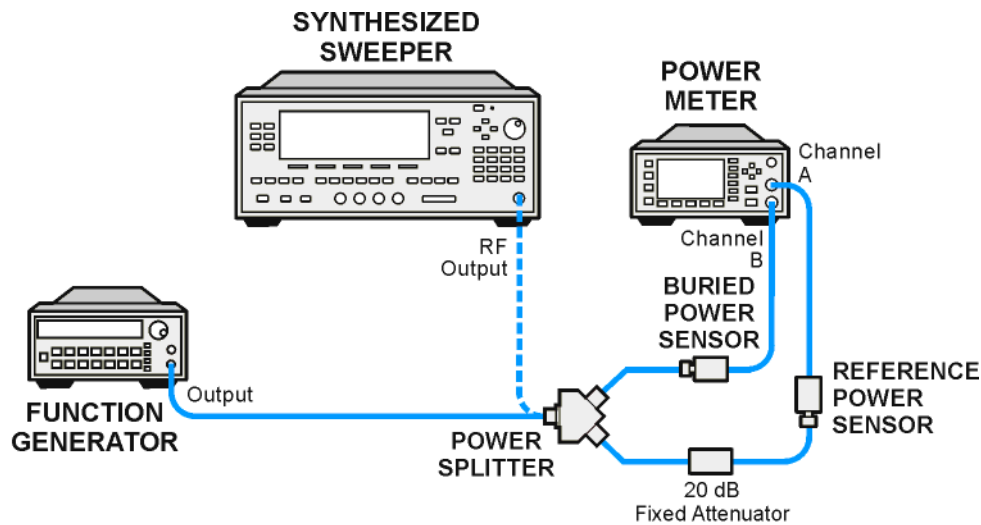
### Procedure

#### Source/Splitter Characterization

1. Connect one RF power sensor to Channel A of the power meter. This will be the “reference” sensor. Connect the other RF power sensor to Channel B of the power meter. This will be the “buried” sensor.
2. Zero and calibrate both power sensors.

**27. Frequency Response (Preamp On): Agilent E7403A, E7404A, and E7405A**

3. On the power meter, set the Channel A calibration factor to the calibration factor of the reference sensor at 1 MHz.
4. On the power meter, set the Channel B calibration factor to 100%. Do not change this calibration factor during this test.
5. Connect the equipment as shown in [Figure 2-40](#). Use the function generator as the source. Note that the reference sensor connects to the 20 dB fixed attenuator.

**Figure 2-40 Source/Splitter Characterization Setup**

wb922a

6. Set the function generator frequency to 1 MHz and amplitude to 446 mV rms (approximately 6 dBm).
7. Adjust the source amplitude to obtain a Channel A power meter reading of  $-20 \text{ dBm} \pm 0.1 \text{ dB}$ .
8. Record the Channel A and Channel B power meter readings in [Table 2-63](#).
9. Tune the source to the next frequency in [Table 2-63](#).
10. On the power meter, set the Channel A calibration factor to the calibration factor of the reference sensor for the current source frequency.
11. Adjust the source amplitude to obtain a Channel A power meter reading of  $-20 \text{ dBm} \pm 0.1 \text{ dB}$ .
12. Record the Channel A and Channel B power meter readings in [Table 2-63](#).
13. Repeat [step 9](#) through [step 12](#) for frequencies up through 10 MHz.
14. Replace the function generator with the synthesized sweeper.
15. Set the synthesized sweeper CW frequency to 10 MHz and the amplitude to 6 dBm.

**27. Frequency Response (Preamp On): Agilent E7403A, E7404A, and E7405A**

16. Adjust the synthesized sweeper power level to obtain a Channel A power meter reading of  $-20 \text{ dBm} \pm 0.1 \text{ dB}$ .
17. Record the synthesized sweeper power level and both Channel A and Channel B power meter readings in [Table 2-63](#).
18. Repeat [step 9](#) through [step 12](#) for each remaining frequency in [Table 2-63](#).
19. For each entry in [Table 2-63](#), calculate the Splitter Tracking Error as follows:

$$\text{Splitter Tracking Error} = \text{Channel A Power} - \text{Channel B Power}$$

For example, if Channel A Power is  $-20.3 \text{ dBm}$  and Channel B power is  $-0.23 \text{ dBm}$ , the splitter tracking error is  $-20.07 \text{ dB}$ .

**Table 2-63****Source/Splitter Characterization**

| Frequency           | Power Meter Reading |           | Splitter Tracking Error |
|---------------------|---------------------|-----------|-------------------------|
|                     | Channel A           | Channel B |                         |
| 1 MHz               |                     |           |                         |
| 5 MHz               |                     |           |                         |
| 10 MHz <sup>a</sup> |                     |           |                         |
| 10 MHz <sup>b</sup> |                     |           |                         |
| 20 MHz              |                     |           |                         |
| 50 MHz              |                     |           |                         |
| 75 MHz              |                     |           |                         |
| 175 MHz             |                     |           |                         |
| 275 MHz             |                     |           |                         |
| 375 MHz             |                     |           |                         |
| 475 MHz             |                     |           |                         |
| 575 MHz             |                     |           |                         |
| 675 MHz             |                     |           |                         |
| 775 MHz             |                     |           |                         |
| 825 MHz             |                     |           |                         |
| 875 MHz             |                     |           |                         |
| 925 MHz             |                     |           |                         |
| 975 MHz             |                     |           |                         |

Table 2-63

Source/Splitter Characterization

| Frequency | Power Meter Reading |           | Splitter Tracking Error |
|-----------|---------------------|-----------|-------------------------|
|           | Channel A           | Channel B |                         |
| 1025 MHz  |                     |           |                         |
| 1075 MHz  |                     |           |                         |
| 1175 MHz  |                     |           |                         |
| 1275 MHz  |                     |           |                         |
| 1375 MHz  |                     |           |                         |
| 1500 MHz  |                     |           |                         |
| 1525 MHz  |                     |           |                         |
| 1675 MHz  |                     |           |                         |
| 1725 MHz  |                     |           |                         |
| 1775 MHz  |                     |           |                         |
| 1825 MHz  |                     |           |                         |
| 1875 MHz  |                     |           |                         |
| 1925 MHz  |                     |           |                         |
| 1975 MHz  |                     |           |                         |
| 2025 MHz  |                     |           |                         |
| 2125 MHz  |                     |           |                         |
| 2325 MHz  |                     |           |                         |
| 2525 MHz  |                     |           |                         |
| 2725 MHz  |                     |           |                         |
| 2925 MHz  |                     |           |                         |
| 2999 MHz  |                     |           |                         |

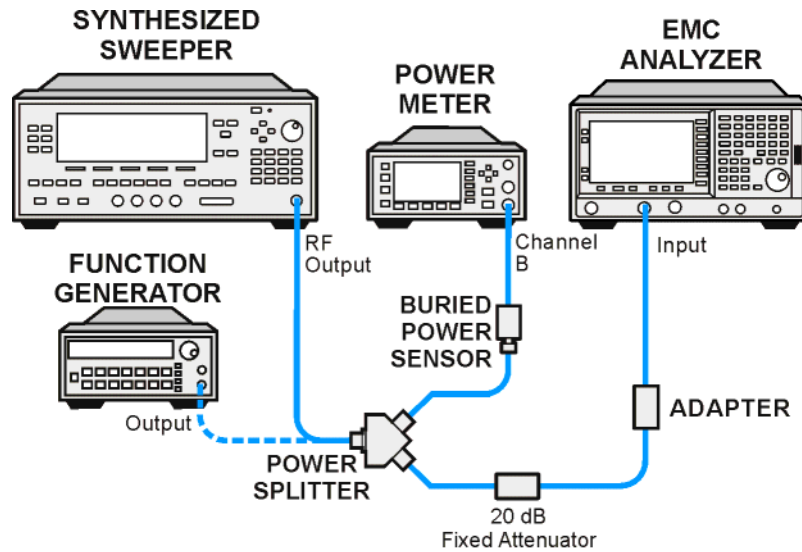
- This entry is for data taken with the function generator as source.
- This entry is for data taken with the synthesized sweeper as source.

### Measuring Frequency Response, Preamp On

- Refer to [Figure 2-41](#). Remove the reference sensor (Channel A sensor) from the 20 dB fixed attenuator. Connect the 20 dB fixed attenuator to the 50  $\Omega$  Input of the analyzer using an adapter. Do not use a cable.

## 27. Frequency Response (Preamp On): Agilent E7403A, E7404A, and E7405A

Figure 2-41 Frequency Response Test Setup, Preamp On



wb923a

2. Set the source frequency to 10 MHz.
3. Set the source power level to  $-6$  dBm.
4. Press **Preset** on the analyzer. Press the **Factory Preset** softkey, if it is displayed. Set the controls as follows:
  - FREQUENCY, Center Freq, 10 MHz**
  - CF Step, 100 MHz**
  - SPAN, 20 kHz**
  - Input/Output (or Input), Coupling, (DC)** (Agilent E7403A, E7404A, or any model with Option UKB)
  - AMPLITUDE, More, Int Preamp, On**
  - AMPLITUDE, More, Y Axis Units (or Amptd Units), dBm**
  - AMPLITUDE, Ref Level,  $-30$  dBm**
  - Attenuation, 0 dB (Man)**
  - Scale/Div, 2 dB**
  - BW/Avg, Res BW, 3 kHz (Man)**
  - Video BW, 3 kHz (Man)**
5. On the analyzer, press **Peak Search** (or **Search**).
6. Adjust the source power level to obtain a marker amplitude reading on the analyzer of  $-32.00$  dBm  $\pm 0.2$  dB.
7. Record the current Channel B power reading in Table 2-64 as the Current Channel B Reading for ac or dc coupling, as appropriate. If the analyzer does not have switchable ac/dc coupling, enter all data into the dc columns.
8. Record the marker (Mkr1) amplitude reading in Table 2-64.

**27. Frequency Response (Preamp On): Agilent E7403A, E7404A, and E7405A**

9. Set the source to the next frequency listed in [Table 2-64](#).
10. Set the analyzer center frequency to the next frequency listed in [Table 2-64](#).
11. On the analyzer, press **Peak Search** (or **Search**).
12. Adjust the source power level to obtain a marker amplitude reading on the analyzer of  $-32.00 \text{ dBm} \pm 0.2 \text{ dB}$ .
13. Record the current Channel B power reading in [Table 2-64](#) as the current Channel B reading in the ac or dc column, as appropriate.
14. Record the marker (Mkr1) amplitude reading in [Table 2-64](#).
15. Repeat [step 9](#) through [step 14](#) for each remaining frequency in [Table 2-64](#).
16. If the analyzer is an Agilent E7405A with Option UKB and is being tested in ac coupled mode, continue with [step 26](#). These analyzers are specified only down to 10 MHz in ac coupled mode.
17. Replace the synthesized sweeper with the function generator.
18. Set the function generator amplitude to 112 mV rms ( $-6 \text{ dBm}$ , or  $-12 \text{ dBm}$  plus nominal power splitter insertion loss).
19. Set the function generator frequency to 1 MHz.
20. Set the analyzer center frequency to 1 MHz.
21. On the analyzer, press **Peak Search** (or **Search**).
22. Adjust the function generator amplitude to obtain a marker amplitude reading of  $-00 \text{ dBm} \pm 0.2 \text{ dB}$ .
23. Record the current Channel B power reading in [Table 2-64](#) as the current Channel B reading.
24. Record the analyzer marker (Mkr1) amplitude reading in [Table 2-64](#) as marker (Mkr1) amplitude.
25. Repeat [step 19](#) through [step 24](#) for frequencies between 1 MHz and 10 MHz.
26. Copy the Splitter Tracking Error values from [Table 2-63](#) into [Table 2-64](#).
27. Calculate the Flatness Error for each frequency in [Table 2-64](#) as follows:  

$$\text{Flatness Error} = \text{Mkr1 Amptd}_{\text{dBm}} - \text{Current Channel B}_{\text{dBm}} - \text{Splitter Tracking Error}_{\text{dB}}$$

For example, if marker (Mkr1) Amptd is  $-33.32 \text{ dBm}$ , Current Channel B is  $-12.4 \text{ dBm}$ , and Splitter Tracking Error is  $-20.07 \text{ dB}$ , Flatness Error would be  $-0.85 \text{ dB}$ .
28. Record the Flatness Error for 50 MHz below as the 50 MHz Ref Amptd:  
50 MHz Ref Amptd: \_\_\_\_\_
29. If the analyzer is an Agilent E7405A with Option UKB and is being tested in ac

**27. Frequency Response (Preamp On): Agilent E7403A, E7404A, and E7405A**

coupled mode, continue with [step 31](#). Calculate the Setup Change Error (error due to changing the test setup from using a synthesized sweeper to using a function generator) as follows:

- a. Record the Flatness Error from [Table 2-64](#) at 10 MHz using the function generator as FlatError<sub>FG</sub>:

FlatError<sub>FG</sub>=\_\_\_\_\_ dB

- b. Record the Flatness Error from [Table 2-64](#) at 10 MHz using the synthesized sweeper as FlatError<sub>SS</sub>:

FlatError<sub>SS</sub>=\_\_\_\_\_ dB

- c. Subtract FlatError<sub>SS</sub> from FlatError<sub>FG</sub> and record the result as the Setup Change Error:

$$\text{Setup Change Error} = \text{FlatError}_{\text{FG}} - \text{FlatError}_{\text{SS}}$$

Setup Change Error =\_\_\_\_\_ dB

30. For frequencies less than 10 MHz calculate the Flatness Relative to 50 MHz for each frequency in [Table 2-64](#) as follows:

$$\text{Flatness Relative to 50 MHz} = \text{Flatness Error} - 50 \text{ MHz Ref Amptd} - \text{Setup Change Error}$$

For example, if Flatness Error is –0.30 dB, 50 MHz Ref Amptd is 0.15 dB, and Setup Change Error is –0.19 dB, Flatness Relative to 50 MHz would be –0.26 dB.

31. For frequencies 10 MHz and greater, calculate the Flatness Relative to 50 MHz for each frequency in [Table 2-64](#) as follows:

$$\text{Flatness Relative to 50 MHz} = \text{Flatness Error} - 50 \text{ MHz Ref Amptd}$$

For example, if Flatness Error is –0.30 dB and 50 MHz Ref Amptd is 0.15 dB, Flatness Relative to 50 MHz would be –0.45 dB.

32. Replace the function generator with the synthesized sweeper.
33. If the analyzer is an Agilent E7405A with Option UKB then repeat [step 2](#) through [step 31](#) using ac coupled mode.

Table 2-64 Frequency Response Worksheet, Preamp On

| Freq.<br>(MHz)   | Splitter<br>Tracking<br>Error | Current<br>Channel B<br>Reading |    | Marker (Mkr1)<br>Amptd |    | Flatness Error |    | Flatness<br>Relative to<br>50 MHz |               |
|------------------|-------------------------------|---------------------------------|----|------------------------|----|----------------|----|-----------------------------------|---------------|
|                  |                               | dc                              | ac | dc                     | ac | dc             | ac | dc                                | ac            |
| 1 <sup>a</sup>   |                               |                                 |    |                        |    |                |    |                                   |               |
| 5 <sup>a</sup>   |                               |                                 |    |                        |    |                |    |                                   |               |
| 10 <sup>ab</sup> |                               |                                 |    |                        |    |                |    |                                   |               |
| 10 <sup>c</sup>  |                               |                                 |    |                        |    |                |    |                                   |               |
| 20               |                               |                                 |    |                        |    |                |    |                                   |               |
| 50               |                               |                                 |    |                        |    |                |    | 0 dB<br>(ref)                     | 0 dB<br>(ref) |
| 75               |                               |                                 |    |                        |    |                |    |                                   |               |
| 175              |                               |                                 |    |                        |    |                |    |                                   |               |
| 275              |                               |                                 |    |                        |    |                |    |                                   |               |
| 375              |                               |                                 |    |                        |    |                |    |                                   |               |
| 475              |                               |                                 |    |                        |    |                |    |                                   |               |
| 575              |                               |                                 |    |                        |    |                |    |                                   |               |
| 675              |                               |                                 |    |                        |    |                |    |                                   |               |
| 775              |                               |                                 |    |                        |    |                |    |                                   |               |
| 825              |                               |                                 |    |                        |    |                |    |                                   |               |
| 875              |                               |                                 |    |                        |    |                |    |                                   |               |
| 925              |                               |                                 |    |                        |    |                |    |                                   |               |
| 975              |                               |                                 |    |                        |    |                |    |                                   |               |
| 1025             |                               |                                 |    |                        |    |                |    |                                   |               |
| 1075             |                               |                                 |    |                        |    |                |    |                                   |               |
| 1175             |                               |                                 |    |                        |    |                |    |                                   |               |
| 1275             |                               |                                 |    |                        |    |                |    |                                   |               |
| 1375             |                               |                                 |    |                        |    |                |    |                                   |               |
| 1500             |                               |                                 |    |                        |    |                |    |                                   |               |
| 1525             |                               |                                 |    |                        |    |                |    |                                   |               |
| 1675             |                               |                                 |    |                        |    |                |    |                                   |               |



## 27. Frequency Response (Preamp On): Agilent E7403A, E7404A, and E7405A

**Table 2-64** Frequency Response Worksheet, Preamp On

| Freq.<br>(MHz) | Splitter<br>Tracking<br>Error | Current<br>Channel B<br>Reading |    | Marker (Mkr1)<br>Amptd |    | Flatness Error |    | Flatness<br>Relative to<br>50 MHz |    |
|----------------|-------------------------------|---------------------------------|----|------------------------|----|----------------|----|-----------------------------------|----|
|                |                               | dc                              | ac | dc                     | ac | dc             | ac | dc                                | ac |
| 1725           |                               |                                 |    |                        |    |                |    |                                   |    |
| 1775           |                               |                                 |    |                        |    |                |    |                                   |    |
| 1825           |                               |                                 |    |                        |    |                |    |                                   |    |
| 1875           |                               |                                 |    |                        |    |                |    |                                   |    |
| 1925           |                               |                                 |    |                        |    |                |    |                                   |    |
| 1975           |                               |                                 |    |                        |    |                |    |                                   |    |
| 2025           |                               |                                 |    |                        |    |                |    |                                   |    |
| 2125           |                               |                                 |    |                        |    |                |    |                                   |    |
| 2325           |                               |                                 |    |                        |    |                |    |                                   |    |
| 2525           |                               |                                 |    |                        |    |                |    |                                   |    |
| 2725           |                               |                                 |    |                        |    |                |    |                                   |    |
| 2925           |                               |                                 |    |                        |    |                |    |                                   |    |
| 2999           |                               |                                 |    |                        |    |                |    |                                   |    |

- This frequency is not tested on Agilent E7405A analyzers with Option UKB when in ac coupled mode.
- This entry is for data taken with the function generator as source.
- This entry is for data taken with the synthesized sweeper as source.

**Test Results**

- Record the most positive number from the Flatness Relative to 50 MHz (dc) column of [Table 2-64](#) as the Maximum Response for Band 0 in [Table 2-65](#).
- Record the most negative number from the Flatness Relative to 50 MHz (dc) column of [Table 2-64](#) as the Minimum Response for Band 0 in [Table 2-65](#).
- For Band 0 in [Table 2-65](#), subtract the Minimum Response value from the Maximum Response value and record the result in the Peak-to-Peak Response column.
- If the analyzer is an Agilent E7403A then continue with [step 8](#). Otherwise, transfer the values entered in [Table 2-65](#) to the test record in this guide; the frequency response test is now complete.
- If the analyzer is an Agilent E7404A then continue with [step 8](#). Otherwise, transfer the values entered in [Table 2-65](#) to the test record in this guide; the frequency response test is now complete.

**27. Frequency Response (Preamp On): Agilent E7403A, E7404A, and E7405A**

6. If the analyzer is an Agilent E7405A and does not have Option UKB then continue with [step 8](#). Otherwise, transfer the values entered in [Table 2-65](#) to the test record in this guide; the frequency response test is now complete.
7. If the analyzer is an Agilent E7405A with Option UKB, continue with [step 16](#).
8. Note the most positive number from the Flatness Relative to 50 MHz (dc) column of [Table 2-64](#) for frequencies between 800 MHz and 1.0 GHz. Record the number in [Table 2-65](#) as the Maximum Response for Band 0A.
9. Note the most negative number from the Flatness Relative to 50 MHz (dc) column of [Table 2-64](#) for frequencies between 800 MHz and 1.0 GHz. Record the number in [Table 2-65](#) as the Minimum Response for Band 0A.
10. For Band 0A in [Table 2-65](#), subtract the Minimum Response value from the Maximum Response value and record the result in the Peak-to-Peak Response column.
11. Note the most positive number from the Flatness Relative to 50 MHz (dc) column of [Table 2-64](#) for frequencies between 1.7 GHz and 2.0 GHz. Record the number in [Table 2-65](#) as the Maximum Response for Band 0B.
12. Note the most negative number from the Flatness Relative to 50 MHz (dc) column of [Table 2-64](#) for frequencies between 1.7 GHz and 2.0 GHz. Record the number in [Table 2-65](#) as the Minimum Response for Band 0B.
13. For Band 0B in [Table 2-65](#), subtract the Minimum Response value from the Maximum Response value and record the result in the Peak-to-Peak Response column.
14. Transfer the values entered in [Table 2-65](#) to the test record in this guide.
15. The frequency response (preamp on) test is now complete.

**Table 2-65 Frequency Response Results, dc Coupled**

| Band | Maximum Response |                   | Minimum Response |                   | Peak-to-Peak Response |                   |
|------|------------------|-------------------|------------------|-------------------|-----------------------|-------------------|
|      | dB               | Test Record Entry | dB               | Test Record Entry | dB                    | Test Record Entry |
| 0    |                  | 1)                |                  | 2)                |                       | 3)                |
| 0A   |                  | 4)                |                  | 5)                |                       | 6)                |
| 0B   |                  | 7)                |                  | 8)                |                       | 9)                |

16. Note the most positive number from the Flatness Relative to 50 MHz (ac) column of [Table 2-64](#). Record the number in [Table 2-66](#) as the Maximum Response for Band 0.
17. Note the most negative number from the Flatness Relative to 50 MHz (ac) column of [Table 2-64](#). Record the number in [Table 2-66](#) as the Minimum Response for Band 0.
18. For Band 0 in [Table 2-66](#), subtract the Minimum Response value from the

**27. Frequency Response (Preamp On): Agilent E7403A, E7404A, and E7405A**

Maximum Response value and record the result in the Peak-to-Peak Response column.

19. Note the most positive number from the Flatness Relative to 50 MHz (ac) column of [Table 2-64](#) for frequencies between 800 MHz and 1.0 GHz. Record the number in [Table 2-66](#) as the Maximum Response for Band 0A.
20. Note the most negative number from the Flatness Relative to 50 MHz (ac) column of [Table 2-64](#) for frequencies between 800 MHz and 1.0 GHz. Record the number in [Table 2-66](#) as the Minimum Response for Band 0A.
21. For Band 0A in [Table 2-66](#), subtract the Minimum Response value from the Maximum Response value and record the result in the Peak-to-Peak Response column.
22. Note the most positive number from the Flatness Relative to 50 MHz (ac) column of [Table 2-64](#) for frequencies between 1.7 GHz and 2.0 GHz. Record the number in [Table 2-66](#) as the Maximum Response for Band 0B.
23. Note the most negative number from the Flatness Relative to 50 MHz (ac) column of [Table 2-64](#) for frequencies between 1.7 GHz and 2.0 GHz. Record the number in [Table 2-66](#) as the Minimum Response for Band 0B.
24. For Band 0B in [Table 2-66](#), subtract the Minimum Response value from the Maximum Response value and record the result in the Peak-to-Peak Response column.
25. Transfer the values entered in [Table 2-66](#) to the test record in this guide.
26. The frequency response (preamp on) test is now complete.

**Table 2-66****Frequency Response Results, Agilent E7405A Option UKB**

| Band | Maximum Response |                   | Minimum Response |                   | Peak-to-Peak Response |                   |
|------|------------------|-------------------|------------------|-------------------|-----------------------|-------------------|
|      | dB               | Test Record Entry | dB               | Test Record Entry | dB                    | Test Record Entry |
| 0    |                  | 10)               |                  | 11)               |                       | 12)               |
| 0A   |                  | 13)               |                  | 14)               |                       | 15)               |
| 0B   |                  | 16)               |                  | 17)               |                       | 18)               |

---

## 28. Other Input-Related Spurious Responses: Agilent E7401A

This test measures the ability of the analyzer to reject image and multiple responses. A synthesized source and the analyzer are set to the same frequency and the amplitude of the source is set to  $-20$  dBm. A marker amplitude reference is set on the analyzer. The source is then tuned to several different frequencies which should generate image and multiple responses. At each source frequency, the source amplitude is set to  $-20$  dBm and the amplitude of the response, if any, is measured using the analyzer marker functions.

There are no related adjustment procedures for this performance test.

### Equipment Required

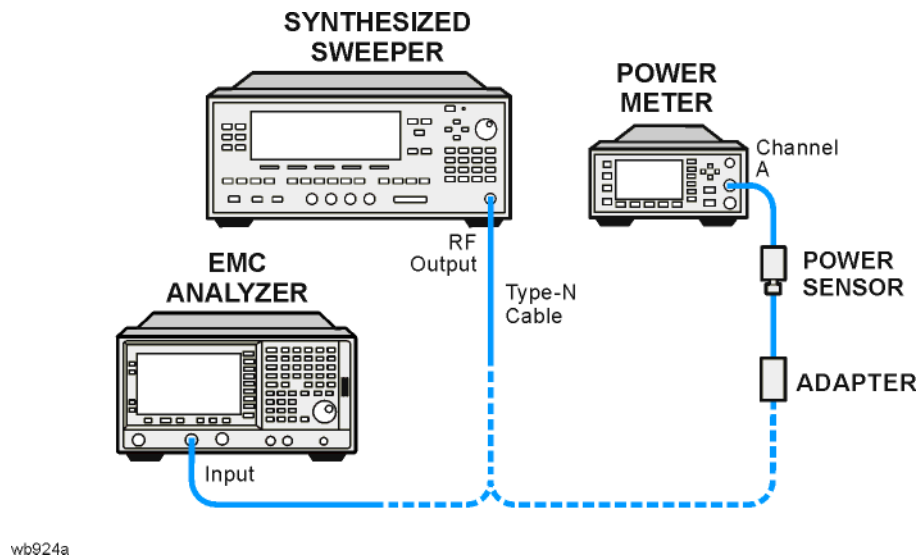
- Synthesized signal generator
- Power meter
- RF power sensor
- Adapter, Type-N (f) to APC 3.5 (f)
- Adapter, Type-N (f) to Type-N (f)
- Cable, Type-N, 152-cm (60-in)

### Procedure

1. Zero and calibrate the power meter and RF power sensor in log mode (power reads out in dBm), as described in the power meter operation manual. Enter the 500 MHz calibration factor of the power sensor into the power meter.
2. Press **Preset** on the synthesized sweeper and set the controls as follows:
  - CW, 542.8 MHz**
  - POWER LEVEL,  $-10$  dBm**
3. Connect the equipment as shown in [Figure 2-42](#) with the output of the synthesized sweeper connected to the power sensor using an adapter between the cable and the power sensor.
4. Adjust the power level of the synthesized sweeper for a  $-10$  dBm  $\pm 0.1$  dB reading on the power meter.
5. On the synthesized sweeper, press **SAVE, 1**.

## 28. Other Input-Related Spurious Responses: Agilent E7401A

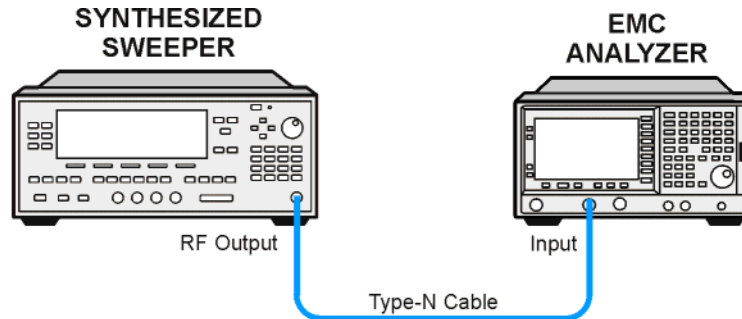
Figure 2-42 Other Input Related Spurious Responses Power Setting Setup



6. Set the CW frequency on the synthesized sweeper to 510.7 MHz.
7. Adjust the synthesized sweeper power level for a  $-10 \text{ dBm} \pm 0.1 \text{ dB}$  reading on the power meter.
8. On the synthesized sweeper, press **SAVE 2**.
9. Enter the 1 GHz calibration factor for the power sensor into the power meter.
10. Set the CW frequency on the synthesized sweeper to 1310.7 MHz.
11. Adjust the synthesized sweeper power level for a  $-10 \text{ dBm} \pm 0.1 \text{ dB}$  reading on the power meter.
12. On the synthesized sweeper, press **SAVE 3**.
13. Enter the 100 MHz calibration factor of the power sensor into the power meter.
14. Set the CW frequency of the synthesized sweeper to 100 MHz.
15. Adjust the synthesized sweeper power level for a  $-10 \text{ dBm} \pm 0.1 \text{ dB}$  reading on the power meter.
16. On the synthesized sweeper, press **SAVE 4**.
17. Set the CW frequency on the synthesized sweeper to 500 MHz.
18. Adjust the power level of the synthesized sweeper for a  $-10 \text{ dBm} \pm 0.1 \text{ dB}$  reading on the power meter.
19. Connect the synthesized sweeper to the Input of the analyzer using the appropriate cable and adapters. See Figure 2-43.

Figure 2-43

## Other Input Related Spurious Responses Measurement Setup



wb925a

20. Press **Preset** on the analyzer. Press the **Factory Preset** softkey, if it is displayed. Set the controls as follows:

**FREQUENCY, Center Freq, 500 MHz**  
**SPAN, 200 kHz**  
**AMPLITUDE, Attenuation, 10 dB (Man)**  
**BW/Avg, Res BW, 1 kHz**  
**Peak Search (or Search), Marker →, Mkr → Ref Lvl**  
**Peak Search (or Search), Marker, Delta**  
**Single**

21. On the synthesized sweeper, press **RECALL, 1**.
22. On the analyzer, press **Single** and wait for the completion of a new sweep.
23. On the analyzer, press **Peak Search (or Search)**, and record the marker delta ( $\Delta \text{Mkr1}$ ) amplitude in the performance verification test record as indicated in [Table 2-67](#).
24. On the synthesized sweeper, press **RECALL, 2**.
25. On the analyzer, press **Single** and wait for the completion of a new sweep.
26. On the analyzer, press **Peak Search (or Search)**, record the marker delta ( $\Delta \text{Mkr1}$ ) amplitude in the performance verification test record as indicated in [Table 2-67](#).
27. On the synthesized sweeper, press **RECALL, 4**.
28. On the analyzer press the following keys:

**FREQUENCY, Center Freq, 100 MHz**  
**AMPLITUDE, 102 dB $\mu$ V**

**28. Other Input-Related Spurious Responses: Agilent E7401A****Marker, Normal****Sweep, Sweep (Cont)****Peak Search (or Search), Meas Tools, Mkr → Ref Lvl****Peak Search (or Search), Meas Tools, Delta****Single**

29. On the synthesized sweeper, press **RECALL 3** for a CW frequency of 1310.7 MHz.
30. Press **Single** on the analyzer and wait for a completion of a new sweep.
31. On the analyzer, press **Peak Search** (or **Search**) and record the marker delta ( $\Delta$  Mkr1) amplitude in the performance test record as indicated in [Table 2-67](#).

Table 2-67

Other Input-Related Spurious Responses Worksheet

| Synthesized Sweeper CW Frequency |                         |             | Test Record<br>Entry<br>Marker Delta<br>( $\Delta$ <del>Mkr</del> 1) |
|----------------------------------|-------------------------|-------------|--|
| Save Register                    | CW                      | Power Level |  |
| 1                                | 542.8 MHz <sup>a</sup>  | –10 dBm     | 1)   |
| 2                                | 510.7 MHz <sup>b</sup>  | –10 dBm     | 2)   |
| 3                                | 1310.7 MHz <sup>b</sup> | –10 dBm     | 3)   |
| 4                                | 100 MHz                 | –10 dBm     | N/A  |

a. Image response

b. Multiple response



## 29. Other Input-Related Spurious Responses: Agilent E7402A, E7403A, E7404A, and E7405A

This test measures the ability of the analyzer to reject image, multiple, and out-of-band responses. A synthesized source and the analyzer are set to the same frequency and the amplitude of the source is set to  $-10$  dBm and  $-20$  dBm. A marker amplitude reference is set on the analyzer for each source amplitude setting. The source is then tuned to several different frequencies which should generate image, multiple, and out-of-band responses. At each source frequency, the source amplitude is set to the appropriate amplitude and the amplitude of the response, if any, is measured using the analyzer marker functions.

There are no related adjustment procedures for this performance test.

### Equipment Required

- Synthesized sweeper
- Power meter
- RF power sensor, (Agilent E7402A)
- Microwave power sensor (Agilent E7403A, E7404A, E7405A)
- RF power splitter (Agilent E7402A)
- Microwave power splitter (Agilent E7403A, E7404A, E7405A)
- Adapter, Type-N (m) to Type-N (m)
- Adapter, Type-N (m) to APC 3.5 (m)
- Adapter, APC 3.5 (f) to APC 3.5 (f)
- Cable, APC 3.5, 91 cm (36 in)

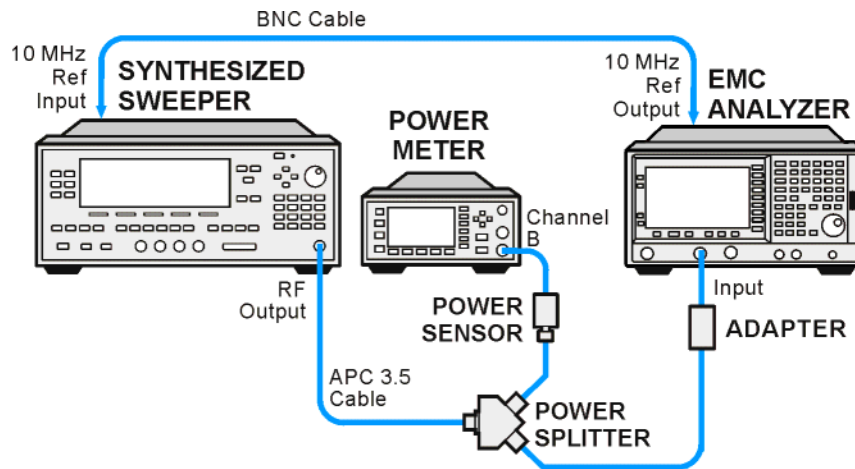
### Procedure

#### Band 0

1. Zero and calibrate the power meter and power sensor in log mode (power reads out in dBm), as described in the power meter operation manual. Enter the power sensor 2 GHz calibration factor into the power meter.
2. Preset the synthesized sweeper and set the controls as follows:
  - CW, 2000 MHz**
  - POWER LEVEL,  $-4$  dBm**
3. Connect the equipment as shown in [Figure 2-44](#). The analyzer provides the 10 MHz reference for the synthesized sweeper.

## 29. Other Input-Related Spurious Responses: Agilent E7402A, E7403A, E7404A, and E7405A

**Figure 2-44 Other Input-Related Spurious Responses Test Setup**



wb919a

- Press **Preset** on the analyzer. Press the **Factory Preset** softkey, if it is displayed. Set the controls as follows:

**FREQUENCY, Center Freq, 2 GHz**  
**SPAN, 200 kHz**  
**AMPLITUDE, More, Y Axis Units (or Amptd Units), dBm**  
**AMPLITUDE, Ref Level -10 dBm**  
**AMPLITUDE, Attenuation 0 dBm (Man)**  
**BW/Avg, Res BW, 1 kHz**

- Adjust the synthesized sweeper power level for a  $-10 \text{ dBm} \pm 0.1 \text{ dB}$  reading on the power meter.
- On the analyzer, press **Single**, and wait for the sweep to finish. Then press following keys:

**Marker, Select Marker (1)**  
**Peak Search (or Search)**  
**Marker**  
**Delta**

The signal peak might be slightly above the reference level, but the marker function can still make an accurate measurement.

- Adjust the synthesized sweeper power level for a  $-20 \text{ dBm} \pm 0.1 \text{ dB}$  reading on the power meter.
- On the analyzer, press **Single**, and wait for the sweep to finish. Press following keys:

**Marker, Select Marker (2)**  
**Peak Search (or Search)**  
**Marker**  
**Delta**

- On the analyzer, press **AMPLITUDE, Ref Level, -30 dBm**.

## 29. Other Input-Related Spurious Responses: Agilent E7402A, E7403A, E7404A, and E7405A

10. Repeat [step a](#) through [step h](#) using the data in [Table 2-68](#) for Band 0.
  - a. Set the synthesized sweeper to the listed CW frequency.  
*Do not set the synthesized sweeper to frequencies outside the frequency range of the analyzer.*
  - b. Enter the appropriate power sensor calibration factor into the power meter.
  - c. Adjust the synthesized sweeper power level until the power meter reading is equal to the Mixer Level in [Table 2-68](#),  $\pm 0.1$  dB.
  - d. On the analyzer, press **Single** and wait for the completion of a new sweep. Then, press **Peak Search** (or **Search**).
  - e. If the Mixer Level in [Table 2-68](#) is  $-20$  dBm, press **Marker**, **Select Marker** (2).
  - f. If the Mixer Level in [Table 2-68](#) is  $-10$  dBm, press **Marker**, **Select Marker** (1).
  - g. On the analyzer, press **Peak Search** (or **Search**).
  - h. Record the delta marker ( $\Delta$  Mkr) amplitude reading in [Table 2-68](#) and in the appropriate entry locations in the performance verification test record.
11. On the analyzer, press the following keys:

**Marker, More, Marker All Off**  
**Auto Couple**  
**SPAN, 1 MHz**  
**AMPLITUDE, Ref Level,  $-10$  dBm**  
**AMPLITUDE, Attenuation, 0 dB**  
**Sweep, Sweep** (Cont)

---

**NOTE** End of procedure for Agilent E7402A.

---

### Band 1

12. On the analyzer, press the following keys:  
**FREQUENCY, Center Freq, 4 GHz**
13. On the synthesized sweeper, press **CW, 4 GHz**.
14. Enter the power sensor 4 GHz calibration factor into the power meter.
15. On the analyzer, press the following keys:  
**Marker, More, Marker All Off**  
**Amplitude, Presel Center**
16. Repeat [step 5](#) through [step 11](#) for the synthesized sweeper CW frequencies listed in [Table 2-68](#) for Band 1.

---

**NOTE** End of procedure for Agilent E7403A.

---

**29. Other Input-Related Spurious Responses: Agilent E7402A, E7403A, E7404A, and E7405A**

**Band 2**

17. On the analyzer, press the following keys:

**FREQUENCY, Center Freq, 9 GHz**

18. On the synthesized sweeper, press **CW, 9 GHz**.

19. Enter the power sensor 9 GHz calibration factor into the power meter.

20. On the analyzer press the following keys:

**AMPLITUDE, Presel Center  
Marker, More, Marker All Off**

21. Repeat [step 5](#) through [step 11](#) for the synthesized sweeper CW frequencies listed in [Table 2-68](#) for Band 2.

---

**NOTE**

End of procedure for Agilent E7404A.

**Band 3**

22. On the analyzer, press the following keys:

**FREQUENCY, Center Freq, 15 GHz**

23. On the synthesized sweeper, press: **CW, 15 GHz**.

24. Enter the power sensor 15 GHz calibration factor into the power meter.

25. On the analyzer press the following keys:

**AMPLITUDE, Presel Center  
Marker, More, Marker All Off**

26. Repeat [step 5](#) through [step 11](#) for the synthesized sweeper CW frequencies listed in [Table 2-68](#) for Band 3 for the 15 GHz analyzer center frequency.

**Band 4**

27. On the analyzer, press:

**FREQUENCY, Center Freq, 21 GHz**

28. On the synthesized sweeper, press: **CW, 21 GHz**.

29. Enter the power sensor 21 GHz calibration factor into the power meter.

30. On the analyzer, press **AMPLITUDE, Presel Center**.

31. On the analyzer, press the following:

**Marker, More, Marker All Off**

32. Repeat [step 5](#) through [step 11](#) for the synthesized sweeper CW frequencies listed in [Table 2-68](#) for Band 4 for the 21 GHz analyzer center frequency.

**29. Other Input-Related Spurious Responses: Agilent E7402A, E7403A, E7404A, and E7405A**

**Table 2-68 Other Input-Related Spurious Responses**

| Band  | Analyzer Center Frequency (GHz) | Synthesized Sweeper CW Frequency (MHz) | Mixer Level (dBm) | Test Record Entry<br>$\Delta$ Mkr1 or<br>$\Delta$ Mkr2<br>Amplitude |
|---|---------------------------------|--|-------------------|---|
| 0   | 2.0                             | 2042.8 <sup>a</sup>                    | –20               | 1)  |
|   | 2.0                             | 2642.8 <sup>a</sup>                    | –20               | 2)  |
|   | 2.0                             | 1820.8 <sup>b</sup>                    | –20               | 3)  |
|   | 2.0                             | 278.5 <sup>b</sup>                     | –20               | 4)  |
| Note: The following data applies only to the Agilent E7403A, E7404A, and E7405A |                                 |  |                   |   |
| 0   | 2.0                             | 5600.0 <sup>c</sup>                    | –10               | 5)  |
|   | 2.0                             | 6242.8 <sup>c</sup>                    | –10               | 6)  |
| 1   | 4.0                             | 4042.8 <sup>a</sup>                    | –20               | 7)  |
|   | 4.0                             | 4642.8 <sup>a</sup>                    | –20               | 8)  |
|   | 4.0                             | 3742.9 <sup>b</sup>                    | –20               | 9)  |
|   | 4.0                             | 2242.8 <sup>c</sup>                    | –10               | 10)   |
| Note: The following data applies only to the Agilent E7404A, and E7405A         |                                 |  |                   |   |
| 2   | 9.0                             | 9042.8 <sup>a</sup>                    | –20               | 11)   |
|   | 9.0                             | 9642.8 <sup>a</sup>                    | –20               | 12)   |
|   | 9.0                             | 4982.1 <sup>b</sup>                    | –20               | 13)   |
|   | 9.0                             | 9342.8 <sup>c</sup>                    | –10               | 14)   |
| Note: The following data applies only to the Agilent E7405A                     |                                 |  |                   |   |
| 3   | 15.0                            | 15042.8 <sup>a</sup>                   | –20               | 15)   |
|   | 15.0                            | 15642.8 <sup>a</sup>                   | –20               | 16)   |
|   | 15.0                            | 18830.35 <sup>b</sup>                  | –20               | 17)   |
|   | 15.0                            | 4151.75 <sup>c</sup>                   | –10               | 18)   |
| 4   | 21.0                            | 21042.8 <sup>a</sup>                   | –20               | 19)   |
|   | 21.0                            | 21642.8 <sup>a</sup>                   | –20               | 20)   |
|   | 21.0                            | 21342.8 <sup>b</sup>                   | –20               | 21)   |

Table 2-68 Other Input-Related Spurious Responses

| Band | Analyzer Center Frequency (GHz) | Synthesized Sweeper CW Frequency (MHz) | Mixer Level (dBm) | Test Record Entry<br>$\Delta$ Mkr1 or<br>$\Delta$ Mkr2<br>Amplitude |
|------|---------------------------------|--|-------------------|---|
|      | 21.0                            | 5008.95 <sup>c</sup>                   | −10               | 22)   |

- a. Image response
- b. Multiple response
- c. Out-of-band response

## 30. Spurious Responses: Agilent E7401A

This test is performed in two parts. Part 1 measures third order intermodulation distortion. Part 2 measures second harmonic distortion.

To test second harmonic distortion, a low pass filter is used to filter the source output, ensuring that harmonics read by the analyzer are internally generated and not coming from the source. To measure the distortion products, the power at the mixer is set 25 dB higher than specified.

For example, if the specification states that with  $-40$  dBm at the input mixer, the distortion products should be suppressed by  $>75$  dBc, the equivalent second harmonic intercept (SHI) is  $>35$  dBm ( $-40$  dBm +  $75$  dBc). Measuring with  $-15$  dBm at the mixer and verifying the distortion products suppressed by  $>50$  dBc also ensures the SHI is  $>35$  dBm ( $-15$  dBm +  $50$  dBc).

For third order intermodulation distortion, two signals are combined in a directional bridge to provide isolation. These two signals are applied to the analyzer input. The power level of the two signals is several dB higher than specified, so the distortion products should be suppressed by less than the amount specified. In this manner, the equivalent third order intercept (TOI) is measured.

For example, if the specification states that with two  $-30$  dBm signals at the input mixer, the distortion products should be suppressed by  $>80$  dBc, which yields a third order intercept of  $>10$  dBm ( $-30$  dBm +  $(80$  dBc/ $2$ )). Measuring with  $-20$  dBm at the mixer and verifying the distortion products are suppressed by  $>60$  dBc, the equivalent TOI is also  $>10$  dBm ( $-20$  dBm +  $(60$  dBc/ $2$ )).

There are no related adjustment procedures for this performance test.

### Equipment Required

- Synthesized signal generator
- Synthesized sweeper
- Power meter, dual channel
- RF power sensor
- Power splitter
- Directional bridge
- 50 MHz low pass filter
- Cable, BNC, 120-cm
- Cable, APC 3.5, 91-cm (2 required)
- Adapter, Type-N (m) to APC 3.5 (f) (3 required)
- Adapter, Type-N (m) to SMA (m)
- Adapter, Type-N (m) to BNC (f)
- Adapter, Type-N (m) to Type-N (m)
- Adapter, SMA (f) to BNC (m)
- Adapter, APC 3.5 (f) to APC 3.5 (f)

## Procedure

This performance test consists of two parts:

Part 1: Third Order Intermodulation Distortion

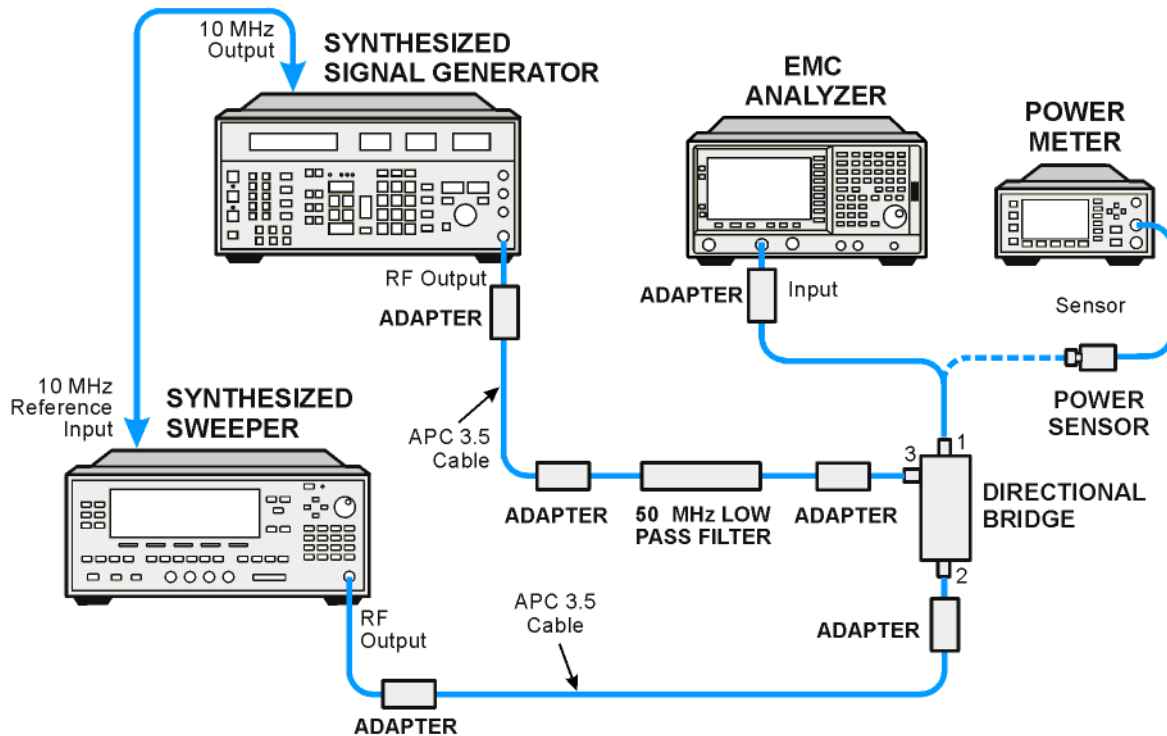
Part 2: Second Harmonic Distortion

Perform Part 1 before Part 2.

### Part 1: Third Order Intermodulation Distortion

1. Zero and calibrate the power meter and RF power sensor in log mode (power reads out in dBm), as described in the power meter operation manual.
2. Connect the equipment as shown in [Figure 2-45](#) with the output of the directional bridge connected to the power sensor.

**Figure 2-45** Third Order Intermodulation Distortion Test Setup



cl715b

3. Perform [step 4](#) through [step 29](#) using the information and entries from [Table](#)



2-69. Then continue with [step 30](#) through [step 37](#).

**Table 2-69**

**Test Equipment Settings for Testing TOI**

| TOI Test      | F1<br>(MHz) | F2<br>(MHz) | Low Pass<br>Filter<br>(MHz) |
|---------------|-------------|-------------|-----------------------------|
| 1             | 50.0        | 50.05       | 50                          |
| Narrow Res BW | 50.0        | 50.05       | 50                          |

4. Press **Blue Key, Special, 0, 0** on the signal generator. Set the frequency to the F1 value for TOI Test 1 in [Table 2-69](#). Set the amplitude to 4 dBm.
5. Press **PRESET** on the synthesized sweeper. Set the CW frequency of the synthesized sweeper to the F2 value for TOI Test 1 in [Table 2-69](#). Then press the following:  
**POWER LEVEL, –10 dBm**  
**RF Off**
6. Enter the power sensor calibration factor for the signal generator frequency into the power meter.
7. Adjust the amplitude of the signal generator until the power meter reads –12 dBm  $\pm 0.1$  dB.
8. Disconnect the power sensor from the directional bridge. Connect the directional bridge directly to the analyzer input using an adapter (do not use a cable).

**CAUTION**

Support the directional bridge and low pass filter to minimize stress on the analyzer input connector.

9. Press **Preset** on the analyzer. Press the **Factory Preset** softkey, if it is displayed. Press **System, Alignments, Auto Align, Off**. Set the analyzer center frequency to the F1 value for TOI Test 1 in [Table 2-69](#). Then, set the analyzer by pressing the following keys:

**FREQUENCY, CF Step, 50 kHz (Man)**  
**SPAN, 20 kHz**  
**AMPLITUDE, More, Y Axis Units (or Amptd Units), dBm**  
**AMPLITUDE, Ref Level, –5 dBm**  
**AMPLITUDE, Attenuation, 5 dB (Man)**  
**BW/Avg, 1 kHz (Man)**  
**BW/Avg, Video BW, 300 Hz (Man)**  
**Peak Search (or Search), More, Search Param, Peak Excursn, 3 dB**

10. On the analyzer, press the following keys:

**Peak Search (or Search)**  
**Meas Tools**  
**Mkr → CF, Delta**

**30. Spurious Responses: Agilent E7401A**

11. On the analyzer, press **FREQUENCY**, Center Freq,  $\uparrow$ .
12. If the resolution bandwidth is  $\geq 1$  kHz, press **SPAN**, **4 kHz**.
13. On the synthesized sweeper, set the RF On.
14. On the analyzer, press **Peak Search** (or **Search**).
15. On the synthesized sweeper, adjust the power level until the marker delta ( $\Delta$  Mkr1) amplitude reads 0 dB  $\pm 0.05$  dB.
16. On the analyzer, press: **FREQUENCY**,  $\downarrow$ ,  $\downarrow$ . The center frequency should now be lower than the signal generator frequency by the CF Step value.
17. Set the analyzer reference level to  $-15$  dBm.
18. On the analyzer, press **BW/Avg**, **Average**, **20**, and wait for “Vavg 20” to appear along the left side of the display.
19. On the analyzer, press **Peak Search** (or **Search**) and record the marker amplitude reading in [Table 2-70](#) as the Lower Distortion Amplitude.
20. On the analyzer, press **BW/Avg**, **Average Off**.
21. On the analyzer, increment the center frequency by three times the CF Step value. Press **FREQUENCY**, **Center Freq**,  $\uparrow$ ,  $\uparrow$ ,  $\uparrow$ . The center frequency should now be one CF Step value above the synthesized sweeper frequency.
22. Set the synthesized signal generator frequency to F2 as indicated in [Table 2-69](#).
23. Set the synthesized sweeper CW frequency to F1 as indicated in [Table 2-69](#).
24. On the analyzer, press **BW/Avg**, **Average**, **20**, and wait for Vavg 20 to appear along the left side of the display.
25. On the analyzer, press **Peak Search** (or **Search**) and record the marker amplitude reading in [Table 2-70](#) as the Upper Distortion Amplitude.
26. On the analyzer, press **BW/Avg**, **Average Off**.
27. Of the Lower Distortion Amplitude and Upper Distortion Amplitudes recorded in [Table 2-70](#), enter the most positive value as the Worst Distortion Amplitude in [Table 2-70](#). For example, if the Upper Distortion Amplitude is  $-62$  dBc and the Lower Distortion Amplitude is  $-63$  dBc, enter  $-62$  dBc as the Worst Distortion Amplitude.
28. Enter  $-17$  dBm as the Mixer Level in [Table 2-70](#) ( $-12$  dBm input power  $- 5$  dB input attenuation).
29. Calculate the equivalent TOI by subtracting one half of the Worst Distortion Amplitude (in dB) from the Mixer Level. Enter the result in [Table 2-70](#) as the Calculated TOI. For example, if the Worst Distortion Amplitude is  $-62$  dBc and the Mixer Level is  $-17$  dBm, the Calculated TOI would be:

$$\text{TOI} = -17 \text{ dBm} - \left( -\frac{62 \text{ dB}}{2} \right) = -17 \text{ dBm} + 31 \text{ dB} = +14 \text{ dBm}$$

**Table 2-70 Third Order Intermodulation Distortion Worksheet**

| TOI Test      | Lower Distortion Amplitude | Upper Distortion Amplitude | Worst Distortion Amplitude | Mixer Level | Test Record Entry Calculated TOI |
|---------------|----------------------------|----------------------------|----------------------------|-------------|----------------------------------|
| 1             |                            |                            |                            |             | 1)                               |
| Narrow Res BW |                            |                            |                            |             | 2)                               |

30. Set synthesized signal generator frequency to the F1 value used in TOI Test 1 of [Table 2-69](#).

31. Set synthesized sweeper CW frequency to the F2 value used in TOI Test 1 of [Table 2-69](#).

32. Press **Preset** on the analyzer. Press the **Factory Preset** softkey, if it is displayed. Press **System, Alignments, Auto Align, Off**. Set the analyzer to the F1 value for TOI Test Narrow Res BW in [Table 2-69](#). Then set the analyzer by pressing the following keys:

**FREQUENCY, CF Step, 50 kHz (Man)**  
**SPAN, 20 kHz**  
**AMPLITUDE, More, Y Axis Units (or Amptd Units), dBm**  
**AMPLITUDE, Ref Level, -5 dBm**  
**AMPLITUDE, Attenuation, 5 dB (Man)**  
**BW/Avg, 1 kHz (Man)**  
**BW/Avg, Video BW, 300 Hz (Man)**  
**Peak Search (or Search), More**  
**Search Param (or Search Criteria), Peak Excursn, 3 dB**

33. On the analyzer, press the following keys:

**Peak Search (or Search)**  
**Marker →**  
**Mkr → CF**

34. Set the analyzer as follows:

**SPAN, 500 Hz**  
**BW/Avg, Res BW, 30 Hz**  
**BW/Avg, Video BW, 10 Hz**

35. Repeat [step 10](#) through [step 29](#). This is the TOI test for narrow resolution bandwidths.

36. On the analyzer, press **System, Alignments, Auto Align, On**.

37. Part 1: Third Order Intermodulation Distortion is complete. Continue with Part

2: Second Harmonic Distortion.

## Part 2: Second Harmonic Distortion

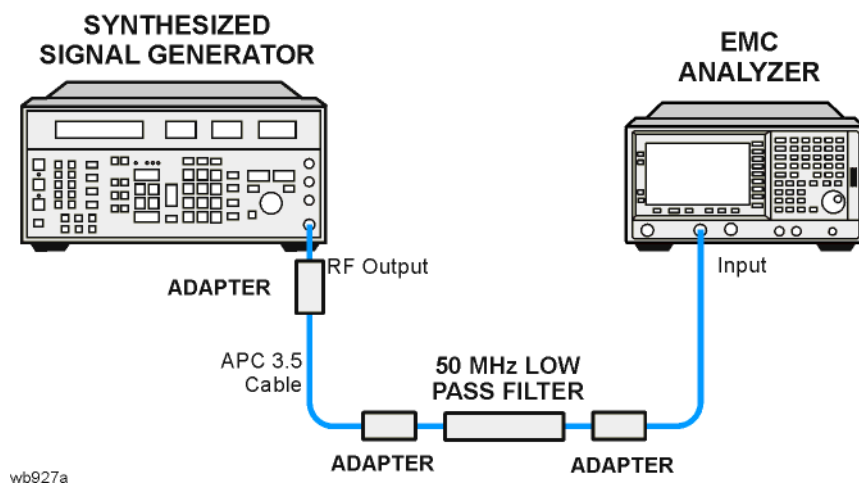
1. Set the synthesized signal generator controls as follows:

**FREQUENCY, 40 MHz**

**AMPLITUDE, -10 dBm**

2. Connect the equipment as shown in [Figure 2-46](#).

**Figure 2-46**      **Second Harmonic Distortion Test Setup**



3. Press **Preset** on the analyzer. Press the **Factory Preset** softkey, if it is displayed. Set the controls as follows:

**FREQUENCY, Center Freq, 40 MHz**

**SPAN, 1 MHz**

**AMPLITUDE, More, Y Axis Units (or Amptd Units), dBm**

**AMPLITUDE, -10 dBm**

**Attenuation Auto Man 10 dB**

**BW/Avg, 30 kHz**

4. Adjust the synthesized signal generator amplitude to place the peak of the signal at the reference level.
5. Set the analyzer control as follows:

**SPAN, 50 kHz**

**BW/Avg, 1 kHz**

**Video BW Auto Man, 100 Hz**

6. Wait for two sweeps to finish, then press the following analyzer keys:

**Peak Search (or Search)**

**Mkr →, Mkr → CF Step**

**Marker, Delta**

**FREQUENCY**, Center Freq, ↑

7. Press **Peak Search** (or **Search**). The marker delta ( $\Delta$  Mkr1) amplitude reading is the second harmonic suppression.
8. Calculate the second harmonic intercept (SHI) using the second harmonic suppression value read in [step 7](#) as follows:

$$\text{SHI} = -20 \text{ dBm} - \text{Second Harmonic Suppression}$$

For example, if the second harmonic suppression is  $-62 \text{ dB}$ , the SHI would be  $42 \text{ dBm}$ :

$$42 \text{ dBm} = -20 \text{ dBm} - (-62 \text{ dB})$$

9. Record the SHI result as Entry 3 in the performance verification test record.

## **31. Spurious Responses: Agilent E7402A**

This test is performed in two parts. Part 1 measures third order intermodulation distortion; Part 2 measures second harmonic distortion.

To test second harmonic distortion, a low pass filter is used to filter the source output, ensuring that harmonics read by the analyzer are internally generated and not coming from the source. To measure the distortion products, the power at the mixer is set 25 dB higher than specified.

For example, if the specification states that with  $-30$  dBm at the input mixer, the distortion products should be suppressed by  $>75$  dBc, the equivalent second harmonic intercept (SHI) is  $>45$  dBm ( $-30$  dBm +  $75$  dBc). Measuring with  $-15$  dBm at the mixer and verifying the distortion products suppressed by  $>60$  dBc also ensures the SHI is  $>45$  dBm ( $-15$  dBm +  $60$  dBc).

For third order intermodulation distortion, two signals are combined in a directional bridge to provide isolation. These two signals are applied to the analyzer input. The power level of the two signals is several dB higher than specified, so the distortion products should be suppressed by less than the amount specified. In this manner, the equivalent third order intercept (TOI) is measured.

For example, if the specification states that with two  $-30$  dBm signals at the input mixer, the distortion products should be suppressed by  $>82$  dBc, which yields a third order intercept of  $>11$  dBm ( $-30$  dBm +  $(82$  dBc/ $2$ )). Measuring with  $-20$  dBm at the mixer and verifying the distortion products are suppressed by  $>62$  dBc, the equivalent TOI is also  $>11$  dBm ( $-20$  dBm +  $(62$  dBc/ $2$ )).

There are no related adjustment procedures for this performance test.

### **Equipment Required**

- Synthesized signal generator
- Synthesized sweeper
- Power meter, dual channel
- RF power sensor
- Power splitter
- Directional bridge
- 300 MHz low pass filter
- Cable, APC 3.5, 91-cm (2 required)
- Cable, BNC, 120-cm
- Adapter, Type-N (m) to APC 3.5 (f) (*3 required*)
- Adapter, Type-N (m) to SMA (m)
- Adapter, Type-N (m) to BNC (f)
- Adapter, Type-N (m) to Type-N (m)
- Adapter, SMA (f) to BNC (m)
- Adapter, APC 3.5 (f) to APC 3.5 (f)

## Procedure

This performance test consists of two parts:

Part 1: Third Order Intermodulation Distortion

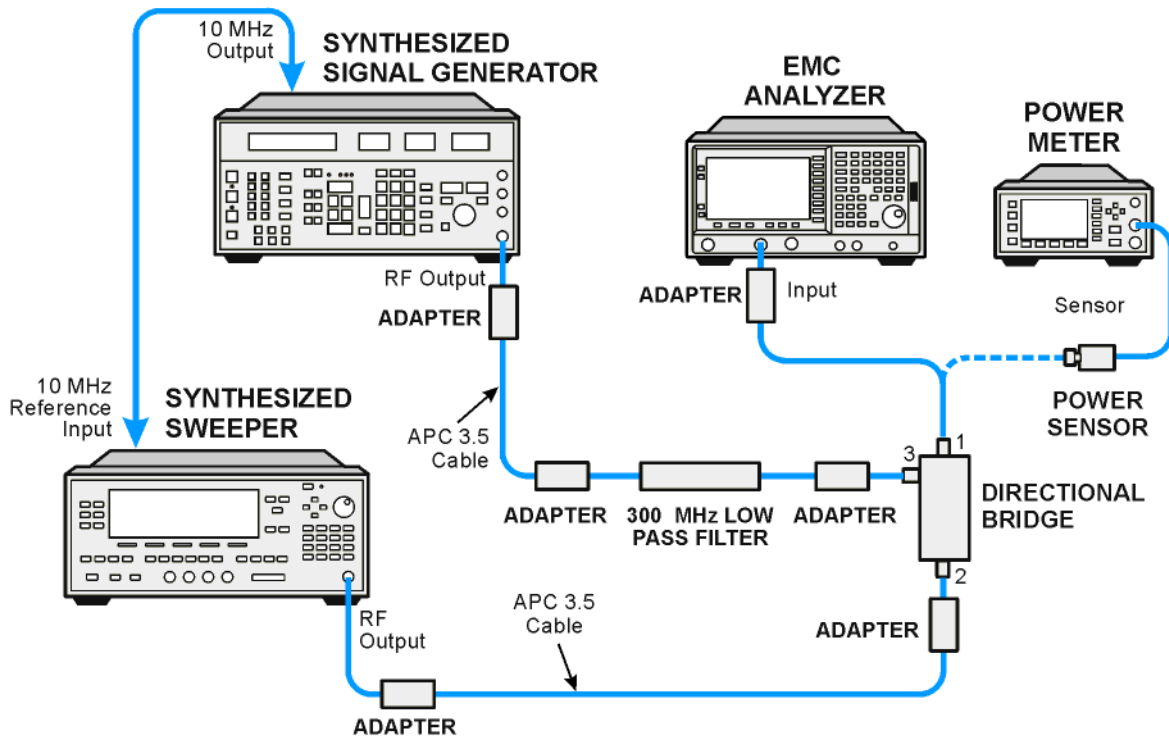
Part 2: Second Harmonic Distortion

Perform Part 1 before Part 2.

### Part 1: Third Order Intermodulation Distortion

1. Zero and calibrate the power meter and RF power sensor in log mode (power reads out in dBm), as described in the power meter operation manual.
2. Connect the equipment as shown in Figure 2-47 with the output of the directional bridge connected to the power sensor.

**Figure 2-47** Third Order Intermodulation Distortion Test Setup



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3. Perform step 4 through step 29 using the information and entries from Table

2-71. Then continue with [step 30](#) through [step 37](#).

**Table 2-71**

**Test Equipment Settings for TOI**

| TOI Test         | F1<br>(MHz) | F2<br>(MHz) | Low Pass<br>Filter<br>(MHz) |
|------------------|-------------|-------------|-----------------------------|
| 1                | 300.0       | 300.05      | 300                         |
| Narrow Res<br>BW | 300.0       | 300.05      | 300                         |

- Press **Blue Key, Special, 0, 0** on the signal generator. Set the frequency to F1 in [Table 2-71](#) for TOI Test 1. Set the amplitude to 4 dBm.
- Press **PRESET** on the synthesized sweeper, and set the frequency to F2 in [Table 2-71](#) for TOI Test 1. Set the synthesized sweeper controls as follows:

**POWER LEVEL, –10 dBm**  
**RF Off**

- Enter the power sensor calibration factor for the signal generator frequency into the power meter.
- Adjust the amplitude of the signal generator until the power meter reads –12 dBm  $\pm 0.1$  dB.
- Disconnect the power sensor from the directional bridge. Connect the directional bridge directly to the analyzer input using an adapter (do not use a cable).

---

**CAUTION**

Support the directional bridge and low pass filter to minimize stress on the analyzer input connector.

---

- Press **Preset** on the analyzer. Press the **Factory Preset** softkey, if it is displayed. Press **System, Alignments, Auto Align, Off**. Set the analyzer center frequency to the F1 value for TOI Test 1 in [Table 2-71](#). Then, set the analyzer by pressing the following keys:

**FREQUENCY, CF Step, 50 kHz (Man)**  
**SPAN, 20 kHz**  
**AMPLITUDE, More, Y Axis Units (or Amptd Units), dBm**  
**AMPLITUDE, Ref Level, –5 dBm**  
**AMPLITUDE, Attenuation, 5 dB (Man)**  
**BW/Avg, 1 kHz (Man)**  
**BW/Avg, Video BW, 300 Hz (Man)**  
**Peak Search (or Search), More**  
**Search Param (or Search Criteria), Peak Excursn, 3 dB**

- On the analyzer, press the following keys:

**Peak Search (or Search)**  
**Marker →**



**Mkr → CF**  
**Delta**

11. On the analyzer, press: **FREQUENCY**, Center Freq, ↑.
12. If the resolution bandwidth is  $\geq 1$  kHz, press: **SPAN, 4 kHz**.
13. On the synthesized sweeper, set the RF on.
14. On the analyzer, press **Peak Search** (or **Search**).
15. On the synthesized sweeper, adjust the power level until the marker delta ( $\Delta$  Mkr1) amplitude reads 0 dB  $\pm$  0.05 dB.
16. On the analyzer, press **FREQUENCY**, Center Freq, ↓, ↓. The center frequency should now be lower than the signal generator frequency by the CF Step value.
17. Set the analyzer reference level to –15 dBm.
18. On the analyzer, press: **BW/Avg, Average, 20**, and wait for “Vavg 20” to appear along the left side of the display.
19. On the analyzer, press **Peak Search** (or **Search**) and record the marker amplitude reading in Table 2-72 as the Lower Distortion Amplitude.
20. On the analyzer, press: **BW/Avg, Average Off**.
21. On the analyzer, press **FREQUENCY, Center Freq**, ↑, ↑, ↑. The center frequency should now be one CF Step value above the synthesized sweeper frequency.
22. Set the synthesized signal generator frequency to F2 as indicated in Table 2-71.
23. Set the synthesized sweep CW frequency to F1 as indicated in Table 2-71.
24. On the analyzer, press **BW/Avg, Average, 20**, and wait for “Vavg 20” to appear along the left side of the display.
25. On the analyzer, press **Peak Search** (or **Search**) and record the marker amplitude reading in Table 2-72 as the Upper Distortion Amplitude.
26. On the analyzer, press **BW/Avg, Average Off**.
27. Of the Lower Distortion Amplitude and Upper Distortion Amplitudes recorded in Table 2-72, enter the most positive value as the Worst Distortion Amplitude in Table 2-72. For example, if the Upper Distortion Amplitude is –62 dBc and the Lower Distortion Amplitude is –63 dBc, enter –62 dBc as the Worst Distortion Amplitude.
28. Enter –17 dBm as the Mixer Level in Table 2-72 (–12 dBm input power –5 dB input attenuation).
29. Calculate the equivalent TOI by subtracting one half of the Worst Distortion Amplitude (in dB) from the Mixer Level (in dBm). Enter the result in Table 2-72 as the Calculated TOI. For example, if the Worst Distortion Amplitude is –62 dBc and the Mixer Level is –17 dBm, the Calculated TOI would be:

## 31. Spurious Responses: Agilent E7402A

$$\text{TOI} = -17 \text{ dBm} - \left( -\frac{62 \text{ dB}}{2} \right) = -17 \text{ dBm} + 31 \text{ dB} = +14 \text{ dBm}$$

Table 2-72 Third Order Intermodulation Distortion Worksheet

| TOI Test      | Lower Distortion Amplitude | Upper Distortion Amplitude | Worst Distortion Amplitude | Mixer Level | Test Record Entry Calculated TOI |
|---------------|----------------------------|----------------------------|----------------------------|-------------|----------------------------------|
| 1             |                            |                            |                            |             | 1)                               |
| Narrow Res BW |                            |                            |                            |             | 2)                               |

30. Set synthesized signal generator frequency to F1 as indicated in [Table 2-71](#) for TOI Test 1.

31. Set synthesized sweeper CW frequency to F2 as indicated in [Table 2-71](#) for TOI Test 1.

32. Press **Preset** on the analyzer. Press the **Factory Preset** softkey, if it is displayed. Press **System, Alignments, Auto Align, Off**. Set the analyzer center frequency to the F1 value for TOI Test Narrow Res BW in [Table 2-71](#). Then, set the analyzer by pressing the following keys:

**FREQUENCY, CF Step, 50 kHz (Man)**  
**SPAN, 20 kHz**  
**AMPLITUDE, More, Y Axis Units (or Amptd Units), dBm**  
**AMPLITUDE, Ref Level, -5 dBm**  
**AMPLITUDE, Attenuation, 5 dB (Man)**  
**BW/Avg, 1 kHz (Man)**  
**BW/Avg, Video BW, 300 Hz (Man)**  
**Peak Search (or Search), More,**  
**Search Param (or Search Criteria), Peak Excursn, 3 dB**

33. On the analyzer, press the following keys:

**Peak Search (or Search)**  
**Marker →**  
**Mkr → CF**

34. Set the analyzer as follows:

**SPAN, 500 Hz**  
**BW/Avg, Res BW, 30 Hz**  
**Video BW, 10 Hz**

35. Repeat [step 10](#) through [step 29](#). This is the TOI test for narrow resolution bandwidths.

36. On the analyzer, press **System, Alignments, Auto Align, On**.

37. [Part 1: Third Order Intermodulation Distortion](#) is complete. Continue with [Part 2: Second Harmonic Distortion](#).

## Part 2: Second Harmonic Distortion

1. Zero and calibrate the power meter and RF power sensor. Enter the power sensor 300 MHz calibration factor into the power meter.

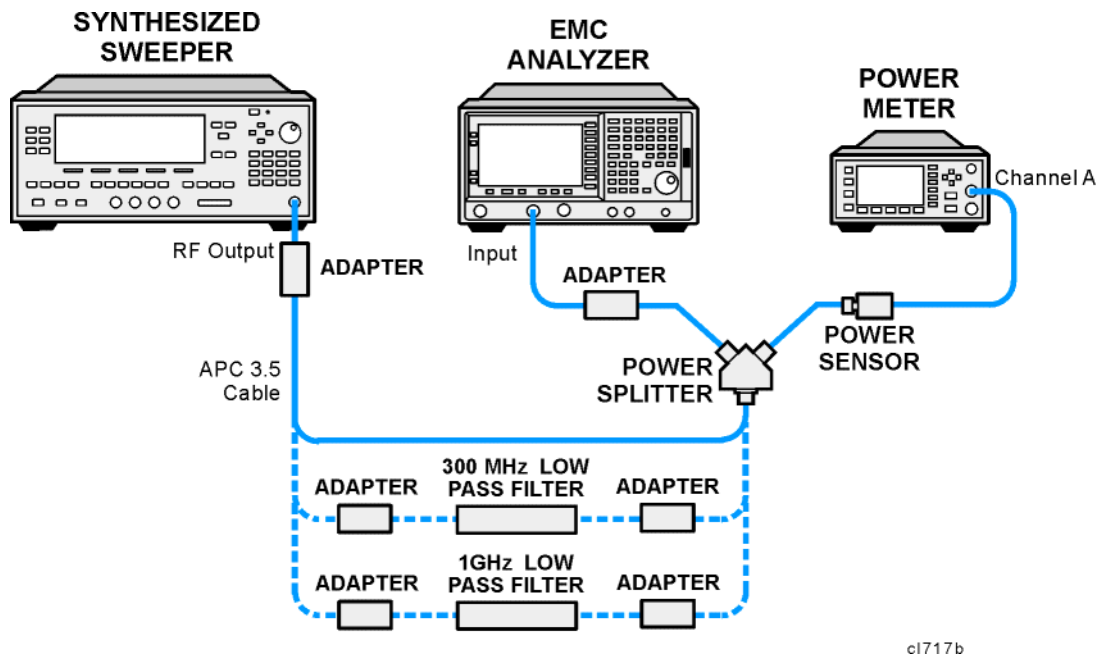
### Measuring the 300 MHz Frequency Response Error

2. Press **Preset** on the analyzer. Press the **Factory Preset** softkey, if it is displayed. Set the controls as follows:

**FREQUENCY, Center Freq, 300 MHz**  
**SPAN, 10 MHz**

3. Connect the equipment as shown in Figure 2-48, with the output of the synthesized sweeper connected to the power splitter input and the power splitter outputs connected to the analyzer and power sensor.

Figure 2-48 Second Harmonic Distortion Test Setup



cl717b

4. Preset the synthesized sweeper and set the controls as follows:

**CW, 300 MHz**  
**POWER LEVEL, 0 dBm**

5. On the analyzer, press **Peak Search** (or **Search**), **Marker, Delta**.
6. Record the power meter reading at 300 MHz in Table 2-73.
7. Set the synthesized sweeper CW to 600 MHz.
8. On the analyzer, press **FREQUENCY, Center Freq, 600 MHz**, then **Peak Search** (or **Search**).

**31. Spurious Responses: Agilent E7402A**

9. Adjust the synthesized sweeper power level until the marker delta ( $\Delta \text{Mkr1}$ ) amplitude reads  $0 \text{ dB} \pm 0.10 \text{ dB}$ .
10. Enter the power sensor 600 MHz calibration factor into the power meter.
11. Record the power meter reading at 600 MHz in [Table 2-73](#).
12. Subtract the power meter reading at 600 MHz from the power meter reading at 300 MHz. Record this difference as the 300 MHz Frequency Response Error in [Table 2-73](#). For example, if the power meter reading at 600 MHz is  $-6.45 \text{ dBm}$  and the power meter reading at 300 MHz is  $-7.05 \text{ dBm}$ , the 300 MHz Frequency Response Error would be  $-0.60 \text{ dB}$ :

$$-0.60 \text{ dB} = -7.05 \text{ dBm} - (-6.45 \text{ dBm})$$

**Table 2-73****Second Harmonic Distortion Worksheet**

| Description                            | Measurement |
|--|-------------|
| Power Meter Reading at 300 MHz         | _____ dBm   |
| Power Meter Reading at 600 MHz         | _____ dBm   |
| 300 MHz Frequency Response Error (FRE) | _____ dB    |
| Power Meter Reading at 900 MHz         | _____ dBm   |
| Power Meter Reading at 1800 MHz        | _____ dBm   |
| 900 MHz Frequency Response Error (FRE) | _____ dB    |

**Measuring 900 MHz Frequency Response Error**

13. On the synthesized sweeper, press the following:

**CW, 900 MHz**  
**POWER LEVEL, 0 dBm**

14. On the analyzer, press **FREQUENCY, Center Freq, 900 MHz**.
15. Enter the power sensor 1 GHz calibration factor into the power meter.
16. On the analyzer, press

**Marker, Off**  
**Peak Search** (or **Search**).  
**Marker, Delta**

17. Record the power meter reading in [Table 2-73](#) as the 900 MHz power meter reading.
18. On the synthesized sweeper, press **CW, 1.8 GHz**.
19. On the analyzer, press the following:

**FREQUENCY, Center Freq, 1.8 GHz**  
**Peak Search** (or **Search**)

## AMPLITUDE

20. On the analyzer, press **Peak Search** (or **Search**).
21. Adjust the synthesized sweeper power level until the marker delta ( $\Delta$  Mkr1) amplitude reads 0 dB  $\pm$ 0.1 dB.
22. Enter the power sensor 2 GHz calibration factor into the power meter.
23. Record the power meter reading in [Table 2-73](#) as the 1.8 GHz power meter reading.
24. On the analyzer, press **Marker, Off**.
25. Subtract the power meter reading at 1.8 GHz from the power meter reading at 900 MHz. Record this difference as the 900 MHz Frequency Response Error in [Table 2-73](#). For example, if the power meter reading at 1.8 GHz is  $-6.35$  dBm and the power meter reading at 900 MHz is  $-7.05$  dBm, the 900 MHz Frequency Response Error would be  $-0.7$  dB:

$$-0.70 \text{ dB} = -7.05 \text{ dBm} - (-6.35 \text{ dBm})$$

## Measuring the 300 MHz Second Harmonic Distortion

1. Connect the equipment as shown in [Figure 2-48](#) using the 300 MHz Low Pass Filter.
2. On the synthesized sweeper, press:

**CW, 300 MHz**  
**POWER LEVEL,  $-10$  dBm**

3. Enter the power sensor 300 MHz calibration factor into the power meter.
4. On the analyzer, press the following:

**FREQUENCY, Center Freq, 300 MHz**  
**SPAN, 100 kHz**  
**AMPLITUDE, More, Y Axis Units (or Amptd Units), dBm**  
**AMPLITUDE, Ref Level,  $-10$  dBm**  
**AMPLITUDE, Attenuation, 10 dB (Man)**  
**BW/Avg, Res BW 1 kHz (Man)**  
**Video BW, 1 kHz (Man)**  
**Markers, Off**

5. Adjust the synthesized sweeper power level until the power meter reading is  $-10$  dBm  $\pm$ 0.2 dB.
6. On the analyzer, press the following:

**Peak Search (or Search), Marker, Delta**  
**FREQUENCY, Center Freq, 600 MHz**  
**BW/Avg, 10**

Wait for the "Vavg 10" to appear along the left side of the display.

**31. Spurious Responses: Agilent E7402A**

7. On the analyzer, press **Peak Search** (or **Search**). The marker delta ( $\Delta$  Mkr1) amplitude is the second harmonic suppression.
8. On the synthesized sweeper, press **Marker, Off**.
9. Calculate the 300 MHz Second Harmonic Intercept (SHI) using the second harmonic suppression value read in [step 7](#) and the 300 MHz Frequency Response Error (FRE) from [Table 2-73](#) as follows:

$$300 \text{ MHz SHI} = -20 \text{ dBm} - \text{Second Harmonic Suppression} + 300 \text{ MHz FRE}$$

For example, if the second harmonic suppression is  $-59 \text{ dB}$ , and the 300 MHz FRE is  $-0.60 \text{ dB}$ , the SHI would be  $38.4 \text{ dBm}$ :

$$38.4 \text{ dBm} = -20 \text{ dBm} - (-59 \text{ dB}) + (-0.60 \text{ dB})$$

10. Record the 300 MHz SHI as Entry 3 in the performance verification test record.

**Measuring 900 MHz Second Harmonic Distortion**

1. Replace the 300 MHz low pass filter with the 1 GHz low pass filter as shown in [Figure 2-48](#).
2. On the synthesized sweeper, press the following:

**CW, 900 MHz**  
**POWER LEVEL,  $-10 \text{ dBm}$**

3. Enter the power sensor 1 GHz calibration factor into the power meter.
4. On the analyzer, press **FREQUENCY, Center Freq, 900 MHz**.
5. On the analyzer, press **Peak Search** (or **Search**).
6. Adjust the synthesized sweeper power level until the power meter reading is  $-10 \text{ dBm} \pm 0.1 \text{ dB}$ .
7. On the analyzer, press the following:

**Peak Search** (or **Search**)  
**Marker, Delta**  
**FREQUENCY, Center Freq, 1.8 GHz**

8. On the analyzer, press the following:  
**AMPLITUDE, Ref Level,  $-20 \text{ dBm}$**   
**BW/Avg, Video BW, 30 Hz (Man)**
9. On the analyzer, press **BW/Avg, Average, 10 Hz**. Wait until "VAvg 10" is displayed along the left side of the display.
10. On the analyzer, press **Peak Search** (or **Search**). The marker delta ( $\Delta$  Mkr1) amplitude reading is the second harmonic suppression.
11. Calculate the 900 MHz Second Harmonic Intercept (SHI) using the second harmonic suppression value read in [step 10](#) and the 300 MHz Frequency Response Error (FRE) from [Table 2-73](#) as follows:

**31. Spurious Responses: Agilent E7402A**

$$900 \text{ MHz SHI} = -20 \text{ dBm} - \text{Second Harmonic Suppression} + 900 \text{ GHz FRE}$$

For example, if the second harmonic suppression is  $-73 \text{ dB}$ , and the 900 MHz FRE is  $0.70 \text{ dB}$ , the SHI would be  $52.3 \text{ dBm}$ :

$$52.3 \text{ dBm} = -20 \text{ dBm} - (-73 \text{ dB}) + (-0.70 \text{ dB})$$

12. Record the 900 MHz SHI as Entry 4 in the performance verification test record.

---

## 32. Spurious Responses: Agilent E7403A, E7404A, and E7405A

This test is performed in two parts. Part 1 measures third order intermodulation distortion. Part 2 measures second harmonic distortion.

To test second harmonic distortion, a low pass filter is used to filter the source output, ensuring that harmonics read by the analyzer are internally generated and not coming from the source. To measure the distortion products, the power at the mixer is set 25 dB higher than specified.

A power meter, power sensor, and power splitter are used to characterize the frequency response of the analyzer so this uncertainty can be eliminated.

For example, if the specification states that with  $-30$  dBm at the input mixer, the distortion products should be suppressed by  $>75$  dBc, the equivalent second harmonic intercept (SHI) is  $>45$  dBm ( $-30$  dBm +  $75$  dBc). Measuring with  $-15$  dBm at the mixer and verifying the distortion products suppressed by  $>60$  dBc also ensures the SHI is  $>45$  dBm ( $-15$  dBm +  $60$  dBc).

For third order intermodulation distortion, two signals are combined in a directional bridge or directional coupler to provide isolation. These two signals are applied to the analyzer input. The power level of the two signals is several dB higher than specified, so the distortion products should be suppressed by less than the amount specified. In this manner, the equivalent third order intercept (TOI) is measured.

For example, if the specification states that with two  $-30$  dBm signals at the input mixer, the distortion products should be suppressed by  $>75$  dBc, which yields a third order intercept of  $>7.5$  dBm ( $-30$  dBm +  $(75$  dBc/ $2$ )). Measuring with  $-20$  dBm at the mixer and verifying the distortion products are suppressed by  $>55$  dBc, the equivalent TOI is also  $>7.5$  dBm ( $-20$  dBm +  $(55$  dBc/ $2$ )).

There are no related adjustment procedures for this performance test.

### Equipment Required

- Synthesized sweeper (2 required)
- Power meter, dual channel
- Microwave power sensor
- Microwave power splitter
- Directional bridge
- Directional coupler
- 300 MHz low pass filter
- 1 GHz low pass filter
- 1.8 GHz low pass filter (2 required)
- 4.4 GHz low pass filter (2 required)
- Cable, BNC, 120-cm (48-in)
- Cable, APC 3.5, 91-cm (48-in) (2 required)
- Adapter, Type-N (m) to APC 3.5 (f) (3 required)



**32. Spurious Responses: Agilent E7403A, E7404A, and E7405A**

Adapter, Type-N (m) to SMA (m)  
 Adapter, Type-N (m) to BNC (f)  
 Adapter, Type-N (m) to Type-N (m)  
 Adapter, SMA (f) to BNC (m)  
 Adapter, APC 3.5 (f) to APC 3.5 (f)

**Procedure**

This performance test consists of two parts:

[Part 1: Third Order Intermodulation Distortion](#)

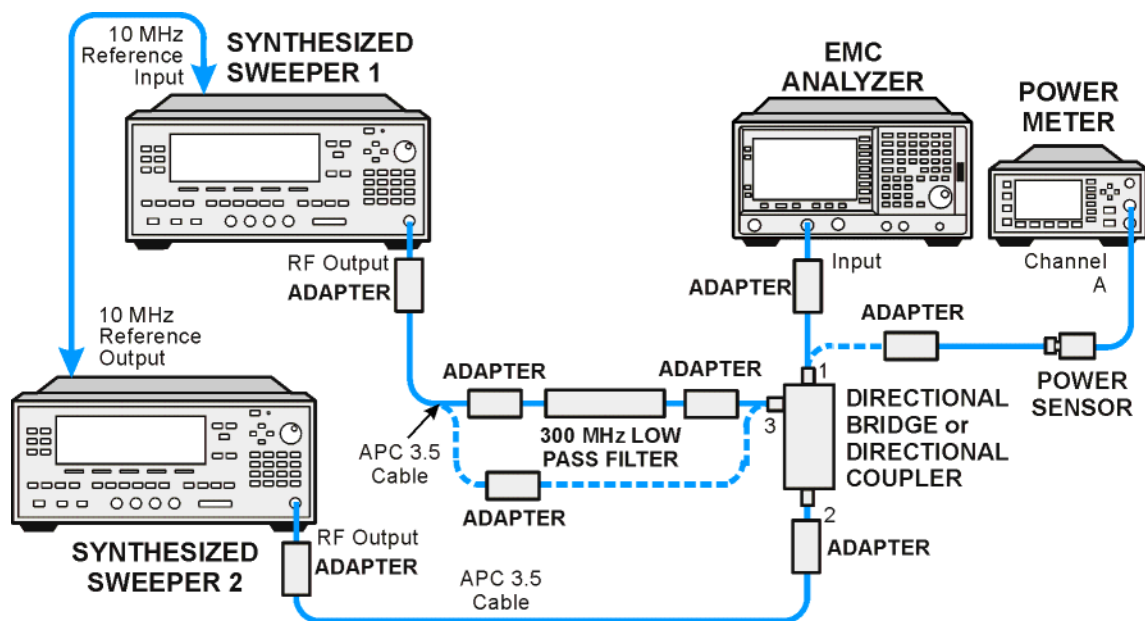
[Part 2: Second Harmonic Distortion](#)

Perform Part 1 before Part 2.

**Part 1: Third Order Intermodulation Distortion**

1. Zero and calibrate the power meter and microwave power sensor in log mode (power reads out in dBm), as described in the power meter operation manual.
2. Connect the equipment as shown in [Figure 2-49](#) using the 300 MHz low pass filter with the output of the directional bridge connected to the power sensor.

**Figure 2-49 Third Order Intermodulation Distortion Test Setup**



c1718b

3. Perform [step 4](#) through [step 29](#) using the information and entries from [Table](#)

2-74. Then continue with [step 31](#) through [step 42](#).

**Table 2-74** Test Equipment Settings for TOI

| TOI Test       | F1 (MHz) | F2 (MHz) | Low Pass Filter (MHz) | Bridge or Coupler | Presel Center |
|----------------|----------|----------|-----------------------|-------------------|---------------|
| 1              | 300.0    | 300.05   | 300                   | Bridge            | No            |
| Narrow Res BW  | 300.0    | 300.05   | 300                   | Bridge            | No            |
| 2              | 5000.0   | 5000.05  | None                  | Coupler           | Yes           |
| 3 <sup>a</sup> | 8000.0   | 8000.05  | None                  | Coupler           | Yes           |

a. This test does not apply to the Agilent E7403A.

4. Press **PRESET** on synthesized sweeper 1. Set the CW frequency to F1 as indicated in [Table 2-74](#), and set the power level to 4 dBm.
5. Press **PRESET** on synthesized sweeper 2. Set the CW frequency to F2 as indicated in [Table 2-74](#), and set the controls as follows:

**POWER LEVEL, –10 dBm**

**RF Off**

6. Enter the power sensor calibration factor for F1 into the power meter.
7. Adjust the power level of synthesized sweeper 1 until the power meter reads –12 dBm  $\pm$ 0.1 dB.
8. Disconnect the power sensor from the directional bridge (or directional coupler). Connect the directional bridge (or directional coupler) directly to the analyzer input using an adapter (do not use a cable).

#### CAUTION

Support the directional bridge (or directional coupler) and low pass filter to minimize stress on the analyzer input connector.

9. Press **Preset** on the analyzer. Press the **Factory Preset** softkey, if it is displayed. Press **System, Alignments, Auto Align, Off**. Set the analyzer center frequency to the F1 value for TOI Test 1 in [Table 2-74](#). Then set the analyzer by pressing the following keys:

**FREQUENCY, CF Step, 50 kHz (Man)**

**SPAN, 20 kHz**

**AMPLITUDE, More, Y Axis Units (or Amptd Units), dBm**

**AMPLITUDE, Ref Level, –5 dBm**

**AMPLITUDE, Attenuation, 5 dB (Man)**

**BW/Avg, 1 kHz (Man)**

**BW/Avg, Video BW, 300 Hz (Man)**

**Peak Search (or Search), More**

**Search Param, Peak Excursn, 3 dB**

**32. Spurious Responses: Agilent E7403A, E7404A, and E7405A**

10. On the analyzer, press the following keys:

**Peak Search** (or **Search**)

**Marker** →

**Mkr** → **CF**

**Delta**

11. On the analyzer, Press **FREQUENCY**, Center Freq, ↑. The center frequency should now be equal to synthesized sweeper 2 frequency.
12. If the resolution bandwidth is  $\geq 1$  kHz, press **SPAN**, **4 kHz**.
13. On the synthesized sweeper 2, set the RF On.
14. On the analyzer, press **Peak Search** (or **Search**).
15. Adjust the power level of synthesized sweeper 2 until the marker delta ( $\Delta$  Mkr1) amplitude reads 0 dB  $\pm$  0.05 dB.
16. On the analyzer, press **FREQUENCY**, Center Freq, ↓, ↓. The center frequency should now be lower than synthesized sweeper 1 by the CF Step value.
17. Set the analyzer reference level to -15 dBm.
18. On the analyzer, press **BW/Avg**, **Average**, **20**, and wait for "Vavg 20" to appear along the left side of the display.
19. On the analyzer, press **Peak Search** (or **Search**) and record the marker amplitude reading in [Table 2-75](#) as the Lower Distortion Amplitude.
20. On the analyzer, press **BW/Avg**, **Average Off**.
21. On the analyzer, press **FREQUENCY**, **Center Freq**, ↑, ↑, ↑. The center frequency should now be one CF Step value above synthesized sweeper 2 frequency.
22. Set synthesized sweeper 1 CW to F2 as indicated in [Table 2-74](#).
23. Set synthesized sweeper 2 CW to F1 as indicated in [Table 2-74](#).
24. On the analyzer, press **BW/Avg**, **Average**, **20**, and wait for "Vavg 20" to appear along the left side of the display.
25. On the analyzer, press **Peak Search** (or **Search**) and record the marker amplitude reading in [Table 2-75](#) as the Upper Distortion Amplitude.
26. On the analyzer, press **BW/Avg**, **Average Off**.
27. Of the Lower Distortion Amplitude and Upper Distortion Amplitudes recorded in [Table 2-75](#), enter the most positive value as the Worst Distortion Amplitude in [Table 2-75](#). For example, if the Upper Distortion Amplitude is -62 dBc and the Lower Distortion Amplitude is -63 dBc, enter -62 dBc as the Worst Distortion Amplitude.
28. Enter -17 dBm as the Mixer Level in [Table 2-75](#) (-12 dBm input power - 5 dB input attenuation).
29. Calculate the equivalent TOI by subtracting one half of the Worst Distortion

**32. Spurious Responses: Agilent E7403A, E7404A, and E7405A**

Amplitude (in dB) from the Mixer Level (in dBm). Enter the result in [Table 2-75](#) as the Calculated TOI. For example, if the Worst Distortion Amplitude is -62 dBc and the Mixer Level is -17 dBm, the Calculated TOI would be:

$$\text{TOI} = -17 \text{ dBm} - \left( -\frac{62 \text{ dB}}{2} \right) = -17 \text{ dBm} + 31 \text{ dB} = +14 \text{ dBm}$$

30. Record the Calculated TOI in the performance verification test record as specified in [Table 2-75](#).

**Table 2-75 Third Order Intermodulation Distortion Worksheet**

| TOI Test      | Lower Distortion Amplitude | Upper Distortion Amplitude | Worst Distortion Amplitude | Mixer Level | Calculated TOI Test Record Entry |
|---------------|----------------------------|----------------------------|----------------------------|-------------|----------------------------------|
| 1             |                            |                            |                            |             | 1)                               |
| Narrow Res BW |                            |                            |                            |             | 2)                               |
| 2             |                            |                            |                            |             | 3)                               |
| 3             |                            |                            |                            |             | 4)                               |

31. Set synthesized sweeper 1 CW frequency to F1 as indicated in TOI Test 1 of [Table 2-74](#).

32. Set synthesized sweeper 2 CW frequency to F2 as indicated in TOI Test 1 of [Table 2-74](#).

33. Press **Preset** on the analyzer. Press the **Factory Preset** softkey, if it is displayed. Press **System, Alignments, Auto Align, Off**. Set the analyzer center frequency to the F1 value for TOI Test Narrow Res BW in [Table 2-74](#). Then, set the analyzer by pressing the following keys:

**FREQUENCY, CF Step, 50 kHz (Man)**  
**SPAN, 20 kHz**  
**AMPLITUDE, More, Y Axis Units (or Amptd Units), dBm**  
**AMPLITUDE, Ref Level, -5 dBm**  
**AMPLITUDE, Attenuation, 5 dB (Man)**  
**BW/Avg, 1 kHz (Man)**  
**BW/Avg, Video BW, 300 Hz (Man)**  
**Peak Search (or Search), More**  
**Search Param (or Search Criteria), Peak Excursn, 3 dB**

34. On the analyzer, press the following keys:

**Peak Search (or Search)**  
**Meas Tools**  
**Mkr → CF**  
**SPAN, 500 Hz**  
**BW/Avg, Res BW, 30 Hz**

**32. Spurious Responses: Agilent E7403A, E7404A, and E7405A****BW/Avg, Video BW, 10 Hz**

35. Repeat [step 9](#) through [step 26](#). This is the TOI test for narrow resolution bandwidths.
36. See [Figure 2-49](#). Replace the directional bridge with the directional coupler. The cable from synthesized sweeper 1 should be connected directly to the input of the directional coupler; no low pass filter is required when testing frequencies >3 GHz.
37. Connect the output of the directional coupler to the power sensor.
38. Repeat [step 4](#) through [step 29](#) using information and entries for TOI Test 2 in [Table 2-74](#) and [Table 2-75](#).
39. Connect the output of the directional bridge to the power sensor.
40. Repeat [step 4](#) through [step 29](#) using information and entries for TOI Test 3 in [Table 2-74](#) and [Table 2-75](#).
41. On the analyzer, press **System, Alignments, Auto Align, All**.
42. [Part 1: Third Order Intermodulation Distortion](#) is complete. Continue with [Part 2: Second Harmonic Distortion](#).

**Part 2: Second Harmonic Distortion**

1. Zero and calibrate the power meter and microwave power sensor. Enter the power sensor 300 MHz calibration factor into the power meter.

**Measuring the Noise Level at 6.2 GHz**

2. Remove any cables or adapters from the analyzer Input.
3. Press **Preset** on the analyzer. Press the **Factory Preset** softkey, if it is displayed. Set the controls as follows:
  - FREQUENCY, Center Freq, 6.2 GHz**
  - SPAN, 0 Hz**
  - AMPLITUDE, More, Y Axis Units (or Amptd Units), dBm**
  - AMPLITUDE, Ref Level, -40 dBm**
  - AMPLITUDE, Attenuation, 10 dB**
  - BW/Avg, Res BW 1 kHz**
  - Video BW, 30 Hz**
  - Sweep, Sweep time, 5 s**
4. Wait until “V<sub>Avg</sub> 10” is displayed along the left side of the display.
5. Press **Peak Search** (or **Search**) and record the marker amplitude reading as the 6.2 GHz Noise Level in [Table 2-76](#).

**Measuring 300 MHz Frequency Response Error**

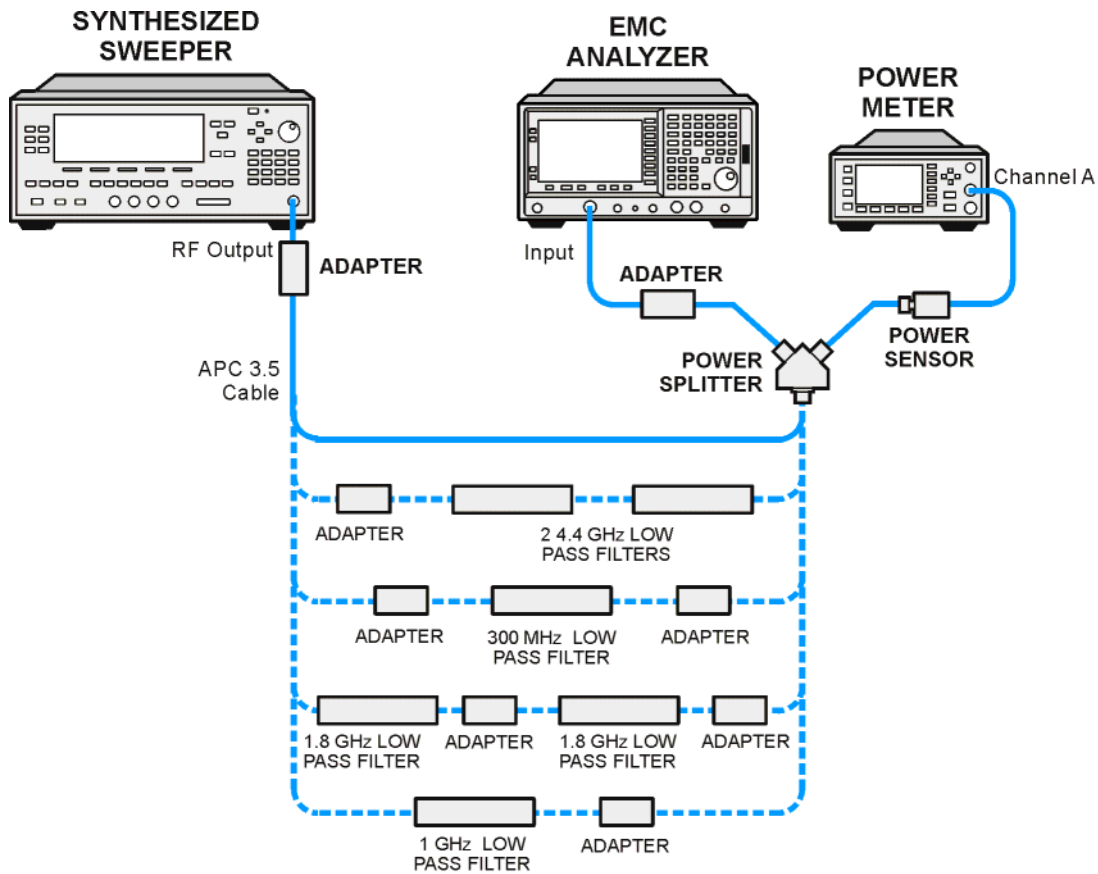
1. Press **Preset** on the analyzer. Press the **Factory Preset** softkey, if it is displayed. Set the controls as follows:

**32. Spurious Responses: Agilent E7403A, E7404A, and E7405A**

**FREQUENCY, Center Freq, 300 MHz**  
**SPAN, 10 MHz**

2. Connect the equipment as shown in Figure 2-50, with the output of the synthesized sweeper connected to the power splitter input and the power splitter outputs connected to the analyzer and power sensor.

**Figure 2-50 Second Harmonic Distortion Test Setup**



wb931a

3. Preset the synthesized sweeper and set the controls as follows:

**CW, 300 MHz**  
**POWER LEVEL, 0 dBm**

4. On the analyzer, press **Peak Search** (or **Search**), **Marker, Delta**.
5. Record the power meter reading at 300 MHz in Table 2-76.
6. Set the synthesized sweeper CW to 600 MHz.
7. On the analyzer, press **FREQUENCY, Center Freq, 600 MHz**, then **Peak Search** (or **Search**).

**32. Spurious Responses: Agilent E7403A, E7404A, and E7405A**

8. Adjust the synthesized sweeper power level until the marker delta ( $\Delta \text{Mkr1}$ ) amplitude reads  $0 \text{ dB} \pm 0.10 \text{ dB}$ .
9. Enter the power sensor 600 MHz calibration factor into the power meter.
10. Record the power meter reading at 600 MHz in [Table 2-76](#).
11. Subtract the power meter reading at 600 MHz from the power meter reading at 300 MHz. Record this difference as the 300 MHz Frequency Response Error in [Table 2-76](#). For example, if the power meter reading at 600 MHz is  $-6.45 \text{ dBm}$  and the power meter reading at 300 MHz is  $-7.05 \text{ dBm}$ , the 300 MHz Frequency Response Error would be  $-0.60 \text{ dB}$ :

$$-0.60 \text{ dB} = -7.05 \text{ dBm} - (-6.45 \text{ dBm})$$

**Measuring 900 MHz Frequency Response Error**

12. On the synthesized sweeper, press the following:

**CW, 900 MHz**  
**POWER LEVEL, 0 dBm**

13. On the analyzer, press **FREQUENCY, Center Freq, 900 MHz**.
14. Enter the power sensor 1 GHz calibration factor into the power meter.
15. On the analyzer, press
 

**Marker, Off**  
**Peak Search (or Search).**  
**Marker, Delta**
16. Record the power meter reading in [Table 2-76](#) as the 900 MHz power meter reading.
17. On the synthesized sweeper, press **CW, 1.8 GHz**.
18. On the analyzer, press the following:

**FREQUENCY, Center Freq, 1.8 GHz**  
**Peak Search (or Search)**  
**AMPLITUDE**

19. On the analyzer, press **Peak Search (or Search)**.
20. Adjust the synthesized sweeper power level until the marker delta ( $\Delta \text{Mkr1}$ ) amplitude reads  $0 \text{ dB} \pm 0.1 \text{ dB}$ .
21. Enter the power sensor 2 GHz calibration factor into the power meter.
22. Record the power meter reading in [Table 2-76](#) as the 1.8 GHz power meter reading.
23. On the analyzer, press **Marker, Off**.
24. Subtract the power meter reading at 1.8 GHz from the power meter reading at 900 MHz. Record this difference as the 900 MHz Frequency Response Error in

**32. Spurious Responses: Agilent E7403A, E7404A, and E7405A**

[Table 2-76](#). For example, if the power meter reading at 1.8 GHz is  $-6.35$  dBm and the power meter reading at 900 MHz is  $-7.05$  dBm, the 900 MHz Frequency Response Error would be  $-0.7$  dB:

$$-0.70 \text{ dB} = -7.05 \text{ dBm} - (-6.35 \text{ dBm})$$

**Measuring 1.55 GHz Frequency Response Error**

1. On the synthesized sweeper, press the following:

**CW, 1.55 GHz**  
**POWER LEVEL, 0 dBm**

2. On the analyzer, press **FREQUENCY, Center Freq, 1.55 GHz**.
3. Enter the power sensor 2 GHz calibration factor into the power meter.
4. On the analyzer, press the following:

**Marker, Off**  
**Peak Search (or Search)**

5. On the analyzer, press **Peak Search (or Search), Marker, Delta**.
6. Record the power meter reading in [Table 2-76](#) as the 1.55 GHz power meter reading.
7. On the synthesized sweeper, press **CW, 3.1 GHz**.
8. On the analyzer, press **FREQUENCY, Center Freq, 3.1 GHz**.
9. On the analyzer, press the following:

**Peak Search (or Search)**  
**AMPLITUDE**  
**Presel Center**

10. On the analyzer, press **Peak Search (or Search)**.
11. Adjust the synthesized sweeper power level until the marker delta ( $\Delta \text{Mkr1}$ ) amplitude reads  $0 \text{ dB} \pm 0.1 \text{ dB}$ .
12. Enter the power sensor 3 GHz calibration factor into the power meter.
13. Record the power meter reading in [Table 2-76](#) as the 3.1 GHz power meter reading.
14. On the analyzer, press **Marker, Off**.
15. Subtract the power meter reading at 3.1 GHz from the power meter reading at 1.55 GHz. Record this difference as the 1.55 GHz Frequency Response Error in [Table 2-76](#). For example, if the power meter reading at 3.1 GHz is  $-6.05$  dBm and the power meter reading at 1.55 GHz is  $-7.35$  dBm, the 3.1 GHz Frequency Response Error would be  $-1.2$  dB:

$$-1.2 \text{ dB} = -7.35 \text{ dBm} - (-6.15 \text{ dBm})$$



**32. Spurious Responses: Agilent E7403A, E7404A, and E7405A****Measuring 3.1 GHz Frequency Response Error**

1. On the synthesized sweeper, press the following:

**CW, 3.1 GHz**  
**POWER LEVEL, 0 dBm**

2. On the analyzer, press **FREQUENCY, Center Freq, 3.1 GHz**.
3. Enter the power sensor 3 GHz calibration factor into the power meter.
4. On the analyzer, press the following:

**Marker, Off**  
**Peak Search (or Search)**  
**AMPLITUDE**  
**Presel Center**

5. On the analyzer, press **Peak Search (or Search), Marker, Delta**.
6. Record the power meter reading in [Table 2-76](#) as the 3.1 GHz power meter reading.
7. On the synthesized sweeper, press **CW, 6.2 GHz**.
8. On the analyzer, press the following:

**FREQUENCY, Center Freq, 6.2 GHz**  
**Peak Search (or Search)**  
**AMPLITUDE**  
**Presel Center**

9. On the analyzer, press **Peak Search (or Search)**.
10. Adjust the synthesized sweeper power level until the marker delta ( $\Delta$  Mkr1) amplitude reads 0 dB  $\pm$ 0.1 dB.
11. Enter the power sensor 6 GHz calibration factor into the power meter.
12. Record the power meter reading in [Table 2-76](#) as the 6.2 GHz power meter reading.
13. On the analyzer, press **Marker, Off**.
14. Subtract the power meter reading at 6.2 GHz from the power meter reading at 3.1 GHz. Record this difference as the 3.1 GHz Frequency Response Error in [Table 2-76](#). For example, if the power meter reading at 6.2 GHz is –6.05 dBm and the power meter reading at 3.1 GHz is –7.25 dBm, the 3.1 GHz Frequency Response Error would be –1.2 dB:

$$-1.2 \text{ dB} = -7.25 \text{ dBm} - (-6.05 \text{ dBm})$$

**Table 2-76****Second Harmonic Distortion Worksheet**

| Description         | Measurement |
|---------------------|-------------|
| 6.2 GHz Noise Level | _____ dBm   |

Table 2-76 Second Harmonic Distortion Worksheet

| Description                             | Measurement |
|---|-------------|
| Power Meter Reading at 300 MHz          | _____ dBm   |
| Power Meter Reading at 600 MHz          | _____ dBm   |
| 300 MHz Frequency Response Error (FRE)  | _____ dB    |
| Power Meter Reading at 900 MHz          | _____ dBm   |
| Power Meter Reading at 1.8 GHz          | _____ dBm   |
| 900 MHz Frequency Response Error (FRE)  | _____ dB    |
| Power Meter Reading at 1.55 GHz         | _____ dBm   |
| Power Meter Reading at 3.1 GHz          | _____ dBm   |
| 1.55 GHz Frequency Response Error (FRE) | _____ dB    |
| Power Meter Reading at 3.1 GHz          | _____ dBm   |
| Power Meter Reading at 6.2 GHz          | _____ dBm   |
| 3.1 GHz Frequency Response Error (FRE)  | _____ dB    |

**Measuring 300 MHz Second Harmonic Distortion**

1. Connect the equipment as shown in [Figure 2-50](#) using the 300 MHz Low Pass Filter.
2. On the synthesized sweeper, press the following:

**CW, 300 MHz**  
**POWER LEVEL, -10 dBm**

3. Enter the power sensor 300 MHz calibration factor into the power meter.
4. On the analyzer, press the following:

**FREQUENCY, Center Freq, 300 MHz**  
**SPAN, 100 kHz**  
**AMPLITUDE, More, Y Axis Units (or Amptd Units), dBm**  
**AMPLITUDE, Ref Level, -10 dBm**  
**AMPLITUDE, Attenuation, 10 dB (Man)**  
**BW/Avg, Res BW 1 kHz (Man)**  
**Video BW, 1 kHz (Man)**  
**Markers, Off**

5. Adjust the synthesized sweeper power level until the power meter reading is  $-10 \text{ dBm} \pm 0.2 \text{ dB}$ .
6. On the analyzer, press the following:

**Peak Search (or Search), Marker, Delta**  
**FREQUENCY, Center Freq, 600 MHz**

**32. Spurious Responses: Agilent E7403A, E7404A, and E7405A****BW/Avg, 10**

Wait for the "VAvg 10" to appear along the left side of the display.

7. On the analyzer, press **Peak Search** (or **Search**). The marker delta ( $\Delta$  Mkr1) amplitude is the second harmonic suppression.
8. Calculate the 300 MHz Second Harmonic Intercept (SHI) using the second harmonic suppression value read in [step 7](#) and the 300 MHz Frequency Response Error (FRE) from [Table 2-76](#) as follows:

$$300 \text{ MHz SHI} = -20 \text{ dBm} - \text{Second Harmonic Suppression} + 300 \text{ MHz FRE}$$

For example, if the second harmonic suppression is  $-59 \text{ dB}$ , and the 300 MHz FRE is  $-0.60 \text{ dB}$ , the SHI would be  $38.4 \text{ dBm}$ :

$$+38.4 \text{ dBm} = -20 \text{ dBm} - (-59 \text{ dB}) + (-0.60 \text{ dB})$$

9. Record the 300 MHz SHI as Entry 5 in the performance verification test record.

**Measuring 900 MHz Second Harmonic Distortion**

1. Replace the 300 MHz low pass filter with the 1 GHz low pass filter as shown in [Figure 2-50](#).
2. On the synthesized sweeper, press the following:

**CW, 900 MHz**  
**POWER LEVEL,  $-10 \text{ dBm}$**

3. Enter the power sensor 1 GHz calibration factor into the power meter.
4. On the analyzer, press **FREQUENCY, Center Freq, 900 MHz**.
5. On the analyzer, press **Peak Search** (or **Search**).
6. Adjust the synthesized sweeper power level until the power meter reading is  $-10 \text{ dBm} \pm 0.1 \text{ dB}$ .
7. On the analyzer, press the following:

**Peak Search** (or **Search**)  
**Marker, Delta**  
**FREQUENCY, Center Freq, 1.8 GHz**

8. On the analyzer, press the following:

**AMPLITUDE, Ref Level,  $-20 \text{ dBm}$**   
**BW/Avg, Video BW, 30 Hz (Man)**

9. On the analyzer, press **BW/Avg, Average, 10 Hz**. Wait until "VAvg 10" is displayed along the left side of the display.
10. On the analyzer, press **Peak Search** (or **Search**). The marker delta ( $\Delta$  Mkr1) amplitude reading is the second harmonic suppression.

**32. Spurious Responses: Agilent E7403A, E7404A, and E7405A**

11. Calculate the 900 MHz Second Harmonic Intercept (SHI) using the second harmonic suppression value read in [step 10](#) and the 300 MHz Frequency Response Error (FRE) from [Table 2-76](#) as follows:

$$900 \text{ MHz SHI} = -20 \text{ dBm} - \text{Second Harmonic Suppression} + 900 \text{ MHz FRE}$$

For example, if the second harmonic suppression is  $-73 \text{ dB}$ , and the 900 MHz FRE is  $0.70 \text{ dB}$ , the SHI would be  $52.3 \text{ dBm}$ :

$$52.3 \text{ dBm} = -20 \text{ dBm} - (-73 \text{ dB}) + (-0.70 \text{ dB})$$

12. Record the 900 MHz SHI as Entry 6 in the performance verification test record.

**32. Spurious Responses: Agilent E7403A, E7404A, and E7405A****Measuring 1.55 GHz Second Harmonic Distortion**

1. Replace the 1. GHz low pass filter with the two 1.8 GHz low pass filters as shown in [Figure 2-50](#). Two filters are necessary to reduce the second harmonics from the source to less than  $-100$  dBc.

2. On the synthesized sweeper, press the following:

**CW, 1.55 GHz**  
**POWER LEVEL, 6 dBm**

3. Enter the power sensor 2 GHz calibration factor into the power meter.

4. On the analyzer, press the following:

**FREQUENCY, Center Freq, 1.55 GHz**  
**AMPLITUDE, Ref Level, 0 dBm**  
**AMPLITUDE, Attenuation, 10 dB (Man)**  
**Peak Search (or Search).**

5. Adjust the synthesized sweeper power level until the power meter reading is  $0$  dBm  $\pm 0.1$  dB.

6. On the analyzer, press the following:

**Peak Search (or Search)**  
**Marker, Delta**  
**FREQUENCY, Center Freq, 3.1 GHz**

7. See [Figure 2-50](#). Remove the 1.8 GHz low pass filters and connect the synthesized sweeper output directly to the power splitter input.

8. On the analyzer, press the following:

**Peak Search (or Search)**  
**AMPLITUDE**  
**Presel Center**

9. Reinstall the filters between the synthesized sweeper and the power splitter.

10. On the analyzer, press the following:

**AMPLITUDE, Ref Level,  $-40$  dBm**  
**BW/Avg, Video BW, 30 Hz (Man)**

11. On the analyzer, press **BW/Avg, Average, 10 Hz**. Wait until "VAvg 10" is displayed along the left side of the display.

12. On the analyzer, press **Peak Search (or Search)**. The marker delta ( $\Delta$  Mkr1) amplitude reading is the second harmonic suppression.

**32. Spurious Responses: Agilent E7403A, E7404A, and E7405A**

13. Calculate the 1.55 GHz Second Harmonic Intercept (SHI) using the second harmonic suppression value read in [step 12](#) and the 300 MHz Frequency Response Error (FRE) from [Table 2-76](#) as follows:

$$1.55\text{ GHz SHI} = -20\text{ dBm} - \text{Second Harmonic Suppression} + 1.55\text{ GHz FRE}$$

For example, if the second harmonic suppression is -93 dB, and the 1.55 GHz FRE is -1.05 dB, the SHI would be 81.95 dBm:

$$81.95\text{ dBm} = -10\text{ dBm} - (-93\text{ dB}) + (-1.05\text{ dB})$$

14. Record the 1.55 GHz SHI as Entry 7 in the performance verification test record.

**Measuring 3.1 GHz Second Harmonic Distortion**

1. Replace the 1.8 GHz low pass filters with the two 4.4 GHz low pass filters as shown in [Figure 2-50](#). Two filters are necessary to reduce the second harmonics from the source to less than -110 dBc.
2. On the synthesized sweeper, press the following:

**CW, 3.1 GHz**  
**POWER LEVEL, 6 dBm**

3. Enter the power sensor 3 GHz calibration factor into the power meter.
4. On the analyzer, press the following:

**FREQUENCY, Center Freq, 3.1 GHz**  
**AMPLITUDE, Ref Level, 0 dBm**  
**AMPLITUDE, Attenuation, 10 dB (Man)**

5. On the analyzer, press the following:

**Peak Search (or Search)**  
**AMPLITUDE**  
**Presel Center**

6. Adjust the synthesized sweeper power level until the power meter reading is 0 dBm  $\pm$ 0.1 dB.
7. On the analyzer, press the following:

**Peak Search (or Search)**  
**Marker**  
**Delta**

8. On the analyzer, press the following:

**FREQUENCY, Center Freq, 6.2 GHz**

9. See [Figure 2-50](#). Remove the 4.4 GHz low pass filters and connect the synthesized sweeper output directly to the power splitter input.

**32. Spurious Responses: Agilent E7403A, E7404A, and E7405A**

10. On the analyzer, press the following:

**Peak Search** (or **Search**)  
**AMPLITUDE**  
**Presel Center**

11. Reinstall the filters between the synthesized sweeper and the power splitter.

12. On the analyzer, press the following:

**AMPLITUDE, Ref Level, -40 dBm**  
**BW/Avg, Video BW, 30 Hz (Man)**

13. On the analyzer, press **BW/Avg, Average, 10 Hz**. Wait until “VAvg 10” is displayed along the left side of the display.

14. On the analyzer, press **Peak Search** (or **Search**). The marker delta ( $\Delta$  Mkr1) amplitude reading is the second harmonic suppression.

15. If the marker does not appear to be on a signal, do the following:

- a. Press **Marker, Select Marker** (2)
- b. Compare the marker 2 (Mkr2) and the 6.2 GHz Noise Level recorded in [Table 2-76](#).
- c. If the difference between marker 2 (Mkr2) and the 6.2 GHz Noise Level recorded in [Table 2-76](#) is less than 2 dB, check the box on the performance verification test record that the 3.1 GHz SHI test was noise limited.

16. If the measurement is not noise limited, calculate the 3.1 GHz Second Harmonic Intercept (SHI) using the second harmonic suppression value read in [step 14](#) and the 3.1 GHz Frequency Response Error (FRE) from [Table 2-76](#) as follows:

$$3.1 \text{ GHz SHI} = -10 \text{ dBm} - \text{Second Harmonic Suppression} + 3.1 \text{ GHz FRE}$$

For example, if the second harmonic suppression is -103 dB, and the 3.1 GHz FRE is -1.20 dB, the SHI would be 91.8 dBm:

$$91.8 \text{ dBm} = -10 \text{ dBm} - (-103 \text{ dB}) + (-1.20 \text{ dB})$$

17. Record the 3.1 GHz SHI as Entry 8 in the performance verification test record.

---

### 33. Gain Compression: Agilent E7401A and E7402A

This test verifies the ability of the analyzer to measure relatively low-amplitude signals in the presence of higher-amplitude signals. Gain compression is measured by applying two signals, separated by a defined amount in frequency. The higher-amplitude signal is set to yield the specified total power at the input mixer (the power at the input mixer is defined as the input power level minus the input attenuation). The lower-amplitude signal is set at least 35 dB below the higher-amplitude signal, such that its power does not significantly add to the total power. The higher-amplitude signal is turned off and the lower-amplitude signal level is measured. This is the uncompressed amplitude.

The higher-amplitude signal is turned on and the amplitude of the lower-amplitude signal is again measured. This is the compressed amplitude. The difference between the uncompressed and compressed amplitude is the measured gain compression.

There are no related adjustment procedures for this performance test.

#### Equipment Required

- Synthesized sweeper
- Synthesized signal generator
- Power meter, dual channel
- RF power sensor
- Directional bridge
- Cable, BNC, 120-cm (48-in)
- Cable, APC 3.5 (m) (2 *required*)
- Adapter, Type-N (m) to Type-N (m)
- Adapter, Type-N (m) to APC 3.5 (f) (3 *required*)
- Adapter, Type-N (m) to SMA (m)

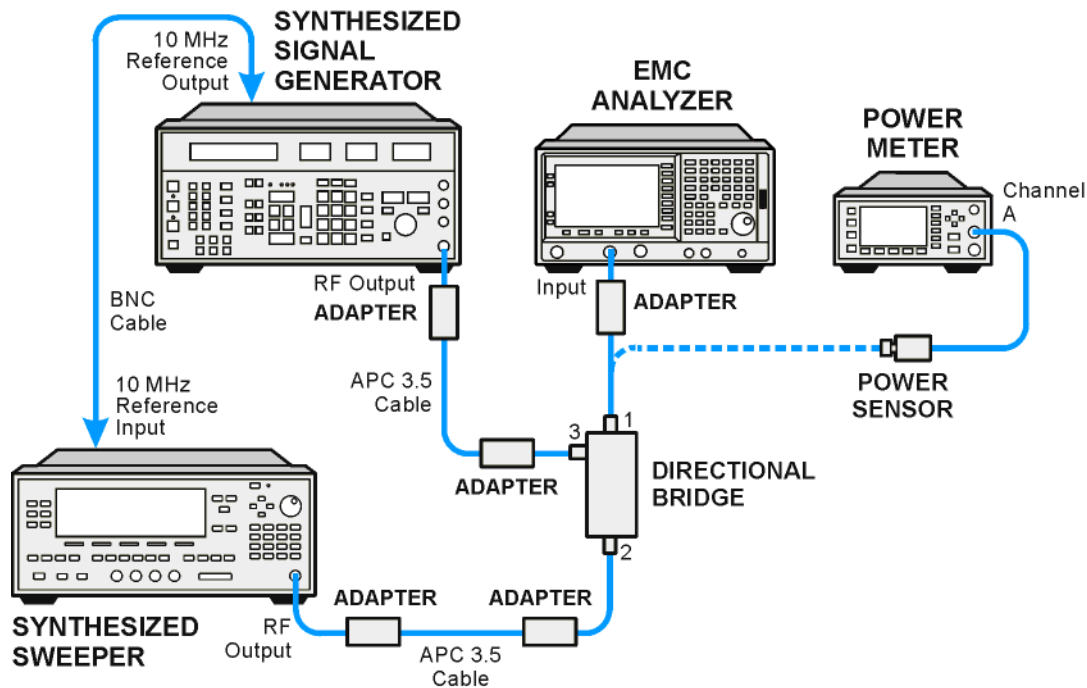
#### Procedure

1. Zero and calibrate the power meter and power sensor combination in log mode (power reads out in dBm) as described in the power meter operation manual.
2. Connect the equipment as shown in [Figure 2-51](#), with port 1 of the directional bridge connected to the power sensor.



33. Gain Compression: Agilent E7401A and E7402A

Figure 2-51 Gain Compression Test Setup



3. Set the synthesized signal generator controls as follows:

**FREQUENCY, 50 MHz**  
**AMPLITUDE, -100 dBm**

4. On the synthesized sweeper press **INSTRUMENT PRESET**, then set the controls as follows:

**CW, 53 MHz**  
**POWER LEVEL, -3 dBm**

5. Enter the power sensor calibration factor for the synthesizer frequency into the power meter.
6. Adjust the synthesized sweeper power level setting until the power meter reading is the same as indicated in [Table 2-77](#).
7. Record the actual synthesized sweeper power level setting in [Table 2-77](#) for each frequency indicated.

Table 2-77

Source Frequency and Amplitude Settings

| Synthesized Signal Generator |                    | Synthesized Sweeper   |                                 |                                |
|------------------------------|--------------------|-----------------------|---------------------------------|--------------------------------|
| Frequency<br>(GHz)           | Amplitude<br>(dBm) | CW Frequency<br>(MHz) | Desired<br>Power Level<br>(dBm) | Actual<br>Power Level<br>(dBm) |

## 33. Gain Compression: Agilent E7401A and E7402A

Table 2-77

Source Frequency and Amplitude Settings

| Synthesized Signal Generator |                  | Synthesized Sweeper |                  |  |
|------------------------------|------------------|---------------------|------------------|--|
| 0.05                         | −40              | 53                  | 0.0              |  |
| 0.05                         | −40              | 50.004              | 0.0              |  |
| 1.40                         | −40              | 1403                | 0.0              |  |
| 2.50 <sup>a</sup>            | −40 <sup>a</sup> | 2503 <sup>a</sup>   | 0.0 <sup>a</sup> |  |

a. Agilent E7402A only.

Table 2-78

Analyzer Settings

| Test Frequency      | Analyzer          |                  |                    |                    |                    |                 |                  | Test Record Entry |
|---------------------|-------------------|------------------|--------------------|--------------------|--------------------|-----------------|------------------|-------------------|
| (MHz)               | Center Freq (GHz) | Span (kHz)       | RBW (kHz)          | VBW (kHz)          | Ref Lvl (dBm)      | Scale (dB)      | Atten (dB)       |                   |
| 53                  | 0.05              | 150              | 30                 | 0.300              | −10.0              | 10              | 0.0              | 1)                |
| 50.004 <sup>a</sup> | 0.05 <sup>a</sup> | 1.0 <sup>a</sup> | 0.030 <sup>a</sup> | 0.030 <sup>a</sup> | −10.0 <sup>a</sup> | 10 <sup>a</sup> | 0.0 <sup>a</sup> | 2)                |
| 1403                | 1.40              | 150              | 30                 | 0.300              | −10.0              | 10              | 0.0              | 3)                |
| 2503 <sup>b</sup>   | 2.50 <sup>b</sup> | 150 <sup>b</sup> | 30 <sup>b</sup>    | 0.300 <sup>b</sup> | −10.0 <sup>b</sup> | 10 <sup>b</sup> | 0.0 <sup>b</sup> | 4)                |

a. Narrow resolution bandwidths only.

b. Agilent E7402A only.

8. Repeat [step 3](#) through [step 7](#) for each of the settings listed in [Table 2-77](#). The test at 50 MHz with a span of 1 kHz, is only for the E4401B and E4402B with Option 1DR.
9. Disconnect the power sensor from the directional bridge and connect the directional bridge to the input of the analyzer using an adapter. Do not use a cable.
10. Set the synthesized sweeper amplitude Off.
11. Set the synthesized signal generator amplitude to −24 dBm.
12. Press **Preset** on the analyzer. Press the **Factory Preset** softkey, if it is displayed. Press **System, Alignments, Auto Align, Off**. Set the analyzer by pressing the following keys:

**FREQUENCY, Center Freq, 50 MHz** (or as indicated in [Table 2-78](#))

**SPAN, 150 kHz** (or as indicated in [Table 2-78](#))

**AMPLITUDE, More, Y Axis Units** (or **Amptd Units**), **dBm**

**AMPLITUDE, Ref Level, −10 dBm, Attenuation 0 dB**

**AMPLITUDE, Scale/Div, 10 dB**

**33. Gain Compression: Agilent E7401A and E7402A**

**BW/Avg, Res BW, 30 kHz** (or as indicated in [Table 2-78](#))

**BW/Avg, Video BW, 300 Hz** (or as indicated in [Table 2-78](#))

13. On the synthesized sweeper, set the appropriate power level to the setting recorded in [Table 2-77](#). Then set RF to Off.
14. On the analyzer, press **Peak Search** (or **Search**).
15. Adjust the amplitude of the synthesized signal generator to achieve a marker amplitude reading within 0.5 dB of the value indicated in [Table 2-77](#). The marker amplitude is the uncompressed amplitude.
16. On the analyzer, press the following keys:  
**Peak Search** (or **Search**)  
**Marker**  
**Delta**
17. On the synthesized sweeper, set RF to On. The amplitude should be the same as recorded in [Table 2-77](#).
18. On the analyzer, press **Peak Search** (or **Search**). This is the compressed amplitude. The marker delta ( $\Delta \text{Mkr1}$ ) amplitude is the measured gain compression.
19. Record the measured gain compression in the performance test record as the Entry listed in [Table 2-78](#).
20. Repeat [step 6](#) through [step 19](#) for each set of settings in [Table 2-77](#) and [Table 2-78](#).

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## 34. Gain Compression: Agilent E7403A, E7404A, and E7405A

This test verifies the ability of the analyzer to measure relatively low-amplitude signals in the presence of higher-amplitude signals. Gain compression is measured by applying two signals, separated by a defined amount in frequency. The higher-amplitude signal is set to yield the specified total power at the input mixer (the power at the input mixer is defined as the input power level minus the input attenuation). The lower-amplitude signal is set at least 35 dB below the higher-amplitude signal, such that its power does not significantly add to the total power. The higher-amplitude signal is turned off and the lower-amplitude signal level is measured. This is the uncompressed amplitude.

The higher-amplitude signal is turned on and the amplitude of the lower-amplitude signal is again measured. This is the compressed amplitude. The difference between the uncompressed and compressed amplitude is the measured gain compression.

There are no related adjustment procedures for this performance test.

### Equipment Required

- Synthesized sweeper (*2 required*)
- Power meter, dual channel
- Microwave power sensor
- Directional bridge
- Directional coupler
- Cable, BNC, 120-cm (48-in)
- Cable, APC 3.5 (m) (*2 required*)
- Adapter, Type-N (m) to Type-N (m)
- Adapter, Type-N (m) to APC 3.5 (f) (*3 required*)
- Adapter, Type-N (m) to SMA (m)

### Additional Equipment for Option BAB

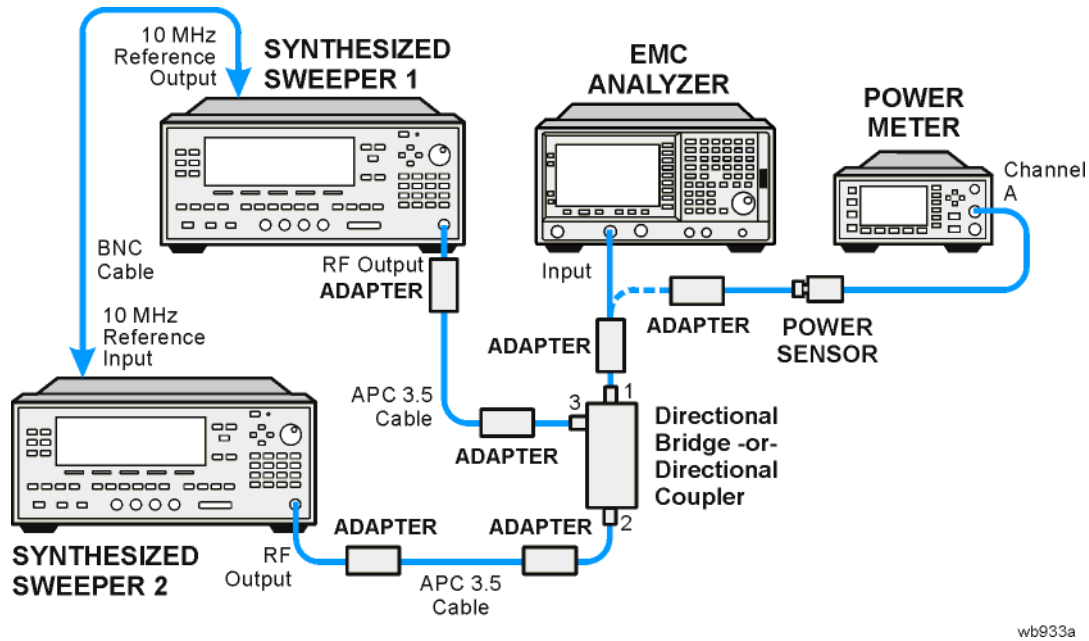
- Adapter, Type-N (m), to APC 3.5 (f)

### Procedure

1. Zero and calibrate the power meter and power sensor combination in log mode (power reads out in dBm) as described in the power meter operation manual.
2. Connect the equipment as shown in [Figure 2-50](#), with the load port of the directional bridge connected to the power sensor. The directional bridge should be used for measurements of frequencies less than or equal to 2.5 GHz. Use the directional coupler for higher frequency measurements.

## 34. Gain Compression: Agilent E7403A, E7404A, and E7405A

Figure 2-52 Gain Compression Test Setup



3. On the synthesized sweeper 1 press **PRESET**, then set the controls as follows:

**CW, 50 MHz**  
**POWER LEVEL, -100 dBm**

4. On the synthesized sweeper 2 press **PRESET**, then set the controls as follows:

**CW, 53 MHz**  
**POWER LEVEL, -3 dBm**

5. Enter the power sensor calibration factor for the synthesized sweeper 2 frequency into the power meter.
6. Adjust the synthesized sweeper 2 power level setting until the power meter reading is the same as indicated in [Table 2-80](#).
7. Record the actual synthesized sweeper 2 power level setting in [Table 2-80](#) for each frequency indicated.

Table 2-79

Source Frequency and Amplitude Settings

| First Synthesized Sweeper |                   | Second Synthesized Sweeper |                           |                          |
|---------------------------|-------------------|----------------------------|---------------------------|--------------------------|
| CW Frequency (MHz)        | Power Level (dBm) | CW Frequency (MHz)         | Desired Power Level (dBm) | Actual Power Level (dBm) |
| 50                        | -40               | 53                         | -0.0                      |                          |
| 50 <sup>a</sup>           | -40 <sup>a</sup>  | 50.004 <sup>a</sup>        | -0.0 <sup>a</sup>         |                          |

## 34. Gain Compression: Agilent E7403A, E7404A, and E7405A

Table 2-79

Source Frequency and Amplitude Settings

| First Synthesized Sweeper |     | Second Synthesized Sweeper |      |  |
|---------------------------|-----|----------------------------|------|--|
| 1400                      | −40 | 1403                       | 0.0  |  |
| 2500                      | −40 | 2503                       | 0.0  |  |
| 4400                      | −40 | 4403                       | 0.0  |  |
| 7600 <sup>b</sup>         | −40 | 7603                       | −3.0 |  |
| 14000 <sup>c</sup>        | −40 | 14003                      | −3.0 |  |

a. Narrow resolution bandwidths only.

b. Agilent E7404A and E7405A only.

c. Agilent E7405A only.

Table 2-80

Analyzer Settings

| Test Frequency      | Analyzer Settings |                  |                    |                    |                    |                 |                  | Test Record Entry |
|---------------------|-------------------|------------------|--------------------|--------------------|--------------------|-----------------|------------------|-------------------|
| (MHz)               | Center Freq (GHz) | Span (kHz)       | RBW (kHz)          | VBW (kHz)          | Ref Lvl (dBm)      | Scale (dB)      | Atten (dB)       |                   |
| 53                  | 0.05              | 150              | 30                 | 0.300              | −10.0              | 10              | 0.0              | 1)                |
| 50.004 <sup>a</sup> | 0.05 <sup>a</sup> | 1.0 <sup>a</sup> | 0.030 <sup>a</sup> | 0.030 <sup>a</sup> | −10.0 <sup>a</sup> | 10 <sup>a</sup> | 0.0 <sup>a</sup> | 2)                |
| 1403                | 1.40              | 150              | 30                 | 0.300              | −10.0              | 10              | 0.0              | 3)                |
| 2503                | 2.50              | 150              | 30                 | 0.300              | −10.0              | 10              | 0.0              | 4)                |
| 4403                | 4.40              | 150              | 30                 | 0.300              | −10.0              | 10              | 0.0              | 5)                |
| 7603 <sup>b</sup>   | 7.60              | 150              | 30                 | 0.300              | −10.0              | 10              | 0.0              | 6)                |
| 14003 <sup>c</sup>  | 14.0              | 150              | 30                 | 0.300              | −10.0              | 10              | 0.0              | 7)                |

a. Narrow resolution bandwidths only.

b. Agilent E7404A and E7405A only.

c. Agilent E7405A only.

8. Repeat [step 3](#) through [step 7](#) for each of the settings listed in [Table 2-79](#). Use the directional bridge in place of the coupler for frequencies less than or equal to 2503 MHz. The test at 50 MHz with a span of 1 kHz is only for E4404B, E4405B or E4407B with Option 1DR.
9. Disconnect the power sensor from the directional bridge and connect the directional bridge to the input of the analyzer using an adapter. Do not use a cable.

**34. Gain Compression: Agilent E7403A, E7404A, and E7405A**

10. Set the synthesized sweeper 2 power level to Off.
11. Set the synthesized sweeper 1 power level to  $-24$  dBm.
12. Press **Preset** on the analyzer. Press the **Factory Preset** softkey, if it is displayed. Press **System, Alignments, Auto Align, Off**. Set the analyzer by pressing the following keys:

**FREQUENCY, Center Freq, 50 MHz** (or as indicated in [Table 2-80](#))

**SPAN, 150 kHz** (or as indicated in [Table 2-80](#))

**AMPLITUDE, More, Y Axis Units** (or **Amptd Units**), dBm

**AMPLITUDE, Ref Level,  $-10$  dBm, Attenuation 0 dB**

**AMPLITUDE, Scale/Div, 10 dB**

**BW/Avg, Res BW, 30 kHz** (or as indicated in [Table 2-80](#))

**BW/Avg, Video BW, 300 Hz** (or as indicated in [Table 2-80](#))

13. On the synthesized sweeper 2, set the appropriate power level to the setting recorded in [Table 2-79](#). Then set RF to Off.
14. On the analyzer, press **Peak Search** (or **Search**).
15. Adjust the power level of the synthesized sweeper 1 to achieve a marker amplitude reading within 0.5 dB of the value indicated in [Table 2-79](#). The marker amplitude is the uncompressed amplitude.
16. On the analyzer, press the following keys:
  - Peak Search** (or **Search**)
  - Marker**
  - Delta**
17. On the synthesized sweeper 2, set RF to On. The amplitude should be the same as recorded in [Table 2-79](#).
18. On the analyzer, press **Peak Search** (or **Search**). This is the compressed amplitude. The marker delta ( $\Delta \text{Mkr}1$ ) amplitude is the measured gain compression.
19. Record the measured gain compression in the performance test record as the Entries indicated in [Table 2-80](#).
20. Repeat [step 10](#) through [step 19](#) for each set of settings in [Table 2-79](#) and [Table 2-80](#) for frequencies less than or equal to 2503 MHz.
21. Replace the directional bridge with the directional coupler.
22. Repeat [step 10](#) through [step 19](#) for the remaining frequencies in [Table 2-79](#).

## 35. Displayed Average Noise Level: Agilent E7401A

This performance test measures the Displayed Average Noise Level (DANL) within the frequency range specified. The analyzer input is terminated in its characteristic impedance. If the analyzer is also equipped with a tracking generator (Option 1DN), the tracking generator is also terminated in its characteristic impedance and set for maximum leveled output power.

The test tunes the analyzer frequency across the band and uses the marker to locate the frequency with the highest response. It then reads the average noise in zero span using the minimum resolution bandwidth (RBW) specified for the analyzer. Analyzers having Option 1DN (Tracking Generator) installed are tested in a 1 kHz RBW. All EMC Analyzers have a minimum RBW of 10 Hz. Even though analyzers having Option 1D5 (High Stability Frequency Reference) and firmware revision A.08.00 or later installed have a minimum RBW of 1 Hz, DANL for these analyzers is specified and tested with a 10 Hz RBW.

To reduce measurement uncertainty due to input attenuator switching and resolution bandwidth switching, a reference level offset is added. The 50 MHz alignment signal is used as the amplitude reference for determining the amount of offset required. The offset is removed at the end of the test by pressing instrument preset.

The related adjustment for this procedure is “Frequency Response.”

### Equipment Required

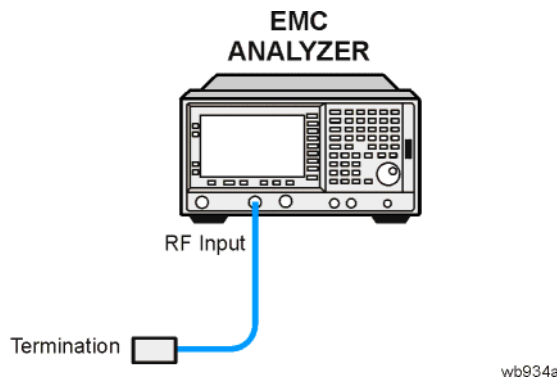
Termination, 50  $\Omega$ , Type-N (m) (2 *required for Option 1DN*)

### Procedure

1. Set up the analyzers as shown in [Figure 2-53](#).

Figure 2-53

Displayed Average Noise Level Test Setup



2. Enter 10 Hz below as the minimum RBW (resolution bandwidth); keep this



**35. Displayed Average Noise Level: Agilent E7401A**

value in mind as you continue to perform this procedure. Also, take note of whether or not Option 1DN (1.5 GHz Tracking Generator) is installed.

Minimum RBW \_\_\_\_\_ Hz

Option 1DN: \_\_\_\_\_

3. On the analyzer, press **Preset**. Press the **Factory Preset** softkey, if it is displayed. Then press the following keys:

**Input/Output (or Input), Amptd Ref (On)**  
**FREQUENCY, Center Freq, 50 MHz**  
**SPAN, 2 kHz**  
**AMPLITUDE, More, Y Axis Units (or Amptd Units), dBm**  
**AMPLITUDE, -25 dBm**  
**AMPLITUDE, Attenuation, 10 dB**  
**BW/Avg, Res BW, 1 kHz**  
**BW/Avg, Video BW, 1 kHz**  
**Det/Demod, Detector, Sample**

4. On the analyzer, press **Single, Peak Search (or Search)** and record the Ref Amptd reading below.

Ref Amptd \_\_\_\_\_ dBm

5. If the analyzer does not have Option 1DN (1.5 GHz Tracking Generator) installed and the minimum RBW is 10 Hz, continue with [step 10](#).
6. If the analyzer has Option 1DN (1.5 GHz Tracking Generator) installed then continue with [step 7](#).
7. On the analyzer, press the following keys:

**AMPLITUDE, Attenuation, 0 dB**  
**SPAN, 20 kHz**  
**BW/Avg, Res BW, 1 kHz**  
**BW/Avg, Video BW, 30 Hz**

8. On the analyzer, press **Single, Peak Search (or Search)** and record the amplitude reading below as Meas Amptd(1 kHz RBW).

Meas Amptd (1 kHz RBW) \_\_\_\_\_ dBm

9. Calculate the necessary reference level offset by subtracting the Meas Amptd in [step 8](#) from the Ref Amptd in [step 4](#). If the calculated Ref Lvl Offset is greater than 0.05 dB or less than -0.05 dB, record the Ref Lvl Offset value below. Otherwise, enter 0.

Ref Lvl Offset (1 kHz RBW) = Ref Amptd – Meas Amptd (1 kHz RBW)

Ref Lvl Offset (1 kHz RBW) \_\_\_\_\_ dB

10. On the analyzer, press the following keys:

**AMPLITUDE, Attenuation, 0 dB**  
**SPAN, 500 Hz**

**35. Displayed Average Noise Level: Agilent E7401A****BW/Avg, Res BW, 10 Hz****BW/Avg, Video BW, 1 Hz**

11. On the analyzer, press **Single, Peak Search** (or **Search**) and record the amplitude reading below as Meas Amptd (10 Hz RBW).

Meas Amptd (10 Hz RBW) \_\_\_\_\_ dBm

12. Calculate the necessary reference level offset by subtracting the Meas Amptd in [step 11](#) from the Ref Amptd in [step 4](#). If the calculated Ref Lvl Offset is greater than 0.05 dB or less than -0.05 dB, record the Ref Lvl Offset value below. Otherwise, enter 0.

Ref Lvl Offset (10 Hz RBW) = Ref Amptd – Meas Amptd (10 Hz RBW)

Ref Lvl Offset (10 Hz RBW) \_\_\_\_\_ dB

13. On the analyzer, press **Input, Amptd Ref** (Off). Then press **AMPLITUDE, More, Ref Lvl Offst**, and enter the value recorded in [step 9](#).

Connect the 50  $\Omega$  termination to the analyzer input as shown in [Figure 2-53](#).

14. If the analyzer has Option 1DN, 50  $\Omega$  tracking generator, do the following:

- On the analyzer, press **BW/Avg, Res BW, 1 kHz**.
- Press **Source, Amplitude, 0 dBm**.
- Connect a 50  $\Omega$  termination to the RF OUT 50  $\Omega$ .

**Measurement Sequence**

The following DANL Measurement Sequence table lists the procedures to be performed and the parameters to be used in each procedure. Also listed in the table are test record entry numbers for recording the results in the performance verification test record.

- Perform all of the following steps (through [step 5](#)) that apply to your analyzer using the appropriate subsets in [Table 2-81](#). Then record the display line amplitude setting as the indicated Test Record entry in the performance verification test record.
- If the minimum RBW of the analyzer is 10 Hz and Option 1DN (1.5 GHz Tracking Generator) is installed, perform those procedures listed in Subset A in [Table 2-81](#).
- If the minimum RBW of the analyzer is 10 Hz and Option 1DN (1.5 GHz Tracking Generator) is installed, also perform those procedures listed in Subset B in [Table 2-81](#).
- If the minimum RBW of the analyzer is 10 Hz, also perform those procedures listed in Subset C in [Table 2-81](#).
- If the minimum RBW of the analyzer is 10 Hz, also perform those procedures listed in Subset D in [Table 2-81](#).
- After performing all applicable DANL measurement procedures, continue with

**35. Displayed Average Noise Level: Agilent E7401A**

“Remove Reference Level Offset”.

**Table 2-81 DANL Measurement Sequence, E7401A**

| Subset | Procedure             | Procedure Parameters |           |          |              | Test Record Entry |
|--------|-----------------------|----------------------|-----------|----------|--------------|-------------------|
|        |                       | Start Freq           | Stop Freq | Test RBW | Preamp State |                   |
| A      | Meas. DANL at 400 kHz | N/A                  | N/A       | 1 kHz    | Off          | 1)                |
|        | Measure DANL          | 1 MHz                | 10 MHz    | 1 kHz    | Off          | 2)                |
|        | Measure DANL          | 10 MHz               | 500 MHz   | 1 kHz    | Off          | 3)                |
|        | Measure DANL          | 500 MHz              | 1 GHz     | 1 kHz    | Off          | 4)                |
|        | Measure DANL          | 1 GHz                | 1.5 GHz   | 1 kHz    | Off          | 5)                |
| B      | Meas. DANL at 400 kHz | N/A                  | N/A       | 1 kHz    | On           | 6)                |
|        | Measure DANL          | 1 MHz                | 10 MHz    | 1 kHz    | On           | 7)                |
|        | Measure DANL          | 10 MHz               | 500 MHz   | 1 kHz    | On           | 8)                |
|        | Measure DANL          | 500 MHz              | 1 GHz     | 1 kHz    | On           | 9)                |
|        | Measure DANL          | 1 GHz                | 1.5 GHz   | 1 kHz    | On           | 10)               |
| C      | Meas. DANL at 400 kHz | N/A                  | N/A       | 10 Hz    | Off          | 11)               |
|        | Measure DANL          | 1 MHz                | 10 MHz    | 10 Hz    | Off          | 12)               |
|        | Measure DANL          | 10 MHz               | 500 MHz   | 10 Hz    | Off          | 13)               |
|        | Measure DANL          | 500 MHz              | 1 GHz     | 10 Hz    | Off          | 14)               |
|        | Measure DANL          | 1 GHz                | 1.5 GHz   | 10 Hz    | Off          | 15)               |
| D      | Meas. DANL at 400 kHz | N/A                  | N/A       | 10 Hz    | On           | 16)               |
|        | Measure DANL          | 1 MHz                | 10 MHz    | 10 Hz    | On           | 17)               |
|        | Measure DANL          | 10 MHz               | 500 MHz   | 10 Hz    | On           | 18)               |
|        | Measure DANL          | 500 MHz              | 1 GHz     | 10 Hz    | On           | 19)               |
|        | Measure DANL          | 1 GHz                | 1.5 GHz   | 10 Hz    | On           | 20)               |

### Measuring Displayed Average Noise Level (DANL)

Use the following procedure for testing DANL over most frequency ranges. The start and stop frequencies and test RBW (1 kHz or 10 Hz) are specified in the DANL Measurement Sequence Table (Table 2-81).

1. If the test RBW is 10 Hz and the analyzer has Option 1DN (1.5 GHz Tracking Generator) installed, press **Source, Amplitude** (Off).
2. Set the analyzer as follows:

**Auto Couple**  
**FREQUENCY, Start Freq**, (*enter specified start frequency*)

## 35. Displayed Average Noise Level: Agilent E7401A

**FREQUENCY, Stop Freq**, *(enter specified stop frequency)*

**AMPLITUDE, More, Y Axis Units** (or **Amptd Units**), **dBm**

**AMPLITUDE, Ref Level**, **-70 dBm**

**Attenuation**, **0 dB**

**AMPLITUDE, More, Ref Lvl Offst**, *(enter Ref Lvl Offset (1 kHz) if test RBW = 1 kHz)*

**AMPLITUDE, More, Ref Lvl Offst**, *(enter Ref Lvl Offset (10 Hz) if test RBW = 10 Hz)*

**BW/Avg, Res BW**, **1 MHz**

**BW/Avg, Video BW**, **10 kHz**

**AMPLITUDE, More, Int Preamp** (Off) *(if preamp state = Off)*

**AMPLITUDE, More, Int Preamp** (On) *(if preamp state = On)*

**Sweep**, **Sweep (Cont)**

**Sweep**, **Sweep Time (Auto)**

3. On the analyzer, press **Single, View/Trace, Trace 1, Clear Write, BW/Avg, Average Type** (Video), **Average, 3, Enter, Single**.

Wait until  $V_{Avg}$  3 is displayed to the left of the graticule (the analyzer will take three sweeps, then stop).

4. On the analyzer, press **Peak Search** (or **Search**). Then press:

**BW/Avg, Average** (Off)

**Marker** →, **Mkr** → **CF**

5. If the test RBW is 1 kHz, press **SPAN, 20 kHz**.

If the test RBW is 10 Hz, press **SPAN, 500 Hz**.

6. If the test RBW is 1 kHz, press **BW/Avg, Res BW, 1 kHz, Video BW, 30 Hz**.

If the test RBW is 10 Hz, press **BW/Avg, Res BW, 100 Hz, Video BW, 1 Hz**.

If the test RBW is 10 Hz, press **BW/Avg, Res BW, 10 Hz, Video BW, 1 Hz**.

7. On the analyzer, press **Single** and wait for the new sweep to finish.
8. Read the average of the trace data, ignoring any residual responses. On the analyzer, press **Display, Display Line** (On), and adjust the display line so that it is centered on the average trace noise, ignoring any residual responses (refer to the Residual Responses verification test for any suspect residuals).

### Measuring Displayed Average Noise Level at 400 kHz

1. If the test RBW is 10 Hz and the analyzer has Option 1DN (1.5 GHz Tracking Generator) installed, press **Source, Amplitude** (Off).
2. Press **FREQUENCY, Center Freq, 400 kHz**. Set the analyzer by pressing the following keys:

**SPAN, 20 kHz** *(if test RBW = 1 kHz)*

**35. Displayed Average Noise Level: Agilent E7401A**

**SPAN, 500 Hz** (*if test RBW = 10 Hz*)

**AMPLITUDE, More, Y Axis Units** (or **Amptd Units**), **dBm**

**AMPLITUDE, -70 dBm**

**Attenuation, 0 dB**

**AMPLITUDE, More, Ref Lvl Offst**, (*enter Ref Lvl Offset (1 kHz) if test RBW = 1 kHz*)

**AMPLITUDE, More, Ref Lvl Offst**, (*enter Ref Lvl Offset (10 Hz) if test RBW = 10 Hz*)

**AMPLITUDE, More, Int Preamp** (Off) (*if preamp state = Off*)

**AMPLITUDE, More, Int Preamp** (On) (*if preamp state = On*)

**BW/Avg, Res BW, 1 kHz** (*if test RBW = 1 kHz*)

**BW/Avg, Res BW, 10 Hz** (*if test RBW = 10 Hz*)

**BW/Avg, Video BW, 30 Hz** (*if test RBW = 1 kHz*)

**BW/Avg, Video BW, 1 Hz** (*if test RBW = 10 Hz*)

3. On the analyzer, press **Single** and wait for a new sweep to complete.
4. On the analyzer, press **Display, Display Line** (On). Adjust the display line so that it is centered on the average trace noise, ignoring any residual responses (refer to the Residual Responses verification test for any suspect residuals).

**Remove Reference Level Offset**

1. Press **AMPLITUDE, More, Ref Lvl Offst, 0 dB**.
2. On the analyzer, press **Preset**.
3. This performance test is now complete.

---

## 36. Displayed Average Noise Level: Agilent E7402A

This performance test measures the Displayed Average Noise Level (DANL) within the frequency range specified. The analyzer input is terminated in its characteristic impedance. If the analyzer is also equipped with a tracking generator (Option 1DN), the tracking generator is also terminated in its characteristic impedance and set for maximum leveled output power.

The test tunes the analyzer frequency across the band and uses the marker to locate the frequency with the highest response. It then reads the average noise in zero span using the minimum resolution bandwidth (RBW) specified for the analyzer. Analyzers having Option 1DN (Tracking Generator) installed are tested in a 1 kHz RBW. All EMC Analyzers have a minimum RBW of 10 Hz. Even though analyzers having Option 1D5 (High Stability Frequency Reference) and firmware revision A.08.00 or later installed have a minimum RBW of 1 Hz, DANL for these analyzers is specified and tested with a 10 Hz RBW.

To reduce measurement uncertainty due to input attenuator switching and resolution bandwidth switching, a reference level offset is added. The 50 MHz alignment signal is used as the amplitude reference for determining the amount of offset required. The offset is removed at the end of the test by pressing instrument preset.

The related adjustment for this procedure is “Frequency Response.”

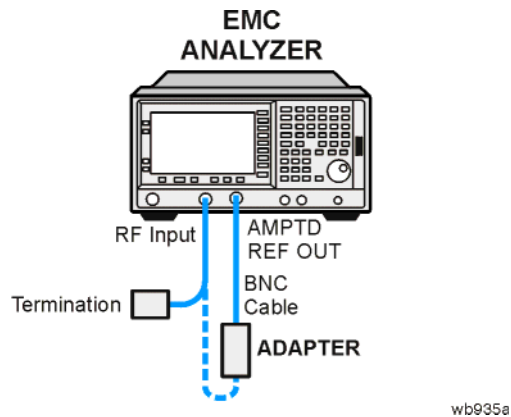
### Equipment Required

Termination, 50  $\Omega$ , Type-N (m) (2 *required for Option 1DN*)  
Cable, BNC  
Adapter, Type-N (m) to BNC (f)

### Procedure

1. Connect the AMPTD REF OUT to the 50  $\Omega$  Input using a BNC cable and adapter as shown in [Figure 2-54](#).

Figure 2-54 Displayed Average Noise Level Test Setup



2. Enter 10 Hz below as the minimum RBW (resolution bandwidth); keep this value in mind as you continue to perform this procedure. Also, take note of whether or not Option 1DN (3.0 GHz Tracking Generator) is installed.

Minimum RBW \_\_\_\_\_ Hz

Option 1DN: \_\_\_\_\_

3. Press **Preset** on the analyzer. Press the **Factory Preset** softkey, if it is displayed. Then press the following keys:

**Input/Output (or Input), Amptd Ref Out (On)**

**FREQUENCY, Center Freq, 50 MHz**

**SPAN, 2 kHz**

**AMPLITUDE, More, Y Axis Units (or Amptd Units), dBm**

**AMPLITUDE, -20 dBm**

**AMPLITUDE, Attenuation, 10 dB**

**BW/Avg, Res BW, 1 kHz**

**BW/Avg, Video BW, 1 kHz**

**Det/Demod, Detector, Sample, Return**

4. On the analyzer, press **Single, Peak Search (or Search)** and record the Ref Amptd reading below.

Ref Amptd \_\_\_\_\_ dBm

5. If the analyzer does not have Option 1DN (3.0 GHz Tracking Generator) installed and the minimum RBW is 10 Hz, continue with [step 11](#).
6. If the analyzer has Option 1DN (3.0 GHz Tracking Generator) installed then continue with [step 7](#).
7. On the analyzer, press the following keys:

**AMPLITUDE, Attenuation, 0 dB**



## 36. Displayed Average Noise Level: Agilent E7402A

**SPAN, 20 kHz**  
**BW/Avg, Res BW, 1 kHz**  
**BW/Avg, Video BW, 30 Hz**

8. On the analyzer, press **Single**.
9. On the analyzer, press **Peak Search** (or **Search**) and record the amplitude reading below as Meas Amptd (1 kHz RBW).

Meas Amptd (1 kHz RBW)\_\_\_\_\_ dBm

10. Calculate the necessary reference level offset by subtracting the Meas Amptd in [step 9](#) from the Ref Amptd in [step 4](#). If the calculated Ref Lvl Offset is greater than 0.05 dB or less than –0.05 dB, record the Ref Lvl Offset value below. Otherwise, enter 0.

Ref Lvl Offset(1 kHz RBW) = Ref Amptd – Meas Amptd(1 kHz RBW)

Ref Lvl Offset(1 kHz RBW)\_\_\_\_\_ dB

11. On the analyzer, press the following keys:

**AMPLITUDE, Attenuation, 0 dB**  
**SPAN, 500 Hz**  
**BW/Avg, Res BW, 10 Hz**  
**BW/Avg, Video BW, 1 Hz**

12. On the analyzer, press **Single, Peak Search** (or **Search**) and record the amplitude reading below as Meas Amptd(10 Hz RBW).

Meas Amptd(10 Hz RBW)\_\_\_\_\_ dB

13. Calculate the necessary reference level offset by subtracting the Meas Amptd in [step 12](#) from the Ref Amptd in [step 4](#). If the calculated Ref Lvl Offset is greater than 0.05 dB or less than –0.05 dB, record the Ref Lvl Offset value below. Otherwise, enter 0.

Ref Lvl Offset(10 Hz RBW) = Ref Amptd – Meas Amptd(10 Hz RBW)

Ref Lvl Offset(10 Hz RBW)\_\_\_\_\_ dB

14. On the analyzer, press **Input, Amptd Ref Out** (Off), then **AMPLITUDE, More, Ref Lvl Offst**, and enter the value recorded in [step 10](#).

15. Connect the 50  $\Omega$  termination to the analyzer input as shown in [Figure 2-54](#).

16. Disconnect the BNC cable and adapter from the AMPTD REF OUT and the 50  $\Omega$  Input.

17. If the analyzer has Option 1DN, 50  $\Omega$  tracking generator, do the following:

- a. On the analyzer, press **BW/Avg, Res BW, 1 kHz**.
- b. Press **Source, Amplitude, 0 dBm**.
- c. Connect a 50  $\Omega$  termination to the RF OUT 50  $\Omega$ .

**Measurement Sequence**

The following DANL Measurement Sequence table lists the procedures to be performed and the parameters to be used in each procedure. Also listed in the table are test record entry numbers for recording the results in the performance verification test record.

1. Perform all of the following steps (through [step 5](#)) that apply to your analyzer using the appropriate subsets in [Table 2-82](#). Then record the display line amplitude setting as the indicated Test Record entry in the performance verification test record.
2. If the minimum RBW of the analyzer is 10 Hz and Option 1DN (3.0 GHz Tracking Generator) is installed, perform those procedures listed in Subset A in [Table 2-82](#).
3. If the minimum RBW of the analyzer is 10 Hz and Option 1DN (3.0 GHz Tracking Generator) is installed, also perform those procedures listed in Subset B in [Table 2-82](#).
4. If the minimum RBW of the analyzer is 10 Hz, perform those procedures listed in Subset C in [Table 2-82](#).
5. If the minimum RBW of the analyzer is 10 Hz, also perform those procedures listed in Subset D in [Table 2-82](#).

**Table 2-82 DANL Measurement Sequence, E7402A**

| Subset | Procedure    | Procedure Parameters |           |          |                    | Test Record Entry <sup>a</sup> |
|--------|--------------|----------------------|-----------|----------|--------------------|--------------------------------|
|        |              | Start Freq           | Stop Freq | Test RBW | Preamplifier State |                                |
| A      | Measure DANL | 10 MHz               | 1 GHz     | 1 kHz    | Off                | 1)                             |
|        | Measure DANL | 1 GHz                | 2 GHz     | 1 kHz    | Off                | 2)                             |
|        | Measure DANL | 2 GHz                | 3 GHz     | 1 kHz    | Off                | 3)                             |
| B      | Measure DANL | 10 MHz               | 1 GHz     | 1 kHz    | On                 | 4/13)                          |
|        | Measure DANL | 1 GHz                | 2 GHz     | 1 kHz    | On                 | 5/14)                          |
|        | Measure DANL | 2 GHz                | 3 GHz     | 1 kHz    | On                 | 6/15)                          |
| C      | Measure DANL | 10 MHz               | 1 GHz     | 10 Hz    | Off                | 7)                             |
|        | Measure DANL | 1 GHz                | 2 GHz     | 10 Hz    | Off                | 8)                             |
|        | Measure DANL | 2 GHz                | 3 GHz     | 10 Hz    | Off                | 9)                             |
| D      | Measure DANL | 10 MHz               | 1 GHz     | 10 Hz    | On                 | 10/16)                         |
|        | Measure DANL | 1 GHz                | 2 GHz     | 10 Hz    | On                 | 11/17)                         |
|        | Measure DANL | 2 GHz                | 3 GHz     | 10 Hz    | On                 | 12/18)                         |

## 36. Displayed Average Noise Level: Agilent E7402A

- a. There are two possible entries for measurements made with the preamplifier on, depending upon the ambient temperature. The first entry is for measurements made with an ambient temperature outside of the 20° to 30° C range, but within the 0° to 55° C range. The second entry is for measurements made with an ambient temperature within the 20° to 30° C range.
6. After performing all applicable DANL measurement procedures, continue with “Remove Reference Level Offset”.

**Measuring Displayed Average Noise Level (DANL)**

Use the following procedure for testing DANL over most frequency ranges. The start and stop frequencies and test RBW (1 kHz or 10 Hz) are specified in the DANL Measurement Sequence Table (Table 2-82).

1. If the test RBW is 10 Hz and the analyzer has Option 1DN (1.5 GHz Tracking Generator) installed, press **Source, Amplitude** (Off).
2. Set the analyzer as follows:
  - Auto Couple**
  - FREQUENCY, Start Freq**, *(enter specified start frequency)*
  - FREQUENCY, Stop Freq**, *(enter specified stop frequency)*
  - AMPLITUDE, More, Y Axis Units** (or **Amptd Units**), **dBm**
  - AMPLITUDE, -70 dBm**
  - Attenuation, 0 dB**
  - AMPLITUDE, More, Ref Lvl Offst**, *(enter Ref Lvl Offset (1 kHz) if test RBW = 1 kHz)*
  - AMPLITUDE, More, Ref Lvl Offst**, *(enter Ref Lvl Offset (10 Hz) if test RBW = 10 Hz)*
  - BW/Avg, Res BW, 1 MHz**
  - BW/Avg, Video BW, 10 kHz**
  - AMPLITUDE, More, Int Preamp** (Off) *(if preamp state = Off)*
  - AMPLITUDE, More, Int Preamp** (On) *(if preamp state = On)*
  - Sweep, Sweep** (Cont)
  - Sweep, Sweep Time** (Auto)
3. On the analyzer, press **Single, View/Trace, Trace 1, Clear Write, BW/Avg, Average Type** (Video), **Average, 3, Enter, Single**
4. Wait until  $\text{VAvg } 3$  is displayed to the left of the graticule (the analyzer will take three sweeps, then stop).
5. On the analyzer, press the following keys:
  - BW/Avg, Average** (Off)
  - Peak Search** (or **Search**)
  - BW/Avg, Average** (On)
  - Marker** → , **Mkr** → **CF**
6. If the test RBW is 1 kHz, press **SPAN, 20 kHz**.  
If the test RBW is 10 Hz, press **SPAN, 500 Hz**.

**36. Displayed Average Noise Level: Agilent E7402A**

7. If the test RBW is 1 kHz, press **BW/Avg, Res BW, 1 kHz, Video BW, 30 Hz**.  
  
If the test RBW is 10 Hz, press **BW/Avg, Res BW, 10 Hz, Video BW, 1 Hz**.
8. On the analyzer, press **Single** and wait for the new sweep to finish.
9. Read the average of the trace data, ignoring any residual responses. On the analyzer, press **Display, Display Line** (On), and adjust the display line so that it is centered on the average trace noise, ignoring any residual responses (refer to the Residual Responses verification test for any suspect residuals).

**Remove Reference Level Offset**

1. Press **AMPLITUDE, More, Ref Lvl Offst, 0 dB**.
2. On the analyzer, press **Preset**.
3. This performance test is now complete.

---

## 37. Displayed Average Noise Level: Agilent E7403A and E7404A

This performance test measures the displayed average noise level (DANL) within the frequency range specified. The analyzer input is terminated in its characteristic impedance. If the analyzer is also equipped with a tracking generator (Option 1DN), the tracking generator is also terminated in its characteristic impedance and set for maximum leveled output power.

The test tunes the analyzer frequency across the band and uses the marker to locate the frequency with the highest response. It then reads the average noise in zero span using the minimum resolution bandwidth (RBW) specified for the analyzer. Analyzers having Option 1DN (Tracking Generator) installed are tested in a 1 kHz RBW. All EMC Analyzers have a minimum RBW of 10 Hz. Even though analyzers having Option 1D5 (High Stability Frequency Reference) and firmware revision A.08.00 or later installed have a minimum RBW of 1 Hz, DANL for these analyzers is specified and tested with a 10 Hz RBW.

To reduce measurement uncertainty due to input attenuator switching and resolution bandwidth switching, a reference level offset is added. The 50 MHz alignment signal is used as the amplitude reference for determining the amount of offset required. The offset is removed at the end of the test by pressing instrument preset.

The related adjustment for this procedure is “Frequency Response.”

### Equipment Required

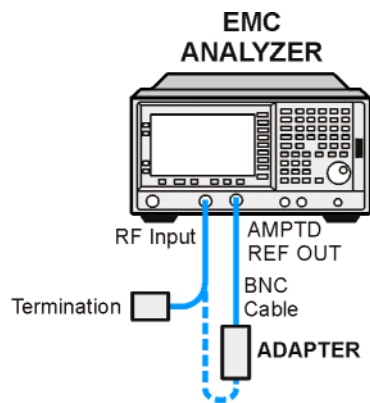
Termination, 50  $\Omega$ , Type-N (m) (2 *required for Option 1DN*)  
Cable, BNC  
Adapter, Type-N (m) to BNC (f)

### Procedure

1. Connect the AMPTD REF OUT to the 50  $\Omega$  Input using a BNC cable and adapter as shown in [Figure 2-55](#).

## 37. Displayed Average Noise Level: Agilent E7403A and E7404A

Figure 2-55 Displayed Average Noise Level Test Setup



wb935a

2. Enter 10 Hz below as the minimum RBW (resolution bandwidth); keep this value in mind as you continue to perform this procedure. Also, take note of whether or not Option 1DN (3.0 GHz Tracking Generator) is installed.

Minimum RBW \_\_\_\_\_ Hz

Option 1DN: \_\_\_\_\_

3. Press **Preset** on the analyzer. Press the **Factory Preset** softkey, if it is displayed. Then press the following keys:

**Input/Output (or Input), Amptd Ref Out (On)****FREQUENCY, Center Freq, 50 MHz****SPAN, 2 kHz****AMPLITUDE, More, Y Axis Units (or Amptd Units), dBm****AMPLITUDE, -20 dBm****AMPLITUDE, Attenuation, 10 dB****BW/Avg, Res BW, 1 kHz****BW/Avg, Video BW, 1 kHz****Det/Demod, Detector, Sample, Return**

4. On the analyzer, press **Single, Peak Search (or Search)** and record the Ref Amptd reading below.

Ref Amptd \_\_\_\_\_ dBm

5. If the analyzer does not have Option 1DN (3.0 GHz Tracking Generator) installed and the minimum RBW is 10 Hz, continue with [step 10](#).
6. If the analyzer has Option 1DN (3.0 GHz Tracking Generator) installed then continue with [step 7](#).
7. On the analyzer, press the following keys:

**AMPLITUDE, Attenuation, 0 dB****SPAN, 20 kHz**

## 37. Displayed Average Noise Level: Agilent E7403A and E7404A

**BW/Avg, Res BW, 1 kHz**  
**BW/Avg, Video BW, 30 Hz**

8. On the analyzer, press **Single, Peak Search** (or **Search**) and record the amplitude reading below as Meas Amptd (1 kHz RBW).

Meas Amptd (1 kHz RBW)\_\_\_\_\_ dB

9. Calculate the necessary reference level offset by subtracting the Meas Amptd in [step 8](#) from the Ref Amptd in [step 4](#). If the calculated Ref Lvl Offset is greater than 0.05 dB or less than –0.05 dB, record the Ref Lvl Offset value below. Otherwise, enter 0.

Ref Lvl Offset (1 kHz RBW) = Ref Amptd – Meas Amptd (1 kHz RBW)

Ref Lvl Offset (1 kHz RBW)\_\_\_\_\_ dB

10. On the analyzer, press the following keys:

**AMPLITUDE, Attenuation, 0 dB**  
**SPAN, 500 Hz**  
**BW/Avg, Res BW, 10 Hz**  
**BW/Avg, Video BW, 1 Hz**

11. On the analyzer, press **Single, Peak Search** (or **Search**) and record the amplitude reading below as Meas Amptd (10 Hz RBW).

Meas Amptd (10 Hz RBW)\_\_\_\_\_ dB

12. Calculate the necessary reference level offset by subtracting the Meas Amptd in [step 11](#) from the Ref Amptd in [step 4](#). If the calculated Ref Lvl Offset is greater than 0.05 dB or less than –0.05 dB, record the Ref Lvl Offset value below. Otherwise, enter 0.

Ref Lvl Offset (10 Hz RBW) = Ref Amptd – Meas Amptd (10 Hz RBW)

Ref Lvl Offset (10 Hz RBW)\_\_\_\_\_ dB

13. On the analyzer, press **Input, Amptd Ref Out** (Off), then **AMPLITUDE, More, Ref Lvl Offst**, and enter the value recorded in [step 8](#).

14. Connect the 50  $\Omega$  termination to the analyzer input as shown in [Figure 2-55](#).

15. Disconnect the BNC cable and adapter from the AMPTD REF OUT and the 50  $\Omega$  Input.

16. If the analyzer has Option 1DN, 50  $\Omega$  tracking generator, do the following:

- On the analyzer, press **BW/Avg, Res BW, 1 kHz**.
- Press **Source, Amplitude, 0 dBm**.
- Connect a 50  $\Omega$  termination to the RF OUT 50  $\Omega$ .

### Measurement Sequence

The following model-specific DANL Measurement Sequence tables list the procedures to be performed and the parameters to be used in each procedure. Also

**37. Displayed Average Noise Level: Agilent E7403A and E7404A**

listed in the tables are test record entry numbers for recording the results in the performance verification test record.

1. Perform all of the following steps (through [step 5](#)) that apply to your analyzer using the appropriate subsets in [Table 2-83](#) or [Table 2-84](#). Then record the display line amplitude setting as the indicated Test Record entry in the performance verification test record.
2. If the minimum RBW of the analyzer is 10 Hz and Option 1DN (3.0 GHz Tracking Generator) is installed, perform those procedures listed in Subset A in [Table 2-83](#) or [Table 2-84](#).
3. If the minimum RBW of the analyzer is 10 Hz and Option 1DN (3.0 GHz Tracking Generator) is installed, also perform those procedures listed in Subset B in [Table 2-83](#) or [Table 2-84](#).
4. If the minimum RBW of the analyzer is 10 Hz, also perform those procedures listed in Subset C in [Table 2-83](#) or [Table 2-84](#).
5. If the minimum RBW of the analyzer is 10 Hz, also perform those procedures listed in Subset D in [Table 2-83](#) or [Table 2-84](#).
6. After performing all applicable DANL measurement procedures, continue with [Remove Reference Level Offset](#).

**Table 2-83 DANL Measurement Sequence, E7403A**

| Subset | Procedure    | Procedure Parameters |           |          |                    | Test Record Entry <sup>a</sup> |
|--------|--------------|----------------------|-----------|----------|--------------------|--------------------------------|
|        |              | Start Freq           | Stop Freq | Test RBW | Preamplifier State |                                |
| A      | Measure DANL | 10 MHz               | 1 GHz     | 1 kHz    | Off                | 1)                             |
|        | Measure DANL | 1 GHz                | 2 GHz     | 1 kHz    | Off                | 2)                             |
|        | Measure DANL | 2 GHz                | 3 GHz     | 1 kHz    | Off                | 3)                             |
|        | Measure DANL | 3 GHz                | 6 GHz     | 1 kHz    | Off                | 4)                             |
|        | Measure DANL | 6 GHz                | 6.7 GHz   | 1 kHz    | Off                | 5)                             |
| B      | Measure DANL | 10 MHz               | 1 GHz     | 1 kHz    | On                 | 6/17)                          |
|        | Measure DANL | 1 GHz                | 2 GHz     | 1 kHz    | On                 | 7/18)                          |
|        | Measure DANL | 2 GHz                | 3 GHz     | 1 kHz    | On                 | 8/19)                          |
| C      | Measure DANL | 10 MHz               | 1 GHz     | 10 Hz    | Off                | 9)                             |
|        | Measure DANL | 1 GHz                | 2 GHz     | 10 Hz    | Off                | 10)                            |
|        | Measure DANL | 2 GHz                | 3 GHz     | 10 Hz    | Off                | 11)                            |
|        | Measure DANL | 3 GHz                | 6 GHz     | 10 Hz    | Off                | 12)                            |
|        | Measure DANL | 6 GHz                | 6.7 GHz   | 10 Hz    | Off                | 13)                            |
| D      | Measure DANL | 10 MHz               | 1 GHz     | 10 Hz    | On                 | 14/20)                         |



## 37. Displayed Average Noise Level: Agilent E7403A and E7404A

Table 2-83 DANL Measurement Sequence, E7403A

| Subset | Procedure    | Procedure Parameters |           |          |              | Test Record Entry <sup>a</sup> |
|--------|--------------|----------------------|-----------|----------|--------------|--------------------------------|
|        |              | Start Freq           | Stop Freq | Test RBW | Preamp State |                                |
|        | Measure DANL | 1 GHz                | 2 GHz     | 10 Hz    | On           | 15/21)                         |
|        | Measure DANL | 2 GHz                | 3 GHz     | 10 Hz    | On           | 16/22)                         |

- a. There are two possible entries for measurements made with the preamplifier on, depending upon the ambient temperature. The first entry is for measurements made with an ambient temperature outside of the 20° to 30° C range, but within the 0° to 55° C range. The second entry is for measurements made with an ambient temperature within the 20° to 30° C range.

Table 2-84 DANL Measurement Sequence, E7404A

| Subset | Procedure    | Procedure Parameters |           |          |              | Test Record Entry <sup>a</sup> |
|--------|--------------|----------------------|-----------|----------|--------------|--------------------------------|
|        |              | Start Freq           | Stop Freq | Test RBW | Preamp State |                                |
| A      | Measure DANL | 10 MHz               | 1 GHz     | 1 kHz    | Off          | 1)                             |
|        | Measure DANL | 1 GHz                | 2 GHz     | 1 kHz    | Off          | 2)                             |
|        | Measure DANL | 2 GHz                | 3 GHz     | 1 kHz    | Off          | 3)                             |
|        | Measure DANL | 3 GHz                | 6 GHz     | 1 kHz    | Off          | 4)                             |
|        | Measure DANL | 6 GHz                | 12 GHz    | 1 kHz    | Off          | 5)                             |
|        | Measure DANL | 12 GHz               | 13.2 GHz  | 1 kHz    | Off          | 6)                             |
| B      | Measure DANL | 10 MHz               | 1 GHz     | 1 kHz    | On           | 7/19)                          |
|        | Measure DANL | 1 GHz                | 2 GHz     | 1 kHz    | On           | 8/20)                          |
|        | Measure DANL | 2 GHz                | 3 GHz     | 1 kHz    | On           | 9/21)                          |
| C      | Measure DANL | 10 MHz               | 1 GHz     | 10 Hz    | Off          | 10)                            |
|        | Measure DANL | 1 GHz                | 2 GHz     | 10 Hz    | Off          | 11)                            |
|        | Measure DANL | 2 GHz                | 3 GHz     | 10 Hz    | Off          | 12)                            |
|        | Measure DANL | 3 GHz                | 6 GHz     | 10 Hz    | Off          | 13)                            |
|        | Measure DANL | 6 GHz                | 12 GHz    | 10 Hz    | Off          | 14)                            |
|        | Measure DANL | 12 GHz               | 13.2 GHz  | 10 Hz    | Off          | 15)                            |
| D      | Measure DANL | 10 MHz               | 1 GHz     | 10 Hz    | On           | 16/22)                         |
|        | Measure DANL | 1 GHz                | 2 GHz     | 10 Hz    | On           | 17/23)                         |
|        | Measure DANL | 2 GHz                | 3 GHz     | 10 Hz    | On           | 18/24)                         |

**37. Displayed Average Noise Level: Agilent E7403A and E7404A**

- a. There are two possible entries for measurements made with the preamplifier on, depending upon the ambient temperature. The first entry is for measurements made with an ambient temperature outside of the 20° to 30° C range, but within the 0° to 55° C range. The second entry is for measurements made with an ambient temperature within the 20° to 30° C range.

**Measuring Displayed Average Noise Level (DANL)**

Use the following procedure for testing DANL over most frequency ranges. The start and stop frequencies and test RBW (1 kHz or 10 Hz) are specified in the DANL Measurement Sequence Table ([Table 2-83](#) or [Table 2-84](#)).

1. If the test RBW is 10 Hz and the analyzer has Option 1DN (1.5 GHz Tracking Generator) installed, press **Source, Amplitude** (Off).
2. Set the analyzer as follows:

**Auto Couple****FREQUENCY, Start Freq**, (*enter specified start frequency*)**FREQUENCY, Stop Freq**, (*enter specified stop frequency*)**AMPLITUDE, More, Y Axis Units** (or **Amptd Units**), **dBm****AMPLITUDE, -70 dBm****Attenuation 0 dB****AMPLITUDE, More, Ref Lvl Offst**, (*enter Ref Lvl Offset (1 kHz) if test RBW = 1 kHz*)**AMPLITUDE, More, Ref Lvl Offst**, (*enter Ref Lvl Offset (10 Hz) if test RBW = 10 Hz*)**BW/Avg, Res BW, 1 MHz****BW/Avg, Video BW, 10 kHz****AMPLITUDE, More, Int Preamp** (Off) (*if preamp state = Off*)**AMPLITUDE, More, Int Preamp** (On) (*if preamp state = On*)**Sweep, Sweep** (Cont)**Sweep, Sweep Time** (Auto)

3. If the analyzer is equipped with Option 1DN and the current stop frequency is >3 GHz, press **Source, Amplitude** (Off).
4. On the analyzer, press **Single, View/Trace, Trace 1, Clear Write, BW/Avg, Average Type** (Video), **Average, 3, Enter, Single**.

Wait until  $V_{Avg}$  3 is displayed to the left of the graticule (the analyzer will take three sweeps, then stop).

5. On the analyzer, press the following keys:

**Peak Search** (or **Search**)**BW/Avg Average** (Off)**Marker**→, **Mkr**→ **XΦ**

6. If the test RBW is 1 kHz, press **SPAN, 20 kHz**.  
If the test RBW is 10 Hz, press **SPAN, 500 Hz**.
7. If the test RBW is 1 kHz, press **BW/Avg, Res BW, 1 kHz, Video BW, 30 Hz**.

**37. Displayed Average Noise Level: Agilent E7403A and E7404A**

If the test RBW is 10 Hz, press **BW/Avg, Res BW, 10 Hz, Video BW, 1 Hz**.

8. On the analyzer, press **Single** and wait for the new sweep to finish.
9. Read the average of the trace data, ignoring any residual responses. On the analyzer, press **Display, Display Line** (On), and adjust the display line so that it is centered on the average trace noise, ignoring any residual responses (refer to the Residual Responses verification test for any suspect residuals).

**Remove Reference Level Offset**

1. Press **AMPLITUDE, More, Ref Lvl Offst, 0 dB**.
2. On the analyzer, press **Preset**.
3. This performance test is now complete.

---

## 38. Displayed Average Noise Level: Agilent E7405A

This performance test measures the displayed average noise level (DANL) within the frequency range specified. The analyzer input is terminated in its characteristic impedance. If the analyzer is also equipped with a tracking generator (Option 1DN), the tracking generator is also terminated in its characteristic impedance and set for maximum leveled output power.

The test tunes the analyzer frequency across the band and uses the marker to locate the frequency with the highest response. It then reads the average noise in zero span using the minimum resolution bandwidth (RBW) specified for the analyzer. Analyzers having Option 1DN (Tracking Generator) installed are tested in a 1 kHz RBW. All EMC Analyzers have a minimum RBW of 10 Hz. Even though analyzers having Option 1D5 (High Stability Frequency Reference) and firmware revision A.08.00 or later installed have a minimum RBW of 1 Hz, DANL for these analyzers is specified and tested with a 10 Hz RBW.

To reduce measurement uncertainty due to input attenuator switching and resolution bandwidth switching, a reference level offset is added. The 50 MHz alignment signal is used as the amplitude reference for determining the amount of offset required. The offset is removed at the end of the test by pressing instrument preset.

The related adjustment for this procedure is “Frequency Response.”

### Equipment Required

Termination, 50  $\Omega$ , Type-N (m) (2 *required for Option 1DN*)  
Cable, BNC  
Adapter, Type-N (m) to BNC (f)

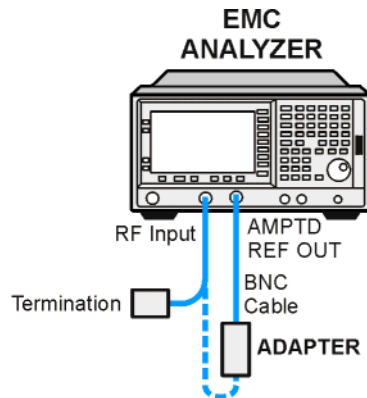
### Additional Equipment for Option BAB

Adapter, APC 3.5 (f) to Type-N (f)

### Procedure

1. Connect the AMPTD REF OUT to the 50  $\Omega$  Input using a BNC cable and adapter as shown in [Figure 2-56](#).

Figure 2-56 Displayed Average Noise Level Test Setup



2. Enter 10 Hz below as the minimum RBW (resolution bandwidth); keep this value in mind as you continue to perform this procedure. Also, take note of whether or not Option 1DN (3.0 GHz Tracking Generator) is installed.

Minimum RBW \_\_\_\_\_ Hz

Option 1DN: \_\_\_\_\_

3. Press **Preset** on the analyzer. Press the **Factory Preset** softkey, if it is displayed. Then press the following keys:

**Input/Output (or Input), Amptd Ref Out (On)**  
**FREQUENCY, Center Freq, 50 MHz**  
**SPAN, 2 kHz**  
**AMPLITUDE, More, Y Axis Units (or Amptd Units), dBm**  
**AMPLITUDE, -20 dBm**  
**AMPLITUDE, Attenuation, 10 dB**  
**BW/Avg, Res BW, 1 kHz**  
**BW/Avg, Video BW, 1 kHz**  
**Det/Demod, Detector, Sample, Return**

4. On the analyzer, press **Single**.
5. On the analyzer, press **Peak Search (or Search)** and record the Ref Amptd reading below.

Ref Amptd \_\_\_\_\_ dBm

6. If the analyzer does not have Option 1DN (3.0 GHz Tracking Generator) installed and the minimum RBW is 10 Hz, continue with [step 12](#).
7. If the analyzer has Option 1DN (3.0 GHz Tracking Generator) installed then continue with [step 8](#).
8. On the analyzer, press the following keys:

**AMPLITUDE, Attenuation, 0 dB**  
**SPAN, 20 kHz**

**38. Displayed Average Noise Level: Agilent E7405A**

**BW/Avg, Res BW, 1 kHz**  
**BW/Avg, Video BW, 30 Hz**

9. On the analyzer, press **Single**.
10. On the analyzer, press **Peak Search** (or **Search**) and record the amplitude reading below as Meas Amptd(1 kHz RBW).

Meas Amptd(1 kHz RBW)\_\_\_\_\_ dB

11. Calculate the necessary reference level offset by subtracting the Meas Amptd in [step 10](#) from the Ref Amptd in [step 5](#). If the calculated Ref Lvl Offset is greater than 0.05 dB or less than -0.05 dB, record the Ref Lvl Offset value below. Otherwise, enter 0.

Ref Lvl Offset(1 kHz RBW) = Ref Amptd – Meas Amptd(1 kHz RBW)

Ref Lvl Offset(1 kHz RBW)\_\_\_\_\_ dB

12. On the analyzer, press the following keys:

**AMPLITUDE, Attenuation, 0 dB**  
**SPAN, 500 Hz**  
**BW/Avg, Res BW, 10 Hz**  
**BW/Avg, Video BW, 1 Hz**

13. On the analyzer, press **Single**.
14. On the analyzer, press **Peak Search** (or **Search**) and record the amplitude reading below as Meas Amptd(10 Hz RBW).

Meas Amptd(10 Hz RBW)\_\_\_\_\_ dB

15. Calculate the necessary reference level offset by subtracting the Meas Amptd in [step 14](#) from the Ref Amptd in [step 5](#). If the calculated Ref Lvl Offset is greater than 0.05 dB or less than -0.05 dB, record the Ref Lvl Offset value below. Otherwise, enter 0.

Ref Lvl Offset(10 Hz RBW) = Ref Amptd – Meas Amptd(10 Hz RBW)

Ref Lvl Offset(10 Hz RBW)\_\_\_\_\_ dB

16. On the analyzer, press **Input, Amptd Ref Out** (Off), then **AMPLITUDE, More, Ref Lvl Offst**, and enter the value recorded in [step 10](#).

17. Connect the 50  $\Omega$  termination to the analyzer input as shown in [Figure 2-56](#).

18. Disconnect the BNC cable and adapter from the AMPTD REF OUT and the 50  $\Omega$  Input.

19. If the analyzer is equipped with Option 1DN, 50  $\Omega$  tracking generator, do the following:

- On the analyzer, press **BW/Avg, Res BW, 1 kHz**.
- Press **Source, Amplitude, 0 dBm**.
- Connect a 50  $\Omega$  termination to the RF OUT 50  $\Omega$ .

**38. Displayed Average Noise Level: Agilent E7405A****Measurement Sequence**

The following model-specific DANL Measurement Sequence table lists the procedures to be performed and the parameters to be used in each procedure. Also listed in the table are test record entry numbers for recording the results in the performance verification test record.

1. Perform all of the following steps (through [step 5](#)) that apply to your analyzer using the appropriate subsets in [Table 2-85](#). Then record the display line amplitude setting as the indicated Test Record entry in the performance verification test record.
2. .
3. If the minimum RBW of the analyzer is 10 Hz and Option 1DN (3.0 GHz Tracking Generator) is installed, perform those procedures listed in Subset A in [Table 2-85](#).
4. If the minimum RBW of the analyzer is 10 Hz and Option 1DN (3.0 GHz Tracking Generator) are installed, also perform those procedures listed in Subset B in [Table 2-85](#).
5. If the minimum RBW of the analyzer is 10 Hz, also perform those procedures listed in Subset C in [Table 2-85](#).
6. If the minimum RBW of the analyzer is 10 Hz, also perform those procedures listed in Subset D in [Table 2-85](#).

**Table 2-85****DANL Measurement Sequence, E7405A**

| Subset | Procedure    | Procedure Parameters |           |          |                    | Test Record Entry <sup>a</sup> |
|--------|--------------|----------------------|-----------|----------|--------------------|--------------------------------|
|        |              | Start Freq           | Stop Freq | Test RBW | Preamplifier State |                                |
| A      | Measure DANL | 10 MHz               | 1 GHz     | 1 kHz    | Off                | 1)                             |
|        | Measure DANL | 1 GHz                | 2 GHz     | 1 kHz    | Off                | 2)                             |
|        | Measure DANL | 2 GHz                | 3 GHz     | 1 kHz    | Off                | 3)                             |
|        | Measure DANL | 3 GHz                | 6 GHz     | 1 kHz    | Off                | 4)                             |
|        | Measure DANL | 6 GHz                | 12 GHz    | 1 kHz    | Off                | 5)                             |
|        | Measure DANL | 12 GHz               | 22 GHz    | 1 kHz    | Off                | 6)                             |
|        | Measure DANL | 22 GHz               | 26.5 GHz  | 1 kHz    | Off                | 7)                             |
| B      | Measure DANL | 10 MHz               | 1 GHz     | 1 kHz    | On                 | 8/21)                          |
|        | Measure DANL | 1 GHz                | 2 GHz     | 1 kHz    | On                 | 9/22)                          |
|        | Measure DANL | 2 GHz                | 3 GHz     | 1 kHz    | On                 | 10/23)                         |

**Table 2-85 DANL Measurement Sequence, E7405A**

| Subset | Procedure    | Procedure Parameters |           |          |              | Test Record Entry <sup>a</sup> |
|--------|--------------|----------------------|-----------|----------|--------------|--------------------------------|
|        |              | Start Freq           | Stop Freq | Test RBW | Preamp State |                                |
| C      | Measure DANL | 10 MHz               | 1 GHz     | 10 Hz    | Off          | 11)                            |
|        | Measure DANL | 1 GHz                | 2 GHz     | 10 Hz    | Off          | 12)                            |
|        | Measure DANL | 2 GHz                | 3 GHz     | 10 Hz    | Off          | 13)                            |
|        | Measure DANL | 3 GHz                | 6 GHz     | 10 Hz    | Off          | 14)                            |
|        | Measure DANL | 6 GHz                | 12 GHz    | 10 Hz    | Off          | 15)                            |
|        | Measure DANL | 12 GHz               | 22 GHz    | 10 Hz    | Off          | 16)                            |
|        | Measure DANL | 22 GHz               | 26.5 GHz  | 10 Hz    | Off          | 17)                            |
| D      | Measure DANL | 10 MHz               | 1 GHz     | 10 Hz    | On           | 18/24)                         |
|        | Measure DANL | 1 GHz                | 2 GHz     | 10 Hz    | On           | 19/25)                         |
|        | Measure DANL | 2 GHz                | 3 GHz     | 10 Hz    | On           | 20/26)                         |

- a. There are two possible entries for measurements made with the preamplifier on, depending upon the ambient temperature. The first entry is for measurements made with an ambient temperature outside of the 20° to 30° C range, but within the 0° to 55° C range. The second entry is for measurements made with an ambient temperature within the 20° to 30° C range.

7. After performing all applicable DANL measurement procedures, continue with [Remove Reference Level Offset](#).

### Measuring Displayed Average Noise Level

Use the following procedure for testing DANL over most frequency ranges. The start and stop frequencies and test RBW (1 kHz or 10 Hz) are specified in the DANL Measurement Sequence Table ([Table 2-85](#)).

1. If the test RBW is 10 Hz and the analyzer has Option 1DN (1.5 GHz Tracking Generator) installed, press **Source, Amplitude** (Off).
2. Set the analyzer as follows:

#### Auto Couple

**FREQUENCY, Start Freq**, (*enter specified start frequency*)

**FREQUENCY, Stop Freq**, (*enter specified stop frequency*)

**AMPLITUDE, More, Y Axis Units** (or **Amptd Units**), **dBm**

**AMPLITUDE, -70 dBm**

**Attenuation, 0 dB**

**AMPLITUDE, More, Ref Lvl Offst**, (*enter Ref Lvl Offset (1 kHz) if test RBW = 1 kHz*)

**AMPLITUDE, More, Ref Lvl Offst**, (*enter Ref Lvl Offset (10 Hz) if test RBW = 10 Hz*)



**38. Displayed Average Noise Level: Agilent E7405A****BW/Avg, Res BW, 1 MHz****BW/Avg, Video BW, 10 kHz****AMPLITUDE, More, Int Preamp** (Off) *(if preamp state = Off)***AMPLITUDE, More, Int Preamp** (On) *(if preamp state = On)***Sweep, Sweep** (Cont)**Sweep, Sweep Time** (Auto)

3. If the analyzer is equipped with Option 1DN and the current stop frequency is >3 GHz, press **Source, Amplitude** (Off).

4. On the analyzer, press **Single, View/Trace, Trace 1, Clear Write, BW/Avg, Average Type (Video), Average, 3, Enter, Single**.

Wait until  $V_{Avg}$  3 is displayed to the left of the graticule (the analyzer will take three sweeps, then stop).

5. On the analyzer, press the following keys:

**Peak Search** (or **Search**)**BW/Avg, Average** (Off)**Marker**→, **Mkr**→ **CF**

6. If the test RBW is 1 kHz, press **SPAN, 20 kHz**.

If the test RBW is 10 Hz, press **SPAN, 500 Hz**.

7. If the test RBW is 1 kHz, press **BW/Avg, Res BW, 1 kHz, Video BW, 30 Hz**.

If the test RBW is 100 Hz, press **BW/Avg, Res BW, 100 Hz, Video BW, 10 Hz**.

If the test RBW is 10 Hz, press **BW/Avg, Res BW, 10 Hz, Video BW, 1 Hz**.

8. On the analyzer, press **Single** and wait for the new sweep to finish.
9. Read the average of the trace data, ignoring any residual responses. On the analyzer, press **Display, Display Line** (On), and adjust the display line so that it is centered on the average trace noise, ignoring any residual responses (refer to the Residual Responses verification test for any suspect residuals).

**Remove Reference Level Offset**

10. Press **AMPLITUDE, More, Ref Lvl Offst, 0 dB**.

11. On the analyzer, press **Preset**.

12. This performance test is now complete.

## 39. Residual Responses

The analyzer input is terminated and the analyzer is swept from 150 kHz to 1 MHz. Then the analyzer is swept in incremental 10 MHz spans from 1 MHz to the upper frequency range. Any responses above the specification are noted.

There are no related adjustment procedures for this performance test.

### Equipment Required

Termination, 50  $\Omega$  Type-N (m)

### Additional Equipment for Option BAB

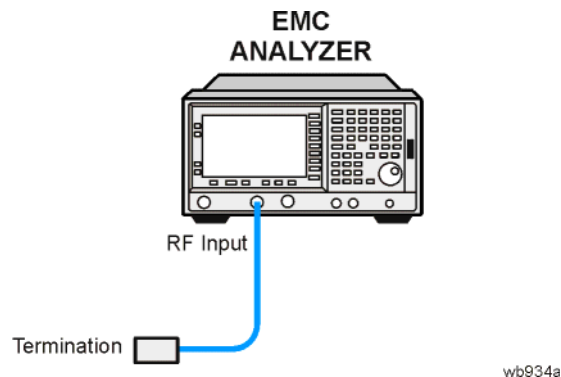
Adapter, Type-N (f) to APC 3.5 (f)

### Procedure

#### 150 kHz to 1 MHz

1. Connect the 50  $\Omega$  termination to the analyzer input as shown in Figure 2-57.

Figure 2-57 Residual Response Test Setup



2. Press **Preset** on the analyzer. Press the **Factory Preset** softkey, if it is displayed. Set the analyzer by pressing the following keys:

**FREQUENCY, Start Freq, 150 kHz**

**FREQUENCY, Stop Freq, 1 MHz**

**AMPLITUDE, More, Y Axis Units (or Amptd Units), dBm**

**AMPLITUDE, -60 dBm**

**AMPLITUDE, Attenuation, 0 dB**

**BW/Avg, 3 kHz**  
**BW/Avg, Video BW, 1 kHz**  
**Display, Display Line On, –90 dBm**

3. Press **Single** and wait for a new sweep to finish. Look for any residual responses at or above the display line.

If a residual is suspected, press **Single** again. A residual response will persist on successive sweeps, but a noise peak will not. Note the frequency and amplitude of any residual responses above the display line in [Table 2-86](#).

4. Press **Preset** on the analyzer. Press the **Factory Preset** softkey, if it is displayed. Set the analyzer by pressing the following keys:

**FREQUENCY, Center Freq, 5.9 MHz**  
**FREQUENCY, CF Step, 9.9 MHz**  
**SPAN, 10 MHz**  
**AMPLITUDE, More, Y Axis Units (or Amptd Units), dBm**  
**AMPLITUDE, –60 dBm**  
**AMPLITUDE, Attenuation, 0 dB**  
**BW/Avg, 10 kHz**  
**BW/Avg, Video BW, 3 kHz**  
**Display, Display Line On, –90 dBm**

5. Repeat [step 6](#) and [step 7](#) until the complete range of frequencies has been checked for the model and frequency ranges below.

| Agilent Model              | Frequency Range  |
|----------------------------|------------------|
| E7401A                     | 1 MHz to 1.5 GHz |
| E7402A                     | 1 MHz to 3.0 GHz |
| E7403A, E7404A, and E7405A | 1 MHz to 6.7 GHz |

6. Press **Single** and wait for a new sweep to finish. Look for any residual responses at or above the display line.

If a residual is suspected, press **Single** again. A residual response will persist on successive sweeps, but a noise peak will not. Record the frequency and amplitude of any residual responses above the display line in [Table 2-86](#).

7. Press **FREQUENCY, Center Freq, ↑**.

If there are any residuals at or near the frequency specification limits (1 MHz, 1.5 GHz, 3 GHz, or 6.7 GHz), it is recommended that a known frequency source be used as a frequency marker. This will ensure that testing is done at or

below the specification limits.

Table 2-86      Residual Responses Worksheet

| Frequency<br>(MHz) | Amplitude<br>(dBm) |
|--------------------|--------------------|
|                    |                    |
|                    |                    |
|                    |                    |
|                    |                    |
|                    |                    |
|                    |                    |
|                    |                    |
|                    |                    |
|                    |                    |

8. Record the highest residual from [Table 2-86](#) as Test Record entry 1 in the performance verification test record. If no residuals are found, then record “N/A” in the performance verification test record.

## 40. Fast Time Domain Amplitude Accuracy: Agilent E7401A, E7402A, E7403A, E7404A, E7405A (Option AYX)

The analyzer amplitude reference signal is used to compare the amplitude level of a normal sweep time ( $\geq 5$  ms) to a fast sweep time ( $\leq 5$  ms) using the marker functions. The difference should be less than the marker readout resolution specification for the fast sweep times.

### Equipment Required

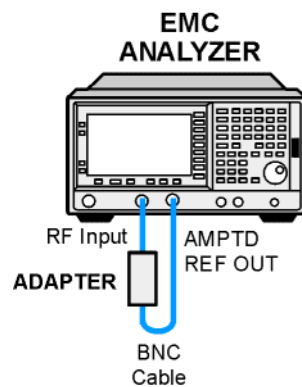
Cable, BNC, 122 cm (48 in)  
Adapter, Type-N (m) to BNC (f)

### Procedure

#### Fast Sweep Time Amplitude Accuracy

1. Connect the equipment as shown in [Figure 2-58](#).

**Figure 2-58** Fast Time Domain Amplitude Accuracy Test Setup



wb98a

**NOTE** No test setup is required for the Agilent E7401A.

2. Press **Preset** on the analyzer. Press the **Factory Preset** softkey, if it is displayed.
3. Set the analyzer as follows:
  - FREQUENCY, 50 MHz**
  - SPAN, Zero Span**
  - Sweep 5 ms**
  - Input/Output (or Input), Amptd Ref (On)** (Agilent E7401A only)

**40. Fast Time Domain Amplitude Accuracy: Agilent E7401A, E7402A, E7403A, E7404A, E7405A (Option AYX)**

**Input/Output** (or **Input**), **Amptd Ref Out** (On) (Agilent E7402A, E7403A, E7404A, and E7405A only)

**AMPLITUDE, Scale Type** (Lin)

**AMPLITUDE, More, Y-Axis Units** (or **Amptd Units**), **Volts**

**AMPLITUDE, Ref Level, 12.57 mV** (Agilent E7401A only)

**AMPLITUDE, Ref Level, 30.73 mV** (Agilent E7402A, E7403A, E7404A, and E7405A only)

4. On the analyzer, press:

**Marker, More 1 of 2, Function**

**Marker Noise, Single**

**Marker, Delta**

**Sweep, 1 ms**

**Single**

5. If the marker delta ( $\Delta \text{Mkr1}$ ) amplitude readout (the second line) is not expressed as a percentage, subtract 1 from the marker delta ( $\Delta \text{Mkr1}$ ) amplitude (ignore the “X”) and multiply the result by 100 to obtain the amplitude error in percent:

$$\text{Amplitude Error} = (\Delta \text{Mkr1} - 1.0) \times 100$$

6. If the marker delta ( $\Delta \text{Mkr1}$ ) amplitude readout is expressed as a percentage, subtract 100% from the marker delta ( $\Delta \text{Mkr1}$ ) amplitude reading to obtain the amplitude error in percent:

$$\text{Amplitude Error} = \Delta \text{Mkr1} - 100\%$$

7. Record the Amplitude Error as Test Record entry 1 in the performance verification test record.

## 41. Tracking Generator Absolute Amplitude and Vernier Accuracy: Agilent E7401A (Option 1DN)

A calibrated power sensor is connected to the tracking generator output to measure the power level at 50 MHz.

The power meter is set to relative mode so that future power level readings are in dB relative to the reference power level setting. The output power level setting is decreased in 1 dB steps and the power level is measured at each step. The difference between the ideal and actual power levels is calculated at each step.

Since a power sweep is accomplished by stepping through the vernier settings, the peak-to-peak variation of the vernier accuracy is equal to the power sweep accuracy.

The related adjustments for this performance test are “Tracking Generator ALC Calibration” and “Tracking Generator Frequency Slope.”

### Equipment Required

Power meter, compatible with power sensor  
RF power sensor, 50  $\Omega$

### Procedure

1. Press **Preset** on the analyzer. Press the **Factory Preset** softkey, if it is displayed. Set the analyzer by pressing the following keys:

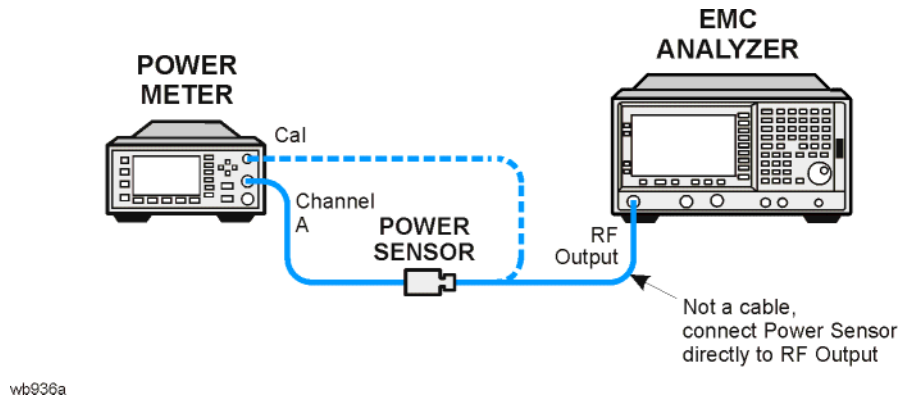
**FREQUENCY, Center Freq, 50 MHz**  
**SPAN, Zero Span**  
**AMPLITUDE, More, Y Axis Units (or Amptd Units), dBm**  
**AMPLITUDE, 0 dBm (Option 1DN)**  
**Source, Amplitude (On), 0 dBm (Option 1DN)**  
**Source, Attenuation, 0 dB**  
**Single**

2. Zero and calibrate the power meter and power sensor in log mode (power reads out in dBm), as described in the power meter operation manual. Enter the 50 MHz Cal Factor of the power sensor into the power meter.
3. Connect the 50  $\Omega$  power sensor to the RF OUT as shown in [Figure 2-59](#).

**41. Tracking Generator Absolute Amplitude and Vernier Accuracy:  
Agilent E7401A (Option 1DN)**

**Figure 2-59**

**Absolute Amplitude, Vernier, and Power Sweep Accuracy Test Setup**



wb936a

4. Read the power level displayed on the power meter and record the result as Test Record entry 1 of the performance verification test record as the Absolute Amplitude Accuracy.

Absolute Amplitude Accuracy at 50 MHz = \_\_\_\_\_ dB

5. Set the power meter to dB relative mode as described in the power meter operation manual so that the readout is in power level relative to the power level at 50 MHz (press **Rel/Offset, Rel**).
6. Set the source amplitude to the settings indicated in [Table 2-87](#).
7. Press **Single** on the analyzer. At each setting, record the power level displayed on the power meter as Measured Power Level in [Table 2-87](#).
8. Calculate the Vernier Accuracy by subtracting the Source Vernier Setting from the Measured Power Level for each Source Amplitude Setting in [Table 2-87](#).

$$\text{Vernier Accuracy} = \text{Measured Power Level (dB)} - \text{Source Vernier Setting (dB)}$$

9. Locate the most positive and most negative Vernier Accuracy Values for Source Vernier Settings of -1 dBm to -10 dBm recorded in [Table 2-87](#). Record the Positive Vernier Accuracy as Test Record entry 2 and the Negative Vernier Accuracy as Test Record entry 3 in the performance verification test record.

Positive Vernier Accuracy \_\_\_\_\_ dB

Negative Vernier Accuracy \_\_\_\_\_ dB

10. Locate the most positive and most negative Vernier Accuracy values for all Source Amplitude Settings in [Table 2-87](#) and record these values below:

Positive Power Sweep Accuracy \_\_\_\_\_ dB

Negative Power Sweep Accuracy \_\_\_\_\_ dB

11. Calculate the Power Sweep Accuracy by subtracting the Negative Power Sweep Accuracy recorded in the previous step from the Positive Power Sweep Accuracy recorded in the previous step. Record the Power Sweep Accuracy as



**41. Tracking Generator Absolute Amplitude and Vernier Accuracy:  
Agilent E7401A (Option 1DN)**

Test Record entry 4 in the performance verification test record.

Power Sweep Accuracy = Positive Power Sweep Accuracy – Negative Power Sweep Accuracy

Power Sweep Accuracy \_\_\_\_\_ dB

**41. Tracking Generator Absolute Amplitude and Vernier Accuracy:  
Agilent E7401A (Option 1DN)**

# 41. Tracking Generator Absolute Amplitude and Vernier Accuracy: Agilent E7401A (Option 1DN)

Table 2-87

Vernier Accuracy Worksheet

| Source Amplitude Setting | Source Vernier Setting | Measured Power Level | Vernier Accuracy |
|--------------------------|------------------------|----------------------|------------------|
| Option 1DN (dBm)         | (dB)                   | (dB)                 | (dB)             |
| 0 (Ref)                  | 0 (Ref)                | NA                   | NA               |
| -1                       | -1                     |                      |                  |
| -2                       | -2                     |                      |                  |
| -3                       | -3                     |                      |                  |
| -4                       | -4                     |                      |                  |
| -5                       | -5                     |                      |                  |
| -6                       | -6                     |                      |                  |
| -7                       | -7                     |                      |                  |
| -8                       | -8                     |                      |                  |
| -9                       | -9                     |                      |                  |
| -10                      | -10                    |                      |                  |
| -11                      | -11                    |                      |                  |
| -12                      | -12                    |                      |                  |
| -13                      | -13                    |                      |                  |
| -14                      | -14                    |                      |                  |
| -15                      | -15                    |                      |                  |

## **42. Tracking Generator Absolute Amplitude and Vernier Accuracy: Agilent E7402A, E7403A, E7404A, and E7405A (Option 1DN)**

A calibrated power sensor is connected to the tracking generator output to measure the power level at 50 MHz.

The power meter is set to relative mode so that future power level readings are in dB relative to the reference power level setting. The output power level setting is decreased in 1 dB steps and the power level is measured at each step. The difference between the ideal and actual power levels is calculated at each step.

Since a power sweep is accomplished by stepping through the vernier settings, the peak-to-peak variation of the vernier accuracy is equal to the power sweep accuracy.

The related adjustment for this performance test is the front panel **Align Now, TG (Ext Cable)** under the **System, Alignments** menu.

### **Equipment Required**

Power meter, compatible with power sensor  
Power sensor, 50  $\Omega$

### **Procedure**

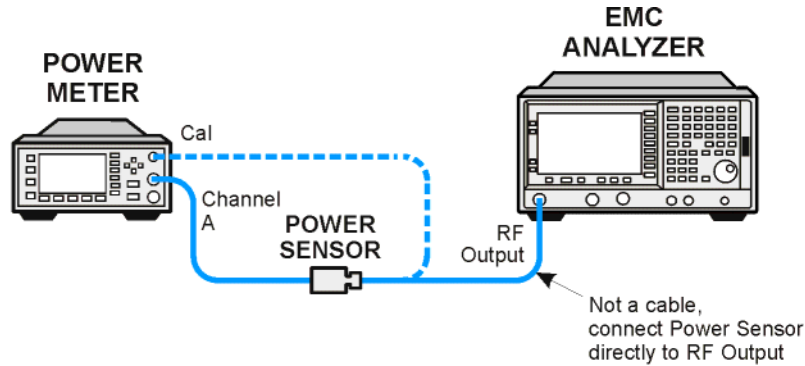
1. Press **Preset** on the analyzer. Press the **Factory Preset** softkey, if it is displayed. Set the analyzer by pressing the following keys:

**FREQUENCY, Center Freq, 50 MHz**  
**SPAN, Zero Span**  
**AMPLITUDE, More, Y Axis Units (or Amptd Units), dBm**  
**AMPLITUDE, 0 dBm**  
**System, Alignments, Auto Align, Off**  
**Source Amptd, Amplitude (On), -20 dBm**  
**Source Amptd, Attenuation (Man), 16 dB**  
**Single Sweep**

2. Zero and calibrate the power meter and power sensor in log mode (power reads out in dBm), as described in the power meter operation manual. Enter the 50 MHz Cal Factor of the power sensor into the power meter.
3. Connect the 50  $\Omega$  power sensor to the RF output as shown in [Figure 2-60](#).

#### 42. Tracking Generator Absolute Amplitude and Vernier Accuracy: Agilent E7402A, E7403A, E7404A, and E7405A (Option 1DN)

**Figure 2-60 Absolute Amplitude, Vernier, and Power Sweep Accuracy Test Setup**



wb936a

- Read the power level displayed on the power meter, add 20 dB, and record the result as Test Record entry 1 of the performance verification test record as the Absolute Amplitude Accuracy.

Absolute Amplitude Accuracy at 50 MHz = \_\_\_\_\_ dB

- Set the power meter to dB relative mode as described in the power meter operation manual so that the readout is in power level relative to the power level at 50 MHz (press **Rel/Offset**, **Rel**).
- Press **Single** on the analyzer. At each setting, record the power level displayed on the power meter in [Table 2-88](#).
- Set the source amplitude to the settings indicated in [Table 2-88](#).

**Table 2-88**

**Vernier and Power Sweep Accuracy Worksheet**

| Source Amplitude Setting (dBm) | Source Vernier Setting (dBm) | Measured Power Level (dB) | Vernier Accuracy (dB) |
|--------------------------------|------------------------------|---------------------------|-----------------------|
| -18                            | -2                           |                           | 2)                    |
| -19                            | -3                           |                           | 3)                    |
| -20 (Ref)                      | -4                           | N/A                       | N/A                   |
| -21                            | -5                           |                           | 4)                    |
| -22                            | -6                           |                           | 5)                    |
| -23                            | -7                           |                           | 6)                    |
| -24                            | -8                           |                           | 7)                    |
| -25                            | -9                           |                           | 8)                    |
| -26                            | -10                          |                           | 9)                    |

- Calculate the Vernier Accuracy by adding 4 dB to the Source Vernier setting

**42. Tracking Generator Absolute Amplitude and Vernier Accuracy:  
Agilent E7402A, E7403A, E7404A, and E7405A (Option 1DN)**

and subtracting the result from the Measured Power Level for each Source Amplitude Setting in [Table 2-88](#).

$$\text{Vernier Accuracy} = \text{Measured Power Level (dB)} - (\text{Source Vernier Setting (dB)} + 4 \text{ dB})$$

9. Record the vernier accuracy values from [Table 2-88](#) as test record entries (TR entries) 2 through 9 in the performance test record.
10. Copy the Absolute Vernier Accuracy values from [Table 2-88](#) into columns 2 and 3 of [Table 2-89 on page 306](#), as indicated by the TR entry numbers.
11. Calculate the Incremental Vernier Accuracy for each Source Vernier Setting by subtracting the Absolute Vernier Accuracy value in Column 3 of [Table 2-89](#) from the Absolute Vernier Accuracy value in Column 2. Record the result in Column 4 of [Table 2-89](#) and in the Performance Test Record as indicated by the TR entry number.

*Example:*

If the Absolute Vernier Accuracy for the  $-7$  dB vernier setting is  $0.23$  dB (TR entry 6) and the Absolute Vernier Accuracy for the  $-8$  dB vernier setting is  $0.08$  dB (TR entry 7), the Incremental Vernier Accuracy for the  $-8$  dB vernier setting would be  $-0.15$  dB ( $-0.15 = 0.08 - 0.23$ ).

**Table 2-89****Incremental Vernier Accuracy Worksheet**

| Column 1                    | Column 2                       | Column 3                       | Column 4                          |
|-----------------------------|--------------------------------|--------------------------------|-----------------------------------|
| Source Vernier Setting (dB) | Absolute Vernier Accuracy (dB) | Absolute Vernier Accuracy (dB) | Incremental Vernier Accuracy (dB) |
| $-2$                        | 2)                             | 3)                             | 10)                               |
| $-3$                        | 3)                             | 0.0                            | 11)                               |
| $-4$                        | 0.0 (Ref)                      | 0.0 (Ref)                      | 0.0 (Ref)                         |
| $-5$                        | 4)                             | 0.0                            | 12)                               |
| $-6$                        | 5)                             | 4)                             | 13)                               |
| $-7$                        | 6)                             | 5)                             | 14)                               |
| $-8$                        | 7)                             | 6)                             | 15)                               |
| $-9$                        | 8)                             | 7)                             | 16)                               |
| $-10$                       | 9)                             | 8)                             | 17)                               |

12. Press **System, Alignments, Auto Align, All**.

## 43. Tracking Generator Level Flatness: Agilent E7401A (Option 1DN)

This test verifies that analyzers with the tracking generator option (1DN) meet their tracking generator level flatness specification. A calibrated power sensor is connected to the tracking generator output to measure the power level at 50 MHz. The power meter is set for dB relative mode so that future power level readings are in dB, relative to the power level at 50 MHz.

Next, the tracking generator is stepped to several frequencies throughout its range, and the output power difference relative to the power level at 50 MHz is measured for each frequency recorded.

For frequencies below 100 kHz, a digital voltmeter and precision 50  $\Omega$  termination are used to measure the power of the tracking generator output. The DVM is set to read out in dBm using the MATH function with R value set to 50  $\Omega$ . The following equation is used to calculate dBm:

$$\text{dBm} = 10 \log_{10}((E^2/R)/1\text{mW})$$

The DVM readout is corrected by making the readings relative to the 100 kHz reading from the power sensor.

*Option 1DN, 50  $\Omega$  tracking generators are tested from 9 kHz to 1500 MHz.*

The related adjustments for this procedure are “Tracking Generator ALC Calibration” and “Tracking Generator Frequency Slope.”

### Equipment Required

- Power meter
- Power sensor, 50  $\Omega$ , 100 kHz to 1.5 GHz
- Digital multimeter
- Termination, 50  $\Omega$
- Cable, BNC
- Adapter, Type-N tee, (m) (f) (f)
- Adapter, Type-N (m) to BNC (f)
- Adapter, BNC (f) to dual banana plug

### Procedure

#### Tracking Generator Level Flatness, Center Frequency $\geq 100$ kHz

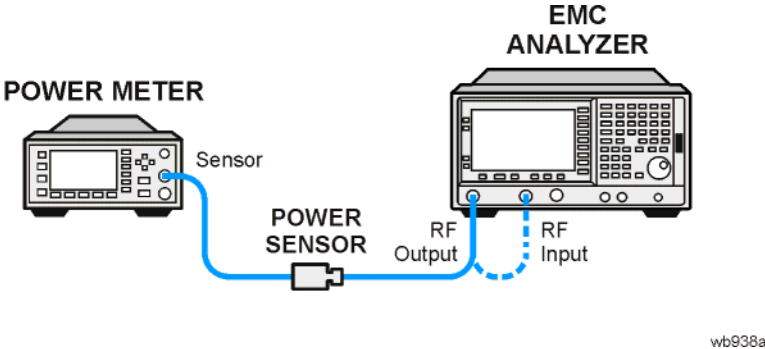
1. Press **Preset** on the analyzer. Press the **Factory Preset** softkey, if it is displayed.

Performance Verification Tests

**43. Tracking Generator Level Flatness: Agilent E7401A (Option 1DN)**

2. Set the analyzer by pressing the following keys:
- FREQUENCY, Center Freq, 50 MHz**  
**FREQUENCY, CF Step, 150 MHz**  
**SPAN, Zero Span**  
**Source, Amplitude On, +107 dB $\mu$ V (Option 1DN)**  
**Single**
3. Zero and calibrate the power meter with the power sensor in log mode (power reads out in dBm), as described in the power meter operation manual.
4. Connect the power sensor to the RF Out on the analyzer. See [Figure 2-61](#).

**Figure 2-61**      **Tracking Generator Level Flatness Test Setup,  $\geq 100$  kHz**



5. Set the power meter to relative mode, as described in the power meter operation manual. Power levels now read out in power level relative to the power level at 50 MHz.

Perform the next four steps for each measurement value in [Table 2-90](#).

1. Set the center frequency of the analyzer according to the values in [Table 2-90](#).  
For 100 kHz, press **FREQUENCY, Center Freq, 100 kHz**.  
The **step up key** ( $\uparrow$ ) may be used to tune to center frequencies above 100 MHz.
2. Press **Single** on the analyzer.
3. Enter the appropriate power sensor Cal Factor into the power meter as indicated in [Table 2-90](#).
4. Record the power level displayed on the power meter in the Level Flatness column in [Table 2-90](#).

**Table 2-90**      **Tracking Generator Level Flatness Worksheet,  $\geq 100$  kHz**

| Center Frequency | Level Flatness (dB) | Cal Factor (MHz) |
|------------------|---------------------|------------------|
| 100 kHz          |                     | 0.1              |
| 300 kHz          |                     | 0.3              |



**43. Tracking Generator Level Flatness: Agilent E7401A (Option 1DN)****Table 2-90****Tracking Generator Level Flatness Worksheet,  $\geq 100$  kHz**

| Center Frequency | Level Flatness (dB) | Cal Factor (MHz) |
|------------------|---------------------|------------------|
| 500 kHz          |                     | 0.3              |
| 1 MHz            |                     | 1                |
| 2 MHz            |                     | 3                |
| 5 MHz            |                     | 3                |
| 10 MHz           |                     | 10               |
| 20 MHz           |                     | 30               |
| 40 MHz           |                     | 50               |
| 50 MHz           | 0 (Ref)             | 50               |
| 80 MHz           |                     | 100              |
| 100 MHz          |                     | 100              |
| 250 MHz          |                     | 300              |
| 400 MHz          |                     | 300              |
| 550 MHz          |                     | 300              |
| 700 MHz          |                     | 1000             |
| 850 MHz          |                     | 1000             |
| 1000 MHz         |                     | 1000             |
| 1150 MHz         |                     | 1000             |
| 1300 MHz         |                     | 1000             |
| 1450 MHz         |                     | 1000             |
| 1500 MHz         |                     | 2000             |

5. Disconnect the power sensor from the RF Out on the analyzer.

Tracking Generator Level Flatness, Center Frequency  $\leq 100$  kHz

1. Set up the digital multimeter as follows.

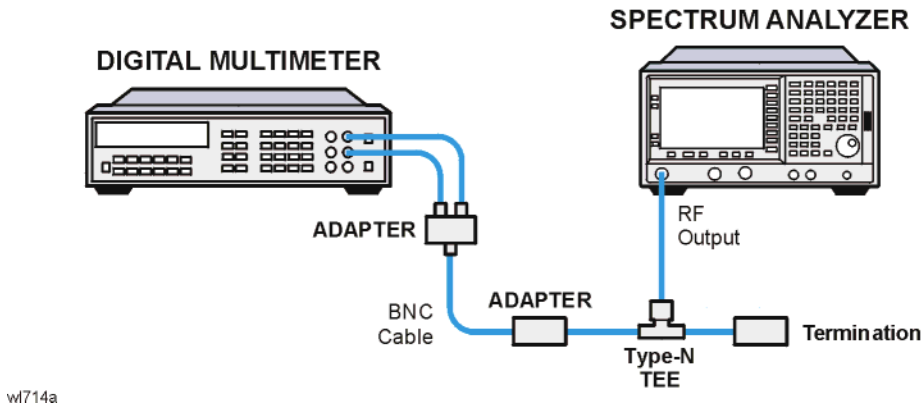
| Parameter                    | Setting               |
|------------------------------|-----------------------|
| AC/DC                        | AC Volts              |
| Impedance & Units:           |                       |
| Set to 50 $\Omega$ impedance | SMATH 10 <sup>a</sup> |
| Set to dBm                   | MATH 5 <sup>a</sup>   |
| Set to Synchronous           | SETACV 3 <sup>a</sup> |
| Sub-sampled mode             |                       |

- a. To set the Agilent 3458A multimeter functions from the front panel, press the blue shift key, then Recall State (T) key. Use the  $\uparrow$  (up) and  $\downarrow$  (down) arrows to select the appropriate function, then enter the value from the numeric keypad and press enter.

**NOTE** Perform [step 2](#) to [step 7](#) for each measurement value in [Table 2-92](#).

2. Refer to [Figure 2-62](#) to set up the equipment.

**Figure 2-62** Tracking Generator Level Flatness Test Setup,  $\leq 100$  kHz



3. To set the analyzer center frequency to 9 kHz, press **FREQUENCY, Center Freq, 9 kHz** (or as indicated in [Table 2-91](#)).
4. Press **Single**.
5. Record the DVM readout in [Table 2-91](#).
6. Subtract the 100 kHz Level Flatness readout in [Table 2-90](#) from the 100 kHz DVM Readout in [Table 2-91](#) and record as the DVM Offset at 100 kHz.

DVM Offset at 100 kHz \_\_\_\_\_ dB

**43. Tracking Generator Level Flatness: Agilent E7401A (Option 1DN)**

For example, if the Level Flatness reading from [Table 2-90](#) is 0.7 dB and the DVM Readout from [Table 2-91](#) is –0.53 dBm, the DVM offset would be –1.23 dB.

$$\text{DVM Offset} = \text{DVM Readout} - \text{Level Flatness}$$

7. Add the DVM Offset at 100 kHz from [step 6](#), above, to each of the DVM Readouts in [Table 2-91](#) and record as the Corrected Level Flatness in Column 3.

For example, if the DVM Readout from [Table 2-91](#) is 0.22 dBm, and the DVM Offset is –1.23 dB, the Corrected Level Flatness would be –1.01 dB.

$$\text{Corrected Level Flatness} = \text{DVM} + \text{DVM Offset}$$

**Table 2-91****Tracking Generator Level Flatness Worksheet, ≤100 kHz**

| Center Frequency | DVM Readout (dBm) | Corrected Level Flatness (dB) |
|------------------|-------------------|-------------------------------|
| 9 kHz            |                   |                               |
| 20 kHz           |                   |                               |
| 40 kHz           |                   |                               |
| 60 kHz           |                   |                               |
| 80 kHz           |                   |                               |
| 100 kHz          |                   |                               |

8. Locate the most positive Level Flatness reading in [Table 2-90](#) and [Table 2-91](#) for frequencies <1 MHz and enter this value as Test Record entry 1 of the performance verification test record.
9. Locate the most negative Level Flatness reading in [Table 2-90](#) and [Table 2-91](#) for frequencies <1 MHz and enter this value as Test Record entry 2 of the performance verification test record.
10. Locate the most positive Level Flatness reading in [Table 2-90](#) and [Table 2-91](#) for frequencies ≥1 MHz and ≤10 MHz and enter this value as Test Record entry 3 of the performance verification test record.
11. Locate the most negative Level Flatness reading in [Table 2-90](#) and [Table 2-91](#) for frequencies ≥1 MHz and ≤10 MHz and enter this value as Test Record entry 4 of the performance verification test record.
12. Locate the most positive Level Flatness reading in [Table 2-90](#) for frequencies

**43. Tracking Generator Level Flatness: Agilent E7401A (Option 1DN)**

$\geq 10$  MHz and  $\leq 1.5$  GHz and enter this value as Test Record entry 5 of the performance verification test record.

13. Locate the most negative Level Flatness reading in [Table 2-90](#) for frequencies  $\geq 10$  MHz and  $\leq 1.5$  GHz and enter this value as Test Record entry 6 of the performance verification test record.

## 44. Tracking Generator Level Flatness: Agilent E7402A, E7403A, E7404A, and E7405A (Option 1DN)

This test verifies that analyzers with the tracking generator option 1DN meet their tracking generator level flatness specification. In this test, a calibrated power sensor is connected to the tracking generator output to measure the power level at 50 MHz. The power meter is set for dB Relative mode so that future power level readings are in dB, relative to the power level at 50 MHz.

Next, the tracking generator is stepped to several frequencies throughout its range, and the output power difference relative to the power level at 50 MHz is measured for each frequency recorded.

For frequencies below 100 kHz, a digital voltmeter and precision 50  $\Omega$  termination are used to measure the power of the tracking generator output. The DVM is set to read out in dBm using the MATH function with R value set to 50  $\Omega$ . The following equation is used to calculate dBm:

$$\text{dBm} = 10 \log_{10}((E^2/R)/1\text{mW})$$

The DVM readout is corrected by making the readings relative to the 100 kHz reading from the power sensor.

- *Option 1DN, 50  $\Omega$  tracking generators are tested from 9 kHz to 3000 MHz.*

The related adjustment for this performance test is the front panel **Align Now, TG (Ext Cable)** under the **System, Alignments** menu.

### Equipment Required

Power meter  
Power sensor, 50  $\Omega$   
Digital multimeter  
Termination, 50  $\Omega$   
Cable, BNC  
Cable, Type-N (m) (m)  
Adapter, Type-N tee, (m) (f) (f)  
Adapter, Type-N (m) to BNC (f)  
Adapter, BNC (f) to dual banana plug

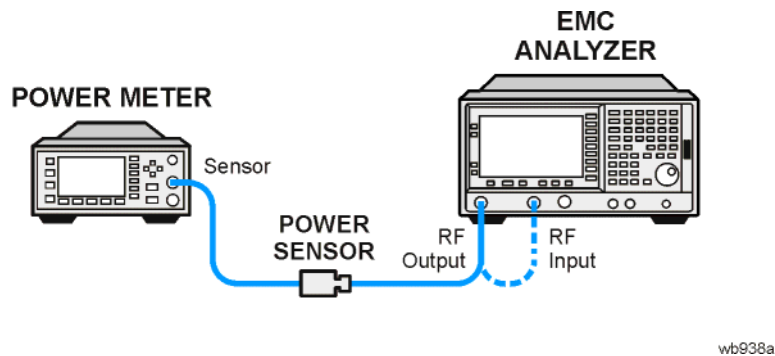
### Procedure

#### 44. Tracking Generator Level Flatness: Agilent E7402A, E7403A, E7404A, and E7405A (Option 1DN)

### Tracking Generator Level Flatness, Center Frequency ≥100 kHz

1. Press **Preset** on the analyzer. Press the **Factory Preset** softkey, if it is displayed.
2. Connect the Type-N cable between the RF Input and the tracking generator RF OUT, as shown in [Figure 2-63](#). Do not connect the power sensor to the analyzer yet.

**Figure 2-63**      **Tracking Generator Level Flatness Test Setup ≥100 kHz**



3. Set the analyzer by pressing the following keys:  
**FREQUENCY, Center Freq, 50 MHz**  
**FREQUENCY, CF Step, 150 MHz**  
**SPAN, Zero Span**  
**System, Alignments, Auto Align, Off**  
**Marker**  
**Source, Amplitude (On),**  
**Source, More, Tracking Peak** (*Wait for the Peaking message to disappear.*)  
**Source, Amplitude, +87 dB $\mu$ V**  
**Single**
4. Disconnect the Type-N cable.
5. Zero and calibrate the power meter with the power sensor in log mode (power reads out in dBm), as described in the power meter operation manual.
6. Connect the 50  $\Omega$  power sensor to the RF OUT 50  $\Omega$  on the analyzer. See [Figure 2-63](#).
7. Set the power meter to relative mode, as described in the power meter operation manual. Power levels now read out in power level relative to the power level at 50 MHz.

Perform the next four steps for each measurement value in [Table 2-92](#).

8. Set the center frequency of the analyzer according to the values in [Table 2-92](#). For 100 kHz, press **FREQUENCY, Center Freq, 100 kHz**. The  $\uparrow$  (step up key) may be used to tune to most center frequencies above 100 MHz.

#### 44. Tracking Generator Level Flatness: Agilent E7402A, E7403A, E7404A, and E7405A (Option 1DN)

9. Press **Single** on the analyzer.
10. Enter the appropriate power sensor Cal Factor into the power meter as indicated in [Table 2-92](#).
11. Record the power level displayed on the power meter in the Level Flatness column in [Table 2-92](#).

Table 2-92

Tracking Generator Level Flatness Worksheet,  $\geq 100$  kHz

| Center Frequency | Level Flatness (dB) | Cal Factor (MHz) |
|------------------|---------------------|------------------|
| 100 kHz          |                     | 0.1              |
| 300 kHz          |                     | 0.3              |
| 500 kHz          |                     | 0.3              |
| 1 MHz            |                     | 1                |
| 2 MHz            |                     | 3                |
| 5 MHz            |                     | 3                |
| 10 MHz           |                     | 10               |
| 20 MHz           |                     | 30               |
| 40 MHz           |                     | 50               |
| 50 MHz           | 0 (Ref)             | 50               |
| 80 MHz           |                     | 100              |
| 100 MHz          |                     | 100              |
| 250 MHz          |                     | 300              |
| 400 MHz          |                     | 300              |
| 550 MHz          |                     | 300              |
| 700 MHz          |                     | 1000             |
| 850 MHz          |                     | 1000             |
| 1000 MHz         |                     | 1000             |
| 1150 MHz         |                     | 1000             |
| 1300 MHz         |                     | 1000             |
| 1450 MHz         |                     | 1000             |
| 1600 MHz         |                     | 2000             |
| 1750 MHz         |                     | 2000             |
| 1900 MHz         |                     | 2000             |
| 2050 MHz         |                     | 2000             |

Table 2-92 Tracking Generator Level Flatness Worksheet,  $\geq 100$  kHz

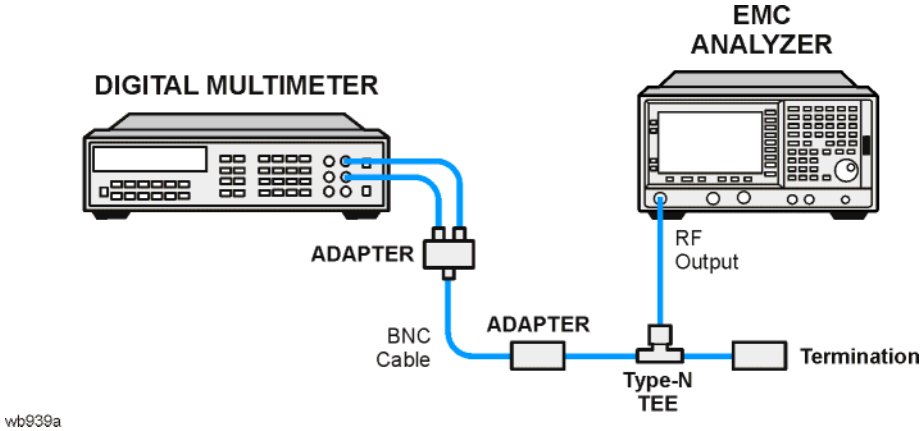
| Center Frequency | Level Flatness (dB) | Cal Factor (MHz) |
|------------------|---------------------|------------------|
| 2200 MHz         |                     | 2000             |
| 2350 MHz         |                     | 2000             |
| 2500 MHz         |                     | 3000             |
| 2650 MHz         |                     | 3000             |
| 2800 MHz         |                     | 3000             |
| 2950 MHz         |                     | 3000             |
| 3000 MHz         |                     | 3000             |

12. See Figure 2-63. Disconnect the power sensor from the RF Out 50  $\Omega$  on the analyzer.

Tracking Generator Level Flatness, Center Frequency  $\leq 100$  kHz

1. Refer to Figure 2-64 to set up the equipment.

Figure 2-64 Tracking Generator Level Flatness Test Setup,  $\leq 100$  kHz



Set up the digital multimeter as follows.

| Parameter                    | Setting               |
|------------------------------|-----------------------|
| AC/DC                        | AC Volts              |
| Impedance & Units:           |                       |
| Set to 50 $\Omega$ impedance | SMATH 10 <sup>a</sup> |
| Set to dBm                   | MATH 5 <sup>a</sup>   |



#### 44. Tracking Generator Level Flatness: Agilent E7402A, E7403A, E7404A, and E7405A (Option 1DN)

| Parameter          | Setting               |
|--------------------|-----------------------|
| Set to Synchronous | SETACV 3 <sup>a</sup> |
| Sub-sampled mode   |                       |

- a. To set the Agilent 3458A multimeter functions from the front panel, press the blue shift key, then Recall State (T) key. Use the ↑ (up) and ↓ (down) arrows to select the appropriate function, then enter the value from the numeric keypad and press enter.
2. Set the analyzer resolution bandwidth to 10 kHz by pressing **BW/Avg, Res BW, 10 kHz**.  
Repeat [step 3](#) through [step 7](#) for each Center Frequency value in [Table 2-93](#).
3. Set the analyzer center frequency to 9 kHz, by pressing **FREQUENCY, Center Freq, 9 kHz**.
4. Press **Single**.
5. Record the DVM readout in [Table 2-93](#).
6. Subtract the 100 kHz Level Flatness readout in [Table 2-92](#) from the 100 kHz DVM Readout in [Table 2-93](#) and record as the DVM Offset at 100 kHz.

DVM Offset at 100 kHz \_\_\_\_\_ dB

For example, if the Level Flatness reading from [Table 2-92](#) is 0.7 dB and the DVM Readout from [Table 2-93](#) is –0.53 dBm, the DVM offset would be –1.23 dB.

$$\text{DVM Offset} = \text{DVM Readout} - \text{Level Flatness}$$

7. Add the DVM Offset at 100 kHz from [step 6](#), above, to each of the DVM Readouts in [Table 2-93](#) and record as the Corrected Level Flatness in Column 3.

For example, if the DVM Readout from [Table 2-93](#) is 0.22 dBm, and the DVM Offset is –1.23 dB, the Corrected Level Flatness would be –1.01 dB.

$$\text{Corrected Level Flatness} = \text{DVM Readout} + \text{DVM Offset}$$

8. Press **System, Alignments, Auto Align, All**.

Table 2-93

Tracking Generator Level Flatness Worksheet, 100 kHz

| Center Frequency | DVM Readout (dBm) | Corrected Level Flatness (dB) |
|------------------|-------------------|-------------------------------|
| 9 kHz            |                   |                               |
| 20 kHz           |                   |                               |

**44. Tracking Generator Level Flatness: Agilent E7402A, E7403A, E7404A, and E7405A (Option 1DN)****Table 2-93****Tracking Generator Level Flatness Worksheet, 100 kHz**

| Center Frequency | DVM Readout (dBm) | Corrected Level Flatness (dB) |
|------------------|-------------------|-------------------------------|
| 40 kHz           |                   |                               |
| 60 kHz           |                   |                               |
| 80 kHz           |                   |                               |
| 100 kHz          |                   |                               |

1. Locate the most positive Level Flatness reading in [Table 2-92](#) and [Table 2-93](#) for frequencies <1 MHz and enter this value as Test Record entry 1 of the performance verification test record.
2. Locate the most negative Level Flatness reading in [Table 2-92](#) and [Table 2-93](#) for frequencies <1 MHz and enter this value as Test Record entry 2 of the performance verification test record.
3. Locate the most positive Level Flatness reading in [Table 2-92](#) and [Table 2-93](#) for frequencies  $\geq 1$  MHz and  $\leq 10$  MHz and enter this value as Test Record entry 3 of the performance verification test record.
4. Locate the most negative Level Flatness reading in [Table 2-92](#) and [Table 2-93](#) for frequencies  $\geq 1$  MHz and  $\leq 10$  MHz and enter this value as Test Record entry 4 of the performance verification test record.
5. Locate the most positive Level Flatness reading in [Table 2-92](#) for frequencies  $\geq 10$  MHz and  $\leq 1.5$  GHz and enter this value as Test Record entry 5 of the performance verification test record.
6. Locate the most negative Level Flatness reading in [Table 2-92](#) for frequencies  $\geq 10$  MHz and  $\leq 1.5$  GHz and enter this value as Test Record entry 6 of the performance verification test record.
7. Locate the most positive Level Flatness reading in [Table 2-92](#) for frequencies >1.5 GHz and enter this value as Test Record entry 7 of the performance verification test record.
8. Locate the most negative Level Flatness reading in [Table 2-92](#) for frequencies >1.5 GHz and enter this value as Test Record entry 8 of the performance verification test record.

## 45. Tracking Generator Harmonic Spurious Outputs: Agilent E7401A (Option 1DN)

The measurement for tracking generator harmonic spurious outputs determines the maximum level of tracking generator harmonics. The tracking generator output is connected to the input of a microwave analyzer, then tuned to several different frequencies as the amplitude of the second and third harmonics relative to the fundamental are measured at each frequency.

There are no related adjustment procedures for this performance test.

### Equipment Required

Microwave analyzer  
 Cable, Type-N, 62 cm (24 in)  
 Cable, BNC to BNC, 23 cm (9 in)  
 Adapter, Type-N (m) to BNC (f)

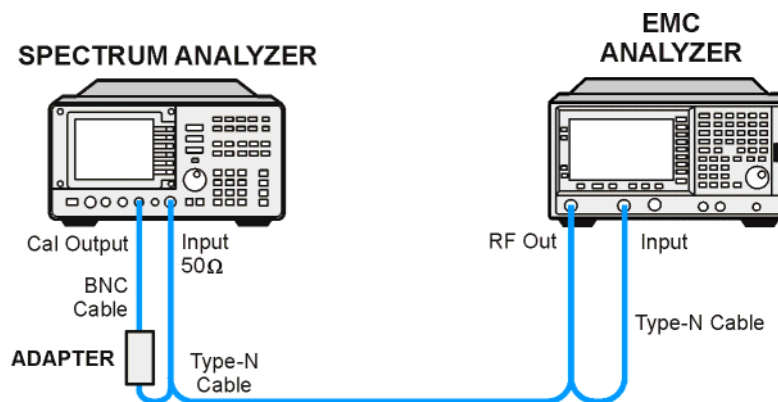
### Procedure

#### NOTE

The following steps are for an Agilent 8563E microwave analyzer, the steps may be different if you are using another microwave analyzer.

1. Connect the 10 MHz reference output from the microwave analyzer to the 10 MHz reference input of the analyzer as shown in [Figure 2-65](#).

**Figure 2-65** Harmonic Spurious Outputs Test Setup



wb940a

2. Complete this step only if more than 24 hours have elapsed since performing a front-panel calibration of the microwave analyzer.

*The microwave analyzer should be allowed to warm up for at least 5 minutes before proceeding.*

**45. Tracking Generator Harmonic Spurious Outputs: Agilent E7401A (Option 1DN)**

Complete a front-panel calibration of the microwave analyzer by performing the following steps:

- a. Preset the microwave analyzer.
  - b. Connect a BNC cable between CAL OUTPUT and 50  $\Omega$  Input.
  - c. Press **CAL, REALIGN LO & IF**.
  - d. Set **FREQUENCY, 300 MHz**.
  - e. Set **SPAN, 20 MHz**.
  - f. Set **AMPLITUDE, -10 dBm**.
  - g. Press **PEAK SEARCH**.
  - h. Press **CAL, REF LVL ADJ** and use the  $\uparrow \downarrow$  arrows to adjust the DAC value to a marker amplitude reading of -10 dBm. Press **STORE REF LVL**.
  - i. Disconnect the BNC cable from between the CAL OUTPUT and 50  $\Omega$  Input.
3. Press **Preset** on the analyzer under test. Press the **Factory Preset** softkey, if it is displayed.
  4. Set the analyzer by pressing the following keys:
 

**FREQUENCY, Center Freq, 10 MHz**  
**SPAN, Zero Span**  
**BW/Avg, 10 kHz**  
**Source, Amplitude (On)**  
**Source, Amplitude (On), +107 dB $\mu$ V**  
**Single**
  5. Set the microwave analyzer controls as follows:
 

**FREQUENCY, 10 MHz**  
**FREQUENCY, CF STEP, 10 MHz**  
**SPAN, 10 kHz**  
**AMPLITUDE, 5 dBm**  
**BW, 1 kHz**
  6. Refer to [Figure 2-65](#) to connect the Type-N cable from the spectrum analyzer RF OUT to the input of the microwave analyzer.

**NOTE**

The following steps are for an Agilent 8563E microwave analyzer, the steps may be different if you are using another microwave analyzer.

Perform [step 7](#) and [step 8](#) for each measurement value in [Table 2-94](#).

7. Set the analyzer center frequency to the next frequency listed in [Table 2-94](#). Similarly, set the microwave analyzer frequency and step size to match the analyzer center frequency. Press **Single** on the analyzer.
8. On the microwave analyzer:

#### 45. Tracking Generator Harmonic Spurious Outputs: Agilent E7401A (Option 1DN)

- a. Press **MKR, SIG TRK** (On). Wait for the signal to be displayed at center screen.
- b. Press **PEAK SEARCH, MKR, SIG TRK** (Off), **MARKER DELTA**.
- c. Press **FREQUENCY** and  $\uparrow$  (step-up key) to tune to the second harmonic.
- d. Press **PEAK SEARCH** and record the marker amplitude reading in [Table 2-94](#) as the 2nd Harmonic Level for the appropriate Tracking Generator Output Frequency.
- e. Perform this step only if the Tracking Generator Output Frequency is  $\leq 500$  MHz. Press **FREQUENCY** and  $\uparrow$  (step-up key) to tune to the third harmonic. Press **PEAK SEARCH**.

Record the marker amplitude reading in [Table 2-94](#) as the 3rd Harmonic Level for the appropriate Tracking Generator Output Frequency.

- f. Press **MKR, MARKERS** (Off).

**Table 2-94**

**Tracking Generator Harmonic Spurious Response Worksheet**

| 1.5 GHz<br>Tracking Generator<br>Output Frequency | 2nd Harmonic Level<br>(dBc) | 3rd Harmonic Level<br>(dBc) |
|---|-----------------------------|-----------------------------|
| 10 MHz  |                             |                             |
| 100 MHz   |                             |                             |
| 300 MHz   |                             |                             |
| 750 MHz   |                             | N/A                         |

9. From [Table 2-94](#), enter the 2nd Harmonic Level at 10 MHz as Test Record entry 1 and copy this value into the performance verification test record.
  - Test Record entry 1:  
TG 2nd Harmonic Spurious Output \_\_\_\_\_ dB
10. From [Table 2-94](#), locate the most positive 2nd Harmonic Level for tracking generator frequencies of 100 MHz to 750 MHz and record this value as Test Record entry 2 and copy this value into the performance verification test record.
  - Test Record entry 2:  
TG 2nd Harmonic Spurious Output \_\_\_\_\_ dB
11. From [Table 2-94](#), enter the 3rd Harmonic Level at 10 MHz as Test Record entry 3 and copy this value into the performance verification test record.
  - Test Record entry 3:  
TG 3rd Harmonic Spurious Output \_\_\_\_\_ dB
12. From [Table 2-94](#), locate the most positive 3rd Harmonic Level for tracking generator frequencies of 100 MHz to 750 MHz and record this value as Test Record entry 4 and copy this value into the performance verification test

**45. Tracking Generator Harmonic Spurious Outputs: Agilent E7401A (Option 1DN)**

record.

- Test Record entry 4:  
TG 3rd Harmonic Spurious Output \_\_\_\_\_ dB

## 46. Tracking Generator Harmonic Spurious Outputs: Agilent E7402A, E7403A, E7404A, and E7405A (Option 1DN)

The measurement for tracking generator harmonic spurious outputs determines the maximum level of tracking generator harmonics. The tracking generator output is connected to the input of a microwave analyzer, then tuned to several different frequencies as the amplitude of the second and third harmonics (relative to the fundamental) are measured at each frequency.

There are no related adjustment procedures for this performance test.

### Equipment Required

Microwave analyzer  
 Cable, Type-N, 62 cm (24 in)  
 Cable, BNC to BNC, 23 cm (9 in)  
 Adapter, Type-N (m) to BNC (f)

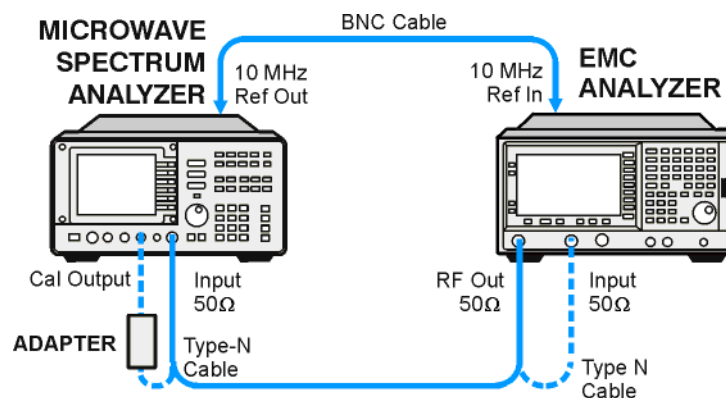
### Procedure

#### NOTE

The following steps are for an Agilent 8563E microwave analyzer, the steps may be different if you are using another microwave analyzer.

1. Use the Type-N cable to connect the RF INPUT to the tracking generator RF OUT as shown in Figure 2-66. Do not connect the Type-N cable to the microwave analyzer yet. Connect the 10 MHz Reference from the output of the microwave analyzer to the 10 MHz Reference Input of the analyzer being tested.

Figure 2-66 Harmonic Spurious Outputs Test Setup



wb941a

**46. Tracking Generator Harmonic Spurious Outputs: Agilent E7402A, E7403A, E7404A, and E7405A (Option 1DN)****NOTE**

*Complete this step only if more than 24 hours have elapsed since performing a front-panel calibration of the microwave analyzer.*

*The microwave analyzer should be allowed to warm up for at least 5 minutes before proceeding.*

Complete a front-panel calibration of the microwave analyzer by performing the following steps:

- a. Preset the microwave analyzer.
  - b. Connect a BNC cable between CAL OUTPUT and 50  $\Omega$  Input.
  - c. Press **CAL, REALIGN LO & IF**.
  - d. Set **FREQUENCY, 300 MHz**.
  - e. Set **SPAN, 20 MHz**.
  - f. Set **AMPLITUDE, -10 dBm**.
  - g. Press **PEAK SEARCH**.
  - h. Press **CAL, REF LVL ADJ** and use the  $\uparrow \downarrow$  arrows to adjust the DAC value to a marker amplitude reading of -10 dBm. Press **STORE REF LVL**.
  - i. Disconnect the BNC cable from between the CAL OUTPUT and 50  $\Omega$  Input.
2. Press **Preset** on the analyzer. Press the **Factory Preset** softkey, if it is displayed.
  3. Set the analyzer under test by pressing the following keys:
 

**FREQUENCY, Center Freq, 10 MHz**  
**SPAN, Zero Span**  
**BW/Avg, 10 kHz**  
**System, Alignments, Auto Align, Off**  
**Marker**  
**Source, Amplitude (On)**  
**Source, Tracking Peak** (*Wait for the Peaking message to appear.*)  
**Source, Amplitude (On), +105 dB $\mu$ V**  
**Single**
  4. Set the microwave analyzer controls as follows:
 

**FREQUENCY, 9 kHz**  
**FREQUENCY, CF STEP, 9 kHz**  
**SPAN, 10 kHz**  
**AMPLITUDE, 5 dBm**  
**BW, 1 kHz**
  5. Disconnect the Type-N cable from between the analyzer RF INPUT and the tracking generator RF OUT. Refer to [Figure 2-66](#) to connect the Type-N cable



#### 46. Tracking Generator Harmonic Spurious Outputs: Agilent E7402A, E7403A, E7404A, and E7405A (Option 1DN)

from the analyzer RF OUT to the input of the microwave analyzer.

#### NOTE

The following steps are for an Agilent 8563E microwave analyzer, the steps may be different if you are using another microwave analyzer.

Perform [step 6](#) and [step 7](#) for each measurement value in [Table 2-95](#).

6. Set the analyzer under test center frequency to the next frequency listed in [Table 2-95](#). Similarly, set the microwave analyzer frequency and step size to match the analyzer under test center frequency. Press **Single** on the analyzer under test.

7. On the microwave analyzer:

- a. Press **MKR, SIG TRK** (On). Wait for the signal to be displayed at center screen.
- b. Press **PEAK SEARCH, MKR, SIG TRK** (Off), **MARKER DELTA**.
- c. Press **FREQUENCY** and  $\uparrow$  (step up key) to tune to the second harmonic.
- d. Press **PEAK SEARCH** and record the marker amplitude reading in [Table 2-95](#) as the 2nd Harmonic Level for the appropriate Tracking Generator Output Frequency.
- e. Perform this step only if the Tracking Generator Output Frequency is  $\leq 900$  MHz. Press **FREQUENCY** and  $\uparrow$  (step up key) to tune to the third harmonic. Press **PEAK SEARCH**.

Record the marker amplitude reading in [Table 2-95](#) as the 3rd Harmonic Level for the appropriate Tracking Generator Output Frequency.

- f. Press **MKR, MARKERS** (Off).

**Table 2-95**

**Tracking Generator Harmonic Spurious Response Worksheet**

| 1.5 GHz Tracking Generator Output Frequency | 2nd Harmonic Level (dBc) | 3rd Harmonic Level (dBc) |
|---|--------------------------|--------------------------|
| 9 kHz                                       |                          |                          |
| 25 kHz                                      |                          |                          |
| 100 MHz                                     |                          |                          |
| 300 MHz                                     |                          |                          |
| 900 MHz                                     |                          |                          |
| 1500 MHz                                    |                          | N/A                      |

8. From [Table 2-95](#), enter the 2nd Harmonic Level at 9 kHz as Test Record entry 1 and copy this value into the performance verification test record.

- Test Record entry 1:

## Performance Verification Tests

### 46. Tracking Generator Harmonic Spurious Outputs: Agilent E7402A, E7403A, E7404A, and E7405A (Option 1DN)

TG 2nd Harmonic Spurious Output \_\_\_\_\_ dB

9. From [Table 2-95](#), locate the most positive 2nd Harmonic Level for tracking generator frequencies of 9 kHz to 750 MHz and record this value as Test Record entry 2 and copy this value into the performance verification test record.

- Test Record entry 2:  
TG 2nd Harmonic Spurious Output \_\_\_\_\_ dB

10. From [Table 2-95](#), enter the 3rd Harmonic Level at 9 kHz as Test Record entry 3 and copy this value into the performance verification test record.

- Test Record entry 3:  
TG 3rd Harmonic Spurious Output \_\_\_\_\_ dB

11. From [Table 2-95](#), locate the most positive 3rd Harmonic Level for tracking generator frequencies of 25 kHz to 1500 MHz and record this value as Test Record entry 4 and copy this value into the performance verification test record.

- Test Record entry 4:  
TG 3rd Harmonic Spurious Output \_\_\_\_\_ dB

12. Press **System, Alignments, Auto Align, All**.

## 47. Tracking Generator Non-Harmonic Spurious Outputs: Agilent E7401A (Option 1DN)

This procedure determines the maximum level of the non-harmonic spurious outputs of the tracking generator. The tracking generator output is set to several different output frequencies. For each output frequency, several sweeps are taken on the microwave analyzer over different frequency spans and the highest displayed spurious response is measured in each span. Responses at the fundamental frequency of the tracking generator output or their harmonics are ignored. The amplitude of the highest spurious response is recorded.

There are no related adjustment procedures for this performance test.

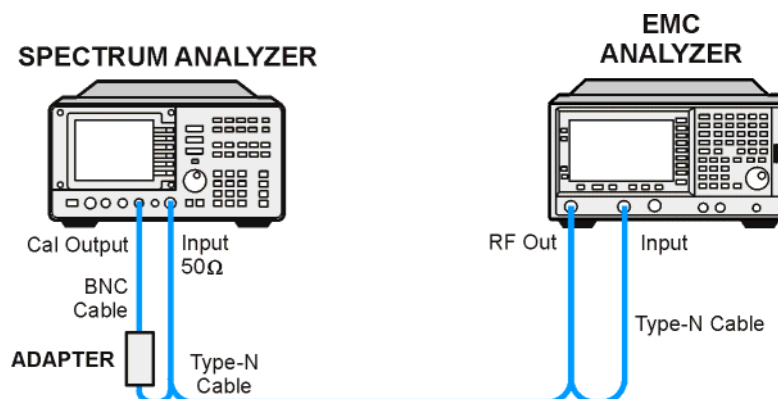
### Equipment Required

Microwave analyzer  
Cable, Type-N, 62 cm (24 in)  
Cable, BNC, 23 cm (9 in)  
Adapter, Type-N (m) to BNC (f)

### Procedure

1. Connect the equipment as shown in [Figure 2-67](#).

**Figure 2-67**      **Non-Harmonic Spurious Outputs Test Setup**



wb940a

### NOTE

The following steps are for an Agilent 8563E microwave analyzer, the steps may be different if you are using another microwave analyzer.

#### 47. Tracking Generator Non-Harmonic Spurious Outputs: Agilent E7401A (Option 1DN)

1. *Complete this step only if more than two hours have elapsed since performing a front-panel calibration of the microwave analyzer.*

*The microwave analyzer should be allowed to warm up for at least 30 minutes before proceeding.*

Complete a front-panel calibration of the microwave analyzer by performing the following steps:

- a. Preset the microwave analyzer.
  - b. Connect a BNC cable between CAL OUTPUT and 50  $\Omega$  Input.
  - c. Press **CAL, REALIGN LO & IF**.
  - d. Set **FREQUENCY, 300 MHz**.
  - e. Set **SPAN, 20 MHz**.
  - f. Set **AMPLITUDE, -10 dBm**.
  - g. Press **PEAK SEARCH**.
  - h. Press **CAL, REF LVL ADJ** and use the  $\uparrow \downarrow$  arrows to adjust the DAC value to a marker amplitude reading of -10 dBm. Press **STORE REF LVL**.
  - i. Disconnect the BNC cable from between the CAL OUTPUT and 50  $\Omega$  Input.
2. Press **Preset** on the analyzer under test. Press the **Factory Preset** softkey, if it is displayed. Set the analyzer by pressing the following keys:

**FREQUENCY, Center Freq, 50 MHz**  
**SPAN, Zero Span**  
**BW/Avg, 30 kHz**  
**Marker**  
**Source, Amplitude On, +107 dB $\mu$ V**

3. Set the microwave analyzer by pressing the following keys:
  - **SPAN, 100 kHz**
  - **AMPLITUDE, 5 dBm**
  - **AMPLITUDE, ATTEN, 20 dB**
  - **AMPLITUDE, LOG dB/DIV, 10 dB**
4. Disconnect the Type-N cable from between the analyzer RF INPUT and the tracking generator RF OUT. Refer to [Figure 2-67](#) to connect the Type-N cable from the analyzer RF OUT to the microwave analyzer 50  $\Omega$  Input.

### Measuring Fundamental Amplitudes

Perform the following two steps for each fundamental frequency in [Table 2-96](#).

1. Set the analyzer under test center frequency to the fundamental frequency listed in [Table 2-96](#) and press **Single** to activate a single sweep. Set the microwave

## 47. Tracking Generator Non-Harmonic Spurious Outputs: Agilent E7401A (Option 1DN)

analyzer to the same frequency.

- On the microwave analyzer, press **PEAK SEARCH**. Press **MKR** →, **MARKER** → **REF LVL**. Wait for another sweep to finish. Press **PEAK SEARCH**. Record the marker amplitude reading in [Table 2-96](#) as the Fundamental Amplitude.

**Table 2-96**

**Tracking Generator Fundamental Response Worksheet**

| Fundamental Frequency | Fundamental Amplitude (dBm) |
|-----------------------|-----------------------------|
| 10 MHz                |                             |
| 750 MHz               |                             |
| 1.5 GHz               |                             |

### Measuring Non-Harmonic Responses

- On the analyzer under test, set the center frequency to the initial value indicated in the first row of [Table 2-96](#). Press **Single** on the analyzer to trigger a single sweep.
- Set the microwave analyzer Start Freq, Stop Freq, and Res BW as indicated in the first row of [Table 2-97](#).
- Press **SGL SWP** on the microwave analyzer to activate a single sweep and wait for the sweep to finish. Press **PEAK SEARCH** to locate the largest spurious response.
- Verify that the marked signal is not the fundamental or a harmonic of the fundamental by performing the following steps:

#### NOTE

The following steps are for an Agilent 8563E microwave analyzer, the steps may be different if you are using another microwave analyzer.

- Divide the marker frequency by the fundamental frequency (the analyzer center frequency setting). For example, if the marker frequency is 30.3 MHz and the fundamental frequency is 10 MHz, dividing 30.3 MHz by 10 MHz yields 3.03.
- Round the number calculated in [step a](#) to the nearest whole number. In the example above, 3.03 should be rounded to 3. Values less than 1 should be rounded up to 1.
- Multiply the fundamental frequency by the number calculated in [step b](#). Following the example, multiplying 10 MHz by 3 yields 30 MHz.
- Calculate the difference between the marker frequency and the frequency calculated in [step c](#) above. Continuing the example, the difference would be 300 kHz.
- Due to span accuracy uncertainties in the microwave analyzer, the marker frequency might not equal the actual frequency. Given the marker frequency, check if the difference calculated in [step d](#) is within the

#### 47. Tracking Generator Non-Harmonic Spurious Outputs: Agilent E7401A (Option 1DN)

appropriate tolerance:

- For marker frequencies <5 MHz, tolerance =  $\pm 200$  kHz
- For marker frequencies <55 MHz, tolerance =  $\pm 750$  kHz
- For marker frequencies >55 MHz, tolerance =  $\pm 10$  MHz

- f. If the difference in [step d](#) is within the indicated tolerance, the signal in question is the fundamental signal (if the number in [step b](#) = 1) or a harmonic of the fundamental (if the number in [step b](#) > 1). This response should be ignored.
5. Verify that the marked signal is a true response and not a random noise peak by pressing **SINGLE** to trigger a new sweep and press **PEAK SEARCH**. A true response will remain at the same frequency and amplitude on successive sweeps but a noise peak will not.

If the marked signal is not the fundamental or a harmonic of the fundamental and is a true response, continue with [step 7](#).

6. If the marked signal is either the fundamental or a harmonic of the fundamental or a noise peak, move the marker on the microwave analyzer to the next highest signal by pressing **NEXT PEAK**. Repeat [step 4](#) above.

Perform [step 7](#) only if the marker signal is a true response and not a fundamental or harmonic of the fundamental. Otherwise, continue with [step 8](#).

7. Calculate the difference between the amplitude of marked signal and the fundamental amplitude as listed in [Table 2-96](#).

For example, if the fundamental amplitude for a fundamental frequency of 10 MHz is 1.2 dBm and the marker amplitude is -40.8 dBm, the difference is -42 dBc.

Record this difference as the non-harmonic response amplitude for the appropriate analyzer center frequency and microwave analyzer start and stop frequency settings in [Table 2-97](#).

Non-harmonic Amplitude = Marker Amplitude – Fundamental Amplitude

8. If a true non-harmonic spurious response is not found, record “NOISE” as the Amplitude of Non-Harmonic Response in [Table 2-97](#) for the appropriate analyzer center frequency and microwave analyzer start and stop frequency settings.
9. Repeat [step 1](#) through [step 8](#) for the remaining analyzer center frequency and microwave analyzer settings in [Table 2-97](#).

**Table 2-97**

**1.5 GHz Tracking Generator Non-Harmonic Spurious Response Worksheet**

| Analyzer Center Frequency | Microwave Analyzer Start Frequency | Microwave Analyzer Stop Frequency | Microwave Analyzer Resolution Bandwidth | Amplitude of Non-Harmonic Response (dBc) |
|---------------------------|------------------------------------|-----------------------------------|---|--|
| 10 MHz                    | 9 kHz                              | 100 kHz                           | 300 Hz                                  |  |

## 47. Tracking Generator Non-Harmonic Spurious Outputs: Agilent E7401A (Option 1DN)

**Table 2-97                      1.5 GHz Tracking Generator Non-Harmonic Spurious Response Worksheet**

| Analyzer Center Frequency | Microwave Analyzer Start Frequency | Microwave Analyzer Stop Frequency | Microwave Analyzer Resolution Bandwidth | Amplitude of Non-Harmonic Response (dBc) |
|---------------------------|------------------------------------|-----------------------------------|---|--|
| 10 MHz                    | 100 kHz                            | 5 MHz                             | 10 kHz                                  |  |
| 10 MHz                    | 5 MHz                              | 55 MHz                            | 100 kHz                                 |  |
| 10 MHz                    | 55 MHz                             | 1240 MHz                          | 1 MHz                                   |  |
| 10 MHz                    | 1240 MHz                           | 1500 MHz                          | 1 MHz                                   |  |
| 750 MHz                   | 9 kHz                              | 100 kHz                           | 300 Hz                                  |  |
| 750 MHz                   | 100 kHz                            | 5 MHz                             | 10 kHz                                  |  |
| 750 MHz                   | 5 MHz                              | 55 MHz                            | 100 kHz                                 |  |
| 750 MHz                   | 55 MHz                             | 1240 MHz                          | 1 MHz                                   |  |
| 750 MHz                   | 1240 MHz                           | 1500 MHz                          | 1 MHz                                   |  |
| 1.5 GHz                   | 9 kHz                              | 100 kHz                           | 300 Hz                                  |  |
| 1.5 GHz                   | 100 kHz                            | 5 MHz                             | 10 kHz                                  |  |
| 1.5 GHz                   | 5 MHz                              | 55 MHz                            | 100 kHz                                 |  |
| 1.5 GHz                   | 55 MHz                             | 1240 MHz                          | 1 MHz                                   |  |
| 1.5 GHz                   | 1240 MHz                           | 1500 MHz                          | 1 MHz                                   |  |

### Determining the Highest Non-harmonic Spurious Response

1. In [Table 2-97](#), locate the most positive non-harmonic response amplitude.  
Record this amplitude as the highest non-harmonic response amplitude in Test Record entry 1 of the performance verification test record.

## 48. Tracking Generator Non-Harmonic Spurious Outputs: Agilent E7402A, E7403A, E7404A, and E7405A (Option 1DN)

This procedure determines the maximum level of the non-harmonic spurious outputs of the tracking generator. The tracking generator output is set to several different output frequencies. For each output frequency, several sweeps are taken on the microwave analyzer over different frequency spans and the highest displayed spurious response is measured in each span. Responses at the fundamental frequency of the tracking generator output or their harmonics are ignored. The amplitude of the highest spurious response is recorded.

There are no related adjustment procedures for this performance test.

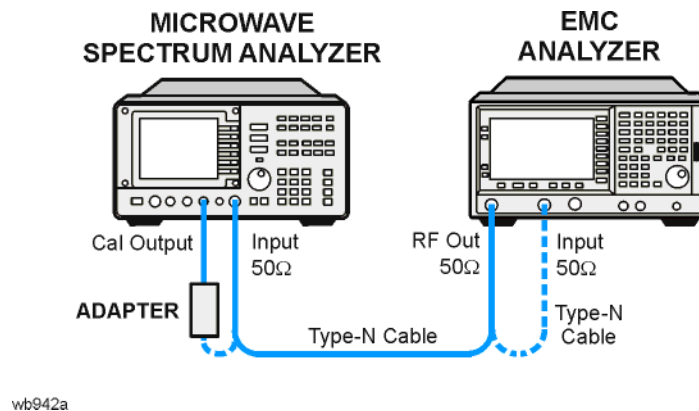
### Equipment Required

Microwave analyzer  
 Cable, Type-N, 62 cm (24 in)  
 Cable, BNC, 23 cm (9 in)  
 Adapter, Type-N (m) to BNC (f)

### Procedure

1. Connect the equipment as shown in [Figure 2-68](#).

**Figure 2-68** Non-Harmonic Spurious Outputs Test Setup



#### NOTE

The following steps are for an Agilent 8563E microwave analyzer, the steps may be different if you are using another microwave analyzer.

1. *Complete this step only if more than two hours have elapsed since performing a front-panel calibration of the microwave analyzer.*



#### 48. Tracking Generator Non-Harmonic Spurious Outputs: Agilent E7402A, E7403A, E7404A, and E7405A (Option 1DN)

*The microwave analyzer should be allowed to warm up for at least 30 minutes before proceeding.*

Complete a front-panel calibration of the microwave analyzer by performing the following steps:

- a. Preset the microwave analyzer.
  - b. Connect a BNC cable between CAL OUTPUT and 50  $\Omega$  Input.
  - c. Press **CAL, REALIGN LO & IF**.
  - d. Set **FREQUENCY, 300 MHz**.
  - e. Set **SPAN, 20 MHz**.
  - f. Set **AMPLITUDE, -10 dBm**.
  - g. Press **PEAK SEARCH**.
  - h. Press **CAL, REF LVL ADJ** and use the  $\uparrow \downarrow$  arrows to adjust the DAC value to a marker amplitude reading of -10 dBm. Press **STORE REF LVL**.
  - i. Disconnect the BNC cable from between the CAL OUTPUT and 50  $\Omega$  Input.
2. Use the Type-N cable to connect the RF Input to the RF OUT of the tracking generator as shown in [Figure 2-68](#). Do not connect to the RF Input of the microwave analyzer yet.
  3. Press **Preset** on the analyzer under test. Press the **Factory Preset** softkey, if it is displayed. Set the analyzer by pressing the following keys:
 

**FREQUENCY, Center Freq, 50 MHz**  
**SPAN, Zero Span**  
**BW/Avg, 30 kHz**  
**System, Alignments, Auto Align, Off**  
**Marker**  
**Source, Tracking Peak** (wait for the Peaking message to appear)  
**Source, Amplitude On, +105 dB $\mu$ V**  
**Single**
  4. Set the microwave analyzer by pressing the following keys:
    - **SPAN, 100 kHz**
    - **AMPLITUDE, 5 dBm**
    - **AMPLITUDE, Attenuation, 20 dB**
    - **AMPLITUDE, LOG dB/DIV, 10 dB**
  5. Disconnect the Type-N cable from between the analyzer RF INPUT and the tracking generator RF OUT. Refer to [Figure 2-68](#) to connect the Type-N cable from the analyzer RF OUT to the microwave analyzer 50  $\Omega$  Input.

#### Measuring Fundamental Amplitudes

Perform the following two steps for each measurement value in [Table 2-98](#).

**48. Tracking Generator Non-Harmonic Spurious Outputs: Agilent E7402A, E7403A, E7404A, and E7405A (Option 1DN)**

6. Set the analyzer center frequency to the Fundamental Frequency listed in [Table 2-98](#) and press **Single** to activate a single sweep. Set the microwave analyzer to the same frequency.
7. On the microwave analyzer, press **PEAK SEARCH**. Press **MARKER** →, **MKR** → **REF LVL**. Wait for another sweep to finish. Press **PEAK SEARCH**. Record the marker amplitude reading in [Table 2-98](#) as the fundamental amplitude.

**Table 2-98****Tracking Generator Fundamental Response Worksheet**

| Fundamental Frequency | Fundamental Amplitude (dBm) |
|-----------------------|-----------------------------|
| 10 MHz                |                             |
| 1.5 GHz               |                             |
| 3.0 GHz               |                             |

**Measuring Non-Harmonic Responses**

8. On the analyzer, set the center frequency to the initial value indicated in the first row of [Table 2-98](#). Press **Single** on the analyzer to trigger a single sweep.
9. Set the Start Freq, Stop Freq, and Res BW of the microwave analyzer as indicated in the first row of [Table 2-99](#).
10. Press **SGL SWP** on the microwave analyzer to activate a single sweep and wait for the sweep to finish. Press **PEAK SEARCH** to locate the largest spurious response.
11. Verify that the marked signal is not the fundamental or a harmonic of the fundamental by performing the following steps:

**NOTE**

The following steps are for an Agilent 8563E microwave analyzer, the steps may be different if you are using another microwave analyzer.

- a. Divide the marker frequency by the fundamental frequency (the analyzer center frequency setting). For example, if the marker frequency is 30.3 MHz and the fundamental frequency is 10 MHz, dividing 30.3 MHz by 10 MHz yields 3.03.
- b. Round the number calculated in [step a](#) to the nearest whole number. In the example above, 3.03 should be rounded to 3. Values less than 1 should be rounded up to 1.
- c. Multiply the fundamental frequency by the number calculated in [step b](#). Following the example, multiplying 10 MHz by 3 yields 30 MHz.
- d. Calculate the difference between the marker frequency and the frequency calculated in [step c](#) above. Continuing the example, the difference would be 300 kHz.
- e. Due to span accuracy uncertainties in the microwave analyzer, the marker frequency might not equal the actual frequency. Given the marker

#### 48. Tracking Generator Non-Harmonic Spurious Outputs: Agilent E7402A, E7403A, E7404A, and E7405A (Option 1DN)

frequency, check if the difference calculated in [step d](#) is within the appropriate tolerance:

For marker frequencies <5 MHz, tolerance =  $\pm 200$  kHz

For marker frequencies <55 MHz, tolerance =  $\pm 750$  kHz

For marker frequencies >55 MHz, tolerance =  $\pm 10$  MHz

- f. If the difference in [step d](#) is within the indicated tolerance, the signal in question is the fundamental signal (if the number in [step b](#) = 1) or a harmonic of the fundamental (if the number in [step b](#) > 1). This response should be ignored.
12. Verify that the marked signal is a true response and not a random noise peak by pressing **SINGLE** to trigger a new sweep and press **PEAK SEARCH**. A true response will remain at the same frequency and amplitude on successive sweeps but a noise peak will not.

If the marked signal is not the fundamental or a harmonic of the fundamental and is a true response, continue with [step 14](#).

13. If the marked signal is either the fundamental or a harmonic of the fundamental or a noise peak, move the marker on the microwave analyzer to the next highest signal by pressing **NEXT PEAK**. Repeat [step 11](#) above.

Perform [step 14](#) only if the marker signal is a true response and not a fundamental or harmonic of the fundamental. Otherwise, continue with [step 15](#).

14. Calculate the difference between the amplitude of marked signal and the fundamental amplitude as listed in [Table 2-98](#).

For example, if the fundamental amplitude for a fundamental frequency of 10 MHz is 1.2 dBm and the marker amplitude is -40.8 dBm, the difference is -42 dBc.

Record this difference as the non-harmonic response amplitude for the appropriate analyzer center frequency and microwave analyzer start and stop frequency settings in [Table 2-99](#).

Non-harmonic Amplitude = Marker Amplitude – Fundamental Amplitude

15. If a true non-harmonic spurious response is not found, record “NOISE” as the non-harmonic response Amplitude in [Table 2-99](#) for the appropriate analyzer center frequency and microwave analyzer start and stop frequency settings.
16. Repeat [step 8](#) through [step 15](#) for the remaining analyzer center frequency and microwave analyzer settings in [Table 2-99](#).

**48. Tracking Generator Non-Harmonic Spurious Outputs: Agilent E7402A, E7403A, E7404A, and E7405A (Option 1DN)**17. Press **System, Alignments, Auto Align, All****Table 2-99****3.0 GHz Tracking Generator Non-Harmonic Spurious Response Worksheet**

| <b>Analyzer Center Frequency</b> | <b>Microwave Analyzer Start Frequency</b> | <b>Microwave Analyzer Stop Frequency</b> | <b>Microwave Analyzer Resolution Bandwidth</b> | <b>Amplitude of Non-Harmonic Response (dBc)</b> |
|----------------------------------|---|--|--|---|
| 10 MHz                           | 9 kHz                                     | 100 kHz                                  | 300 Hz   |   |
| 10 MHz                           | 100 kHz                                   | 5 MHz                                    | 10 kHz   |   |
| 10 MHz                           | 5 MHz                                     | 55 MHz                                   | 100 kHz  |   |
| 10 MHz                           | 55 MHz                                    | 1240 MHz                                 | 1 MHz  |   |
| 10 MHz                           | 1240 MHz                                  | 2000 MHz                                 | 1 MHz  |   |
| 10 MHz                           | 2000 MHz                                  | 3000 MHz                                 | 1 MHz  |   |
| 1.5 GHz                          | 9 kHz                                     | 100 kHz                                  | 300 Hz   |   |
| 1.5 GHz                          | 100 kHz                                   | 5 MHz                                    | 10 kHz   |   |
| 1.5 GHz                          | 5 MHz                                     | 55 MHz                                   | 100 kHz  |   |
| 1.5 GHz                          | 55 MHz                                    | 1240 MHz                                 | 1 MHz  |   |
| 1.5 GHz                          | 1240 MHz                                  | 2000 MHz                                 | 1 MHz  |   |
| 1.5 GHz                          | 2000 MHz                                  | 3000 MHz                                 | 1 MHz  |   |
| 3.0 GHz                          | 9 kHz                                     | 100 kHz                                  | 300 Hz   |   |
| 3.0 GHz                          | 100 kHz                                   | 5 MHz                                    | 10 kHz   |   |
| 3.0 GHz                          | 5 MHz                                     | 55 MHz                                   | 100 kHz  |   |
| 3.0 GHz                          | 55 MHz                                    | 1240 MHz                                 | 1 MHz  |   |
| 3.0 GHz                          | 1240 MHz                                  | 2000 MHz                                 | 1 MHz  |   |
| 3.0 GHz                          | 2000 MHz                                  | 3000 MHz                                 | 1 MHz  |   |

**Determining the Highest Non-harmonic Spurious Response**

1. In [Table 2-99](#), locate the most positive non-harmonic response amplitude for microwave analyzer stop frequency settings  $\leq 2000$  MHz. Record this amplitude as the highest non-harmonic response amplitude in Test Record entry 1 of the performance verification test record.
2. In [Table 2-99](#), locate the most positive non-harmonic response amplitude for microwave analyzer start frequency settings  $\geq 2000$  MHz. Record this amplitude as the highest non-harmonic response amplitude in Test Record entry 2 of the performance verification test record.

## 49. Tracking Generator LO Feedthrough: Agilent E7402A, E7403A, E7404A, and E7405A (Option 1DN)

The tracking generator output is connected to the analyzer 50 W Input, and the tracking is adjusted at 50 MHz for a maximum signal level. The tracking generator output is then connected to the input of a microwave analyzer. The tracking generator is tuned to several different frequencies and the LO Feedthrough is measured at the frequency extremes of the LO.

The related adjustment for this procedure is “TG LO Leveling.”

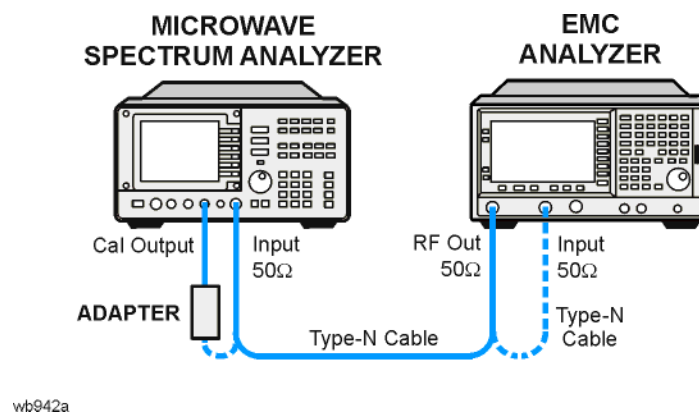
### Equipment Required

Microwave analyzer  
Cable, Type-N, 62 cm (24 in)  
Cable, BNC, 23 cm (9 in)  
Adapter, Type-N (m) to BNC (f)

### Procedure

1. Connect the equipment as shown in [Figure 2-69](#).

**Figure 2-69** LO Feedthrough Amplitude Test Setup



### NOTE

Note that the following steps are for an Agilent 8563E microwave analyzer, the steps may be different if you are using another microwave analyzer.

1. Press **PRESET** on the microwave analyzer.

*The microwave analyzer should be allowed to warm up for at least five minutes before proceeding.*

**49. Tracking Generator LO Feedthrough: Agilent E7402A, E7403A, E7404A, and E7405A (Option 1DN)**

*Complete step 2 only if more than 24 hours have elapsed since performing a front-panel calibration of the microwave analyzer.*

2. Perform a front-panel calibration of the microwave analyzer by performing the following steps:
  - a. Connect a BNC cable between CAL OUTPUT and 50  $\Omega$  Input.
  - b. Press **CAL, REALIGN LO & IF**.
  - c. Set **FREQUENCY, 300 MHz**.
  - d. Set **SPAN, 20 MHz**.
  - e. Set **AMPLITUDE, -10 dBm**.
  - f. Press **PEAK SEARCH**.
  - g. Press **CAL, REF LVL ADJ** and use the  $\uparrow \downarrow$  arrows to adjust the DAC value to a marker amplitude reading of -10 dBm. Press **STORE REF LVL**.
  - h. Disconnect the BNC cable from between the CAL OUTPUT and 50  $\Omega$  Input.
3. Press **Preset** on the analyzer under test. Press the **Factory Preset** softkey, if it is displayed.
4. Use the type-N cable to connect the RF Input to the tracking generator RF OUT on the analyzer under test as shown in [Figure 2-69](#). *Do not connect to the microwave analyzer RF Input yet.*
5. Initialize the test equipment by pressing the following keys on the analyzer under test:

**FREQUENCY, Center Freq, 50 MHz**  
**SPAN, Zero Span**  
**BW / Avg, 30 kHz**  
**System, Alignments, Auto Align, Off**  
**Marker**  
**Source, Amplitude On, +102 dB $\mu$ V**  
**Source, Tracking Peak** (*Wait for the PEAKING SIGNAL message to disappear.*)  
**FREQUENCY, 9 kHz**  
**Source, Amplitude On, +105 dB $\mu$ V**  
**Single**

6. On the microwave analyzer, press the following keys:

**FREQUENCY, 3.921409 GHz**  
**SPAN, 100 kHz**  
**AMPLITUDE, 0 dBm**  
**BW, 1 kHz**

7. Disconnect the type-N cable from between the analyzer RF INPUT and the Tracking Generator RF OUT. Refer to [Figure 2-69](#) to connect the type-N cable

#### 49. Tracking Generator LO Feedthrough: Agilent E7402A, E7403A, E7404A, and E7405A (Option 1DN)

from the analyzer RF OUT to the microwave analyzer 50 W Input.

8. On the microwave analyzer, press:

**PEAK SEARCH**  
**MKR, SIG TRK (On)**

Wait for the signal to be displayed at center screen, then press **SIG TRK (Off)**.

9. On the microwave analyzer, press **AUX CTRL**,  
**INTERNAL MIXER, PRESEL AUTO PK** then wait for the PEAKING message to disappear.
10. Record the microwave analyzer marker amplitude in [Table 2-100](#) as the LO Feedthrough Amplitude for the Microwave analyzer CENTER FREQUENCY at 3.921409 GHz.
11. Repeat [step 8](#) through [step 10](#) for the remaining Analyzer CENTER FREQUENCY and Microwave Analyzer CENTER FREQUENCY settings listed in [Table 2-100](#). Press **Single** on the analyzer to activate a single sweep each time the center frequency is changed.
12. Press **System, Alignments, Auto Align, All**.
13. In [Table 2-100](#), for analyzer center frequencies of 9 kHz to 1.5 GHz, locate the highest LO Feedthrough Amplitude then record this amplitude as Test Record entry 1 of the performance verification test record.
14. In [Table 2-100](#), for the Analyzer Center Frequency of 3.0 GHz, record this LO Feedthrough Amplitude as Test Record entry 2 of the performance verification test record.

**Table 2-100**

**Tracking Generator LO Feedthrough Amplitude Worksheet**

| Analyzer Center Frequency | Microwave Analyzer Center Frequency | LO Feedthrough Amplitude (dBm) |
|---------------------------|-------------------------------------|--------------------------------|
| 9 kHz                     | 3.921409 GHz                        |                                |
| 70 MHz                    | 3.9914 GHz                          |                                |
| 150 MHz                   | 4.0714 GHz                          |                                |
| 1.5 GHz                   | 5.4214 GHz                          |                                |
| 3.0 GHz                   | 6.9214 GHz                          |                                |

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## 50. Gate Delay Accuracy and Gate Length Accuracy: Agilent E7401A, E7402A, E7403A, E7404A, and E7405A (Option 1D6)

The method used for measuring the gate length times is determined by the length of the gate. Shorter gate-length times are measured with an oscilloscope, and longer gate-length times are measured with a counter.

For shorter gate-length times, the output signal of a pulse generator is used to trigger the gate circuitry. To measure the gate delay,  $\Delta t$  markers are used. The oscilloscope pulse width measurement feature is used to measure the short gate-length.

For longer gate-length times, a universal counter is used to measure the time period from the rising edge of the gate output to its falling edge. Because the gate-length time is equivalent to the clock accuracy of the analyzer, the gate-length time is compared to the specification for clock accuracy.

There are no related adjustment procedures for this performance test.

### Equipment Required

Universal counter  
Function generator  
Oscilloscope (*This procedure is written for the Agilent 54820A.*)  
Cable, BNC, 120 cm (48 in) (*four required*)  
Adapter, BNC tee (m) (f) (f) (*two required*)

### Procedure

1. Connect the equipment as shown in [Figure 2-70](#). Connect the GATE OUT to Channel 2.
2. Press **Preset** on the analyzer. Press the **Factory Preset** softkey, if it is displayed. Set the analyzer by pressing the following keys:

**SPAN, Zero Span**  
**Sweep, Sweep Time, 100 s**  
**Sweep, Gate (On)**  
**Gate Setup, Edge Setup (or Edge Gate)**  
**Gate Delay, 1  $\mu$ s**  
**Gate Length, 1  $\mu$ s**

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#### NOTE

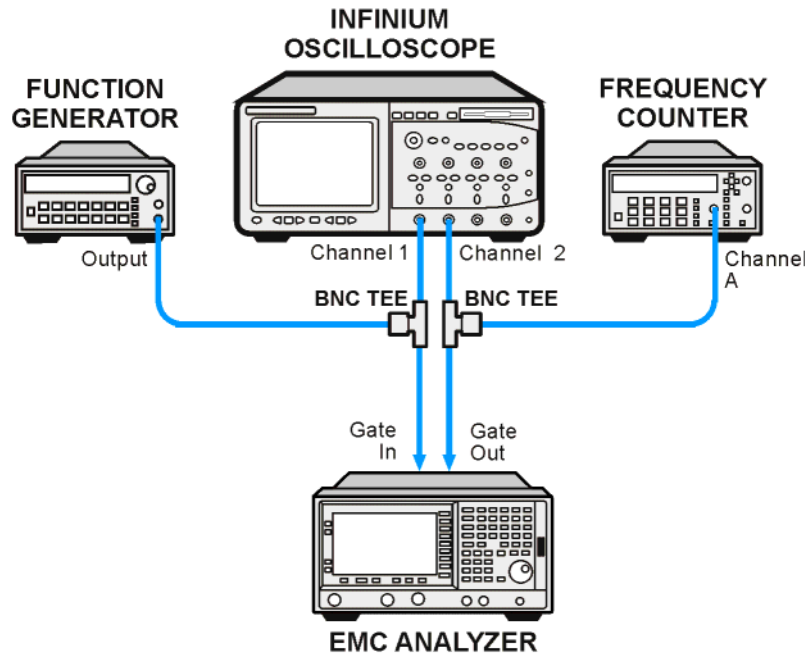
The oscilloscope measurement is much more stable using slow sweep times on the analyzer. The response on the analyzer display will not be valid, but the Gate Delay and Gate Length accuracy are being measured externally with the universal counter and oscilloscope.

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## 50. Gate Delay Accuracy and Gate Length Accuracy: Agilent E7401A, E7402A, E7403A, E7404A, and E7405A (Option 1D6)

**Figure 2-70 Gate Delay and Gate Length Test Setup**



wb943a

- Set up the function generator as follows:

|           |        |
|-----------|--------|
| Waveform  | Square |
| Frequency | 100 Hz |
| Amplitude | 2.5 V  |
| Offset    | 1.25 V |

- Press **Default Setup** on the oscilloscope and set the controls as follows:

|                |            |
|----------------|------------|
| Timebase       | 500 ns/div |
| Trigger        | Edge       |
| Trigger Source | 2          |
| Trigger Level  | 2.0 V      |
| Channel 1      |            |
| V/Div          | 1 V        |
| Coupling       | DC         |
| Offset         | 2.0 V      |
| Channel 2      |            |
| V/Div          | 1 V        |
| Coupling       | DC         |

**50. Gate Delay Accuracy and Gate Length Accuracy: Agilent E7401A, E7402A, E7403A, E7404A, and E7405A (Option 1D6)**

Offset                      3.0 V

5. On the oscilloscope, adjust the horizontal position to place the area between the rising edges of channel 1 and channel 2 at the center of the display. The horizontal position at the bottom of the grid should be between –500 ns and –650 ns.
6. Set the oscilloscope timebase to 200 ns/div. The rising edges of channel 1 and channel 2 should still be displayed. If not, adjust the horizontal position so the rising edges of channel 1 and channel 2 are displayed.
7. Use the mouse connected to the oscilloscope and click on the mouse icon in the upper right-hand corner of the display.
8. Set the oscilloscope statistics on.

Click on **Measure** and verify that “Show Statistics” is checked.

9. Define the conditions for a delta time measurement on the oscilloscope.

Leave the oscilloscope in Auto Trigger “Free Run” mode until all connections and setups are completed on both the oscilloscope and the analyzer. This allows you to confirm that both channels on the oscilloscope are receiving a valid signal.

- a. Click on **Measure, Customize, Measurement Definitions**.
- b. Set Threshold Definition to “10%, 50%, 90%”.
- c. Set Top-Base Definition to “Standard”.
- d. Set From Edge # to 1, and set To Edge # to 2.
- e. Set both Direction selections to “Rising”.
- f. Set both Threshold selections to “Middle Level”.
- g. Click **Close**.

10. Activate the delta time measurement.

- a. Click **Measure, Time, Delta Time**.
- b. Set Source 1 to “Channel 1”.
- c. Set Source 2 to “Channel 2”.
- d. Click **OK**.

11. Wait a few seconds for the minimum and maximum values displayed at the bottom of the oscilloscope grid to stabilize.

12. Refer to the measurement statistics at the bottom of the oscilloscope grid.

Record the  $\Delta$ Time (1)-(2) min value as Minimum Gate Delay in [Table 2-101](#).

Record the  $\Delta$ Time (1)-(2) max value as the Maximum Gate Delay in [Table 2-101](#).

### 50. Gate Delay Accuracy and Gate Length Accuracy: Agilent E7401A, E7402A, E7403A, E7404A, and E7405A (Option 1D6)

13. Clear all current oscilloscope measurements. Click on **Measure**, **Clear**, and **All Measurements**.

14. Adjust the oscilloscope horizontal position to center the pulse on Channel 2 on the display. Switching the trigger source to channel 2 will help with the measurement.

15. Activate the pulse width measurement function for channel 2 of the oscilloscope.

Click on **Measure**, **Time**, and click on **+width**.

Set the Source to be channel 2 and click **OK**.

16. Record the +width (2) mean value in [Table 2-101](#) as the 1  $\mu$ s Gate Length.

17. On the analyzer, press

**Sweep, Sweep Time**  
**150 ms, Sweep**  
**Gate Setup (or Gate), Edge Setup (or Edge Gate)**  
**Gate Delay, 10ms**  
**Sweep, Gate Setup**  
**Edge Setup (or Edge Gate), Gate Length, 65 ms**

18. Set the universal counter controls as follows:

|                |              |
|----------------|--------------|
| Function       | Pos Width 1  |
| Gate Time      | 0.1 s        |
| Auto Trigger   | On           |
| Channel 1      |              |
| Coupling       | DC           |
| Impedance      | 1 M $\Omega$ |
| X10 Atten      | Off          |
| 100 kHz Filter | Off          |
| Common 1       | On           |

19. Record the universal counter readout value as the 65ms Gate Length in [Table 2-101](#).

**Table 2-101**

#### Gate Delay and Gate Length Accuracy Worksheet

| Description           | Value | Test Record Entry |
|-----------------------|-------|-------------------|
| Minimum Gate Delay    |       | 1)                |
| Maximum Gate Delay    |       | 2)                |
| 1 $\mu$ s Gate Length |       | 3)                |

Table 2-101 Gate Delay and Gate Length Accuracy Worksheet

| Description       | Value | Test Record Entry |
|-------------------|-------|-------------------|
| 65 ms Gate Length |       | 4)                |

**51. Gate Mode Additional Amplitude Error: Agilent E7401A, E7402A, E7403A, E7404A, and E7405A (Option 1D6)**

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**51. Gate Mode Additional Amplitude Error:  
Agilent E7401A, E7402A, E7403A, E7404A,  
and E7405A (Option 1D6)**

This procedure measures the additional amplitude error while gate mode is turned on. An amplitude reference is established while gate mode is off. Gate mode is then turned on with a function generator providing the gate trigger input. The amplitude with gate mode on is then measured using the marker delta function.

There are no related adjustment procedures for this performance test.

**Equipment Required**

Synthesized signal generator  
Function generator  
Cable, Type-N (f), 50  $\Omega$   
Cable, BNC, 120 cm

**Additional Equipment for Option BAB**

Adapter, Type-N (f) to APC 3.5 (f)

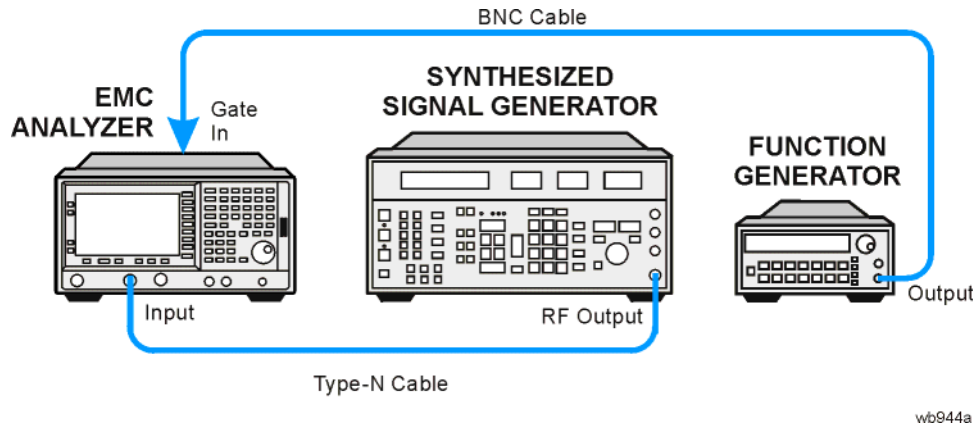
**Procedure**

1. Connect the equipment as shown in [Figure 2-71](#).
2. Press **Preset** on the analyzer. Press the **Factory Preset** softkey, if it is displayed. Set the analyzer by pressing the following keys:

**FREQUENCY, Center Freq, 300 MHz**  
**SPAN, Zero Span**  
**AMPLITUDE, Ref Level, -20 dBm**  
**AMPLITUDE, More, Y Axis Units (or Amptd Units), dBm**  
**Sweep, 20 ms**

### 51. Gate Mode Additional Amplitude Error: Agilent E7401A, E7402A, E7403A, E7404A, and E7405A (Option 1D6)

**Figure 2-71 Gate Delay and Gate Length Accuracy Test Setup**



3. Set up the function generator as follows:

|            |             |
|------------|-------------|
| Waveform   | Square      |
| Duty Cycle | 50%         |
| Frequency  | 100 Hz      |
| Amplitude  | 2.5 V pk-pk |
| Offset     | 1.25V       |

4. On the synthesized signal generator, press **Blue Key, Special, 0, 0**. Set the signal generator as follows:

|           |         |
|-----------|---------|
| FREQUENCY | 300 MHz |
| AMPLITUDE | -20 dBm |

5. On the analyzer, press **Single** and wait for the sweep to finish. Press **Peak Search** (or **Search**).
6. On the analyzer, press **Marker, Delta**.
7. Set the analyzer as follows:
  - Trig, External** (Pos)
  - Sweep, Gate** (On)
  - Gate Setup, Edge Setup (or Edge Gate), Gate Delay, 1  $\mu$ s**
  - Gate Length, 1  $\mu$ s**
  - Sweep, Gate Setup (or Gate), Trig Type** (Level) (or Gate Control (Level))
8. On the analyzer, press **Single** and wait for the sweep to finish. Press **Peak Search** (or **Search**).
9. Record the marker delta ( $\Delta$  Mkr1) amplitude reading as Test Record entry 1 in

**51. Gate Mode Additional Amplitude Error: Agilent E7401A, E7402A, E7403A, E7404A, and E7405A (Option 1D6)**

the performance test record.

**51. Gate Mode Additional Amplitude Error: Agilent E7401A, E7402A, E7403A, E7404A, and E7405A (Option 1D6)**



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## **3 Performance Verification Test Records**

## Agilent E7401A Performance Verification Test Record

Tests for the Agilent E7401A only are included in this test record, therefore not all test numbers are included.

**Table 3-1**      **Agilent E7401A Performance Verification Test Record**

|                              |                  |   |                     |
|------------------------------|------------------|---|---------------------|
| Agilent Technologies         |                  |   |                     |
| Address: _____               |                  | Report No. _____                              |                     |
| _____                        |                  | Date _____                                    |                     |
| _____                        |                  |   |                     |
| Model E7401A                 |                  |   |                     |
| Serial No. _____             |                  | Ambient temperature _____ ° C                 |                     |
| Options _____                |                  | Relative humidity _____ %                     |                     |
| Firmware Revision _____      |                  | Power mains line frequency _____ Hz (nominal) |                     |
| Customer _____               |                  | Tested by _____                               |                     |
| <b>Test Equipment Used:</b>  |                  |   |                     |
| <b>Description</b>           | <b>Model No.</b> | <b>Trace No.</b>                              | <b>Cal Due Date</b> |
| Synthesized Signal Generator | _____            | _____   | _____               |
| Synthesized Sweeper          | _____            | _____   | _____               |
| Function Generator           | _____            | _____   | _____               |
| Power Meter, Dual-Channel    | _____            | _____   | _____               |
| RF Power Sensor #1           | _____            | _____   | _____               |
| RF Power Sensor #2           | _____            | _____   | _____               |
| Low-Power Power Sensor       | _____            | _____   | _____               |
| Digital Multimeter           | _____            | _____   | _____               |
| Universal Counter            | _____            | _____   | _____               |
| Frequency Standard           | _____            | _____   | _____               |
| Power Splitter               | _____            | _____   | _____               |
| 50 Ω Termination             | _____            | _____   | _____               |
| 1 dB Step Attenuator         | _____            | _____   | _____               |
| 10 dB Step Attenuator        | _____            | _____   | _____               |

**Table 3-1 Agilent E7401A Performance Verification Test Record**

|   |       |       |       |
|---|-------|-------|-------|
| Oscilloscope<br>(Option 1D6 only)           | _____ | _____ | _____ |
| Microwave Spectrum<br>Analyzer (Option 1DN) | _____ | _____ | _____ |
| Notes/comments:                             | _____ |       |       |
|   | _____ |       |       |

**Table 3-2 Agilent E7401A Performance Verification Test Record**

| Agilent Technologies |  |                  |                  |                 |                         |
|----------------------|--|------------------|------------------|-----------------|-------------------------|
| Model E7401A         |  | Report No. _____ |                  |                 |                         |
| Serial No. _____     |  | Date _____       |                  |                 |                         |
| Test Description     |  | Minimum          | Results Measured | Maximum         | Measurement Uncertainty |
| 1.                   | <b>10 MHz Reference Output Accuracy</b> (Non-Option 1D5 only)                      |                  |                  |                 |                         |
|                      | Settability  | –5.0 Hz          | (1)_____         | 5.0 Hz          | ±293.3 µHz              |
| 2.                   | <b>10 MHz High-Stability Frequency Reference Output Accuracy</b> (Option 1D5 only) |                  |                  |                 |                         |
|                      | 5 Minute Warm-Up Error   | –0.1 ppm         | (1)_____         | 0.1 ppm         | ±0.000072 ppm           |
|                      | 15 Minute Warm-Up Error  | –0.01 ppm        | (2)_____         | 0.01 ppm        | ±0.000070 ppm           |
| 3.                   | <b>Frequency Readout and Marker Frequency Count Accuracy</b>                       |                  |                  |                 |                         |
|                      | Frequency Readout Accuracy   |                  |                  |                 |                         |
|                      | Center Freq    Span  |                  |                  |                 |                         |
|                      | 1490 MHz    20 MHz   | 1489.83 MHz      | (1)_____         | 1490.17 MHz     | ±0 Hz                   |
|                      | 1490 MHz    10 MHz   | 1489.91 MHz      | (2)_____         | 1490.09 MHz     | ±0 Hz                   |
|                      | 1490 MHz    1 MHz  | 1489.991 MHz     | (3)_____         | 1490.009 MHz    | ±0 Hz                   |
|                      | Marker Count Accuracy  |                  |                  |                 |                         |
|                      | Center Freq    Span  |                  |                  |                 |                         |
|                      | 1490 MHz    10 MHz   | 1489.999999 MHz  | (4)_____         | 1490.000001 MHz | ±0 Hz                   |

Performance Verification Test Records  
**Agilent E7401A Performance Verification Test Record**

**Table 3-2 Agilent E7401A Performance Verification Test Record**

| Agilent Technologies |   |  |  |  |  |
|----------------------|---|--|--|--|--|
| Model E7401A         |   |  | Report No. _____   |  |  |
| Serial No. _____     |   |  | Date _____   |  |  |
| Test Description     |   | Minimum  | Results Measured   | Maximum  | Measurement Uncertainty  |
|                      | 1490 MHz 1 MHz  | 1489.999999 MHz  | (5)_____   | 1490.000001 MHz  | ±0 Hz  |
| <b>5.</b>            | <b>Frequency Span Accuracy</b><br><br>Span      Start Freq<br>1500 MHz 0 Hz<br>100 MHz 10 MHz<br>100 kHz 10 MHz<br>100 MHz 800 MHz<br>100 kHz 800 MHz<br>100 MHz 1400 MHz<br>100 kHz 1499 MHz | 1185 MHz<br>79 MHz<br>79 kHz<br>79 MHz<br>79 kHz<br>79 MHz<br>79 kHz | (1)_____<br>(2)_____<br>(3)_____<br>(4)_____<br>(5)_____<br>(6)_____<br>(7)_____ | 1215 MHz<br>81 MHz<br>81 kHz<br>81 MHz<br>81 kHz<br>81 MHz<br>81 kHz | ±3.06 MHz<br>±204 kHz<br>±204 Hz<br>±204 kHz<br>±204 Hz<br>±204 kHz<br>±204 Hz |
| <b>7.</b>            | <b>Noise Sidebands</b><br><br>Offset from 1 GHz signal<br><br>10 kHz<br>20 kHz<br>30 kHz<br>100 kHz   |  | (1)_____<br>(2)_____<br>(3)_____<br>(4)_____                                     | –93 dBc/Hz<br>–100 dBc/Hz<br>–104 dBc/Hz<br>–113 dBc/Hz              | ±2.44 dB<br>±2.44 dB<br>±2.44 dB<br>±2.44 dB                                   |
| <b>9.</b>            | <b>System-Related Sidebands</b><br><br>Offset from 500 MHz signal<br><br>30 kHz to 230 kHz<br>–30 kHz to –230 kHz   |  | (1)_____<br>(2)_____   | –65 dBc<br>–65 dBc   | ±1.3 dB<br>±1.3 dB   |
| <b>10.</b>           | <b>Residual FM</b><br><br>1 kHz Res BW,<br>(Non-Option 1D5)<br><br>1 kHz Res BW,<br>(Option 1D5)  |  | (1)_____<br><br>(1)_____   | 150 Hz<br><br>100 Hz   | ±21 Hz<br><br>±21 Hz   |

**Table 3-2 Agilent E7401A Performance Verification Test Record**

| Agilent Technologies |   |          |                  |         |                         |
|----------------------|---|----------|------------------|---------|-------------------------|
| Model E7401A         |   |          | Report No. _____ |         |                         |
| Serial No. _____     |   |          | Date _____       |         |                         |
| Test Description     |   | Minimum  | Results Measured | Maximum | Measurement Uncertainty |
|                      | 10 Hz Res BW                              |          | (2)_____         | 2 Hz    | ±0.27 Hz                |
| <b>11.</b>           | <b>Sweep Time Accuracy</b>                |          |                  |         |                         |
|                      | Sweep Time                                |          |                  |         |                         |
|                      | 5 ms                                      | –1.0%    | (1)_____         | ±1.0%   | ±0.16%                  |
|                      | 20 ms                                     | –1.0%    | (2)_____         | ±1.0%   | ±0.16%                  |
|                      | 100 ms                                    | –1.0%    | (3)_____         | ±1.0%   | ±0.16%                  |
|                      | 1 s                                       | –1.0%    | (4)_____         | ±1.0%   | ±0.16%                  |
|                      | 10 s                                      | –1.0%    | (5)_____         | ±1.0%   | ±0.16%                  |
|                      | 1 ms ( <i>Option AYX only</i> )           | –1.0%    | (6)_____         | ±1.0%   | ±0.16%                  |
|                      | 500 µs ( <i>Option AYX only</i> )         | –1.0%    | (7)_____         | ±1.0%   | ±0.16%                  |
|                      | 100 µs ( <i>Option AYX only</i> )         | –1.0%    | (8)_____         | ±1.0%   | ±0.16%                  |
| <b>12.</b>           | <b>Display Scale Fidelity</b>             |          |                  |         |                         |
|                      | Cumulative Log Fidelity,<br>Res BW ≥1 kHz |          |                  |         |                         |
|                      | dB from Ref Level                         |          |                  |         |                         |
|                      | –4  | –0.30 dB | (1)_____         | 0.30 dB | ±0.082 dB               |
|                      | –8  | –0.30 dB | (2)_____         | 0.30 dB | ±0.078 dB               |
|                      | –12                                       | –0.40 dB | (3)_____         | 0.40 dB | ±0.075 dB               |
|                      | –16                                       | –0.40 dB | (4)_____         | 0.40 dB | ±0.073 dB               |
|                      | –20                                       | –0.40 dB | (5)_____         | 0.40 dB | ±0.078 dB               |
|                      | –24                                       | –0.50 dB | (6)_____         | 0.50 dB | ±0.074 dB               |
|                      | –28                                       | –0.50 dB | (7)_____         | 0.50 dB | ±0.073 dB               |
|                      | –32                                       | –0.60 dB | (8)_____         | 0.60 dB | ±0.077 dB               |
|                      | –36                                       | –0.60 dB | (9)_____         | 0.60 dB | ±0.075 dB               |
|                      | –40                                       | –0.60 dB | (10)_____        | 0.60 dB | ±0.081 dB               |
|                      | –44                                       | –0.70 dB | (11)_____        | 0.70 dB | ±0.077 dB               |

Performance Verification Test Records  
**Agilent E7401A Performance Verification Test Record**

**Table 3-2                      Agilent E7401A Performance Verification Test Record**

| <b>Agilent Technologies</b>                                     |          |                  |                         |                         |  |
|---|----------|------------------|-------------------------|-------------------------|--|
| <b>Model E7401A</b>   |          |                  | <b>Report No. _____</b> |                         |  |
| <b>Serial No. _____</b>   |          |                  | <b>Date _____</b>       |                         |  |
| Test Description  | Minimum  | Results Measured | Maximum                 | Measurement Uncertainty |  |
| -48   | -0.70 dB | (12)_____        | 0.70 dB                 | ±0.076 dB               |  |
| -52   | -0.70dB  | (13)_____        | 0.70 dB                 | ±0.080 dB               |  |
| -56   | -0.70 dB | (14)_____        | 0.70 dB                 | ±0.078 dB               |  |
| -60   | -0.70 dB | (15)_____        | 0.70 dB                 | ±0.084 dB               |  |
| -64   | -0.80 dB | (16)_____        | 0.80 dB                 | ±0.081 dB               |  |
| -68   | -0.80 dB | (17)_____        | 0.80 dB                 | ±0.080 dB               |  |
| -72   | -0.80 dB | (18)_____        | 0.80 dB                 | ±0.084 dB               |  |
| -76   | -0.80 dB | (19)_____        | 0.80 dB                 | ±0.083 dB               |  |
| -80   | -0.80 dB | (20)_____        | 0.80 dB                 | ±0.089 dB               |  |
| -84   | -1.15 dB | (21)_____        | 1.15 dB                 | ±0.086 dB               |  |
| Incremental Log Fidelity,<br>Res BW ≥1 kHz<br>dB from Ref Level |          |                  |                         |                         |  |
| -4  | -0.4 dB  | (22)_____        | 0.4 dB                  | ±0.082 dB               |  |
| -8  | -0.4 dB  | (23)_____        | 0.4 dB                  | ±0.078 dB               |  |
| -12   | -0.4 dB  | (24)_____        | 0.4 dB                  | ±0.075 dB               |  |
| -16   | -0.4 dB  | (25)_____        | 0.4 dB                  | ±0.073 dB               |  |
| -20   | -0.4 dB  | (26)_____        | 0.4 dB                  | ±0.078 dB               |  |
| -24   | -0.4 dB  | (27)_____        | 0.4 dB                  | ±0.074 dB               |  |
| -28   | -0.4 dB  | (28)_____        | 0.4 dB                  | ±0.073 dB               |  |
| -32   | -0.4 dB  | (29)_____        | 0.4 dB                  | ±0.077 dB               |  |
| -36   | -0.4 dB  | (30)_____        | 0.4 dB                  | ±0.075 dB               |  |
| -40   | -0.4 dB  | (31)_____        | 0.4 dB                  | ±0.081 dB               |  |
| -44   | -0.4 dB  | (32)_____        | 0.4 dB                  | ±0.077 dB               |  |
| -48   | -0.4 dB  | (33)_____        | 0.4 dB                  | ±0.076 dB               |  |
| -52   | -0.4 dB  | (34)_____        | 0.4 dB                  | ±0.080 dB               |  |

**Table 3-2 Agilent E7401A Performance Verification Test Record**

| <b>Agilent Technologies</b> |   |                |                         |                |                                |
|-----------------------------|---|----------------|-------------------------|----------------|--------------------------------|
| <b>Model E7401A</b>         |   |                | <b>Report No.</b> _____ |                |                                |
| <b>Serial No.</b> _____     |   |                | <b>Date</b> _____       |                |                                |
| <b>Test Description</b>     |   | <b>Minimum</b> | <b>Results Measured</b> | <b>Maximum</b> | <b>Measurement Uncertainty</b> |
|                             | –56   | –0.4 dB        | (35)_____               | 0.4 dB         | ±0.078 dB                      |
|                             | –60   | –0.4 dB        | (36)_____               | 0.4 dB         | ±0.084 dB                      |
|                             | –64   | –0.4 dB        | (37)_____               | 0.4 dB         | ±0.081 dB                      |
|                             | –68   | –0.4 dB        | (38)_____               | 0.4 dB         | ±0.080 dB                      |
|                             | –72   | –0.4 dB        | (39)_____               | 0.4 dB         | ±0.084 dB                      |
|                             | –76   | –0.4 dB        | (40)_____               | 0.4 dB         | ±0.083 dB                      |
|                             | –80   | –0.4 dB        | (41)_____               | 0.4 dB         | ±0.089 dB                      |
|                             | Cumulative Log Fidelity,<br>Res BW ≤300 Hz<br>dB from Ref Level |                |                         |                |                                |
|                             | –4  | –0.34 dB       | (43)_____               | 0.34 dB        | ±0.082 dB                      |
|                             | –8  | –0.38 dB       | (44)_____               | 0.38 dB        | ±0.078 dB                      |
|                             | –12   | –0.42 dB       | (45)_____               | 0.42 dB        | ±0.075 dB                      |
|                             | –16   | –0.46 dB       | (46)_____               | 0.46 dB        | ±0.073 dB                      |
|                             | –20   | –0.50 dB       | (47)_____               | 0.50 dB        | ±0.078 dB                      |
|                             | –24   | –0.54 dB       | (48)_____               | 0.54 dB        | ±0.074 dB                      |
|                             | –28   | –0.58 dB       | (49)_____               | 0.58 dB        | ±0.073 dB                      |
|                             | –32   | –0.62 dB       | (50)_____               | 0.62 dB        | ±0.077 dB                      |
|                             | –36   | –0.66 dB       | (51)_____               | 0.66 dB        | ±0.075 dB                      |
|                             | –40   | –0.70 dB       | (52)_____               | 0.70 dB        | ±0.081 dB                      |
|                             | –44   | –0.74 dB       | (53)_____               | 0.74 dB        | ±0.077 dB                      |
|                             | –48   | –0.78 dB       | (54)_____               | 0.78 dB        | ±0.076 dB                      |
|                             | –52   | –0.82 dB       | (55)_____               | 0.82 dB        | ±0.080 dB                      |
|                             | –56   | –0.86 dB       | (56)_____               | 0.86 dB        | ±0.078 dB                      |
|                             | –60   | –0.90 dB       | (57)_____               | 0.90 dB        | ±0.084 dB                      |

Performance Verification Test Records  
**Agilent E7401A Performance Verification Test Record**

**Table 3-2                      Agilent E7401A Performance Verification Test Record**

| <b>Agilent Technologies</b> |  |          |                         |         |                         |
|-----------------------------|--|----------|-------------------------|---------|-------------------------|
| <b>Model E7401A</b>         |  |          | <b>Report No.</b> _____ |         |                         |
| <b>Serial No.</b> _____     |  |          | <b>Date</b> _____       |         |                         |
|                             | Test Description   | Minimum  | Results Measured        | Maximum | Measurement Uncertainty |
|                             | -64  | -0.94 dB | (58)_____               | 0.94 dB | ±0.081 dB               |
|                             | -68  | -0.98 dB | (59)_____               | 0.98 dB | ±0.080 dB               |
|                             | -72  | -1.02 dB | (60)_____               | 1.02 dB | ±0.084 dB               |
|                             | -76  | -1.06 dB | (61)_____               | 1.06 dB | ±0.083 dB               |
|                             | -80  | -1.10 dB | (62)_____               | 1.10 dB | ±0.089 dB               |
|                             | -84  | -1.14 dB | (63)_____               | 1.14 dB | ±0.086 dB               |
|                             | -88  | -1.18 dB | (64)_____               | 1.18 dB | ±0.085 dB               |
|                             | -92  | -1.22 dB | (65)_____               | 1.22 dB | ±0.100 dB               |
|                             | -96  | -1.26 dB | (66)_____               | 1.26 dB | ±0.099 dB               |
|                             | -98  | -1.28 dB | (67)_____               | 1.28 dB | ±0.098 dB               |
|                             | Incremental Log Fidelity,<br>Res BW ≤300 Hz<br>dB from Ref Level |          |                         |         |                         |
|                             | -4   | -0.4 dB  | (68)_____               | 0.4 dB  | ±0.082 dB               |
|                             | -8   | -0.4 dB  | (69)_____               | 0.4 dB  | ±0.078 dB               |
|                             | -12  | -0.4 dB  | (70)_____               | 0.4 dB  | ±0.075 dB               |
|                             | -16  | -0.4 dB  | (71)_____               | 0.4 dB  | ±0.073 dB               |
|                             | -20  | -0.4 dB  | (72)_____               | 0.4 dB  | ±0.078 dB               |
|                             | -24  | -0.4 dB  | (73)_____               | 0.4 dB  | ±0.074 dB               |
|                             | -28  | -0.4 dB  | (74)_____               | 0.4 dB  | ±0.073 dB               |
|                             | -32  | -0.4 dB  | (75)_____               | 0.4 dB  | ±0.077 dB               |
|                             | -36  | -0.4 dB  | (76)_____               | 0.4 dB  | ±0.075 dB               |
|                             | -40  | -0.4 dB  | (77)_____               | 0.4 dB  | ±0.081 dB               |
|                             | -44  | -0.4 dB  | (78)_____               | 0.4 dB  | ±0.077 dB               |
|                             | -48  | -0.4 dB  | (79)_____               | 0.4 dB  | ±0.076 dB               |
|                             | -52  | -0.4 dB  | (80)_____               | 0.4 dB  | ±0.080 dB               |



**Table 3-2 Agilent E7401A Performance Verification Test Record**

| <b>Agilent Technologies</b>                             |          |                  |                         |                         |  |
|---|----------|------------------|-------------------------|-------------------------|--|
| <b>Model E7401A</b>                                     |          |                  | <b>Report No.</b> _____ |                         |  |
| <b>Serial No.</b> _____                                 |          |                  | <b>Date</b> _____       |                         |  |
| Test Description  | Minimum  | Results Measured | Maximum                 | Measurement Uncertainty |  |
| -56   | -0.4 dB  | (81)_____        | 0.4 dB                  | ±0.078 dB               |  |
| -60   | -0.4 dB  | (82)_____        | 0.4 dB                  | ±0.084 dB               |  |
| -64   | -0.4 dB  | (83)_____        | 0.4 dB                  | ±0.081 dB               |  |
| -68   | -0.4 dB  | (84)_____        | 0.4 dB                  | ±0.080 dB               |  |
| -72   | -0.4 dB  | (85)_____        | 0.4 dB                  | ±0.084 dB               |  |
| -76   | -0.4 dB  | (86)_____        | 0.4 dB                  | ±0.083 dB               |  |
| -80   | -0.4 dB  | (87)_____        | 0.4 dB                  | ±0.089 dB               |  |
| Linear Fidelity,<br>Res BW ≥1 kHz<br>dB from Ref Level  |          |                  |                         |                         |  |
| -4  | -2.0%    | (93)_____        | 2.0%                    | ±0.064%                 |  |
| -8  | -2.0%    | (94)_____        | 2.0%                    | ±0.064%                 |  |
| -12   | -2.0%    | (95)_____        | 2.0%                    | ±0.064%                 |  |
| -16   | -2.0%    | (96)_____        | 2.0%                    | ±0.064%                 |  |
| -20   | -2.0%    | (97)_____        | 2.0%                    | ±0.063%                 |  |
| Linear Fidelity,<br>Res BW ≤300 Hz<br>dB from Ref Level |          |                  |                         |                         |  |
| -4  | -2.0%    | (98)_____        | 2.0%                    | ±0.064%                 |  |
| -8  | -2.0%    | (99)_____        | 2.0%                    | ±0.064%                 |  |
| -12   | -2.0%    | (100)_____       | 2.0%                    | ±0.064%                 |  |
| -16   | -2.0%    | (101)_____       | 2.0%                    | ±0.064%                 |  |
| -20   | -2.0%    | (102)_____       | 2.0%                    | ±0.063%                 |  |
| Zero Span,<br>Res BW ≤300 Hz<br>dB from Ref Level       |          |                  |                         |                         |  |
| -4  | -0.36 dB | (103)_____       | 0.36 dB                 | ±0.082 dB               |  |

Performance Verification Test Records  
**Agilent E7401A Performance Verification Test Record**

**Table 3-2 Agilent E7401A Performance Verification Test Record**

| <b>Agilent Technologies</b> |  |                         |                         |                |                                |
|-----------------------------|--|-------------------------|-------------------------|----------------|--------------------------------|
| <b>Model E7401A</b>         |  | <b>Report No.</b> _____ |                         |                |                                |
| <b>Serial No.</b> _____     |  | <b>Date</b> _____       |                         |                |                                |
| <b>Test Description</b>     |  | <b>Minimum</b>          | <b>Results Measured</b> | <b>Maximum</b> | <b>Measurement Uncertainty</b> |
|                             | -8   | -0.42 dB                | (104)_____              | 0.42 dB        | ±0.078 dB                      |
|                             | -12  | -0.48 dB                | (105)_____              | 0.48 dB        | ±0.075 dB                      |
|                             | -16  | -0.54 dB                | (106)_____              | 0.54 dB        | ±0.073 dB                      |
|                             | -20  | -0.60 dB                | (107)_____              | 0.60 dB        | ±0.078 dB                      |
|                             | -24  | -0.66 dB                | (108)_____              | 0.66 dB        | ±0.074 dB                      |
|                             | -28  | -0.72 dB                | (109)_____              | 0.72 dB        | ±0.073 dB                      |
|                             | -32  | -0.78 dB                | (110)_____              | 0.78 dB        | ±0.077 dB                      |
|                             | -36  | -0.84 dB                | (111)_____              | 0.84 dB        | ±0.075 dB                      |
|                             | -40  | -0.90 dB                | (112)_____              | 0.90 dB        | ±0.081 dB                      |
|                             | -44  | -0.96 dB                | (113)_____              | 0.96 dB        | ±0.077 dB                      |
|                             | -48  | -1.02 dB                | (114)_____              | 1.02 dB        | ±0.076 dB                      |
|                             | -52  | -1.08 dB                | (115)_____              | 1.08 dB        | ±0.080 dB                      |
|                             | -56  | -1.14 dB                | (116)_____              | 1.14 dB        | ±0.078 dB                      |
|                             | -60  | -1.20 dB                | (117)_____              | 1.20 dB        | ±0.084 dB                      |
|                             | -64  | -1.5 dB                 | (118)_____              | 1.5 dB         | ±0.081 dB                      |
|                             | -68  | -1.5 dB                 | (119)_____              | 1.5 dB         | ±0.080 dB                      |
|                             | -70  | -1.5 dB                 | (120)_____              | 1.5 dB         | ±0.084 dB                      |
| <b>13.</b>                  | <b>Input Attenuation Switching Uncertainty</b> |                         |                         |                |                                |
|                             | Input Attenuation Setting                      |                         |                         |                |                                |
|                             | 0 dB   | -0.3 dB                 | (1)_____                | 0.3 dB         | ±0.101 dB                      |
|                             | 5 dB   | -0.3 dB                 | (2)_____                | 0.3 dB         | ±0.104 dB                      |
|                             | 15 dB  | -0.3 dB                 | (3)_____                | 0.3 dB         | ±0.102 dB                      |
|                             | 20 dB  | -0.3 dB                 | (4)_____                | 0.3 dB         | ±0.098 dB                      |
|                             | 25 dB  | -0.35 dB                | (5)_____                | 0.35 dB        | ±0.098 dB                      |
|                             | 30 dB  | -0.40 dB                | (6)_____                | 0.40 dB        | ±0.096 dB                      |

**Table 3-2 Agilent E7401A Performance Verification Test Record**

| <b>Agilent Technologies</b> |  |          |                         |         |                         |
|-----------------------------|--|----------|-------------------------|---------|-------------------------|
| <b>Model E7401A</b>         |  |          | <b>Report No.</b> _____ |         |                         |
| <b>Serial No.</b> _____     |  |          | <b>Date</b> _____       |         |                         |
|                             | Test Description   | Minimum  | Results Measured        | Maximum | Measurement Uncertainty |
|                             | 35 dB  | −0.45 dB | (7)_____                | 0.45 dB | ±0.099 dB               |
|                             | 40 dB  | −0.50 dB | (8)_____                | 0.50 dB | ±0.096 dB               |
|                             | 45 dB  | −0.55 dB | (9)_____                | 0.55 dB | ±0.099 dB               |
|                             | 50 dB  | −0.60 dB | (10)_____               | 0.60 dB | ±0.095 dB               |
|                             | 55 dB  | −0.65 dB | (11)_____               | 0.65 dB | ±0.099 dB               |
|                             | 60 dB  | −0.70 dB | (12)_____               | 0.70 dB | ±0.100 dB               |
| <b>14.</b>                  | <b>Reference Level Accuracy</b><br><br>Log, Res BW ≥1 kHz<br>Reference Level<br>(dBm)<br><br>−15                      −0.3 dB                      (1)_____                      0.3 dB                      ±0.091 dB<br>−5                        −0.3 dB                      (2)_____                      0.3 dB                      ±0.100 dB<br>−35                       −0.3 dB                      (3)_____                      0.3 dB                      ±0.092 dB<br>−45                       −0.3 dB                      (4)_____                      0.3 dB                      ±0.094 dB<br>−55                       −0.5 dB                      (5)_____                      0.5 dB                      ±0.095 dB<br>−65                       −0.5 dB                      (6)_____                      0.5 dB                      ±0.097 dB<br>−75                       −0.7 dB                      (7)_____                      0.7 dB                      ±0.099 dB<br><br>Linear, Res BW ≤300 Hz<br>Reference Level<br>(dBm)<br><br>−15                       −0.3 dB                      (8)_____                      0.3 dB                      ±0.091 dB<br>−5                        −0.3 dB                      (9)_____                      0.3 dB                      ±0.100 dB<br>−35                       −0.3 dB                      (10)_____                      0.3 dB                      ±0.092 dB<br>−45                       −0.3 dB                      (11)_____                      0.3 dB                      ±0.094 dB<br>−55                       −0.5 dB                      (12)_____                      0.5 dB                      ±0.095 dB<br>−65                       −0.5 dB                      (13)_____                      0.5 dB                      ±0.097 dB |          |                         |         |                         |

Performance Verification Test Records  
**Agilent E7401A Performance Verification Test Record**

**Table 3-2 Agilent E7401A Performance Verification Test Record**

| <b>Agilent Technologies</b> |  |                         |                         |                |                                |
|-----------------------------|--|-------------------------|-------------------------|----------------|--------------------------------|
| <b>Model E7401A</b>         |  | <b>Report No.</b> _____ |                         |                |                                |
| <b>Serial No.</b> _____     |  | <b>Date</b> _____       |                         |                |                                |
| <b>Test Description</b>     |  | <b>Minimum</b>          | <b>Results Measured</b> | <b>Maximum</b> | <b>Measurement Uncertainty</b> |
|                             | –75<br>Log, Res BW ≤300 Hz<br>Reference Level<br>(dBm) | –0.7 dB                 | (14)_____               | 0.7 dB         | ±0.099 dB                      |
|                             | –15  | –0.3 dB                 | (15)_____               | 0.3 dB         | ±0.091 dB                      |
|                             | –5   | –0.3 dB                 | (16)_____               | 0.3 dB         | ±0.100 dB                      |
|                             | –35  | –0.3 dB                 | (17)_____               | 0.3 dB         | ±0.092 dB                      |
|                             | –45  | –0.3 dB                 | (18)_____               | 0.3 dB         | ±0.094 dB                      |
|                             | –55  | –0.5 dB                 | (19)_____               | 0.5 dB         | ±0.095 dB                      |
|                             | –65  | –0.5 dB                 | (20)_____               | 0.5 dB         | ±0.097 dB                      |
|                             | –75  | –0.7 dB                 | (21)_____               | 0.7 dB         | ±0.099 dB                      |
|                             | Linear, Res BW ≤300 Hz<br>Reference Level<br>(dBm)     |                         |                         |                |                                |
|                             | –15  | –0.3 dB                 | (22)_____               | 0.3 dB         | ±0.091 dB                      |
|                             | –5   | –0.3 dB                 | (23)_____               | 0.3 dB         | ±0.100 dB                      |
|                             | –35  | –0.3 dB                 | (24)_____               | 0.3 dB         | ±0.092 dB                      |
|                             | –45  | –0.3 dB                 | (25)_____               | 0.3 dB         | ±0.094 dB                      |
|                             | –55  | –0.5 dB                 | (26)_____               | 0.5 dB         | ±0.095 dB                      |
|                             | –65  | –0.5 dB                 | (27)_____               | 0.5 dB         | ±0.097 dB                      |
|                             | –75  | –0.7 dB                 | (28)_____               | 0.7 dB         | ±0.099 dB                      |
| <b>16.</b>                  | <b>Resolution Bandwidth Switching Uncertainty</b>      |                         |                         |                |                                |
|                             | Resolution Bandwidth                                   |                         |                         |                |                                |
|                             | 3 kHz  | –0.3 dB                 | (1)_____                | 0.3 dB         | ±0.048 dB                      |
|                             | 9 kHz  | –0.3 dB                 | (2)_____                | 0.3 dB         | ±0.048 dB                      |

**Table 3-2 Agilent E7401A Performance Verification Test Record**

| Agilent Technologies |   |          |                  |         |                         |
|----------------------|---|----------|------------------|---------|-------------------------|
| Model E7401A         |   |          | Report No. _____ |         |                         |
| Serial No. _____     |   |          | Date _____       |         |                         |
| Test Description     |   | Minimum  | Results Measured | Maximum | Measurement Uncertainty |
|                      | 10 kHz  | -0.3 dB  | (3)_____         | 0.3 dB  | ±0.048 dB               |
|                      | 30 kHz  | -0.3 dB  | (4)_____         | 0.3 dB  | ±0.048 dB               |
|                      | 100 kHz   | -0.3 dB  | (5)_____         | 0.3 dB  | ±0.048 dB               |
|                      | 120 kHz   | -0.3 dB  | (6)_____         | 0.3 dB  | ±0.048 dB               |
|                      | 300 kHz   | -0.3 dB  | (7)_____         | 0.3 dB  | ±0.048 dB               |
|                      | 1 MHz   | -0.3 dB  | (8)_____         | 0.3 dB  | ±0.048 dB               |
|                      | 3 MHz   | -0.3 dB  | (9)_____         | 0.3 dB  | ±0.048 dB               |
|                      | 5 MHz   | -0.6 dB  | (10)_____        | 0.6 dB  | ±0.076 dB               |
|                      | 300 Hz  | -0.3 dB  | (11)_____        | 0.3 dB  | ±0.048 dB               |
|                      | 200 Hz  | -0.3 dB  | (12)_____        | 0.3 dB  | ±0.048 dB               |
|                      | 100 Hz  | -0.3 dB  | (13)_____        | 0.3 dB  | ±0.048 dB               |
|                      | 30 Hz   | -0.3 dB  | (14)_____        | 0.3 dB  | ±0.048 dB               |
|                      | 10 Hz   | -0.3 dB  | (15)_____        | 0.3 dB  | ±0.048 dB               |
|                      | 3 Hz ( <i>Option 1D5 only</i> )<br>Firmware Revision A.08.00 or later | -0.3 dB  | (16)_____        | 0.3 dB  | ±0.048 dB               |
|                      | 1Hz ( <i>Option 1D5 only</i> )<br>Firmware Revision A.08.00 or later  | -0.3 dB  | (17)_____        | 0.3 dB  | ±0.048 dB               |
| <b>17.</b>           | <b>Absolute Amplitude Accuracy (Reference Settings)</b>               |          |                  |         |                         |
|                      | Log, Preamp Off   | -0.30 dB | (1)_____         | 0.30 dB | ±0.09 dB                |
|                      | Lin, Preamp Off   | -0.30 dB | (2)_____         | 0.30 dB | ±0.09 dB                |
|                      | Log, Preamp On  | -0.37 dB | (3)_____         | 0.37 dB | ±0.09 dB                |
|                      | Lin, Preamp On  | -0.37 dB | (4)_____         | 0.37 dB | ±0.09 dB                |
| <b>19.</b>           | <b>Overall Absolute Amplitude Accuracy</b>                            |          |                  |         |                         |

Performance Verification Test Records  
**Agilent E7401A Performance Verification Test Record**

**Table 3-2 Agilent E7401A Performance Verification Test Record**

| <b>Agilent Technologies</b> |                                      |                         |                  |          |                         |
|-----------------------------|--------------------------------------|-------------------------|------------------|----------|-------------------------|
| <b>Model E7401A</b>         |                                      | <b>Report No.</b> _____ |                  |          |                         |
| <b>Serial No.</b> _____     |                                      | <b>Date</b> _____       |                  |          |                         |
|                             | Test Description                     | Minimum                 | Results Measured | Maximum  | Measurement Uncertainty |
|                             | 0 dBm Reference Level                |                         |                  |          |                         |
|                             | 0 dBm input                          | −0.54 dB                | (1)_____         | 0.54 dB  | ±0.234 dB               |
|                             | −10 dBm input                        | −0.54 dB                | (2)_____         | 0.54 dB  | ±0.115 dB               |
|                             | −20 dBm input                        | −0.54 dB                | (3)_____         | 0.54 dB  | ±0.110 dB               |
|                             | −30 dBm input                        | −0.54 dB                | (4)_____         | 0.54 dB  | ±0.109 dB               |
|                             | −40 dBm input                        | −0.54 dB                | (5)_____         | 0.54 dB  | ±0.109 dB               |
|                             | −50 dBm input                        | −0.54 dB                | (6)_____         | 0.54 dB  | ±0.109 dB               |
|                             | −20 dBm Reference Level              |                         |                  |          |                         |
|                             | −20 dBm input                        | −0.54 dB                | (7)_____         | 0.54 dB  | ±0.109 dB               |
|                             | −30 dBm input                        | −0.54 dB                | (8)_____         | 0.54 dB  | ±0.109 dB               |
|                             | −40 dBm input                        | −0.54 dB                | (9)_____         | 0.54 dB  | ±0.109 dB               |
|                             | −50 dBm input                        | −0.54 dB                | (10)_____        | 0.54 dB  | ±0.109 dB               |
|                             | −40 dBm Reference Level              |                         |                  |          |                         |
|                             | −40 dBm input                        | −0.54 dB                | (11)_____        | 0.54 dB  | ±0.087 dB               |
|                             | −50 dBm input                        | −0.54 dB                | (12)_____        | 0.54 dB  | ±0.087 dB               |
|                             | −50 dBm Reference Level              |                         |                  |          |                         |
|                             | −50 dBm input                        | −0.54 dB                | (13)_____        | 0.54 dB  | ±0.087 dB               |
| <b>21.</b>                  | <b>Resolution Bandwidth Accuracy</b> |                         |                  |          |                         |
|                             | Resolution Bandwidth                 |                         |                  |          |                         |
|                             | 5 MHz                                | 3.5 MHz                 | (1)_____         | 6.5 MHz  | ±110 kHz                |
|                             | 3 MHz                                | 2.55 MHz                | (2)_____         | 3.45 MHz | ±66 kHz                 |
|                             | 1 MHz (−3 dB)                        | 0.85 MHz                | (3)_____         | 1.15 MHz | ±22 kHz                 |
|                             | 300 kHz                              | 255 kHz                 | (4)_____         | 345 kHz  | ±6.6 kHz                |
|                             | 100 kHz                              | 85 kHz                  | (5)_____         | 115 kHz  | ±2.2 kHz                |
|                             | 30 kHz                               | 25.5 kHz                | (6)_____         | 34.5 kHz | ±660 Hz                 |

**Table 3-2 Agilent E7401A Performance Verification Test Record**

| <b>Agilent Technologies</b>         |                                   |   |   |          |                         |
|-------------------------------------|-----------------------------------|---|---|----------|-------------------------|
| <b>Model E7401A</b>                 |                                   |   | <b>Report No.</b> _____   |          |                         |
| <b>Serial No.</b> _____             |                                   |   | <b>Date</b> _____   |          |                         |
|                                     | Test Description                  | Minimum   | Results Measured  | Maximum  | Measurement Uncertainty |
|                                     | 10 kHz                            | 8.5 kHz   | (7)_____  | 11.5 kHz | ±220 Hz                 |
|                                     | 3 kHz                             | 2.55 kHz  | (8)_____  | 3.45 kHz | ±66 Hz                  |
|                                     | 1 kHz                             | 850 Hz  | (9)_____  | 1.15 kHz | ±22 Hz                  |
|                                     | 120 kHz                           | 96 kHz  | (10)_____   | 144 kHz  | ±2.17 kHz               |
|                                     | 9 kHz                             | 7.2 kHz   | (11)_____   | 10.8 kHz | ±163 Hz                 |
|                                     | 1 MHz (–6 dB)                     | 900 kHz   | (12)_____   | 1.1 MHz  | ±22 kHz                 |
| <b>22.</b>                          | <b>Frequency Response</b>         | Note: Enter data in the appropriate section below depending upon the ambient temperature at which the test was performed and installed options. |   |          |                         |
|                                     | 20 to 30° C<br>(9 kHz to 1.5 GHz) |   |   |          |                         |
|                                     | Maximum Response                  |   | (1)_____  | 0.50 dB  | ±0.19 dB                |
|                                     | Minimum Response                  | –0.50 dB  | (2)_____  |          | ±0.19 dB                |
|                                     | Peak-to-Peak Response             |   | (3)_____  | 1.0 dB   | ±0.19 dB                |
|                                     | 0 to 55° C<br>(9 kHz to 1.5 GHz)  |   |   |          |                         |
|                                     | Maximum Response                  |   | (1)_____  | 1.0 dB   | ±0.19 dB                |
|                                     | Minimum Response                  | –1.0 dB   | (2)_____  |          | ±0.19 dB                |
|                                     | Peak-to-Peak Response             |   | (3)_____  | 2.0 dB   | ±0.19 dB                |
|                                     | <b>25.</b>                        | <b>Frequency Response (Preamp On)</b>   | Note: Enter data in the appropriate section below depending upon the ambient temperature at which the test was performed and installed options. |          |                         |
| 20 to 30° C<br>(100 kHz to 1.5 GHz) |                                   |   |   |          |                         |
| Maximum Response                    |                                   |   | (1)_____  | 1.0 dB   | ±0.28 dB                |
| Minimum Response                    |                                   | –1.0 dB   | (2)_____  |          | ±0.28 dB                |
| Peak-to-Peak Response               |                                   |   | (3)_____  | 2.0 dB   | ±0.28 dB                |

Performance Verification Test Records  
**Agilent E7401A Performance Verification Test Record**

**Table 3-2 Agilent E7401A Performance Verification Test Record**

| <b>Agilent Technologies</b>  |                                    |                                     |                                       |   |  |
|--|------------------------------------|-------------------------------------|---------------------------------------|---|--|
| <b>Model E7401A</b>  |                                    | <b>Report No.</b> _____             |                                       |   |  |
| <b>Serial No.</b> _____  |                                    | <b>Date</b> _____                   |                                       |   |  |
| Test Description   | Minimum                            | Results Measured                    | Maximum                               | Measurement Uncertainty                     |  |
| 0 to 55° C<br>(100 kHz to 1.5 GHz)<br><br>Maximum Response<br><br>Minimum Response<br><br>Peak-to-Peak Response              | -1.5 dB                            | (1) _____<br>(2) _____<br>(3) _____ | 1.5 dB<br><br><br>3.0 dB              | ±0.28 dB<br><br>±0.28 dB<br><br>±0.28 dB    |  |
| <b>28. Other Input-Related Spurious Responses</b><br><br>Input Frequency<br><br>542.8 MHz<br><br>510.7 MHz<br><br>1310.7 MHz |                                    | (1) _____<br>(2) _____<br>(3) _____ | -65 dBc<br><br>-65 dBc<br><br>-45 dBc | ±0.889 dB<br><br>±0.889 dB<br><br>±0.889 dB |  |
| <b>30. Spurious Responses</b><br><br>50 MHz TOI, 1 kHz RBW<br><br>50 MHz TOI, 30 Hz RBW<br><br>40 MHz SHI                    | 10 dBm<br><br>10 dBm<br><br>35 dBm | (1) _____<br>(2) _____<br>(3) _____ |                                       | ±0.93 dB<br><br>±0.93 dB<br><br>±0.50 dB    |  |
| <b>33. Gain Compression</b><br><br>Test Frequency<br><br>53 MHz<br><br>50.004 MHz<br><br>1403 MHz                            |                                    | (1) _____<br>(2) _____<br>(3) _____ | 1.0 dB<br><br>1.0 dB<br><br>1.0 dB    | ±0.123 dB<br><br>±0.123 dB<br><br>±0.123 dB |  |
| <b>35. Displayed Average Noise Level</b><br><br>1 kHz RBW, Preamp Off<br><br>400 kHz<br><br>1 MHz to 10 MHz                  |                                    | (1) _____<br>(2) _____              | -115 dBm<br><br>-115 dBm              | ±1.23 dB<br><br>±1.23 dB                    |  |



**Table 3-2 Agilent E7401A Performance Verification Test Record**

| <b>Agilent Technologies</b>  |            |                           |          |                         |         |          |
|--|------------|---------------------------|----------|-------------------------|---------|----------|
| <b>Model E7401A</b>  |            | <b>Report No.</b> _____   |          |                         |         |          |
| <b>Serial No.</b> _____  |            | <b>Date</b> _____         |          |                         |         |          |
| Test Description   | Minimum    | Results Measured          | Maximum  | Measurement Uncertainty |         |          |
| <div style="display: flex; flex-direction: column; gap: 5px;"> <div>10 MHz to 500 MHz</div> <div>500 MHz to 1 GHz</div> <div>1 GHz to 1.5 GHz</div> <div>1 kHz RBW,<br/>Preamp On</div> <div>400 kHz</div> <div>1 MHz to 10 MHz</div> <div>10 MHz to 500 MHz</div> <div>500 MHz to 1 GHz</div> <div>1 GHz to 1.5 GHz</div> <div>10 Hz RBW,<br/>Preamp Off</div> <div>400 kHz</div> <div>1 MHz to 10 MHz</div> <div>10 MHz to 500 MHz</div> <div>500 MHz to 1 GHz</div> <div>1 GHz to 1.5 GHz</div> <div>10 Hz RBW,<br/>Preamp On</div> <div>400 kHz</div> <div>1 MHz to 10 MHz</div> <div>10 MHz to 500 MHz</div> <div>500 MHz to 1 GHz</div> <div>1 GHz to 1.5 GHz</div> </div> |            | (3)_____                  | –119 dBm | ±1.23 dB                |         |          |
|  |            | (4)_____                  | –117 dBm | ±1.23 dB                |         |          |
|  |            | (5)_____                  | –114 dBm | ±1.23 dB                |         |          |
|  |            | (6)_____                  | –131 dBm | ±1.23 dB                |         |          |
|  |            | (7)_____                  | –131 dBm | ±1.23 dB                |         |          |
|  |            | (8)_____                  | –135 dBm | ±1.23 dB                |         |          |
|  |            | (9)_____                  | –133 dBm | ±1.23 dB                |         |          |
|  |            | (10)_____                 | –131 dBm | ±1.23 dB                |         |          |
|  |            | (11)_____                 | –134 dBm | ±1.23 dB                |         |          |
|  |            | (12)_____                 | –134 dBm | ±1.23 dB                |         |          |
|  |            | (13)_____                 | –138 dBm | ±1.23 dB                |         |          |
|  |            | (14)_____                 | –136 dBm | ±1.23 dB                |         |          |
|  |            | (15)_____                 | –133 dBm | ±1.23 dB                |         |          |
|  |            | (16)_____                 | –150 dBm | ±1.23 dB                |         |          |
|  |            | (17)_____                 | –150 dBm | ±1.23 dB                |         |          |
|  |            | (18)_____                 | –154 dBm | ±1.23 dB                |         |          |
|  |            | (19)_____                 | –152 dBm | ±1.23 dB                |         |          |
|  |            | (20)_____                 | –150 dBm | ±1.23 dB                |         |          |
|  | <b>39.</b> | <b>Residual Responses</b> |          |                         |         |          |
|  |            | 150 kHz to 1.5 GHz        |          | (1)_____                | –90 dBm | ±0.87 dB |

Performance Verification Test Records  
**Agilent E7401A Performance Verification Test Record**

**Table 3-2 Agilent E7401A Performance Verification Test Record**

| <b>Agilent Technologies</b> |  |                         |                         |                |                                |
|-----------------------------|--|-------------------------|-------------------------|----------------|--------------------------------|
| <b>Model E7401A</b>         |  | <b>Report No.</b> _____ |                         |                |                                |
| <b>Serial No.</b> _____     |  | <b>Date</b> _____       |                         |                |                                |
| <b>Test Description</b>     |  | <b>Minimum</b>          | <b>Results Measured</b> | <b>Maximum</b> | <b>Measurement Uncertainty</b> |
| <b>40.</b>                  | <b>Fast Time Domain Amplitude Accuracy</b> ( <i>Option AYX only</i> )<br><br>Amplitude Error   | –0.3%                   | (1)_____                | 0.3%           | ±0.029%                        |
| <b>41.</b>                  | <b>Tracking Generator Absolute Amplitude and Vernier Accuracy</b><br><br>( <i>Option 1DN only</i> )<br><br>Absolute Amplitude Accuracy<br><br>Positive Vernier Accuracy<br><br>Negative Vernier Accuracy<br><br>Power Sweep Accuracy   |                         |                         |                |                                |
|                             |  | –0.5 dB                 | (1)_____                | 0.5 dB         | ±0.096 dB                      |
|                             |  |                         | (2)_____                | 0.75 dB        | ±0.008 dB                      |
|                             |  | –0.75 dB                | (3)_____                |                | ±0.008 dB                      |
|                             |  |                         | (4)_____                | 1.5 dB         | ±0.008 dB                      |
| <b>43.</b>                  | <b>Tracking Generator Level Flatness</b><br><br>( <i>Option 1DN only</i> )<br><br>Positive Level Flatness, <1 MHz<br><br>Negative Level Flatness, <1 MHz<br><br>Positive Level Flatness, 1 MHz to 10 MHz<br><br>Negative Level Flatness, 1 MHz to 10 MHz<br><br>Positive Level Flatness, >10 MHz<br><br>Negative Level Flatness, >10 MHz |                         |                         |                |                                |
|                             |  |                         | (1)_____                | 2.0 dB         | ±0.73 dB                       |
|                             |  | –2.0 dB                 | (2)_____                |                | ±0.73 dB                       |
|                             |  |                         | (3)_____                | 2.0 dB         | ±0.190 dB                      |
|                             |  | –2.0 dB                 | (4)_____                |                | ±0.190 dB                      |
|                             |  |                         | (5)_____                | 1.5 dB         | ±0.190 dB                      |
|                             |  | –1.5 dB                 | (6)_____                |                | ±0.190 dB                      |
| <b>45.</b>                  | <b>Tracking Generator Harmonic Spurious Outputs</b><br>( <i>Option 1DN only</i> )  |                         |                         |                |                                |

**Table 3-2 Agilent E7401A Performance Verification Test Record**

| Agilent Technologies |   |   |                                     |  |  |
|----------------------|---|---|-------------------------------------|--|--|
| Model E7401A         |   |   | Report No. _____                    |  |  |
| Serial No. _____     |   |   | Date _____                          |  |  |
| Test Description     |   | Minimum                                       | Results Measured                    | Maximum  | Measurement Uncertainty                  |
|                      | 2 <sup>nd</sup> Harmonic, <20 MHz   |   | (1)_____                            | -20 dBc  | ±2.6 dB                                  |
|                      | 2 <sup>nd</sup> Harmonic, ≥20 MHz   |   | (2)_____                            | -25 dBc  | ±2.6 dB                                  |
|                      | 3 <sup>rd</sup> Harmonic, <20 MHz   |   | (3)_____                            | -20 dBc  | ±2.6 dB                                  |
|                      | 3 <sup>rd</sup> Harmonic, ≥20 MHz   |   | (4)_____                            | -25 dBc  | ±2.6 dB                                  |
| <b>47.</b>           | <b>Tracking Generator Non-Harmonic Spurious Outputs</b> ( <i>Option 1DN only</i> )<br><br>Highest Non-Harmonic Spurious Output Amplitude                                |   | (1)_____                            | -35 dBc  | ±2.65 dB                                 |
| <b>50.</b>           | <b>Gate Delay Accuracy and Gate Length Accuracy</b> ( <i>Option 1D6 only</i> )<br><br>Minimum Gate Delay<br>Maximum Gate Delay<br>1 μs Gate Length<br>65 ms Gate Length | 499.9 ns<br>499.9 ns<br>499.9 ns<br>64.993 ms | (1)_____ (2)_____ (3)_____ (4)_____ | 1.5001 μs<br>1.5001 μs<br>1.5001 μs<br>65.007 ms | ±549 ps<br>±549 ps<br>±520 ps<br>±647 ns |
| <b>51.</b>           | <b>Gate Mode Additional Amplitude Error</b> ( <i>Option 1D6 only</i> )<br><br>Amplitude Error   | -0.2 dB                                       | (1)_____                            | 0.2 dB   | ±0.023 dB                                |

## Agilent E7402A Performance Verification Test Record

Tests for the Agilent E7402A only are included in this test record, therefore not all test numbers are included.

**Table 3-3**      **Agilent E7402A Performance Verification Test Record**

|  |                  |   |                     |
|--|------------------|---|---------------------|
| Agilent Technologies                     |                  |   |                     |
| Address: _____                           |                  | Report No. _____                              |                     |
| _____                                    |                  | Date _____                                    |                     |
| _____                                    |                  |   |                     |
| Model E7402A                             |                  |   |                     |
| Serial No. _____                         |                  | Ambient temperature _____ ° C                 |                     |
| Options _____                            |                  | Relative humidity _____ %                     |                     |
| Firmware Revision _____                  |                  | Power mains line frequency _____ Hz (nominal) |                     |
| Customer _____                           |                  | Tested by _____                               |                     |
| <b>Test Equipment Used:</b>              |                  |   |                     |
| <b>Description</b>                       | <b>Model No.</b> | <b>Trace No.</b>                              | <b>Cal Due Date</b> |
| Synthesized Signal Generator             | _____            | _____   | _____               |
| Wide Offset Phase Noise Signal Generator | _____            | _____   | _____               |
| Synthesized Sweeper                      | _____            | _____   | _____               |
| Function Generator                       | _____            | _____   | _____               |
| Power Meter, Dual-Channel                | _____            | _____   | _____               |
| RF Power Sensor #1                       | _____            | _____   | _____               |
| RF Power Sensor #2                       | _____            | _____   | _____               |
| Low-Power Power Sensor                   | _____            | _____   | _____               |
| Digital Multimeter                       | _____            | _____   | _____               |
| Universal Counter                        | _____            | _____   | _____               |
| Frequency Standard                       | _____            | _____   | _____               |
| Power Splitter                           | _____            | _____   | _____               |
| 50 Ω Termination                         | _____            | _____   | _____               |
| 1 dB Step Attenuator                     | _____            | _____   | _____               |
| 10 dB Step Attenuator                    | _____            | _____   | _____               |

**Table 3-3 Agilent E7402A Performance Verification Test Record**

|  |       |       |       |
|--|-------|-------|-------|
| Oscilloscope<br>(Option 1D6 only)                | _____ | _____ | _____ |
| Microwave Spectrum<br>Analyzer (Option 1DN only) | _____ | _____ | _____ |
| Notes/comments:                                  | _____ |       |       |
|  | _____ |       |       |

**Table 3-4 Agilent E7402A Performance Verification Test Record**

| <b>Agilent Technologies</b> |  |   |  |   |  |
|-----------------------------|--|---|--|---|--|
| <b>Model E7402A</b>         |  |   | <b>Report No.</b> _____                              |   |  |
| <b>Serial No.</b> _____     |  |   | <b>Date</b> _____                                    |   |  |
| Test Description            |  | Minimum   | Results Measured                                     | Maximum   | Measurement Uncertainty                              |
| <b>1.</b>                   | <b>10 MHz Reference Output Accuracy</b> (Non-Option 1D5 only)<br><br>Settability   | -5.0 Hz   | (1)_____   | 5.0 Hz  | ±293.3 µHz   |
| <b>2.</b>                   | <b>10 MHz High-Stability Frequency Reference Output Accuracy</b> (Option 1D5 only)<br><br>5 Minute Warm-Up Error<br><br>15 Minute Warm-Up Error  | -0.1 ppm<br><br>-0.01 ppm   | (1)_____<br><br>(2)_____                             | 0.1 ppm<br><br>0.01 ppm   | ±0.000072 ppm<br><br>±0.000070 ppm                   |
| <b>3.</b>                   | <b>Frequency Readout and Marker Frequency Count Accuracy</b><br><br>Frequency Readout Accuracy<br><br>Center Freq    Span<br>1500 MHz    20 MHz<br>1500 MHz    10 MHz<br>1500 MHz    1 MHz<br><br>Marker Count Accuracy<br><br>Center Freq    Span<br>1500 MHz    10 MHz | <br><br><br>1499.83 MHz<br>1499.91 MHz<br>1499.991 MHz<br><br><br>1499.999999 MHz | (1)_____<br>(2)_____<br>(3)_____<br><br><br>(4)_____ | <br><br><br>1500.17 MHz<br>1500.09 MHz<br>1500.009 MHz<br><br><br>1500.000001 MHz | <br><br><br>±0 Hz<br>±0 Hz<br>±0 Hz<br><br><br>±0 Hz |

Performance Verification Test Records  
**Agilent E7402A Performance Verification Test Record**

**Table 3-4 Agilent E7402A Performance Verification Test Record**

| <b>Agilent Technologies</b><br><br><b>Model E7402A</b> <span style="float: right;"><b>Report No.</b> _____</span><br><b>Serial No.</b> _____ <span style="float: right;"><b>Date</b> _____</span> |  |  |  |  |  |
|---|--|--|--|--|--|
| Test Description  | Minimum  | Results Measured   | Maximum  | Measurement Uncertainty  |  |
| 1500 MHz 1 MHz  | 1499.999999 MHz  | (5)_____   | 1500.000001 MHz  | ±0 Hz  |  |
| <b>6. Frequency Span Accuracy</b><br><br>Span Start Freq<br>3000 MHz 0 Hz<br>100 MHz 10 MHz<br>100 kHz 10 MHz<br>100 MHz 800 MHz<br>100 kHz 800 MHz<br>100 MHz 1400 MHz<br>100 kHz 1499 MHz       | 2370 MHz<br>79 MHz<br>79 kHz<br>79 MHz<br>79 kHz<br>79 MHz<br>79 kHz | (1)_____<br>(2)_____<br>(3)_____<br>(4)_____<br>(5)_____<br>(6)_____<br>(7)_____ | 2430 MHz<br>81 MHz<br>81 kHz<br>81 MHz<br>81 kHz<br>81 MHz<br>81 kHz | ±6.12 MHz<br>±204 kHz<br>±204 Hz<br>±204 kHz<br>±204 Hz<br>±204 kHz<br>±204 Hz |  |
| <b>7. Noise Sidebands</b><br><br>Offset from 1 GHz signal<br><br>10 kHz<br>20 kHz<br>30 kHz   |  | (1)_____<br>(2)_____<br>(3)_____   | -90 dBc/Hz<br>-100 dBc/Hz<br>-106 dBc/Hz                             | ±2.44 dB<br>±2.44 dB<br>±2.44 dB   |  |
| <b>8. Noise Sidebands - Wide Offsets</b><br><br>Offset from 1 GHz signal<br><br>100 kHz<br>1 MHz<br>5 MHz<br>10 MHz   |  | (1)_____<br>(2)_____<br>(3)_____<br>(4)_____                                     | -118 dBc/Hz<br>-125 dBc/Hz<br>-127 dBc/Hz<br>-131 dBc/Hz             | ±2.44 dB<br>±2.44 dB<br>±2.44 dB<br>±2.44 dB                                   |  |
| <b>9. System-Related Sidebands</b><br><br>Offset from 500 MHz signal<br><br>30 kHz to 230 kHz   |  | (1)_____   | -65 dBc  | ±1.30 dB   |  |

**Table 3-4 Agilent E7402A Performance Verification Test Record**

| <b>Agilent Technologies</b><br><b>Model E7402A</b><br><b>Serial No. _____</b> |   |          |                  |           |                         | <b>Report No. _____</b><br><b>Date _____</b> |  |  |  |  |  |
|---|---|----------|------------------|-----------|-------------------------|--|--|--|--|--|--|
| Test Description  |   | Minimum  | Results Measured | Maximum   | Measurement Uncertainty |  |  |  |  |  |  |
|   | –30 kHz to –230 kHz                       |          | (2)_____         | –65 dBc   | ±1.30 dB                |  |  |  |  |  |  |
| <b>10.</b>  | <b>Residual FM</b>                        |          |                  |           |                         |  |  |  |  |  |  |
|   | 1 kHz Res BW,<br>(Non-Option 1D5)         |          | (1)_____         | 150 Hz    | ±21 Hz                  |  |  |  |  |  |  |
|   | 1 kHz Res BW,<br>(Option 1D5)             |          | (1)_____         | 100 Hz    | ±21 Hz                  |  |  |  |  |  |  |
|   | 10 Hz Res BW<br>(Option 1D5 only)         |          | (3)_____         | 2 Hz      | ±0.27 Hz                |  |  |  |  |  |  |
| <b>11.</b>  | <b>Sweep Time Accuracy</b>                |          |                  |           |                         |  |  |  |  |  |  |
|   | Sweep Time                                |          |                  |           |                         |  |  |  |  |  |  |
|   | 5 ms                                      | –1.0%    | (1)_____         | 1.0%      | ±0.16%                  |  |  |  |  |  |  |
|   | 20 ms                                     | –1.0%    | (2)_____         | 1.0%      | ±0.16%                  |  |  |  |  |  |  |
|   | 100 ms                                    | –1.0%    | (3)_____         | 1.0%      | ±0.16%                  |  |  |  |  |  |  |
|   | 1 s                                       | –1.0%    | (4)_____         | 1.0%      | ±0.16%                  |  |  |  |  |  |  |
|   | 10 s                                      | –1.0%    | (5)_____         | 1.0%      | ±0.16%                  |  |  |  |  |  |  |
|   | 1 ms (Option AYX only)                    | –1.0%    | (6)_____         | 1.0%      | ±0.16%                  |  |  |  |  |  |  |
|   | 500 μs (Option AYX only)                  | –1.0%    | (7)_____         | 1.0%      | ±0.16%                  |  |  |  |  |  |  |
| 100 μs (Option AYX only)  | –1.0%                                     | (8)_____ | 1.0%             | ±0.16%    |                         |  |  |  |  |  |  |
| <b>12.</b>  | <b>Display Scale Fidelity</b>             |          |                  |           |                         |  |  |  |  |  |  |
|   | Cumulative Log Fidelity,<br>Res BW ≥1 kHz |          |                  |           |                         |  |  |  |  |  |  |
|   | dB from Ref Level                         |          |                  |           |                         |  |  |  |  |  |  |
|   | –4  | –0.30 dB | (1)_____         | 0.30 dB   | ±0.082 dB               |  |  |  |  |  |  |
|   | –8  | –0.30 dB | (2)_____         | 0.30 dB   | ±0.078 dB               |  |  |  |  |  |  |
|   | –12                                       | –0.40 dB | (3)_____         | 0.40 dB   | ±0.075 dB               |  |  |  |  |  |  |
| –16   | –0.40 dB                                  | (4)_____ | 0.40 dB          | ±0.073 dB |                         |  |  |  |  |  |  |
| –20   | –0.40 dB                                  | (5)_____ | 0.40 dB          | ±0.078 dB |                         |  |  |  |  |  |  |

Performance Verification Test Records  
**Agilent E7402A Performance Verification Test Record**

**Table 3-4                      Agilent E7402A Performance Verification Test Record**

| <b>Agilent Technologies</b><br><br><b>Model E7402A</b> <span style="float: right;"><b>Report No.</b> _____</span><br><b>Serial No.</b> _____ <span style="float: right;"><b>Date</b> _____</span> |   |          |                  |         |                         |
|---|---|----------|------------------|---------|-------------------------|
|   | Test Description  | Minimum  | Results Measured | Maximum | Measurement Uncertainty |
|   | -24   | -0.50 dB | (6)_____         | 0.50 dB | ±0.074 dB               |
|   | -28   | -0.50 dB | (7)_____         | 0.50 dB | ±0.073 dB               |
|   | -32   | -0.60 dB | (8)_____         | 0.60 dB | ±0.077 dB               |
|   | -36   | -0.60 dB | (9)_____         | 0.60 dB | ±0.075 dB               |
|   | -40   | -0.60 dB | (10)_____        | 0.60 dB | ±0.081 dB               |
|   | -44   | -0.70 dB | (11)_____        | 0.70 dB | ±0.077 dB               |
|   | -48   | -0.70 dB | (12)_____        | 0.70 dB | ±0.076 dB               |
|   | -52   | -0.70dB  | (13)_____        | 0.70 dB | ±0.080 dB               |
|   | -56   | -0.70 dB | (14)_____        | 0.70 dB | ±0.078 dB               |
|   | -60   | -0.70 dB | (15)_____        | 0.70 dB | ±0.084 dB               |
|   | -64   | -0.80 dB | (16)_____        | 0.80 dB | ±0.081 dB               |
|   | -68   | -0.80 dB | (17)_____        | 0.80 dB | ±0.080 dB               |
|   | -72   | -0.80 dB | (18)_____        | 0.80 dB | ±0.084 dB               |
|   | -76   | -0.80 dB | (19)_____        | 0.80 dB | ±0.083 dB               |
|   | -80   | -0.80 dB | (20)_____        | 0.80 dB | ±0.089 dB               |
|   | -84   | -1.15 dB | (21)_____        | 1.15 dB | ±0.086 dB               |
|   | Incremental Log Fidelity,<br>Res BW ≥1 kHz<br>dB from Ref Level |          |                  |         |                         |
|   | -4  | -0.4 dB  | (22)_____        | 0.4 dB  | ±0.082 dB               |
|   | -8  | -0.4 dB  | (23)_____        | 0.4 dB  | ±0.078 dB               |
|   | -12   | -0.4 dB  | (24)_____        | 0.4 dB  | ±0.075 dB               |
|   | -16   | -0.4 dB  | (25)_____        | 0.4 dB  | ±0.073 dB               |
|   | -20   | -0.4 dB  | (26)_____        | 0.4 dB  | ±0.078 dB               |
|   | -24   | -0.4 dB  | (27)_____        | 0.4 dB  | ±0.074 dB               |
|   | -28   | -0.4 dB  | (28)_____        | 0.4 dB  | ±0.073 dB               |



**Table 3-4                      Agilent E7402A Performance Verification Test Record**

| <b>Agilent Technologies</b><br><br><b>Model E7402A</b><br><br><b>Serial No. _____</b><br><br><b>Report No. _____</b><br><br><b>Date _____</b> |   |          |                  |         |                         |
|---|---|----------|------------------|---------|-------------------------|
| Test Description  |   | Minimum  | Results Measured | Maximum | Measurement Uncertainty |
|   | –32   | –0.4 dB  | (29)_____        | 0.4 dB  | ±0.077 dB               |
|   | –36   | –0.4 dB  | (30)_____        | 0.4 dB  | ±0.075 dB               |
|   | –40   | –0.4 dB  | (31)_____        | 0.4 dB  | ±0.081 dB               |
|   | –44   | –0.4 dB  | (32)_____        | 0.4 dB  | ±0.077 dB               |
|   | –48   | –0.4 dB  | (33)_____        | 0.4 dB  | ±0.076 dB               |
|   | –52   | –0.4 dB  | (34)_____        | 0.4 dB  | ±0.080 dB               |
|   | –56   | –0.4 dB  | (35)_____        | 0.4 dB  | ±0.078 dB               |
|   | –60   | –0.4 dB  | (36)_____        | 0.4 dB  | ±0.084 dB               |
|   | –64   | –0.4 dB  | (37)_____        | 0.4 dB  | ±0.081 dB               |
|   | –68   | –0.4 dB  | (38)_____        | 0.4 dB  | ±0.080 dB               |
|   | –72   | –0.4 dB  | (39)_____        | 0.4 dB  | ±0.084 dB               |
|   | –76   | –0.4 dB  | (40)_____        | 0.4 dB  | ±0.083 dB               |
|   | –80   | –0.4 dB  | (41)_____        | 0.4 dB  | ±0.089 dB               |
|   | Cumulative Log Fidelity,<br>Res BW ≤300 Hz<br>dB from Ref Level |          |                  |         |                         |
|   | –4  | –0.34 dB | (43)_____        | 0.34 dB | ±0.082 dB               |
|   | –8  | –0.38 dB | (44)_____        | 0.38 dB | ±0.078 dB               |
|   | –12   | –0.42 dB | (45)_____        | 0.42 dB | ±0.075 dB               |
|   | –16   | –0.46 dB | (46)_____        | 0.46 dB | ±0.073 dB               |
|   | –20   | –0.50 dB | (47)_____        | 0.50 dB | ±0.078 dB               |
|   | –24   | –0.54 dB | (48)_____        | 0.54 dB | ±0.074 dB               |
|   | –28   | –0.58 dB | (49)_____        | 0.58 dB | ±0.073 dB               |
|   | –32   | –0.62 dB | (50)_____        | 0.62 dB | ±0.077 dB               |
|   | –36   | –0.66 dB | (51)_____        | 0.66 dB | ±0.075 dB               |
|   | –40   | –0.70 dB | (52)_____        | 0.70 dB | ±0.081 dB               |

Performance Verification Test Records  
**Agilent E7402A Performance Verification Test Record**

**Table 3-4                      Agilent E7402A Performance Verification Test Record**

| <b>Agilent Technologies</b> |  |                         |                  |         |                         |
|-----------------------------|--|-------------------------|------------------|---------|-------------------------|
| <b>Model E7402A</b>         |  | <b>Report No.</b> _____ |                  |         |                         |
| <b>Serial No.</b> _____     |  | <b>Date</b> _____       |                  |         |                         |
|                             | Test Description   | Minimum                 | Results Measured | Maximum | Measurement Uncertainty |
|                             | –44  | –0.74 dB                | (53)_____        | 0.74 dB | ±0.077 dB               |
|                             | –48  | –0.78 dB                | (54)_____        | 0.78 dB | ±0.076 dB               |
|                             | –52  | –0.82 dB                | (55)_____        | 0.82 dB | ±0.080 dB               |
|                             | –56  | –0.86 dB                | (56)_____        | 0.86 dB | ±0.078 dB               |
|                             | –60  | –0.90 dB                | (57)_____        | 0.90 dB | ±0.084 dB               |
|                             | –64  | –0.94 dB                | (58)_____        | 0.94 dB | ±0.081 dB               |
|                             | –68  | –0.98 dB                | (59)_____        | 0.98 dB | ±0.080 dB               |
|                             | –72  | –1.02 dB                | (60)_____        | 1.02 dB | ±0.084 dB               |
|                             | –76  | –1.06 dB                | (61)_____        | 1.06 dB | ±0.083 dB               |
|                             | –80  | –1.10 dB                | (62)_____        | 1.10 dB | ±0.089 dB               |
|                             | –84  | –1.14 dB                | (63)_____        | 1.14 dB | ±0.086 dB               |
|                             | –88  | –1.18 dB                | (64)_____        | 1.18 dB | ±0.085 dB               |
|                             | –92  | –1.22 dB                | (65)_____        | 1.22 dB | ±0.100 dB               |
|                             | –96  | –1.26 dB                | (66)_____        | 1.26 dB | ±0.099 dB               |
|                             | –98  | –1.28 dB                | (67)_____        | 1.28 dB | ±0.098 dB               |
|                             | Incremental Log Fidelity,<br>Res BW ≤300 Hz<br>dB from Ref Level |                         |                  |         |                         |
|                             | –4   | –0.4 dB                 | (68)_____        | 0.4 dB  | ±0.082 dB               |
|                             | –8   | –0.4 dB                 | (69)_____        | 0.4 dB  | ±0.078 dB               |
|                             | –12  | –0.4 dB                 | (70)_____        | 0.4 dB  | ±0.075 dB               |
|                             | –16  | –0.4 dB                 | (71)_____        | 0.4 dB  | ±0.073 dB               |
|                             | –20  | –0.4 dB                 | (72)_____        | 0.4 dB  | ±0.078 dB               |
|                             | –24  | –0.4 dB                 | (73)_____        | 0.4 dB  | ±0.074 dB               |
|                             | –28  | –0.4 dB                 | (74)_____        | 0.4 dB  | ±0.073 dB               |
|                             | –32  | –0.4 dB                 | (75)_____        | 0.4 dB  | ±0.077 dB               |

**Table 3-4                      Agilent E7402A Performance Verification Test Record**

| <b>Agilent Technologies</b><br><br><b>Model E7402A</b> <span style="float: right;"><b>Report No.</b> _____</span><br><b>Serial No.</b> _____ <span style="float: right;"><b>Date</b> _____</span> |   |         |                  |         |                         |
|---|---|---------|------------------|---------|-------------------------|
| Test Description  |   | Minimum | Results Measured | Maximum | Measurement Uncertainty |
|   | -36   | -0.4 dB | (76)_____        | 0.4 dB  | ±0.075 dB               |
|   | -40   | -0.4 dB | (77)_____        | 0.4 dB  | ±0.081 dB               |
|   | -44   | -0.4 dB | (78)_____        | 0.4 dB  | ±0.077 dB               |
|   | -48   | -0.4 dB | (79)_____        | 0.4 dB  | ±0.076 dB               |
|   | -52   | -0.4 dB | (80)_____        | 0.4 dB  | ±0.080 dB               |
|   | -56   | -0.4 dB | (81)_____        | 0.4 dB  | ±0.078 dB               |
|   | -60   | -0.4 dB | (82)_____        | 0.4 dB  | ±0.084 dB               |
|   | -64   | -0.4 dB | (83)_____        | 0.4 dB  | ±0.081 dB               |
|   | -68   | -0.4 dB | (84)_____        | 0.4 dB  | ±0.080 dB               |
|   | -72   | -0.4 dB | (85)_____        | 0.4 dB  | ±0.084 dB               |
|   | -76   | -0.4 dB | (86)_____        | 0.4 dB  | ±0.083 dB               |
|   | -80   | -0.4 dB | (87)_____        | 0.4 dB  | ±0.089 dB               |
|   | Linear Fidelity,<br>Res BW ≥1 kHz<br>dB from Ref Level  |         |                  |         |                         |
|   | -4  | -2.0%   | (93)_____        | 2.0%    | ±0.064%                 |
|   | -8  | -2.0%   | (94)_____        | 2.0%    | ±0.064%                 |
|   | -12   | -2.0%   | (95)_____        | 2.0%    | ±0.064%                 |
|   | -16   | -2.0%   | (96)_____        | 2.0%    | ±0.064%                 |
|   | -20   | -2.0%   | (97)_____        | 2.0%    | ±0.063%                 |
|   | Linear Fidelity,<br>Res BW ≤300 Hz<br>dB from Ref Level |         |                  |         |                         |
|   | -4  | -2.0%   | (98)_____        | 2.0%    | ±0.064%                 |
|   | -8  | -2.0%   | (99)_____        | 2.0%    | ±0.064%                 |
|   | -12   | -2.0%   | (100)_____       | 2.0%    | ±0.064%                 |

Performance Verification Test Records  
**Agilent E7402A Performance Verification Test Record**

**Table 3-4**

**Agilent E7402A Performance Verification Test Record**

| Agilent Technologies |   |                  |                  |           |                         |
|----------------------|---|------------------|------------------|-----------|-------------------------|
| Model E7402A         |   | Report No. _____ |                  |           |                         |
| Serial No. _____     |   | Date _____       |                  |           |                         |
| Test Description     |   | Minimum          | Results Measured | Maximum   | Measurement Uncertainty |
|                      | -16   | -2.0%            | (101)_____       | 2.0%      | ±0.064%                 |
|                      | -20   | -2.0%            | (102)_____       | 2.0%      | ±0.063%                 |
|                      | Zero Span,<br>Res BW ≤300 Hz<br>dB from Ref Level |                  |                  |           |                         |
|                      | -4  | -0.36 dB         | (103)_____       | 0.36 dB   | ±0.082 dB               |
|                      | -8  | -0.42 dB         | (104)_____       | 0.42 dB   | ±0.078 dB               |
|                      | -12   | -0.48 dB         | (105)_____       | 0.48 dB   | ±0.075 dB               |
|                      | -16   | -0.54 dB         | (106)_____       | 0.54 dB   | ±0.073 dB               |
|                      | -20   | -0.60 dB         | (107)_____       | 0.60 dB   | ±0.078 dB               |
|                      | -24   | -0.66 dB         | (108)_____       | 0.66 dB   | ±0.074 dB               |
|                      | -28   | -0.72 dB         | (109)_____       | 0.72 dB   | ±0.073 dB               |
|                      | -32   | -0.78 dB         | (110)_____       | 0.78 dB   | ±0.077 dB               |
|                      | -36   | -0.84 dB         | (111)_____       | 0.84 dB   | ±0.075 dB               |
|                      | -40   | -0.90 dB         | (112)_____       | 0.90 dB   | ±0.081 dB               |
|                      | -44   | -0.96 dB         | (113)_____       | 0.96 dB   | ±0.077 dB               |
|                      | -48   | -1.02 dB         | (114)_____       | 1.02 dB   | ±0.076 dB               |
|                      | -52   | -1.08 dB         | (115)_____       | 1.08 dB   | ±0.080 dB               |
|                      | -56   | -1.14 dB         | (116)_____       | 1.14 dB   | ±0.078 dB               |
|                      | -60   | -1.20 dB         | (117)_____       | 1.20 dB   | ±0.084 dB               |
|                      | -64   | -1.5 dB          | (118)_____       | 1.5 dB    | ±0.081 dB               |
|                      | -68   | -1.5 dB          | (119)_____       | 1.5 dB    | ±0.080 dB               |
| -70                  | -1.5 dB   | (120)_____       | 1.5 dB           | ±0.084 dB |                         |
| <b>13.</b>           | <b>Input Attenuation Switching Uncertainty</b>    |                  |                  |           |                         |
|                      | Input Attenuation Setting                         |                  |                  |           |                         |

**Table 3-4 Agilent E7402A Performance Verification Test Record**

| <b>Agilent Technologies</b><br><b>Model E7402A</b><br><b>Serial No. _____</b> |  |  |  |  |  | <b>Report No. _____</b><br><b>Date _____</b> |  |  |  |  |  |
|---|--|--|--|--|--|--|--|--|--|--|--|
| Test Description  |  | Minimum  | Results Measured   | Maximum  | Measurement Uncertainty  |  |  |  |  |  |  |
|   | 0 dB   | −0.3 dB  | (1)_____   | 0.3 dB   | ±0.101 dB  |  |  |  |  |  |  |
|   | 5 dB   | −0.3 dB  | (2)_____   | 0.3 dB   | ±0.104 dB  |  |  |  |  |  |  |
|   | 15 dB  | −0.3 dB  | (3)_____   | 0.3 dB   | ±0.102 dB  |  |  |  |  |  |  |
|   | 20 dB  | −0.3 dB  | (4)_____   | 0.3 dB   | ±0.098 dB  |  |  |  |  |  |  |
|   | 25 dB  | −0.35 dB   | (5)_____   | 0.35 dB  | ±0.098 dB  |  |  |  |  |  |  |
|   | 30 dB  | −0.40 dB   | (6)_____   | 0.40 dB  | ±0.096 dB  |  |  |  |  |  |  |
|   | 35 dB  | −0.45 dB   | (7)_____   | 0.45 dB  | ±0.099 dB  |  |  |  |  |  |  |
|   | 40 dB  | −0.50 dB   | (8)_____   | 0.50 dB  | ±0.096 dB  |  |  |  |  |  |  |
|   | 45 dB  | −0.55 dB   | (9)_____   | 0.55 dB  | ±0.099 dB  |  |  |  |  |  |  |
|   | 50 dB  | −0.60 dB   | (10)_____  | 0.60 dB  | ±0.095 dB  |  |  |  |  |  |  |
|   | 55 dB  | −0.65 dB   | (11)_____  | 0.65 dB  | ±0.099 dB  |  |  |  |  |  |  |
|   | 60 dB  | −0.70 dB   | (12)_____  | 0.70 dB  | ±0.100 dB  |  |  |  |  |  |  |
|   | 65 dB  | −0.75 dB   | (13)_____  | 0.75 dB  | ±0.111 dB  |  |  |  |  |  |  |
| <b>15.</b>  | <b>Reference Level Accuracy</b><br>Log, Res BW ≥1 kHz<br>Reference Level<br>−10 dBm<br>0 dBm<br>−30 dBm<br>−40 dBm<br>−50 dBm<br>−60 dBm<br>−70 dBm<br>−80 dBm | −0.3 dB<br>−0.3 dB<br>−0.3 dB<br>−0.3 dB<br>−0.5 dB<br>−0.5 dB<br>−0.5 dB<br>−0.7 dB | (1)_____<br>(2)_____<br>(3)_____<br>(4)_____<br>(5)_____<br>(6)_____<br>(7)_____<br>(8)_____ | 0.3 dB<br>0.3 dB<br>0.3 dB<br>0.3 dB<br>0.5 dB<br>0.5 dB<br>0.5 dB<br>0.7 dB | ±0.091 dB<br>±0.100 dB<br>±0.092 dB<br>±0.094 dB<br>±0.095 dB<br>±0.097 dB<br>±0.099 dB<br>±0.101 dB |  |  |  |  |  |  |

Performance Verification Test Records  
**Agilent E7402A Performance Verification Test Record**

**Table 3-4      Agilent E7402A Performance Verification Test Record**

| <b>Agilent Technologies</b><br><br><b>Model E7402A</b> <span style="float: right;"><b>Report No.</b> _____</span><br><b>Serial No.</b> _____ <span style="float: right;"><b>Date</b> _____</span> |                              |         |                  |         |                         |
|---|------------------------------|---------|------------------|---------|-------------------------|
|   | Test Description             | Minimum | Results Measured | Maximum | Measurement Uncertainty |
|   | Linear, Res BW $\geq 1$ kHz  |         |                  |         |                         |
|   | Reference Level              |         |                  |         |                         |
|   | –10 dBm                      | –0.3 dB | (9)_____         | 0.3 dB  | $\pm 0.091$ dB          |
|   | 0 dBm                        | –0.3 dB | (10)_____        | 0.3 dB  | $\pm 0.100$ dB          |
|   | –30 dBm                      | –0.3 dB | (11)_____        | 0.3 dB  | $\pm 0.092$ dB          |
|   | –40 dBm                      | –0.3 dB | (12)_____        | 0.3 dB  | $\pm 0.094$ dB          |
|   | –50 dBm                      | –0.5 dB | (13)_____        | 0.5 dB  | $\pm 0.095$ dB          |
|   | –60 dBm                      | –0.5 dB | (14)_____        | 0.5 dB  | $\pm 0.097$ dB          |
|   | –70 dBm                      | –0.5 dB | (15)_____        | 0.5 dB  | $\pm 0.099$ dB          |
|   | –80 dBm                      | –0.7 dB | (16)_____        | 0.7 dB  | $\pm 0.101$ dB          |
|   | Log, Res BW $\leq 300$ Hz    |         |                  |         |                         |
|   | Reference Level              |         |                  |         |                         |
|   | –10 dBm                      | –0.3 dB | (17)_____        | 0.3 dB  | $\pm 0.091$ dB          |
|   | 0 dBm                        | –0.3 dB | (18)_____        | 0.3 dB  | $\pm 0.100$ dB          |
|   | –30 dBm                      | –0.3 dB | (19)_____        | 0.3 dB  | $\pm 0.092$ dB          |
|   | –40 dBm                      | –0.3 dB | (20)_____        | 0.3 dB  | $\pm 0.094$ dB          |
|   | –50 dBm                      | –0.5 dB | (21)_____        | 0.5 dB  | $\pm 0.095$ dB          |
|   | –60 dBm                      | –0.5 dB | (22)_____        | 0.5 dB  | $\pm 0.097$ dB          |
|   | –70 dBm                      | –0.5 dB | (23)_____        | 0.5 dB  | $\pm 0.099$ dB          |
|   | –80 dBm                      | –0.7 dB | (24)_____        | 0.7 dB  | $\pm 0.101$ dB          |
|   | Linear, Res BW $\leq 300$ Hz |         |                  |         |                         |
|   | Reference Level              |         |                  |         |                         |
|   | –10 dBm                      | –0.3 dB | (25)_____        | 0.3 dB  | $\pm 0.091$ dB          |
|   | 0 dBm                        | –0.3 dB | (26)_____        | 0.3 dB  | $\pm 0.100$ dB          |
|   | –30 dBm                      | –0.3 dB | (27)_____        | 0.3 dB  | $\pm 0.092$ dB          |
|   | –40 dBm                      | –0.3 dB | (28)_____        | 0.3 dB  | $\pm 0.094$ dB          |

### Table 3-4 Agilent E7402A Performance Verification Test Record

| Agilent Technologies               |   |           |                  |           |                         |
|------------------------------------|---|-----------|------------------|-----------|-------------------------|
| Model E7402A                       |   |           | Report No. _____ |           |                         |
| Serial No. _____                   |   |           | Date _____       |           |                         |
| Test Description                   |   | Minimum   | Results Measured | Maximum   | Measurement Uncertainty |
|                                    | –50 dBm   | –0.5 dB   | (29)_____        | 0.5 dB    | ±0.095 dB               |
|                                    | –60 dBm   | –0.5 dB   | (30)_____        | 0.5 dB    | ±0.097 dB               |
|                                    | –70 dBm   | –0.5 dB   | (31)_____        | 0.5 dB    | ±0.099 dB               |
|                                    | –80 dBm   | –0.7 dB   | (32)_____        | 0.7 dB    | ±0.101 dB               |
| 16.                                | <b>Resolution Bandwidth Switching Uncertainty</b> |           |                  |           |                         |
|                                    | Resolution Bandwidth                              |           |                  |           |                         |
|                                    | 3 kHz   | –0.3 dB   | (1)_____         | 0.3 dB    | ±0.048 dB               |
|                                    | 9 kHz   | –0.3 dB   | (2)_____         | 0.3 dB    | ±0.048 dB               |
|                                    | 10 kHz  | –0.3 dB   | (3)_____         | 0.3 dB    | ±0.048 dB               |
|                                    | 30 kHz  | –0.3 dB   | (4)_____         | 0.3 dB    | ±0.048 dB               |
|                                    | 100 kHz   | –0.3 dB   | (5)_____         | 0.3 dB    | ±0.048 dB               |
|                                    | 120 kHz   | –0.3 dB   | (6)_____         | 0.3 dB    | ±0.048 dB               |
|                                    | 300 kHz   | –0.3 dB   | (7)_____         | 0.3 dB    | ±0.048 dB               |
|                                    | 1 MHz   | –0.3 dB   | (8)_____         | 0.3 dB    | ±0.048 dB               |
|                                    | 3 MHz   | –0.3 dB   | (9)_____         | 0.3 dB    | ±0.048 dB               |
|                                    | 5 MHz   | –0.6 dB   | (10)_____        | 0.6 dB    | ±0.076 dB               |
|                                    | 300 Hz  | –0.3 dB   | (11)_____        | 0.3 dB    | ±0.048 dB               |
|                                    | 200 Hz  | –0.3 dB   | (12)_____        | 0.3 dB    | ±0.048 dB               |
|                                    | 100 Hz  | –0.3 dB   | (13)_____        | 0.3 dB    | ±0.048 dB               |
|                                    | 30 Hz   | –0.3 dB   | (14)_____        | 0.3 dB    | ±0.048 dB               |
|                                    | 10 Hz   | –0.3 dB   | (15)_____        | 0.3 dB    | ±0.048 dB               |
| 3 Hz ( <i>Option 1D5 only</i> )    | –0.3 dB   | (16)_____ | 0.3 dB           | ±0.048 dB |                         |
| Firmware Revision A.08.00 or later |   |           |                  |           |                         |

Performance Verification Test Records  
**Agilent E7402A Performance Verification Test Record**

**Table 3-4                      Agilent E7402A Performance Verification Test Record**

| <b>Agilent Technologies</b><br><br><b>Model E7402A</b> <span style="float: right;"><b>Report No.</b> _____</span><br><b>Serial No.</b> _____ <span style="float: right;"><b>Date</b> _____</span>   |  |   |  |  |  |
|---|--|---|--|--|--|
| Test Description  | Minimum  | Results Measured  | Maximum  | Measurement Uncertainty  |  |
| <div style="display: flex; justify-content: space-between;"> <span>1Hz (<i>Option 1D5 only</i>)</span> <span>–0.3 dB</span> <span>(17)_____</span> <span>0.3 dB</span> <span>±0.048 dB</span> </div> Firmware Revision A.08.00 or later   |  |   |  |  |  |
| <b>18. Absolute Amplitude Accuracy (Reference Settings)</b><br><br>Log, Preamp Off<br>Lin, Preamp Off<br>Log, Preamp On<br>Lin, Preamp On   | –0.34 dB<br>–0.34 dB<br>–0.37 dB<br>–0.37 dB   | (1)_____<br>(2)_____<br>(3)_____<br>(4)_____  | 0.34 dB<br>0.34 dB<br>0.37 dB<br>0.37 dB   | ±0.09 dB<br>±0.09 dB<br>±0.09 dB<br>±0.09 dB   |  |
| <b>20. Overall Absolute Amplitude Accuracy</b><br><br>0 dBm Reference Level<br><br>0 dBm input<br>–10 dBm input<br>–20 dBm input<br>–30 dBm input<br>–40 dBm input<br>–50 dBm input<br><br>–20 dBm Reference Level<br><br>–20 dBm input<br>–30 dBm input<br>–40 dBm input<br>–50 dBm input<br><br>–40 dBm Reference Level<br><br>–40 dBm input<br>–50 dBm input | –0.54 dB<br>–0.54 dB<br>–0.54 dB<br>–0.54 dB<br>–0.54 dB<br>–0.54 dB<br><br>–0.54 dB<br>–0.54 dB<br>–0.54 dB<br>–0.54 dB<br><br>–0.54 dB<br>–0.54 dB | (1)_____<br>(2)_____<br>(3)_____<br>(4)_____<br>(5)_____<br>(6)_____<br><br>(7)_____<br>(8)_____<br>(9)_____<br>(10)_____<br><br>(11)_____<br>(12)_____ | 0.54 dB<br>0.54 dB<br>0.54 dB<br>0.54 dB<br>0.54 dB<br>0.54 dB<br><br>0.54 dB<br>0.54 dB<br>0.54 dB<br>0.54 dB<br><br>0.54 dB<br>0.54 dB | ±0.234 dB<br>±0.115 dB<br>±0.110 dB<br>±0.109 dB<br>±0.109 dB<br>±0.109 dB<br><br>±0.109 dB<br>±0.109 dB<br>±0.109 dB<br>±0.109 dB<br><br>±0.087 dB<br>±0.087 dB |  |



**Table 3-4 Agilent E7402A Performance Verification Test Record**

| <b>Agilent Technologies</b><br><b>Model E7402A</b><br><b>Serial No. _____</b> |  |   |   |   |   | <b>Report No. _____</b><br><b>Date _____</b> |  |  |  |  |  |
|---|--|---|---|---|---|--|--|--|--|--|--|
| Test Description  |  | Minimum   | Results Measured  | Maximum   | Measurement Uncertainty   |  |  |  |  |  |  |
|   | –50 dBm Reference Level<br>–50 dBm input   | –0.54 dB  | (13)_____   | 0.54 dB   | ±0.087 dB   |  |  |  |  |  |  |
| <b>21.</b>  | <b>Resolution Bandwidth Accuracy</b><br>Resolution Bandwidth<br>5 MHz<br>3 MHz<br>1 MHz (–3 dB)<br>300 kHz<br>100 kHz<br>30 kHz<br>10 kHz<br>3 kHz<br>1 kHz<br>120 kHz<br>9 kHz<br>1 MHz (–6 dB) | 3.5 MHz<br>2.55 MHz<br>0.85 MHz<br>255 kHz<br>85 kHz<br>25.5 kHz<br>8.5 kHz<br>2.55 kHz<br>850 Hz<br>96 kHz<br>7.2 kHz<br>900 kHz               | (1)_____<br>(2)_____<br>(3)_____<br>(4)_____<br>(5)_____<br>(6)_____<br>(7)_____<br>(8)_____<br>(9)_____<br>(10)_____<br>(11)_____<br>(12)_____ | 6.5 MHz<br>3.45 MHz<br>1.15 MHz<br>345 kHz<br>115 kHz<br>34.5 kHz<br>11.5 kHz<br>3.45 kHz<br>1.15 kHz<br>144 kHz<br>10.8 kHz<br>1.1 MHz | ±110 kHz<br>±66 kHz<br>±22 kHz<br>±6.6 kHz<br>±2.2 kHz<br>±660 Hz<br>±220 Hz<br>±66 Hz<br>±22 Hz<br>±2.17 kHz<br>±163 Hz<br>±22 kHz |  |  |  |  |  |  |
| <b>23.</b>  | <b>Frequency Response</b><br>20 to 30° C<br>Non-Option UKB<br>Band 0<br>(9 kHz to 3.0 GHz)<br><br>Maximum Response<br>Minimum Response<br>Peak-to-Peak Response                                  | Note: Enter data in the appropriate section below depending upon the ambient temperature at which the test was performed and installed options. |   |   |   |  |  |  |  |  |  |
|   |  | –0.46 dB  | (1)_____<br>(2)_____<br>(3)_____  | 0.46 dB<br><br>0.92 dB  | ±0.19 dB<br>±0.19 dB<br>±0.19 dB  |  |  |  |  |  |  |

Performance Verification Test Records  
**Agilent E7402A Performance Verification Test Record**

**Table 3-4      Agilent E7402A Performance Verification Test Record**

| <b>Agilent Technologies</b> |  |                         |                  |         |                         |
|-----------------------------|--|-------------------------|------------------|---------|-------------------------|
| <b>Model E7402A</b>         |  | <b>Report No.</b> _____ |                  |         |                         |
| <b>Serial No.</b> _____     |  | <b>Date</b> _____       |                  |         |                         |
|                             | Test Description   | Minimum                 | Results Measured | Maximum | Measurement Uncertainty |
|                             | Option UKB<br>dc Coupled<br>Band 0<br>(100 Hz to 3.0 GHz)  |                         |                  |         |                         |
|                             | Maximum Response   |                         | (1)_____         | 0.50 dB | ±0.19 dB                |
|                             | Minimum Response   | –0.50 dB                | (2)_____         |         | ±0.19 dB                |
|                             | Peak-to-Peak Response                                      |                         | (3)_____         | 1.0 dB  | ±0.19 dB                |
|                             | Non-Option UKB<br>Band 0A<br>(800 MHz to 1.0 GHz)          |                         |                  |         |                         |
|                             | Maximum Response   |                         | (4)_____         | 0.46 dB | ±0.11 dB                |
|                             | Minimum Response   | –0.46 dB                | (5)_____         |         | ±0.11 dB                |
|                             | Peak-to-Peak Response                                      |                         | (6)_____         | 0.92 dB | ±0.11 dB                |
|                             | Non-Option UKB<br>Band 0B<br>(1.7 GHz to 2.0 GHz)          |                         |                  |         |                         |
|                             | Maximum Response   |                         | (7)_____         | 0.46 dB | ±0.11 dB                |
|                             | Minimum Response   | –0.46 dB                | (8)_____         |         | ±0.11 dB                |
|                             | Peak-to-Peak Response                                      |                         | (9)_____         | 0.92 dB | ±0.11 dB                |
|                             | Option UKB<br>ac Coupled<br>Band 0<br>(100 kHz to 3.0 GHz) |                         |                  |         |                         |
|                             | Maximum Response   |                         | (10)_____        | 0.50 dB | ±0.11 dB                |
|                             | Minimum Response   | –0.50 dB                | (11)_____        |         | ±0.11 dB                |
|                             | Peak-to-Peak Response                                      |                         | (12)_____        | 1.0 dB  | ±0.11 dB                |

### Table 3-4

## Agilent E7402A Performance Verification Test Record

|                      |  |          |                  |         |                         |
|----------------------|--|----------|------------------|---------|-------------------------|
| Agilent Technologies |  |          |                  |         |                         |
| Model E7402A         |  |          | Report No. _____ |         |                         |
| Serial No. _____     |  |          | Date _____       |         |                         |
| Test Description     |  | Minimum  | Results Measured | Maximum | Measurement Uncertainty |
|                      | Option UKB<br>ac Coupled<br>Band 0A<br>(800 MHz to 1.0 GHz)  | −0.50 dB |                  |         |                         |
|                      | Maximum Response   |          | (13)_____        | 0.50 dB | ±0.11 dB                |
|                      | Minimum Response   |          | (14)_____        |         | ±0.11 dB                |
|                      | Peak-to-Peak Response  |          | (15)_____        | 1.0 dB  | ±0.11 dB                |
|                      | Option UKB<br>ac Coupled<br>Band 0B<br>(1.7 GHz to 2.0 GHz)  | −0.50 dB |                  |         |                         |
|                      | Maximum Response   |          | (16)_____        | 0.50 dB | ±0.11 dB                |
|                      | Minimum Response   |          | (17)_____        |         | ±0.11 dB                |
|                      | Peak-to-Peak Response  |          | (18)_____        | 1.0 dB  | ±0.11 dB                |
|                      | 0 to 55° C<br>Non-Option UKB<br>Band 0<br>(9 kHz to 3.0 GHz) | −0.76 dB |                  |         |                         |
|                      | Maximum Response   |          | (1)_____         | 0.76 dB | ±0.19 dB                |
|                      | Minimum Response   |          | (2)_____         |         | ±0.19 dB                |
|                      | Peak-to-Peak Response  |          | (3)_____         | 1.52 dB | ±0.19 dB                |
|                      | Option UKB<br>dc coupled<br>Band 0<br>(100 Hz to 3.0 GHz)    |          |                  |         |                         |
|                      | Maximum Response   |          | (1)_____         | 1.0 dB  | ±0.19 dB                |

Performance Verification Test Records  
**Agilent E7402A Performance Verification Test Record**

**Table 3-4 Agilent E7402A Performance Verification Test Record**

| <b>Agilent Technologies</b>                                 |                       |                         |                         |                |                                |
|---|-----------------------|-------------------------|-------------------------|----------------|--------------------------------|
| <b>Model E7402A</b>   |                       | <b>Report No.</b> _____ |                         |                |                                |
| <b>Serial No.</b> _____                                     |                       | <b>Date</b> _____       |                         |                |                                |
| <b>Test Description</b>                                     |                       | <b>Minimum</b>          | <b>Results Measured</b> | <b>Maximum</b> | <b>Measurement Uncertainty</b> |
|   | Minimum Response      | -1.0 dB                 | (2)_____                |                | ±0.19 dB                       |
|   | Peak-to-Peak Response |                         | (3)_____                | 2.0 dB         | ±0.19 dB                       |
| Non-Option UKB<br>Band 0A<br>(800 MHz to 1.0 GHz)           |                       |                         |                         |                |                                |
|   | Maximum Response      |                         | (4)_____                | 0.76 dB        | ±0.11 dB                       |
|   | Minimum Response      | -0.76 dB                | (5)_____                |                | ±0.11 dB                       |
|   | Peak-to-Peak Response |                         | (6)_____                | 1.52 dB        | ±0.11 dB                       |
| Non-Option UKB<br>Band 0B<br>(1.7 GHz to 2.0 GHz)           |                       |                         |                         |                |                                |
|   | Maximum Response      |                         | (7)_____                | 0.76 dB        | ±0.11 dB                       |
|   | Minimum Response      | -0.76 dB                | (8)_____                |                | ±0.11 dB                       |
|   | Peak-to-Peak Response |                         | (9)_____                | 1.52 dB        | ±0.11 dB                       |
| Option UKB<br>ac Coupled<br>Band 0<br>(100 kHz to 3.0 GHz)  |                       |                         |                         |                |                                |
|   | Maximum Response      |                         | (10)_____               | 1.0 dB         | ±0.11 dB                       |
|   | Minimum Response      | -1.0 dB                 | (11)_____               |                | ±0.11 dB                       |
|   | Peak-to-Peak Response |                         | (12)_____               | 2.0 dB         | ±0.11 dB                       |
| Option UKB<br>ac Coupled<br>Band 0A<br>(800 MHz to 1.0 GHz) |                       |                         |                         |                |                                |

**Table 3-4 Agilent E7402A Performance Verification Test Record**

| <b>Agilent Technologies</b><br><br><b>Model E7402A</b> <span style="float: right;"><b>Report No.</b> _____</span><br><b>Serial No.</b> _____ <span style="float: right;"><b>Date</b> _____</span> |   |                                       |                  |   |                         |  |
|---|---|---------------------------------------|------------------|---|-------------------------|--|
| Test Description  |   | Minimum                               | Results Measured | Maximum   | Measurement Uncertainty |  |
|   | Maximum Response  | -1.0 dB                               | (13)_____        | 1.0 dB  | $\pm 0.11$ dB           |  |
|   | Minimum Response  |                                       | (14)_____        |   | $\pm 0.11$ dB           |  |
|   | Peak-to-Peak Response                                       |                                       | (15)_____        | 2.0 dB  | $\pm 0.11$ dB           |  |
|   | Option UKB<br>ac Coupled<br>Band 0B<br>(1.7 GHz to 2.0 GHz) |                                       |                  |   |                         |  |
|   | Maximum Response  | -1.0 dB                               | (16)_____        | 1.0 dB  | $\pm 0.11$ dB           |  |
|   | Minimum Response  |                                       | (17)_____        |   | $\pm 0.11$ dB           |  |
|   | Peak-to-Peak Response                                       |                                       | (18)_____        | 2.0 dB  | $\pm 0.11$ dB           |  |
|   | <b>26.</b>  | <b>Frequency Response (Preamp On)</b> |                  | Note: Enter data in the appropriate section below depending upon the ambient temperature at which the test was performed and installed options. |                         |  |
|   |   | 20 to 30° C                           |                  |   |                         |  |
| Band 0<br>(1 MHz to 3.0 GHz)  |   |                                       |                  |   |                         |  |
| Maximum Response  |   | -1.5 dB                               | (1)_____         | 1.5 dB  | $\pm 0.28$ dB           |  |
| Minimum Response  |   |                                       | (2)_____         |   | $\pm 0.28$ dB           |  |
| Peak-to-Peak Response   |   |                                       | (3)_____         | 3.0 dB  | $\pm 0.28$ dB           |  |
| Band 0A<br>(800 MHz to 1.0 GHz)   |   |                                       |                  |   |                         |  |
| Maximum Response  |   | -1.5 dB                               | (4)_____         | 1.5 dB  | $\pm 0.28$ dB           |  |
| Minimum Response  |   |                                       | (5)_____         |   | $\pm 0.28$ dB           |  |
| Peak-to-Peak Response   |   |                                       | (6)_____         | 3.0 dB  | $\pm 0.28$ dB           |  |
| Band 0B<br>(1.7 GHz to 2.0 GHz)   |   |                                       |                  |   |                         |  |

Performance Verification Test Records  
**Agilent E7402A Performance Verification Test Record**

**Table 3-4      Agilent E7402A Performance Verification Test Record**

| <b>Agilent Technologies</b><br><br><b>Model E7402A</b> <span style="float: right;"><b>Report No.</b> _____</span><br><b>Serial No.</b> _____ <span style="float: right;"><b>Date</b> _____</span> |   |         |                  |         |                         |
|---|---|---------|------------------|---------|-------------------------|
|   | Test Description                              | Minimum | Results Measured | Maximum | Measurement Uncertainty |
|   | Maximum Response                              |         | (7)_____         | 1.5 dB  | ±0.28 dB                |
|   | Minimum Response                              | –1.5 dB | (8)_____         |         | ±0.28 dB                |
|   | Peak-to-Peak Response                         |         | (9)_____         | 3.0 dB  | ±0.28 dB                |
|   | 0 to 55° C                                    |         |                  |         |                         |
|   | Band 0<br>(1 MHz to 3.0 GHz)                  |         |                  |         |                         |
|   | Maximum Response                              |         | (1)_____         | 2.0 dB  | ±0.28 dB                |
|   | Minimum Response                              | –2.0 dB | (2)_____         |         | ±0.28 dB                |
|   | Peak-to-Peak Response                         |         | (3)_____         | 4.0 dB  | ±0.28 dB                |
|   | Band 0A<br>(800 MHz to 1.0 GHz)               |         |                  |         |                         |
|   | Maximum Response                              |         | (4)_____         | 2.0 dB  | ±0.28 dB                |
|   | Minimum Response                              | –2.0 dB | (5)_____         |         | ±0.28 dB                |
|   | Peak-to-Peak Response                         |         | (6)_____         | 4.0 dB  | ±0.28 dB                |
|   | Band 0B<br>(1.7 GHz to 2.0 GHz)               |         |                  |         |                         |
|   | Maximum Response                              |         | (7)_____         | 2.0 dB  | ±0.28 dB                |
|   | Minimum Response                              | –2.0    | (8)_____         |         | ±0.28 dB                |
|   | Peak-to-Peak Response                         |         | (9)_____         | 4.0 dB  | ±0.28 dB                |
| <b>29.</b>  | <b>Other Input-Related Spurious Responses</b> |         |                  |         |                         |
|   | Input Frequency                               |         |                  |         |                         |
|   | 2042.8 MHz                                    |         | (1)_____         | –65 dBc | ±.891 dB                |
|   | 2642.8 MHz                                    |         | (2)_____         | –65 dBc | ±.891 dB                |

**Table 3-4 Agilent E7402A Performance Verification Test Record**

| <b>Agilent Technologies</b><br><b>Model E7402A</b><br><b>Serial No. _____</b> |  |   |  |                                      |  | <b>Report No. _____</b><br><b>Date _____</b> |  |  |  |  |  |
|---|--|---|--|--------------------------------------|--|--|--|--|--|--|--|
| Test Description  |  | Minimum   | Results Measured                             | Maximum                              | Measurement Uncertainty                          |  |  |  |  |  |  |
|   | 1820.8 MHz   |   | (3)_____                                     | -65 dBc                              | ±.891 dB   |  |  |  |  |  |  |
|   | 278.5 MHz  |   | (4)_____                                     | -65 dBc                              | ±.891 dB   |  |  |  |  |  |  |
| <b>31.</b>  | <b>Spurious Responses</b><br><br>300 MHz TOI, 1 kHz RBW<br>300 MHz TOI, 30 Hz RBW<br>300 MHz SHI<br>900 MHz SHI  | 11 dBm<br>11 dBm<br>35 dBm<br>45 dBm  | (1)_____<br>(2)_____<br>(3)_____<br>(4)_____ |                                      | ±0.93 dB<br>±0.93 dB<br>±0.41 dB<br>±0.41 dB     |  |  |  |  |  |  |
| <b>33.</b>  | <b>Gain Compression</b><br><br>Test Frequency<br>53 MHz<br>50.004 MHz<br>1403 MHz<br>2503 MHz  |   | (1)_____<br>(2)_____<br>(3)_____<br>(4)_____ | 1.0 dB<br>1.0 dB<br>1.0 dB<br>1.0 dB | ±0.123 dB<br>±0.123 dB<br>±0.123 dB<br>±0.123 dB |  |  |  |  |  |  |
| <b>36.</b>  | <b>Displayed Average Noise Level</b><br><br>1 kHz RBW, Preamp Off<br>10 MHz to 1 GHz<br>1 GHz to 2 GHz<br>2 GHz to 3 GHz<br>1kHz RBW, Preamp On,<br>0 to 55° C<br>10 MHz to 1 GHz<br>1 GHz to 2 GHz<br>2 GHz to 3 GHz<br>10 Hz RBW, Preamp Off | Note: Enter results with preamp on in the appropriate section based upon the ambient temperature when the test was performed. |  |                                      |  |  |  |  |  |  |  |
|   |  |   | (1)_____                                     | -117 dBm                             | ±1.23 dB   |  |  |  |  |  |  |
|   |  |   | (2)_____                                     | -116 dBm                             | ±1.23 dB   |  |  |  |  |  |  |
|   |  |   | (3)_____                                     | -114 dBm                             | ±1.23 dB   |  |  |  |  |  |  |
|   |  |   | (4)_____                                     | -132 dBm                             | ±1.23 dB   |  |  |  |  |  |  |
|   |  |   | (5)_____                                     | -132 dBm                             | ±1.23 dB   |  |  |  |  |  |  |
|   |  |   | (6)_____                                     | -129 dBm                             | ±1.23 dB   |  |  |  |  |  |  |

Performance Verification Test Records  
**Agilent E7402A Performance Verification Test Record**

**Table 3-4                      Agilent E7402A Performance Verification Test Record**

| <b>Agilent Technologies</b><br><br><b>Model E7402A</b> <span style="float: right;"><b>Report No.</b> _____</span><br><b>Serial No.</b> _____ <span style="float: right;"><b>Date</b> _____</span>  |  |  |   |   |  |
|--|--|--|---|---|--|
| Test Description   | Minimum                                      | Results Measured   | Maximum   | Measurement Uncertainty   |  |
| <div style="text-align: center;">10 MHz to 1 GHz</div> <div style="text-align: center;">1 GHz to 2 GHz</div> <div style="text-align: center;">2 GHz to 3 GHz</div> <div style="text-align: center;">10 Hz RBW, Preamp On,<br/>0 to 55° C</div> <div style="text-align: center;">10 MHz to 1 GHz</div> <div style="text-align: center;">1 GHz to 2 GHz</div> <div style="text-align: center;">2 GHz to 3 GHz</div> <div style="text-align: center;">1kHz RBW, Preamp On,<br/>20 to 30° C</div> <div style="text-align: center;">10 MHz to 1 GHz</div> <div style="text-align: center;">1 GHz to 2 GHz</div> <div style="text-align: center;">2 GHz to 3 GHz</div> <div style="text-align: center;">10 Hz RBW, Preamp On, 20 to<br/>30° C</div> <div style="text-align: center;">10 MHz to 1 GHz</div> <div style="text-align: center;">1 GHz to 2 GHz</div> <div style="text-align: center;">2 GHz to 3 GHz</div> |  | <div style="text-align: center;">(7)_____</div> <div style="text-align: center;">(8)_____</div> <div style="text-align: center;">(9)_____</div> <div style="text-align: center;">(10)_____</div> <div style="text-align: center;">(11)_____</div> <div style="text-align: center;">(12)_____</div> <div style="text-align: center;">(13)_____</div> <div style="text-align: center;">(14)_____</div> <div style="text-align: center;">(15)_____</div> <div style="text-align: center;">(16)_____</div> <div style="text-align: center;">(17)_____</div> <div style="text-align: center;">(18)_____</div> | <div style="text-align: center;">–136 dBm</div> <div style="text-align: center;">–135 dBm</div> <div style="text-align: center;">–133 dBm</div> <div style="text-align: center;">–151 dBm</div> <div style="text-align: center;">–151 dBm</div> <div style="text-align: center;">–148 dBm</div> <div style="text-align: center;">–133 dBm</div> <div style="text-align: center;">–134 dBm</div> <div style="text-align: center;">–132 dBm</div> <div style="text-align: center;">–152 dBm</div> <div style="text-align: center;">–152 dBm</div> <div style="text-align: center;">–151 dBm</div> | <div style="text-align: center;">±1.23 dB</div> <div style="text-align: center;">±1.23 dB</div> <div style="text-align: center;">±1.23 dB</div> <div style="text-align: center;">±1.23 dB</div> <div style="text-align: center;">±1.23 dB</div> <div style="text-align: center;">±1.23 dB</div> <div style="text-align: center;">±1.23 dB</div> <div style="text-align: center;">±1.23 dB</div> <div style="text-align: center;">±1.23 dB</div> <div style="text-align: center;">±1.23 dB</div> <div style="text-align: center;">±1.23 dB</div> <div style="text-align: center;">±1.23 dB</div> |  |
| <b>39.    Residual Responses</b><br>150 kHz to 3.0 GHz   |  | <div style="text-align: center;">(1)_____</div>  | <div style="text-align: center;">–90 dBm</div>  | <div style="text-align: center;">±0.87 dB</div>   |  |
| <b>40.    Fast Time Domain<br/>Amplitude Accuracy</b> ( <i>Option<br/>AYX only</i> )<br><br>Amplitude Error  | <div style="text-align: center;">–0.3%</div> | <div style="text-align: center;">(1)_____</div>  | <div style="text-align: center;">0.3%</div>   | <div style="text-align: center;">±0.029%</div>  |  |
| <b>42.    Tracking Generator<br/>Absolute Amplitude and<br/>Vernier Accuracy</b> ( <i>Option<br/>IDN only</i> )  |  |  |   |   |  |



**Table 3-4 Agilent E7402A Performance Verification Test Record**

| <b>Agilent Technologies</b><br><br><b>Model E7402A</b> <span style="float: right;"><b>Report No.</b> _____</span><br><b>Serial No.</b> _____ <span style="float: right;"><b>Date</b> _____</span> |   |          |                          |         |                            |
|---|---|----------|--------------------------|---------|----------------------------|
| Test Description  |   | Minimum  | Results Measured         | Maximum | Measurement Uncertainty    |
|   | Absolute Amplitude Accuracy   | −0.75 dB | (1)_____                 | 0.75 dB | ±0.096 dB                  |
|   | Absolute Vernier Accuracy   |          |                          |         |                            |
|   | −2 dB   | −0.5 dB  | (2)_____                 | 0.5 dB  | ±0.008 dB                  |
|   | −3 dB   | −0.5 dB  | (3)_____                 | 0.5 dB  | ±0.008 dB                  |
|   | −5 dB   | −0.5 dB  | (4)_____                 | 0.5 dB  | ±0.008 dB                  |
|   | −6 dB   | −0.5 dB  | (5)_____                 | 0.5 dB  | ±0.008 dB                  |
|   | −7 dB   | −0.5 dB  | (6)_____                 | 0.5 dB  | ±0.008 dB                  |
|   | −8 dB   | −0.5 dB  | (7)_____                 | 0.5 dB  | ±0.008 dB                  |
|   | −9 dB   | −0.5 dB  | (8)_____                 | 0.5 dB  | ±0.008 dB                  |
|   | −10 dB  | −0.5 dB  | (9)_____                 | 0.5 dB  | ±0.008 dB                  |
|   | Incremental Vernier Accuracy  |          |                          |         |                            |
|   | −2 dB   | −0.2 dB  | (10)_____                | 0.2 dB  | ±0.008 dB                  |
|   | −3 dB   | −0.2 dB  | (11)_____                | 0.2 dB  | ±0.008 dB                  |
|   | −5 dB   | −0.2 dB  | (12)_____                | 0.2 dB  | ±0.008 dB                  |
|   | −6 dB   | −0.2 dB  | (13)_____                | 0.2 dB  | ±0.008 dB                  |
|   | −7 dB   | −0.2 dB  | (14)_____                | 0.2 dB  | ±0.008 dB                  |
|   | −8 dB   | −0.2 dB  | (15)_____                | 0.2 dB  | ±0.008 dB                  |
|   | −9 dB   | −0.2 dB  | (16)_____                | 0.2 dB  | ±0.008 dB                  |
|   | −10 dB  | −0.2 dB  | (17)_____                | 0.2 dB  | ±0.008 dB                  |
| <b>44.</b>  | <b>Tracking Generator Level Flatness</b> ( <i>Option 1DN only</i> )<br><br>Positive Level Flatness, <1 MHz<br><br>Negative Level Flatness, <1 MHz | −3.0 dB  | (1)_____<br><br>(2)_____ | 3.0 dB  | ±0.284 dB<br><br>±0.284 dB |

Performance Verification Test Records  
**Agilent E7402A Performance Verification Test Record**

**Table 3-4                      Agilent E7402A Performance Verification Test Record**

| <b>Agilent Technologies</b><br><br><b>Model E7402A</b> <span style="float: right;"><b>Report No.</b> _____</span><br><b>Serial No.</b> _____ <span style="float: right;"><b>Date</b> _____</span>   |         |  |  |  |  |
|---|---------|--|--|--|--|
| Test Description  | Minimum | Results Measured   | Maximum  | Measurement Uncertainty  |  |
| <div style="display: flex; justify-content: space-between;"> <div style="width: 80%;">                     Positive Level Flatness,<br/>1 MHz to 10 MHz<br/><br/>                     Negative Level Flatness, 1<br/>MHz to 10 MHz<br/><br/>                     Positive Level Flatness,<br/>&gt;10 MHz to 1.5 GHz<br/><br/>                     Negative Level Flatness,<br/>&gt;10 MHz to 1.5 GHz<br/><br/>                     Positive Level Flatness,<br/>&gt;1.5 GHz<br/><br/>                     Negative Level Flatness,<br/>&gt;1.5 GHz                 </div> <div style="width: 10%; text-align: center;">                     -3.0 dB<br/><br/><br/><br/>                     -2.0 dB<br/><br/><br/><br/>                     -2.0 dB                 </div> </div> |         | (3)_____<br><br>(4)_____<br><br>(5)_____<br><br>(6)_____<br><br>(7)_____<br><br>(8)_____ | 3.0 dB<br><br><br><br>2.0 dB<br><br><br><br>2.0 dB   | $\pm 0.142$ dB<br><br>$\pm 0.142$ dB<br><br>$\pm 0.142$ dB<br><br>$\pm 0.142$ dB<br><br>$\pm 0.142$ dB |  |
| <b>46. Tracking Generator Harmonic Spurious Outputs</b><br><i>(Option 1DN only)</i><br><br>2 <sup>nd</sup> Harmonic, <20 kHz<br><br>2 <sup>nd</sup> Harmonic, ≥20 kHz<br><br>3 <sup>rd</sup> Harmonic, <20 kHz<br><br>3 <sup>rd</sup> Harmonic, ≥20 kHz   |         | (1)_____<br><br>(2)_____<br><br>(3)_____<br><br>(4)_____                                 | -15 dBc<br><br>-25 dBc<br><br>-15 dBc<br><br>-25 dBc | $\pm 2.6$ dB<br><br>$\pm 2.6$ dB<br><br>$\pm 2.6$ dB<br><br>$\pm 2.6$ dB                               |  |
| <b>48. Tracking Generator Non-Harmonic Spurious Outputs</b><br><i>(Option 1DN only)</i><br><br>Highest Non-Harmonic<br>Spurious Output Amplitude,<br>9 kHz to 2 GHz<br><br>Highest Non-Harmonic<br>Spurious Output Amplitude,<br>2 GHz to 3 GHz   |         | (1)_____<br><br>(2)_____   | -27 dBc<br><br>-23 dBc                               | $\pm 2.63$ dB<br><br>$\pm 3.14$ dB   |  |
| <b>49. Tracking Generator L.O. Feedthrough</b><br><i>(Option 1DN only)</i>  |         |  |  |  |  |

**Table 3-4                      Agilent E7402A Performance Verification Test Record**

| <b>Agilent Technologies</b><br><br><b>Model E7402A</b> <span style="float: right;"><b>Report No.</b> _____</span><br><b>Serial No.</b> _____ <span style="float: right;"><b>Date</b> _____</span> |  |   |  |  |  |
|---|--|---|--|--|--|
| Test Description  |  | Minimum                                       | Results Measured                             | Maximum  | Measurement Uncertainty                  |
|   | 9 kHz to 2.9 GHz   |   | (1)_____                                     | –16 dBm  | ±2.58 dB                                 |
|   | 2.9 GHz to 3.0 GHz   |   | (2)_____                                     | –16 dBm  | ±3.03 dB                                 |
| <b>50.</b>  | <b>Gate Delay Accuracy and Gate Length Accuracy</b><br><i>(Option 1D6 only)</i><br><br>Minimum Gate Delay<br>Maximum Gate Delay<br>1 μs Gate Length<br>65 ms Gate Length | 499.9 ns<br>499.9 ns<br>499.9 ns<br>64.993 ms | (1)_____<br>(2)_____<br>(3)_____<br>(4)_____ | 1.5001 μs<br>1.5001 μs<br>1.5001 μs<br>65.007 ms | ±549 ps<br>±549 ps<br>±520 ps<br>±647 ns |
| <b>51.</b>  | <b>Gate Mode Additional Amplitude Error</b> <i>(Option 1D6 only)</i><br><br>Amplitude Error  | –0.2 dB                                       | (1)_____                                     | 0.2 dB   | ±0.023 dB                                |

**Agilent E7403A Performance Verification Test Record**

Tests for the Agilent E7403A only are included in this test record, therefore not all test numbers are included.

**Table 3-5      Agilent E7403A Performance Verification Test Record**

|  |                  |   |                     |
|--|------------------|---|---------------------|
| Agilent Technologies                     |                  |   |                     |
| Address: _____                           |                  | Report No. _____                              |                     |
| _____                                    |                  | Date _____                                    |                     |
| _____                                    |                  |   |                     |
| Model E7403A                             |                  |   |                     |
| Serial No. _____                         |                  | Ambient temperature _____ ° C                 |                     |
| Options _____                            |                  | Relative humidity _____ %                     |                     |
| Firmware Revision _____                  |                  | Power mains line frequency _____ Hz (nominal) |                     |
| Customer _____                           |                  | Tested by _____                               |                     |
| <b>Test Equipment Used:</b>              |                  |   |                     |
| <b>Description</b>                       | <b>Model No.</b> | <b>Trace No.</b>                              | <b>Cal Due Date</b> |
| Synthesized Signal Generator             | _____            | _____   | _____               |
| Wide Offset Phase Noise Signal Generator | _____            | _____   | _____               |
| Synthesized Sweeper #1                   | _____            | _____   | _____               |
| Synthesized Sweeper #2                   | _____            | _____   | _____               |
| Function Generator                       | _____            | _____   | _____               |
| Power Meter, Dual-Channel                | _____            | _____   | _____               |
| RF Power Sensor #1                       | _____            | _____   | _____               |
| RF Power Sensor #2                       | _____            | _____   | _____               |
| Microwave Power Sensor                   | _____            | _____   | _____               |
| Low-Power Power Sensor                   | _____            | _____   | _____               |
| Digital Multimeter                       | _____            | _____   | _____               |
| Universal Counter                        | _____            | _____   | _____               |
| Frequency Standard                       | _____            | _____   | _____               |
| Power Splitter                           | _____            | _____   | _____               |

**Table 3-5 Agilent E7403A Performance Verification Test Record**

|  |       |       |       |
|--|-------|-------|-------|
| 50 $\Omega$ Termination                          | _____ | _____ | _____ |
| 1 dB Step Attenuator                             | _____ | _____ | _____ |
| 10 dB Step Attenuator                            | _____ | _____ | _____ |
| Oscilloscope<br>(Option 1D6 only)                | _____ | _____ | _____ |
| Microwave Spectrum Analyzer<br>(Option 1DN only) | _____ | _____ | _____ |
| Notes/comments:                                  | _____ |       |       |
|  | _____ |       |       |

**Table 3-6 Agilent E7403A Performance Verification Test Record**

| <b>Agilent Technologies</b><br><br><b>Model E7403A</b> <span style="float: right;"><b>Report No.</b> _____</span><br><b>Serial No.</b> _____ <span style="float: right;"><b>Date</b> _____</span>  |  |  |  |  |  |
|--|--|--|--|--|--|
| Test Description   | Minimum  | Results Measured   | Maximum  | Measurement Uncertainty  |  |
| <b>1. 10 MHz Reference Accuracy</b><br><i>(Non-Option 1D5 only)</i><br><br>Settability   | -5.0 Hz  | (1) _____  | 5.0 Hz   | $\pm 293.3 \mu\text{Hz}$   |  |
| <b>2. 10 MHz High-Stability Frequency Reference Output Accuracy</b><br><i>(Option 1D5 only)</i><br><br>5 Minute Warm-Up Error<br>15 Minute Warm-Up Error   | -0.1 ppm<br>-0.01 ppm  | (1) _____<br>(2) _____   | 0.1 ppm<br>0.01 ppm  | $\pm 0.000072 \text{ ppm}$<br>$\pm 0.000070 \text{ ppm}$   |  |
| <b>4. Frequency Readout and Marker Frequency Count Accuracy</b><br><br>Frequency Readout Accuracy<br>Center Freq    Span<br>1500 MHz    20 MHz<br>1500 MHz    10 MHz<br>1500 MHz    1 MHz<br>4000 MHz    20 MHz<br>4000 MHz    10 MHz<br>4000 MHz    1 MHz | 1499.83 MHz<br>1499.91 MHz<br>1499.991 MHz<br>3999.83 MHz<br>3999.91 MHz<br>3999.991 MHz | (1) _____<br>(2) _____<br>(3) _____<br>(4) _____<br>(5) _____<br>(6) _____ | 1500.17 MHz<br>1500.09 MHz<br>1500.009 MHz<br>4000.17 MHz<br>4000.09 MHz<br>4000.009 MHz | $\pm 0 \text{ Hz}$<br>$\pm 0 \text{ Hz}$<br>$\pm 0 \text{ Hz}$<br>$\pm 0 \text{ Hz}$<br>$\pm 0 \text{ Hz}$<br>$\pm 0 \text{ Hz}$ |  |

Performance Verification Test Records  
**Agilent E7403A Performance Verification Test Record**

**Table 3-6                      Agilent E7403A Performance Verification Test Record**

| <b>Agilent Technologies</b><br><br><b>Model E7403A</b> <span style="float: right;"><b>Report No.</b> _____</span><br><b>Serial No.</b> _____ <span style="float: right;"><b>Date</b> _____</span>                      |  |  |  |  |  |
|--|--|--|--|--|--|
| Test Description   | Minimum  | Results Measured   | Maximum  | Measurement Uncertainty  |  |
| <b>Marker Count Accuracy</b><br>Center Freq    Span<br>1500 MHz    20 MHz<br>1500 MHz    1 MHz<br>4000 MHz    20 MHz<br>4000 MHz    1 MHz  | 1499.999999 MHz<br>1499.999999 MHz<br>3999.999999 MHz<br>3999.999999 MHz | (16)_____<br>(17)_____<br>(18)_____<br>(19)_____                                 | 1500.000001 MHz<br>1500.000001 MHz<br>4000.000001 MHz<br>4000.000001 MHz | ±0 Hz<br>±0 Hz<br>±0 Hz<br>±0 Hz   |  |
| <b>6.      Frequency Span Accuracy</b><br>Span      Start Freq<br>3000 MHz    0 Hz<br>100 MHz    10 MHz<br>100 kHz    10 MHz<br>100 MHz    800 MHz<br>100 kHz    800 MHz<br>100 MHz    1400 MHz<br>100 kHz    1499 MHz | 2370 MHz<br>79 MHz<br>79 kHz<br>79 MHz<br>79 kHz<br>79 MHz<br>79 kHz     | (1)_____<br>(2)_____<br>(3)_____<br>(4)_____<br>(5)_____<br>(6)_____<br>(7)_____ | 2430 MHz<br>81 MHz<br>81 kHz<br>81 MHz<br>81 kHz<br>81 MHz<br>81 kHz     | ±6.12 MHz<br>±204 kHz<br>±204 Hz<br>±204 kHz<br>±204 Hz<br>±204 kHz<br>±204 Hz |  |
| <b>7.      Noise Sidebands</b><br>Offset from 1 GHz signal<br>10 kHz<br>20 kHz<br>30 kHz   |  | (1)_____<br>(2)_____<br>(3)_____   | -90 dBc/Hz<br>-100 dBc/Hz<br>-106 dBc/Hz                                 | ±2.44 dB<br>±2.44 dB<br>±2.44 dB   |  |
| <b>8.      Noise Sidebands - Wide Offsets</b><br>Offset from 1 GHz signal  |  |  |  |  |  |

**Table 3-6 Agilent E7403A Performance Verification Test Record**

| <b>Agilent Technologies</b><br><br><b>Model E7403A</b> <span style="float: right;"><b>Report No.</b> _____</span><br><b>Serial No.</b> _____ <span style="float: right;"><b>Date</b> _____</span>                                 |   |   |   |   |  |
|---|---|---|---|---|--|
| Test Description  | Minimum   | Results Measured  | Maximum   | Measurement Uncertainty   |  |
| <div style="margin-bottom: 5px;">100 kHz</div> <div style="margin-bottom: 5px;">1 MHz</div> <div style="margin-bottom: 5px;">5 MHz</div> <div style="margin-bottom: 5px;">10 MHz</div>  |   | <div style="margin-bottom: 5px;">(1)_____</div> <div style="margin-bottom: 5px;">(2)_____</div> <div style="margin-bottom: 5px;">(3)_____</div> <div style="margin-bottom: 5px;">(4)_____</div>   | <div style="margin-bottom: 5px;">–118 dBc/Hz</div> <div style="margin-bottom: 5px;">–125 dBc/Hz</div> <div style="margin-bottom: 5px;">–127 dBc/Hz</div> <div style="margin-bottom: 5px;">–131 dBc/Hz</div>   | <div style="margin-bottom: 5px;">±2.44 dB</div> <div style="margin-bottom: 5px;">±2.44 dB</div> <div style="margin-bottom: 5px;">±2.44 dB</div> <div style="margin-bottom: 5px;">±2.44 dB</div>   |  |
| <b>9. System-Related Sidebands</b><br><br>Offset from 500 MHz signal<br><br>30 kHz to 230 kHz<br><br>–30 kHz to –230 kHz  |   | <div style="margin-bottom: 5px;">(1)_____</div> <div style="margin-bottom: 5px;">(2)_____</div>   | <div style="margin-bottom: 5px;">–65 dBc</div> <div style="margin-bottom: 5px;">–65 dBc</div>   | <div style="margin-bottom: 5px;">±1.30 dB</div> <div style="margin-bottom: 5px;">±1.30 dB</div>   |  |
| <b>10. Residual FM</b><br><br>1 kHz Res BW,<br><i>(Non-Option 1D5)</i><br><br>1 kHz Res BW,<br><i>(Option 1D5)</i><br><br>10 Hz Res BW<br><i>(Option 1D5 only)</i>  |   | <div style="margin-bottom: 5px;">(1)_____</div> <div style="margin-bottom: 5px;">(1)_____</div> <div style="margin-bottom: 5px;">(2)_____</div>   | <div style="margin-bottom: 5px;">150 Hz</div> <div style="margin-bottom: 5px;">100 Hz</div> <div style="margin-bottom: 5px;">2 Hz</div>   | <div style="margin-bottom: 5px;">±21 Hz</div> <div style="margin-bottom: 5px;">±21 Hz</div> <div style="margin-bottom: 5px;">±0.27 Hz</div>   |  |
| <b>11. Sweep Time Accuracy</b><br><br>Sweep Time<br><br>5 ms<br><br>20 ms<br><br>100 ms<br><br>1 s<br><br>10 s<br><br>1 ms <i>(Option AYX only)</i><br><br>500 μs <i>(Option AYX only)</i><br><br>100 μs <i>(Option AYX only)</i> | <div style="margin-bottom: 5px;">–1.0%</div> <div style="margin-bottom: 5px;">–1.0%</div> <div style="margin-bottom: 5px;">–1.0%</div> <div style="margin-bottom: 5px;">–1.0%</div> <div style="margin-bottom: 5px;">–1.0%</div> <div style="margin-bottom: 5px;">–1.0%</div> <div style="margin-bottom: 5px;">–1.0%</div> <div style="margin-bottom: 5px;">–1.0%</div> | <div style="margin-bottom: 5px;">(1)_____</div> <div style="margin-bottom: 5px;">(2)_____</div> <div style="margin-bottom: 5px;">(3)_____</div> <div style="margin-bottom: 5px;">(4)_____</div> <div style="margin-bottom: 5px;">(5)_____</div> <div style="margin-bottom: 5px;">(6)_____</div> <div style="margin-bottom: 5px;">(7)_____</div> <div style="margin-bottom: 5px;">(8)_____</div> | <div style="margin-bottom: 5px;">1.0%</div> <div style="margin-bottom: 5px;">1.0%</div> <div style="margin-bottom: 5px;">1.0%</div> <div style="margin-bottom: 5px;">1.0%</div> <div style="margin-bottom: 5px;">1.0%</div> <div style="margin-bottom: 5px;">1.0%</div> <div style="margin-bottom: 5px;">1.0%</div> <div style="margin-bottom: 5px;">1.0%</div> | <div style="margin-bottom: 5px;">±0.16%</div> <div style="margin-bottom: 5px;">±0.16%</div> <div style="margin-bottom: 5px;">±0.16%</div> <div style="margin-bottom: 5px;">±0.16%</div> <div style="margin-bottom: 5px;">±0.16%</div> <div style="margin-bottom: 5px;">±0.16%</div> <div style="margin-bottom: 5px;">±0.16%</div> <div style="margin-bottom: 5px;">±0.16%</div> |  |
| <b>12. Display Scale Fidelity</b>   |   |   |   |   |  |

Performance Verification Test Records  
**Agilent E7403A Performance Verification Test Record**

**Table 3-6                      Agilent E7403A Performance Verification Test Record**

| <b>Agilent Technologies</b> |  |                         |                  |         |                         |
|-----------------------------|--|-------------------------|------------------|---------|-------------------------|
| <b>Model E7403A</b>         |  | <b>Report No.</b> _____ |                  |         |                         |
| <b>Serial No.</b> _____     |  | <b>Date</b> _____       |                  |         |                         |
|                             | Test Description   | Minimum                 | Results Measured | Maximum | Measurement Uncertainty |
|                             | Cumulative Log Fidelity,<br>Res BW ≥1 kHz<br>dB from Ref Level |                         |                  |         |                         |
|                             | -4   | -0.30 dB                | (1)_____         | 0.30 dB | ±0.082 dB               |
|                             | -8   | -0.30 dB                | (2)_____         | 0.30 dB | ±0.078 dB               |
|                             | -12  | -0.40 dB                | (3)_____         | 0.40 dB | ±0.075 dB               |
|                             | -16  | -0.40 dB                | (4)_____         | 0.40 dB | ±0.073 dB               |
|                             | -20  | -0.40 dB                | (5)_____         | 0.40 dB | ±0.078 dB               |
|                             | -24  | -0.50 dB                | (6)_____         | 0.50 dB | ±0.074 dB               |
|                             | -28  | -0.50 dB                | (7)_____         | 0.50 dB | ±0.073 dB               |
|                             | -32  | -0.60 dB                | (8)_____         | 0.60 dB | ±0.077 dB               |
|                             | -36  | -0.60 dB                | (9)_____         | 0.60 dB | ±0.075 dB               |
|                             | -40  | -0.60 dB                | (10)_____        | 0.60 dB | ±0.081 dB               |
|                             | -44  | -0.70 dB                | (11)_____        | 0.70 dB | ±0.077 dB               |
|                             | -48  | -0.70 dB                | (12)_____        | 0.70 dB | ±0.076 dB               |
|                             | -52  | -0.70dB                 | (13)_____        | 0.70 dB | ±0.080 dB               |
|                             | -56  | -0.70 dB                | (14)_____        | 0.70 dB | ±0.078 dB               |
|                             | -60  | -0.70 dB                | (15)_____        | 0.70 dB | ±0.084 dB               |
|                             | -64  | -0.80 dB                | (16)_____        | 0.80 dB | ±0.081 dB               |
|                             | -68  | -0.80 dB                | (17)_____        | 0.80 dB | ±0.080 dB               |
|                             | -72  | -0.80 dB                | (18)_____        | 0.80 dB | ±0.084 dB               |
|                             | -76  | -0.80 dB                | (19)_____        | 0.80 dB | ±0.083 dB               |
|                             | -80  | -0.80 dB                | (20)_____        | 0.80 dB | ±0.089 dB               |
|                             | -84  | -1.15 dB                | (21)_____        | 1.15 dB | ±0.086 dB               |



**Table 3-6                      Agilent E7403A Performance Verification Test Record**

| <b>Agilent Technologies</b><br><br><b>Model E7403A</b> <span style="float: right;"><b>Report No.</b> _____</span><br><b>Serial No.</b> _____ <span style="float: right;"><b>Date</b> _____</span> |   |         |                  |         |                         |
|---|---|---------|------------------|---------|-------------------------|
|   | Test Description  | Minimum | Results Measured | Maximum | Measurement Uncertainty |
|   | Incremental Log Fidelity,<br>Res BW $\geq 1$ kHz<br><br>dB from Ref Level |         |                  |         |                         |
|   | –4  | –0.4 dB | (22)_____        | 0.4 dB  | $\pm 0.082$ dB          |
|   | –8  | –0.4 dB | (23)_____        | 0.4 dB  | $\pm 0.078$ dB          |
|   | –12   | –0.4 dB | (24)_____        | 0.4 dB  | $\pm 0.075$ dB          |
|   | –16   | –0.4 dB | (25)_____        | 0.4 dB  | $\pm 0.073$ dB          |
|   | –20   | –0.4 dB | (26)_____        | 0.4 dB  | $\pm 0.078$ dB          |
|   | –24   | –0.4 dB | (27)_____        | 0.4 dB  | $\pm 0.074$ dB          |
|   | –28   | –0.4 dB | (28)_____        | 0.4 dB  | $\pm 0.073$ dB          |
|   | –32   | –0.4 dB | (29)_____        | 0.4 dB  | $\pm 0.077$ dB          |
|   | –36   | –0.4 dB | (30)_____        | 0.4 dB  | $\pm 0.075$ dB          |
|   | –40   | –0.4 dB | (31)_____        | 0.4 dB  | $\pm 0.081$ dB          |
|   | –44   | –0.4 dB | (32)_____        | 0.4 dB  | $\pm 0.077$ dB          |
|   | –48   | –0.4 dB | (33)_____        | 0.4 dB  | $\pm 0.076$ dB          |
|   | –52   | –0.4 dB | (34)_____        | 0.4 dB  | $\pm 0.080$ dB          |
|   | –56   | –0.4 dB | (35)_____        | 0.4 dB  | $\pm 0.078$ dB          |
|   | –60   | –0.4 dB | (36)_____        | 0.4 dB  | $\pm 0.084$ dB          |
|   | –64   | –0.4 dB | (37)_____        | 0.4 dB  | $\pm 0.081$ dB          |
|   | –68   | –0.4 dB | (38)_____        | 0.4 dB  | $\pm 0.080$ dB          |
|   | –72   | –0.4 dB | (39)_____        | 0.4 dB  | $\pm 0.084$ dB          |
|   | –76   | –0.4 dB | (40)_____        | 0.4 dB  | $\pm 0.083$ dB          |
|   | –80   | –0.4 dB | (41)_____        | 0.4 dB  | $\pm 0.089$ dB          |
|   | Cumulative Log Fidelity,<br>Res BW $\leq 300$ Hz<br><br>dB from Ref Level |         |                  |         |                         |

Performance Verification Test Records  
**Agilent E7403A Performance Verification Test Record**

**Table 3-6 Agilent E7403A Performance Verification Test Record**

| <b>Agilent Technologies</b> |     |                         |                         |                |                                |
|-----------------------------|-----|-------------------------|-------------------------|----------------|--------------------------------|
| <b>Model E7403A</b>         |     | <b>Report No.</b> _____ |                         |                |                                |
| <b>Serial No.</b> _____     |     | <b>Date</b> _____       |                         |                |                                |
| <b>Test Description</b>     |     | <b>Minimum</b>          | <b>Results Measured</b> | <b>Maximum</b> | <b>Measurement Uncertainty</b> |
|                             | -4  | -0.34 dB                | (43)_____               | 0.34 dB        | ±0.082 dB                      |
|                             | -8  | -0.38 dB                | (44)_____               | 0.38 dB        | ±0.078 dB                      |
|                             | -12 | -0.42 dB                | (45)_____               | 0.42 dB        | ±0.075 dB                      |
|                             | -16 | -0.46 dB                | (46)_____               | 0.46 dB        | ±0.073 dB                      |
|                             | -20 | -0.50 dB                | (47)_____               | 0.50 dB        | ±0.078 dB                      |
|                             | -24 | -0.54 dB                | (48)_____               | 0.54 dB        | ±0.074 dB                      |
|                             | -28 | -0.58 dB                | (49)_____               | 0.58 dB        | ±0.073 dB                      |
|                             | -32 | -0.62 dB                | (50)_____               | 0.62 dB        | ±0.077 dB                      |
|                             | -36 | -0.66 dB                | (51)_____               | 0.66 dB        | ±0.075 dB                      |
|                             | -40 | -0.70 dB                | (52)_____               | 0.70 dB        | ±0.081 dB                      |
|                             | -44 | -0.74 dB                | (53)_____               | 0.74 dB        | ±0.077 dB                      |
|                             | -48 | -0.78 dB                | (54)_____               | 0.78 dB        | ±0.076 dB                      |
|                             | -52 | -0.82 dB                | (55)_____               | 0.82 dB        | ±0.080 dB                      |
|                             | -56 | -0.86 dB                | (56)_____               | 0.86 dB        | ±0.078 dB                      |
|                             | -60 | -0.90 dB                | (57)_____               | 0.90 dB        | ±0.084 dB                      |
|                             | -64 | -0.94 dB                | (58)_____               | 0.94 dB        | ±0.081 dB                      |
|                             | -68 | -0.98 dB                | (59)_____               | 0.98 dB        | ±0.080 dB                      |
|                             | -72 | -1.02 dB                | (60)_____               | 1.02 dB        | ±0.084 dB                      |
|                             | -76 | -1.06 dB                | (61)_____               | 1.06 dB        | ±0.083 dB                      |
|                             | -80 | -1.10 dB                | (62)_____               | 1.10 dB        | ±0.089 dB                      |
|                             | -84 | -1.14 dB                | (63)_____               | 1.14 dB        | ±0.086 dB                      |
|                             | -88 | -1.18 dB                | (64)_____               | 1.18 dB        | ±0.085 dB                      |
|                             | -92 | -1.22 dB                | (65)_____               | 1.22 dB        | ±0.100 dB                      |
|                             | -96 | -1.26 dB                | (66)_____               | 1.26 dB        | ±0.099 dB                      |
|                             | -98 | -1.28 dB                | (67)_____               | 1.28 dB        | ±0.098 dB                      |

# Agilent E7403A Performance Verification Test Record

| Agilent Technologies |  |                  |                  |         |                         |
|----------------------|--|------------------|------------------|---------|-------------------------|
| Model E7403A         |  | Report No. _____ |                  |         |                         |
| Serial No. _____     |  | Date _____       |                  |         |                         |
| Test Description     |  | Minimum          | Results Measured | Maximum | Measurement Uncertainty |
|                      | Incremental Log Fidelity,<br>Res BW $\leq$ 300 Hz<br><br>dB from Ref Level |                  |                  |         |                         |
|                      | -4   | -0.4 dB          | (68)_____        | 0.4 dB  | $\pm$ 0.082 dB          |
|                      | -8   | -0.4 dB          | (69)_____        | 0.4 dB  | $\pm$ 0.078 dB          |
|                      | -12  | -0.4 dB          | (70)_____        | 0.4 dB  | $\pm$ 0.075 dB          |
|                      | -16  | -0.4 dB          | (71)_____        | 0.4 dB  | $\pm$ 0.073 dB          |
|                      | -20  | -0.4 dB          | (72)_____        | 0.4 dB  | $\pm$ 0.078 dB          |
|                      | -24  | -0.4 dB          | (73)_____        | 0.4 dB  | $\pm$ 0.074 dB          |
|                      | -28  | -0.4 dB          | (74)_____        | 0.4 dB  | $\pm$ 0.073 dB          |
|                      | -32  | -0.4 dB          | (75)_____        | 0.4 dB  | $\pm$ 0.077 dB          |
|                      | -36  | -0.4 dB          | (76)_____        | 0.4 dB  | $\pm$ 0.075 dB          |
|                      | -40  | -0.4 dB          | (77)_____        | 0.4 dB  | $\pm$ 0.081 dB          |
|                      | -44  | -0.4 dB          | (78)_____        | 0.4 dB  | $\pm$ 0.077 dB          |
|                      | -48  | -0.4 dB          | (79)_____        | 0.4 dB  | $\pm$ 0.076 dB          |
|                      | -52  | -0.4 dB          | (80)_____        | 0.4 dB  | $\pm$ 0.080 dB          |
|                      | -56  | -0.4 dB          | (81)_____        | 0.4 dB  | $\pm$ 0.078 dB          |
|                      | -60  | -0.4 dB          | (82)_____        | 0.4 dB  | $\pm$ 0.084 dB          |
|                      | -64  | -0.4 dB          | (83)_____        | 0.4 dB  | $\pm$ 0.081 dB          |
|                      | -68  | -0.4 dB          | (84)_____        | 0.4 dB  | $\pm$ 0.080 dB          |
|                      | -72  | -0.4 dB          | (85)_____        | 0.4 dB  | $\pm$ 0.084 dB          |
|                      | -76  | -0.4 dB          | (86)_____        | 0.4 dB  | $\pm$ 0.083 dB          |
|                      | -80  | -0.4 dB          | (87)_____        | 0.4 dB  | $\pm$ 0.089 dB          |
|                      | Linear Fidelity,<br>Res BW $\geq$ 1 kHz<br><br>dB from Ref Level           |                  |                  |         |                         |

Performance Verification Test Records  
**Agilent E7403A Performance Verification Test Record**

**Table 3-6 Agilent E7403A Performance Verification Test Record**

| <b>Agilent Technologies</b> |   |                         |                         |                |                                |
|-----------------------------|---|-------------------------|-------------------------|----------------|--------------------------------|
| <b>Model E7403A</b>         |   | <b>Report No.</b> _____ |                         |                |                                |
| <b>Serial No.</b> _____     |   | <b>Date</b> _____       |                         |                |                                |
| <b>Test Description</b>     |   | <b>Minimum</b>          | <b>Results Measured</b> | <b>Maximum</b> | <b>Measurement Uncertainty</b> |
|                             | –4  | –2.0%                   | (93)_____               | 2.0%           | ±0.064%                        |
|                             | –8  | –2.0%                   | (94)_____               | 2.0%           | ±0.064%                        |
|                             | –12   | –2.0%                   | (95)_____               | 2.0%           | ±0.064%                        |
|                             | –16   | –2.0%                   | (96)_____               | 2.0%           | ±0.064%                        |
|                             | –20   | –2.0%                   | (97)_____               | 2.0%           | ±0.063%                        |
|                             | Linear Fidelity,<br>Res BW ≤300 Hz<br>dB from Ref Level |                         |                         |                |                                |
|                             | –4  | –2.0%                   | (98)_____               | 2.0%           | ±0.064%                        |
|                             | –8  | –2.0%                   | (99)_____               | 2.0%           | ±0.064%                        |
|                             | –12   | –2.0%                   | (100)_____              | 2.0%           | ±0.064%                        |
|                             | –16   | –2.0%                   | (101)_____              | 2.0%           | ±0.064%                        |
|                             | –20   | –2.0%                   | (102)_____              | 2.0%           | ±0.063%                        |
|                             | Zero Span,<br>Res BW ≤300 Hz<br>dB from Ref Level       |                         |                         |                |                                |
|                             | –4  | –0.36 dB                | (103)_____              | 0.36 dB        | ±0.082 dB                      |
|                             | –8  | –0.42 dB                | (104)_____              | 0.42 dB        | ±0.078 dB                      |
|                             | –12   | –0.48 dB                | (105)_____              | 0.48 dB        | ±0.075 dB                      |
|                             | –16   | –0.54 dB                | (106)_____              | 0.54 dB        | ±0.073 dB                      |
|                             | –20   | –0.60 dB                | (107)_____              | 0.60 dB        | ±0.078 dB                      |
|                             | –24   | –0.66 dB                | (108)_____              | 0.66 dB        | ±0.074 dB                      |
|                             | –28   | –0.72 dB                | (109)_____              | 0.72 dB        | ±0.073 dB                      |
|                             | –32   | –0.78 dB                | (110)_____              | 0.78 dB        | ±0.077 dB                      |
|                             | –36   | –0.84 dB                | (111)_____              | 0.84 dB        | ±0.075 dB                      |
|                             | –40   | –0.90 dB                | (112)_____              | 0.90 dB        | ±0.081 dB                      |

**Table 3-6 Agilent E7403A Performance Verification Test Record**

| <b>Agilent Technologies</b><br><b>Model E7403A</b><br><b>Serial No. _____</b> |   |          |                  |         |                         | <b>Report No. _____</b><br><b>Date _____</b> |  |  |  |  |  |
|---|---|----------|------------------|---------|-------------------------|--|--|--|--|--|--|
| Test Description  |   | Minimum  | Results Measured | Maximum | Measurement Uncertainty |  |  |  |  |  |  |
|   | -44   | -0.96 dB | (113)_____       | 0.96 dB | ±0.077 dB               |  |  |  |  |  |  |
|   | -48   | -1.02 dB | (114)_____       | 1.02 dB | ±0.076 dB               |  |  |  |  |  |  |
|   | -52   | -1.08 dB | (115)_____       | 1.08 dB | ±0.080 dB               |  |  |  |  |  |  |
|   | -56   | -1.14 dB | (116)_____       | 1.14 dB | ±0.078 dB               |  |  |  |  |  |  |
|   | -60   | -1.20 dB | (117)_____       | 1.20 dB | ±0.084 dB               |  |  |  |  |  |  |
|   | -64   | -1.5 dB  | (118)_____       | 1.5 dB  | ±0.081 dB               |  |  |  |  |  |  |
|   | -68   | -1.5 dB  | (119)_____       | 1.5 dB  | ±0.080 dB               |  |  |  |  |  |  |
|   | -70   | -1.5 dB  | (120)_____       | 1.5 dB  | ±0.084 dB               |  |  |  |  |  |  |
| <b>13.</b>  | <b>Input Attenuation Switching Uncertainty</b><br><br>Input Attenuation Setting |          |                  |         |                         |  |  |  |  |  |  |
|   | 0 dB  | -0.3 dB  | (1)_____         | 0.3 dB  | ±0.101 dB               |  |  |  |  |  |  |
|   | 5 dB  | -0.3 dB  | (2)_____         | 0.3 dB  | ±0.104 dB               |  |  |  |  |  |  |
|   | 15 dB   | -0.3 dB  | (3)_____         | 0.3 dB  | ±0.102 dB               |  |  |  |  |  |  |
|   | 20 dB   | -0.3 dB  | (4)_____         | 0.3 dB  | ±0.098 dB               |  |  |  |  |  |  |
|   | 25 dB   | -0.35 dB | (5)_____         | 0.35 dB | ±0.098 dB               |  |  |  |  |  |  |
|   | 30 dB   | -0.40 dB | (6)_____         | 0.40 dB | ±0.096 dB               |  |  |  |  |  |  |
|   | 35 dB   | -0.45 dB | (7)_____         | 0.45 dB | ±0.099 dB               |  |  |  |  |  |  |
|   | 40 dB   | -0.50 dB | (8)_____         | 0.50 dB | ±0.096 dB               |  |  |  |  |  |  |
|   | 45 dB   | -0.55 dB | (9)_____         | 0.55 dB | ±0.099 dB               |  |  |  |  |  |  |
|   | 50 dB   | -0.60 dB | (10)_____        | 0.60 dB | ±0.095 dB               |  |  |  |  |  |  |
|   | 55 dB   | -0.65 dB | (11)_____        | 0.65 dB | ±0.099 dB               |  |  |  |  |  |  |
|   | 60 dB   | -0.70 dB | (12)_____        | 0.70 dB | ±0.100 dB               |  |  |  |  |  |  |
|   | 65 dB   | -0.75 dB | (13)_____        | 0.75 dB | ±0.111 dB               |  |  |  |  |  |  |
| <b>15.</b>  | <b>Reference Level Accuracy</b>   |          |                  |         |                         |  |  |  |  |  |  |

Performance Verification Test Records  
**Agilent E7403A Performance Verification Test Record**

**Table 3-6                      Agilent E7403A Performance Verification Test Record**

| <b>Agilent Technologies</b> |                             |                         |                  |         |                         |
|-----------------------------|-----------------------------|-------------------------|------------------|---------|-------------------------|
| <b>Model E7403A</b>         |                             | <b>Report No.</b> _____ |                  |         |                         |
| <b>Serial No.</b> _____     |                             | <b>Date</b> _____       |                  |         |                         |
|                             | Test Description            | Minimum                 | Results Measured | Maximum | Measurement Uncertainty |
|                             | Log, Res BW $\geq 1$ kHz    |                         |                  |         |                         |
|                             | Reference Level             |                         |                  |         |                         |
|                             | –10 dBm                     | –0.3 dB                 | (1)_____         | 0.3 dB  | $\pm 0.091$ dB          |
|                             | 0 dBm                       | –0.3 dB                 | (2)_____         | 0.3 dB  | $\pm 0.100$ dB          |
|                             | –30 dBm                     | –0.3 dB                 | (3)_____         | 0.3 dB  | $\pm 0.092$ dB          |
|                             | –40 dBm                     | –0.3 dB                 | (4)_____         | 0.3 dB  | $\pm 0.094$ dB          |
|                             | –50 dBm                     | –0.5 dB                 | (5)_____         | 0.5 dB  | $\pm 0.095$ dB          |
|                             | –60 dBm                     | –0.5 dB                 | (6)_____         | 0.5 dB  | $\pm 0.097$ dB          |
|                             | –70 dBm                     | –0.5 dB                 | (7)_____         | 0.5 dB  | $\pm 0.099$ dB          |
|                             | –80 dBm                     | –0.7 dB                 | (8)_____         | 0.7 dB  | $\pm 0.101$ dB          |
|                             | Linear, Res BW $\geq 1$ kHz |                         |                  |         |                         |
|                             | Reference Level             |                         |                  |         |                         |
|                             | –10 dBm                     | –0.3 dB                 | (9)_____         | 0.3 dB  | $\pm 0.091$ dB          |
|                             | 0 dBm                       | –0.3 dB                 | (10)_____        | 0.3 dB  | $\pm 0.100$ dB          |
|                             | –30 dBm                     | –0.3 dB                 | (11)_____        | 0.3 dB  | $\pm 0.092$ dB          |
|                             | –40 dBm                     | –0.3 dB                 | (12)_____        | 0.3 dB  | $\pm 0.094$ dB          |
|                             | –50 dBm                     | –0.5 dB                 | (13)_____        | 0.5 dB  | $\pm 0.095$ dB          |
|                             | –60 dBm                     | –0.5 dB                 | (14)_____        | 0.5 dB  | $\pm 0.097$ dB          |
|                             | –70 dBm                     | –0.5 dB                 | (15)_____        | 0.5 dB  | $\pm 0.099$ dB          |
|                             | –80 dBm                     | –0.7 dB                 | (16)_____        | 0.7 dB  | $\pm 0.101$ dB          |
|                             | Log, Res BW $\leq 300$ Hz   |                         |                  |         |                         |
|                             | Reference Level             |                         |                  |         |                         |
|                             | –10 dBm                     | –0.3 dB                 | (17)_____        | 0.3 dB  | $\pm 0.091$ dB          |
|                             | 0 dBm                       | –0.3 dB                 | (18)_____        | 0.3 dB  | $\pm 0.100$ dB          |
|                             | –30 dBm                     | –0.3 dB                 | (19)_____        | 0.3 dB  | $\pm 0.092$ dB          |
|                             | –40 dBm                     | –0.3 dB                 | (20)_____        | 0.3 dB  | $\pm 0.094$ dB          |

**Table 3-6 Agilent E7403A Performance Verification Test Record**

| <b>Agilent Technologies</b><br><br><b>Model E7403A</b> <span style="float: right;"><b>Report No.</b> _____</span><br><b>Serial No.</b> _____ <span style="float: right;"><b>Date</b> _____</span> |   |         |                  |         |                         |
|---|---|---------|------------------|---------|-------------------------|
| Test Description  |   | Minimum | Results Measured | Maximum | Measurement Uncertainty |
|   | –50 dBm   | –0.5 dB | (21)_____        | 0.5 dB  | ±0.095 dB               |
|   | –60 dBm   | –0.5 dB | (22)_____        | 0.5 dB  | ±0.097 dB               |
|   | –70 dBm   | –0.5 dB | (23)_____        | 0.5 dB  | ±0.099 dB               |
|   | –80 dBm   | –0.7 dB | (24)_____        | 0.7 dB  | ±0.101 dB               |
|   | Linear, Res BW ≤300 Hz<br>Reference Level                                     |         |                  |         |                         |
|   | –10 dBm   | –0.3 dB | (25)_____        | 0.3 dB  | ±0.091 dB               |
|   | 0 dBm   | –0.3 dB | (26)_____        | 0.3 dB  | ±0.100 dB               |
|   | –30 dBm   | –0.3 dB | (27)_____        | 0.3 dB  | ±0.092 dB               |
|   | –40 dBm   | –0.3 dB | (28)_____        | 0.3 dB  | ±0.094 dB               |
|   | –50 dBm   | –0.5 dB | (29)_____        | 0.5 dB  | ±0.095 dB               |
|   | –60 dBm   | –0.5 dB | (30)_____        | 0.5 dB  | ±0.097 dB               |
|   | –70 dBm   | –0.5 dB | (31)_____        | 0.5 dB  | ±0.099 dB               |
|   | –80 dBm   | –0.7 dB | (32)_____        | 0.7 dB  | ±0.101 dB               |
| <b>16.</b>  | <b>Resolution Bandwidth Switching Uncertainty</b><br><br>Resolution Bandwidth |         |                  |         |                         |
|   | 3 kHz   | –0.3 dB | (1)_____         | 0.3 dB  | ±0.048 dB               |
|   | 9 kHz   | –0.3 dB | (2)_____         | 0.3 dB  | ±0.048 dB               |
|   | 10 kHz  | –0.3 dB | (3)_____         | 0.3 dB  | ±0.048 dB               |
|   | 30 kHz  | –0.3 dB | (4)_____         | 0.3 dB  | ±0.048 dB               |
|   | 100 kHz   | –0.3 dB | (5)_____         | 0.3 dB  | ±0.048 dB               |
|   | 120 kHz   | –0.3 dB | (6)_____         | 0.3 dB  | ±0.048 dB               |
|   | 300 kHz   | –0.3 dB | (7)_____         | 0.3 dB  | ±0.048 dB               |
|   | 1 MHz   | –0.3 dB | (8)_____         | 0.3 dB  | ±0.048 dB               |
|   | 3 MHz   | –0.3 dB | (9)_____         | 0.3 dB  | ±0.048 dB               |

Performance Verification Test Records  
**Agilent E7403A Performance Verification Test Record**

**Table 3-6                      Agilent E7403A Performance Verification Test Record**

| <b>Agilent Technologies</b><br><br><b>Model E7403A</b> <span style="float: right;"><b>Report No.</b> _____</span><br><br><b>Serial No.</b> _____ <span style="float: right;"><b>Date</b> _____</span> |  |          |                  |         |                         |
|---|--|----------|------------------|---------|-------------------------|
| Test Description  |  | Minimum  | Results Measured | Maximum | Measurement Uncertainty |
|   | 5 MHz  | −0.6 dB  | (10)_____        | 0.6 dB  | ±0.076 dB               |
|   | 300 Hz   | −0.3 dB  | (11)_____        | 0.3 dB  | ±0.048 dB               |
|   | 200 Hz   | −0.3 dB  | (12)_____        | 0.3 dB  | ±0.048 dB               |
|   | 100 Hz   | −0.3 dB  | (13)_____        | 0.3 dB  | ±0.048 dB               |
|   | 30 Hz  | −0.3 dB  | (14)_____        | 0.3 dB  | ±0.048 dB               |
|   | 10 Hz  | −0.3 dB  | (15)_____        | 0.3 dB  | ±0.048 dB               |
|   | 3 Hz ( <i>Option 1D5 only</i> )<br>Firmware Revision A.08.00 or later  | −0.3 dB  | (16)_____        | 0.3 dB  | ±0.048 dB               |
|   | 1Hz ( <i>Option 1D5 only</i> )<br>Firmware Revision A.08.00 or later   | −0.3 dB  | (17)_____        | 0.3 dB  | ±0.048 dB               |
| <b>18.</b>  | <b>Absolute Amplitude Accuracy (Reference Settings)</b><br><br><div style="padding-left: 20px;">Log, Preamp Off</div> <div style="padding-left: 20px;">Lin, Preamp Off</div> <div style="padding-left: 20px;">Log, Preamp On</div> <div style="padding-left: 20px;">Lin, Preamp On</div>   | −0.34 dB | (1)_____         | 0.34 dB | ±0.09 dB                |
|   |  | −0.34 dB | (2)_____         | 0.34 dB | ±0.09 dB                |
|   |  | −0.37 dB | (3)_____         | 0.37 dB | ±0.09 dB                |
|   |  | −0.37 dB | (4)_____         | 0.37 dB | ±0.09 dB                |
| <b>20.</b>  | <b>Overall Absolute Amplitude Accuracy</b><br><br>0 dBm Reference Level<br><br><div style="padding-left: 20px;">0 dBm input</div> <div style="padding-left: 20px;">−10 dBm input</div> <div style="padding-left: 20px;">−20 dBm input</div> <div style="padding-left: 20px;">−30 dBm input</div> <div style="padding-left: 20px;">−40 dBm input</div> <div style="padding-left: 20px;">−50 dBm input</div> | −0.54 dB | (1)_____         | 0.54 dB | ±0.234 dB               |
|   |  | −0.54 dB | (2)_____         | 0.54 dB | ±0.115 dB               |
|   |  | −0.54 dB | (3)_____         | 0.54 dB | ±0.110 dB               |
|   |  | −0.54 dB | (4)_____         | 0.54 dB | ±0.109 dB               |
|   |  | −0.54 dB | (5)_____         | 0.54 dB | ±0.109 dB               |
|   |  | −0.54 dB | (6)_____         | 0.54 dB | ±0.109 dB               |



**Table 3-6 Agilent E7403A Performance Verification Test Record**

| <b>Agilent Technologies</b><br><b>Model E7403A</b><br><b>Serial No. _____</b> |  |          |                  |          |                         | <b>Report No. _____</b><br><b>Date _____</b> |  |  |  |  |  |
|---|--|----------|------------------|----------|-------------------------|--|--|--|--|--|--|
| Test Description  |  | Minimum  | Results Measured | Maximum  | Measurement Uncertainty |  |  |  |  |  |  |
|   | –20 dBm Reference Level                                      |          |                  |          |                         |  |  |  |  |  |  |
|   | –20 dBm input  | –0.54 dB | (7)_____         | 0.54 dB  | ±0.109 dB               |  |  |  |  |  |  |
|   | –30 dBm input  | –0.54 dB | (8)_____         | 0.54 dB  | ±0.109 dB               |  |  |  |  |  |  |
|   | –40 dBm input  | –0.54 dB | (9)_____         | 0.54 dB  | ±0.109 dB               |  |  |  |  |  |  |
|   | –50 dBm input  | –0.54 dB | (10)_____        | 0.54 dB  | ±0.109 dB               |  |  |  |  |  |  |
|   | –40 dBm Reference Level                                      |          |                  |          |                         |  |  |  |  |  |  |
|   | –40 dBm input  | –0.54 dB | (11)_____        | 0.54 dB  | ±0.087 dB               |  |  |  |  |  |  |
|   | –50 dBm input  | –0.54 dB | (12)_____        | 0.54 dB  | ±0.087 dB               |  |  |  |  |  |  |
|   | –50 dBm Reference Level                                      |          |                  |          |                         |  |  |  |  |  |  |
|   | –50 dBm input  | –0.54 dB | (13)_____        | 0.54 dB  | ±0.087 dB               |  |  |  |  |  |  |
| <b>21.</b>  | <b>Resolution Bandwidth Accuracy</b><br>Resolution Bandwidth |          |                  |          |                         |  |  |  |  |  |  |
|   | 5 MHz  | 3.5 MHz  | (1)_____         | 6.5 MHz  | ±110 kHz                |  |  |  |  |  |  |
|   | 3 MHz  | 2.55 MHz | (2)_____         | 3.45 MHz | ±66 kHz                 |  |  |  |  |  |  |
|   | 1 MHz (–3 dB)  | 0.85 MHz | (3)_____         | 1.15 MHz | ±22 kHz                 |  |  |  |  |  |  |
|   | 300 kHz  | 255 kHz  | (4)_____         | 345 kHz  | ±6.6 kHz                |  |  |  |  |  |  |
|   | 100 kHz  | 85 kHz   | (5)_____         | 115 kHz  | ±2.2 kHz                |  |  |  |  |  |  |
|   | 30 kHz   | 25.5 kHz | (6)_____         | 34.5 kHz | ±660 Hz                 |  |  |  |  |  |  |
|   | 10 kHz   | 8.5 kHz  | (7)_____         | 11.5 kHz | ±220 Hz                 |  |  |  |  |  |  |
|   | 3 kHz  | 2.55 kHz | (8)_____         | 3.45 kHz | ±66 Hz                  |  |  |  |  |  |  |
|   | 1 kHz  | 850 Hz   | (9)_____         | 1.15 kHz | ±22 Hz                  |  |  |  |  |  |  |
|   | 120 kHz  | 96 kHz   | (10)_____        | 144 kHz  | ±2.17 kHz               |  |  |  |  |  |  |
|   | 9 kHz  | 7.2 kHz  | (11)_____        | 10.8 kHz | ±163 Hz                 |  |  |  |  |  |  |
|   | 1 MHz (–6 dB)  | 900 kHz  | (12)_____        | 1.1 MHz  | ±22 kHz                 |  |  |  |  |  |  |

## Agilent E7403A Performance Verification Test Record

| <b>Agilent Technologies</b> |  |   |                  |          |                         |
|-----------------------------|--|---|------------------|----------|-------------------------|
| <b>Model E7403A</b>         |  | <b>Report No.</b> _____   |                  |          |                         |
| <b>Serial No.</b> _____     |  | <b>Date</b> _____   |                  |          |                         |
| Test Description            |  | Minimum   | Results Measured | Maximum  | Measurement Uncertainty |
| <b>24.</b>                  | <b>Frequency Response</b>                                    | Note: Enter data in the appropriate section below depending upon the ambient temperature at which the test was performed and installed options. |                  |          |                         |
|                             | 20 to 30° C  |   |                  |          |                         |
|                             | Non-Option UKB<br>dc Coupled<br>Band 0<br>(9 kHz to 3.0 GHz) |   |                  |          |                         |
|                             | Maximum Response   |   | (1)_____         | 0.46 dB  | ±0.19 dB                |
|                             | Minimum Response   | −0.46 dB  | (2)_____         |          | ±0.19 dB                |
|                             | Peak-to-Peak Response  |   | (3)_____         | 0.92 dB  | ±0.19 dB                |
|                             | Option UKB<br>dc Coupled<br>Band 0<br>(100 Hz to 3.0 GHz)    |   |                  |          |                         |
|                             | Maximum Response   |   | (1)_____         | 0.50 dB  | ±0.19 dB                |
|                             | Minimum Response   | −0.50 dB  | (2)_____         |          | ±0.19 dB                |
|                             | Peak-to-Peak Response  |   | (3)_____         | 1.0 dB   | ±0.19 dB                |
|                             | dc Coupled<br>Band 1<br>(3.0 GHz to 6.7 GHz)                 |   |                  |          |                         |
|                             | Maximum Response   |   | (4)_____         | 1.5 dB   | ±0.39 dB                |
|                             | Minimum Response   | −1.5 dB   | (5)_____         |          | ±0.39 dB                |
|                             | Peak-to-Peak Response  |   | (6)_____         | 2.6 dB   | ±0.39 dB                |
|                             | ac Coupled<br>Band 0<br>(100 kHz to 3.0 GHz)                 |   |                  |          |                         |
| Maximum Response            |  | (10)_____   | 0.5 dB           | ±0.11 dB |                         |

**Table 3-6 Agilent E7403A Performance Verification Test Record**

| <b>Agilent Technologies</b><br><b>Model E7403A</b><br><b>Serial No. _____</b> |  |         |                  |         |                         | <b>Report No. _____</b><br><b>Date _____</b> |  |  |  |  |  |
|---|--|---------|------------------|---------|-------------------------|--|--|--|--|--|--|
| Test Description  |  | Minimum | Results Measured | Maximum | Measurement Uncertainty |  |  |  |  |  |  |
|   | Minimum Response   | −0.5 dB | (11)_____        | 1.0 dB  | ±0.11 dB                |  |  |  |  |  |  |
|   | Peak-to-Peak Response  |         | (12)_____        |         | ±0.11 dB                |  |  |  |  |  |  |
|   | ac Coupled<br>Band 0A<br>(800 MHz to 1.0 GHz)                              |         |                  |         |                         |  |  |  |  |  |  |
|   | Maximum Response   | −0.5 dB | (13)_____        | 0.5 dB  | ±0.11 dB                |  |  |  |  |  |  |
|   | Minimum Response   |         | (14)_____        |         | ±0.11 dB                |  |  |  |  |  |  |
|   | Peak-to-Peak Response  |         | (15)_____        |         | ±0.11 dB                |  |  |  |  |  |  |
|   | ac Coupled<br>Band 0B<br>(1.7 GHz to 2.0 GHz)                              |         |                  |         |                         |  |  |  |  |  |  |
|   | Maximum Response   | −0.5 dB | (16)_____        | 0.5 dB  | ±0.11 dB                |  |  |  |  |  |  |
|   | Minimum Response   |         | (17)_____        |         | ±0.11 dB                |  |  |  |  |  |  |
|   | Peak-to-Peak Response  |         | (18)_____        |         | ±0.11 dB                |  |  |  |  |  |  |
|   | ac Coupled<br>Band 1<br>(3.0 GHz to 6.7 GHz)                               |         |                  |         |                         |  |  |  |  |  |  |
|   | Maximum Response   | −1.5 dB | (19)_____        | 1.5 dB  | ±0.39 dB                |  |  |  |  |  |  |
|   | Minimum Response   |         | (20)_____        |         | ±0.39 dB                |  |  |  |  |  |  |
|   | Peak-to-Peak Response  |         | (21)_____        |         | ±0.39 dB                |  |  |  |  |  |  |
|   | 0 to 55° C<br>Non-Option UKB<br>dc Coupled<br>Band 0<br>(9 kHz to 3.0 GHz) |         |                  |         |                         |  |  |  |  |  |  |

Performance Verification Test Records  
**Agilent E7403A Performance Verification Test Record**

**Table 3-6      Agilent E7403A Performance Verification Test Record**

| <b>Agilent Technologies</b><br><br><b>Model E7403A</b> <span style="float: right;"><b>Report No.</b> _____</span><br><b>Serial No.</b> _____ <span style="float: right;"><b>Date</b> _____</span> |   |          |                  |         |                         |
|---|---|----------|------------------|---------|-------------------------|
|   | Test Description  | Minimum  | Results Measured | Maximum | Measurement Uncertainty |
|   | Maximum Response  |          | (1)_____         | 0.76 dB | ±0.19 dB                |
|   | Minimum Response  | −0.76 dB | (2)_____         |         | ±0.19 dB                |
|   | Peak-to-Peak Response                                     |          | (3)_____         | 1.52 dB | ±0.19 dB                |
|   | Option UKB<br>dc Coupled<br>Band 0<br>(100 Hz to 3.0 GHz) |          |                  |         |                         |
|   | Maximum Response  |          | (1)_____         | 1.0 dB  | ±0.19 dB                |
|   | Minimum Response  | −1.0 dB  | (2)_____         |         | ±0.19 dB                |
|   | Peak-to-Peak Response                                     |          | (3)_____         | 2.0 dB  | ±0.19 dB                |
|   | dc Coupled<br>Band 1<br>(3.0 GHz to 6.7 GHz)              |          |                  |         |                         |
|   | Maximum Response  |          | (4)_____         | 2.5 dB  | ±0.39 dB                |
|   | Minimum Response  | −2.5 dB  | (5)_____         |         | ±0.39 dB                |
|   | Peak-to-Peak Response                                     |          | (6)_____         | 3.0 dB  | ±0.39 dB                |
|   | ac Coupled<br>Band 0<br>(100 kHz to 3.0 GHz)              |          |                  |         |                         |
|   | Maximum Response  |          | (10)_____        | 1.0 dB  | ±0.11 dB                |
|   | Minimum Response  | −1.0 dB  | (11)_____        |         | ±0.11 dB                |
|   | Peak-to-Peak Response                                     |          | (12)_____        | 2.0 dB  | ±0.11 dB                |
|   | ac Coupled<br>Band 0A<br>(800 MHz to 1.0 GHz)             |          |                  |         |                         |

**Table 3-6 Agilent E7403A Performance Verification Test Record**

| <b>Agilent Technologies</b><br><br><b>Model E7403A</b> <span style="float: right;"><b>Report No.</b> _____</span><br><b>Serial No.</b> _____ <span style="float: right;"><b>Date</b> _____</span>   |  |                  |                                  |                         |                                  |   |
|---|--|------------------|----------------------------------|-------------------------|----------------------------------|---|
| Test Description  | Minimum  | Results Measured | Maximum                          | Measurement Uncertainty |                                  |   |
| <div style="display: flex; justify-content: space-between;"> <div style="width: 40%;"> Maximum Response<br/>Minimum Response<br/>Peak-to-Peak Response<br/><br/> ac Coupled<br/>Band 0B<br/>(1.7 GHz to 2.0 GHz)<br/><br/> Maximum Response<br/>Minimum Response<br/>Peak-to-Peak Response<br/><br/> ac Coupled<br/>Band 1<br/>(3.0 GHz to 6.7 GHz)<br/><br/> Maximum Response<br/>Minimum Response<br/>Peak-to-Peak Response </div> <div style="width: 40%;"> -1.0 dB<br/><br/><br/><br/> -1.0 dB<br/><br/><br/><br/> -2.5 dB<br/><br/><br/><br/> </div> <div style="width: 40%;"> (13)_____<br/>(14)_____<br/>(15)_____<br/><br/> (16)_____<br/>(17)_____<br/>(18)_____<br/><br/> (19)_____<br/>(20)_____<br/>(21)_____ </div> <div style="width: 40%;"> 1.0 dB<br/><br/>2.0 dB<br/><br/>1.0 dB<br/><br/>2.0 dB<br/><br/>2.5 dB<br/><br/>3.0 dB </div> <div style="width: 40%;"> ±0.11 dB<br/>±0.11 dB<br/>±0.11 dB<br/><br/>±0.11 dB<br/>±0.11 dB<br/>±0.11 dB<br/><br/>±0.39 dB<br/>±0.39 dB<br/>±0.39 dB </div> </div> |  |                  |                                  |                         |                                  |   |
|   | <b>27. Frequency Response (Preamp On)</b><br>20 to 30° C<br>Band 0<br>(1 MHz to 3.0 GHz) |                  |                                  |                         |                                  | Note: Enter data in the appropriate section below depending upon the ambient temperature at which the test was performed and installed options. |
|   | Maximum Response<br>Minimum Response<br>Peak-to-Peak Response                            | -1.5 dB          | (1)_____<br>(2)_____<br>(3)_____ | 1.5 dB<br><br>3.0 dB    | ±0.28 dB<br>±0.28 dB<br>±0.28 dB |   |
|   | Band 0A<br>(800 MHz to 1.0 GHz)  |                  |                                  |                         |                                  |   |

Performance Verification Test Records  
**Agilent E7403A Performance Verification Test Record**

**Table 3-6      Agilent E7403A Performance Verification Test Record**

| <b>Agilent Technologies</b><br><br><b>Model E7403A</b> <span style="float: right;"><b>Report No.</b> _____</span><br><b>Serial No.</b> _____ <span style="float: right;"><b>Date</b> _____</span> |         |                  |         |                         |  |
|---|---------|------------------|---------|-------------------------|--|
| Test Description  | Minimum | Results Measured | Maximum | Measurement Uncertainty |  |
| Maximum Response  |         | (4)_____         | 1.5 dB  | ±0.28 dB                |  |
| Minimum Response  | –1.5 dB | (5)_____         |         | ±0.28 dB                |  |
| Peak-to-Peak Response   |         | (6)_____         | 3.0 dB  | ±0.28 dB                |  |
| Band 0B<br>(1.7 GHz to 2.0 GHz)   |         |                  |         |                         |  |
| Maximum Response  |         | (7)_____         | 1.5 dB  | ±0.28 dB                |  |
| Minimum Response  | –1.5 dB | (8)_____         |         | ±0.28 dB                |  |
| Peak-to-Peak Response   |         | (9)_____         | 3.0 dB  | ±0.28 dB                |  |
| 0 to 55° C  |         |                  |         |                         |  |
| Band 0<br>(1 MHz to 3.0 GHz)  |         |                  |         |                         |  |
| Maximum Response  |         | (1)_____         | 2.0 dB  | ±0.28 dB                |  |
| Minimum Response  | –2.0 dB | (2)_____         |         | ±0.28 dB                |  |
| Peak-to-Peak Response   |         | (3)_____         | 4.0 dB  | ±0.28 dB                |  |
| Band 0A<br>(800 MHz to 1.0 GHz)   |         |                  |         |                         |  |
| Maximum Response  |         | (4)_____         | 2.0 dB  | ±0.28 dB                |  |
| Minimum Response  | –2.0 dB | (5)_____         |         | ±0.28 dB                |  |
| Peak-to-Peak Response   |         | (6)_____         | 4.0 dB  | ±0.28 dB                |  |
| Band 0B<br>(1.7 GHz to 2.0 GHz)   |         |                  |         |                         |  |
| Maximum Response  |         | (7)_____         | 2.0 dB  | ±0.28 dB                |  |
| Minimum Response  | –2.0 dB | (8)_____         |         | ±0.28 dB                |  |

**Table 3-6 Agilent E7403A Performance Verification Test Record**

| <b>Agilent Technologies</b><br><b>Model E7403A</b><br><b>Serial No. _____</b> |  |  |   |  |  | <b>Report No. _____</b><br><b>Date _____</b> |  |  |  |  |  |
|---|--|--|---|--|--|--|--|--|--|--|--|
| Test Description  |  | Minimum  | Results Measured  | Maximum  | Measurement Uncertainty  |  |  |  |  |  |  |
|   | Peak-to-Peak Response  |  | (9)_____  | 4.0 dB   | ±0.28 dB   |  |  |  |  |  |  |
| <b>29.</b>  | <b>Other Input-Related Spurious Responses</b><br><br>Center Freq Input Freq<br>2.0 GHz 2042.8 MHz<br>2.0 GHz 2642.8 MHz<br>2.0 GHz 1820.8 MHz<br>2.0 GHz 278.5 MHz<br>2.0 GHz 5600.0 MHz<br>2.0 GHz 6242.8 MHz<br>4.0 GHz 4042.8 MHz<br>4.0 GHz 4642.8 MHz<br>4.0 GHz 3742.9 MHz<br>4.0 GHz 2242.8 MHz |  | (1)_____<br>(2)_____<br>(3)_____<br>(4)_____<br>(5)_____<br>(6)_____<br>(7)_____<br>(8)_____<br>(9)_____<br>(10)_____ | -65 dBc<br>-65 dBc<br>-65 dBc<br>-65 dBc<br>-80 dBc<br>-80 dBc<br>-65 dBc<br>-65 dBc<br>-65 dBc<br>-80 dBc | ±.891 dB<br>±.891 dB<br>±.891 dB<br>±.891 dB<br>±.891 dB<br>±.891 dB<br>±.891 dB<br>±.891 dB<br>±.891 dB |  |  |  |  |  |  |
| <b>32.</b>  | <b>Spurious Responses</b><br><br>300 MHz TOI, 1 kHz RBW<br>300 MHz TOI, 30 Hz RBW<br>5 GHz TOI<br>300 MHz SHI<br>900 MHz SHI<br>1.55 GHz SHI<br>3.1 GHz SHI  | 12.5 dBm<br>12.5 dBm<br>11 dBm<br>35 dBm<br>45 dBm<br>75 dBm<br>90 dBm | (1)_____<br>(2)_____<br>(3)_____<br>(5)_____<br>(6)_____<br>(7)_____<br>(8)_____                                      |  | ±0.93 dB<br>±0.93 dB<br>±0.93 dB<br>±0.41 dB<br>±0.41 dB<br>±0.41 dB<br>±0.41 dB                         |  |  |  |  |  |  |
| <b>34.</b>  | <b>Gain Compression</b><br><br>Test Frequency<br>53 MHz<br>50.004 MHz  |  | (1)_____<br>(2)_____  | 1.0 dB<br>1.0 dB   | ±0.123 dB<br>±0.123 dB   |  |  |  |  |  |  |

Performance Verification Test Records  
**Agilent E7403A Performance Verification Test Record**

**Table 3-6 Agilent E7403A Performance Verification Test Record**

| <b>Agilent Technologies</b><br><br><b>Model E7403A</b> <span style="float: right;"><b>Report No.</b> _____</span><br><b>Serial No.</b> _____ <span style="float: right;"><b>Date</b> _____</span> |         |                  |          |                         |  |
|---|---------|------------------|----------|-------------------------|--|
| Test Description  | Minimum | Results Measured | Maximum  | Measurement Uncertainty |  |
| 1403 MHz  |         | (3)_____         | 1.0 dB   | ±0.123 dB               |  |
| 2503 MHz  |         | (4)_____         | 1.0 dB   | ±0.123 dB               |  |
| 4403 MHz  |         | (5)_____         | 1.0 dB   | ±0.123 dB               |  |
| <b>37. Displayed Average Noise Level</b><br>Note: Enter results with preamp on in the appropriate section based upon the ambient temperature when the test was performed.                         |         |                  |          |                         |  |
| 1 kHz RBW, Preamp Off   |         |                  |          |                         |  |
| 10 MHz to 1 GHz   |         | (1)_____         | -116 dBm | ±1.23 dB                |  |
| 1 GHz to 2 GHz  |         | (2)_____         | -116 dBm | ±1.23 dB                |  |
| 2 GHz to 3 GHz  |         | (3)_____         | -112 dBm | ±1.23 dB                |  |
| 3 GHz to 6 GHz  |         | (4)_____         | -112 dBm | ±1.23 dB                |  |
| 6 GHz to 6.7 GHz  |         | (5)_____         | -111 dBm | ±1.23 dB                |  |
| 1kHz RBW, Preamp On, 0 to 55° C   |         |                  |          |                         |  |
| 10 MHz to 1 GHz   |         | (6)_____         | -131 dBm | ±1.23 dB                |  |
| 1 GHz to 2 GHz  |         | (7)_____         | -131 dBm | ±1.23 dB                |  |
| 2 GHz to 3 GHz  |         | (8)_____         | -127 dBm | ±1.23 dB                |  |
| 10 Hz RBW, Preamp Off   |         |                  |          |                         |  |
| 10 MHz to 1 GHz   |         | (9)_____         | -135 dBm | ±1.23 dB                |  |
| 1 GHz to 2 GHz  |         | (10)_____        | -135 dBm | ±1.23 dB                |  |
| 2 GHz to 3 GHz  |         | (11)_____        | -131 dBm | ±1.23 dB                |  |
| 3 GHz to 6 GHz  |         | (12)_____        | -131 dBm | ±1.23 dB                |  |
| 6 GHz to 6.7 GHz  |         | (13)_____        | -130 dBm | ±1.23 dB                |  |
| 10 Hz RBW, Preamp On, 0 to 55° C  |         |                  |          |                         |  |
| 10 MHz to 1 GHz   |         | (14)_____        | -150 dBm | ±1.23 dB                |  |
| 1 GHz to 2 GHz  |         | (15)_____        | -150 dBm | ±1.23 dB                |  |



**Table 3-6 Agilent E7403A Performance Verification Test Record**

| <b>Agilent Technologies</b><br><br><b>Model E7403A</b> <span style="float: right;"><b>Report No.</b> _____</span><br><b>Serial No.</b> _____ <span style="float: right;"><b>Date</b> _____</span>   |   |  |   |   |  |
|---|---|--|---|---|--|
| Test Description  | Minimum   | Results Measured   | Maximum   | Measurement Uncertainty   |  |
| <div style="text-align: center;">2 GHz to 3 GHz</div> <div>1 kHz RBW, Preamp On,<br/>20 to 30° C</div> <div style="text-align: center;">10 MHz to 1 GHz</div> <div style="text-align: center;">1 GHz to 2 GHz</div> <div style="text-align: center;">2 GHz to 3 GHz</div> <div>10 Hz RBW, Preamp On,<br/>20 to 30° C</div> <div style="text-align: center;">10 MHz to 1 GHz</div> <div style="text-align: center;">1 GHz to 2 GHz</div> <div style="text-align: center;">2 GHz to 3 GHz</div> |   | <div>(16)_____</div> <div>(17)_____</div> <div>(18)_____</div> <div>(19)_____</div> <div>(20)_____</div> <div>(21)_____</div> <div>(22)_____</div> | <div>–146 dBm</div> <div>–132 dBm</div> <div>–132 dBm</div> <div>–130 dBm</div> <div>–151 dBm</div> <div>–151 dBm</div> <div>–149 dBm</div> | <div>±1.23 dB</div> <div>±1.23 dB</div> <div>±1.23 dB</div> <div>±1.23 dB</div> <div>±1.23 dB</div> <div>±1.23 dB</div> <div>±1.23 dB</div> |  |
| <b>39. Residual Responses</b><br>150 kHz to 6.7 GHz   |   | <div>(1)_____</div>  | <div>–90 dBm</div>  | <div>±0.87 dB</div>   |  |
| <b>40. Fast Time Domain Amplitude Accuracy</b> ( <i>Option AYX only</i> )<br><br>Amplitude Error  | <div>–0.3%</div>  | <div>(1)_____</div>  | <div>0.3%</div>   | <div>±0.029%</div>  |  |
| <b>42. Tracking Generator Absolute Amplitude and Vernier Accuracy</b> <i>Option IDN only</i><br><br>Absolute Amplitude Accuracy<br><br>Absolute Vernier Accuracy<br>–2 dB<br>–3 dB<br>–5 dB<br>–6 dB  | <div>–0.75 dB</div> <div>–0.5 dB</div> <div>–0.5 dB</div> <div>–0.5 dB</div> <div>–0.5 dB</div> | <div>(1)_____</div> <div>(2)_____</div> <div>(3)_____</div> <div>(4)_____</div> <div>(5)_____</div>  | <div>0.75 dB</div> <div>0.5 dB</div> <div>0.5 dB</div> <div>0.5 dB</div> <div>0.5 dB</div>  | <div>±0.096 dB</div> <div>±0.008 dB</div> <div>±0.008 dB</div> <div>±0.008 dB</div> <div>±0.008 dB</div>                                    |  |

Performance Verification Test Records  
**Agilent E7403A Performance Verification Test Record**

**Table 3-6                      Agilent E7403A Performance Verification Test Record**

| <b>Agilent Technologies</b><br><br><b>Model E7403A</b> <span style="float: right;"><b>Report No.</b> _____</span><br><b>Serial No.</b> _____ <span style="float: right;"><b>Date</b> _____</span>   |         |                  |         |                         |  |
|---|---------|------------------|---------|-------------------------|--|
| Test Description  | Minimum | Results Measured | Maximum | Measurement Uncertainty |  |
| <div style="display: flex; justify-content: space-between; padding: 2px 5px;"> <span>–7 dB</span> <span>–0.5 dB</span> <span>(6)_____</span> <span>0.5 dB</span> <span>±0.008 dB</span> </div> <div style="display: flex; justify-content: space-between; padding: 2px 5px;"> <span>–8 dB</span> <span>–0.5 dB</span> <span>(7)_____</span> <span>0.5 dB</span> <span>±0.008 dB</span> </div> <div style="display: flex; justify-content: space-between; padding: 2px 5px;"> <span>–9 dB</span> <span>–0.5 dB</span> <span>(8)_____</span> <span>0.5 dB</span> <span>±0.008 dB</span> </div> <div style="display: flex; justify-content: space-between; padding: 2px 5px;"> <span>–10 dB</span> <span>–0.5 dB</span> <span>(9)_____</span> <span>0.5 dB</span> <span>±0.008 dB</span> </div> <div style="display: flex; justify-content: space-between; padding: 2px 5px;"> <span>Incremental Vernier Accuracy</span> </div> <div style="display: flex; justify-content: space-between; padding: 2px 5px;"> <span>–2 dB</span> <span>–0.2 dB</span> <span>(10)_____</span> <span>0.2 dB</span> <span>±0.008 dB</span> </div> <div style="display: flex; justify-content: space-between; padding: 2px 5px;"> <span>–3 dB</span> <span>–0.2 dB</span> <span>(11)_____</span> <span>0.2 dB</span> <span>±0.008 dB</span> </div> <div style="display: flex; justify-content: space-between; padding: 2px 5px;"> <span>–5 dB</span> <span>–0.2 dB</span> <span>(12)_____</span> <span>0.2 dB</span> <span>±0.008 dB</span> </div> <div style="display: flex; justify-content: space-between; padding: 2px 5px;"> <span>–6 dB</span> <span>–0.2 dB</span> <span>(13)_____</span> <span>0.2 dB</span> <span>±0.008 dB</span> </div> <div style="display: flex; justify-content: space-between; padding: 2px 5px;"> <span>–7 dB</span> <span>–0.2 dB</span> <span>(14)_____</span> <span>0.2 dB</span> <span>±0.008 dB</span> </div> <div style="display: flex; justify-content: space-between; padding: 2px 5px;"> <span>–8 dB</span> <span>–0.2 dB</span> <span>(15)_____</span> <span>0.2 dB</span> <span>±0.008 dB</span> </div> <div style="display: flex; justify-content: space-between; padding: 2px 5px;"> <span>–9 dB</span> <span>–0.2 dB</span> <span>(16)_____</span> <span>0.2 dB</span> <span>±0.008 dB</span> </div> <div style="display: flex; justify-content: space-between; padding: 2px 5px;"> <span>–10 dB</span> <span>–0.2 dB</span> <span>(17)_____</span> <span>0.2 dB</span> <span>±0.008 dB</span> </div> |         |                  |         |                         |  |
| <b>44. Tracking Generator Level Flatness</b> <i>Option 1DN only)</i><br><br><div style="display: flex; justify-content: space-between; padding: 2px 5px;"> <span>Positive Level Flatness, &lt;1 MHz</span> <span>(1)_____</span> <span>3.0 dB</span> <span>±0.284 dB</span> </div> <div style="display: flex; justify-content: space-between; padding: 2px 5px;"> <span>Negative Level Flatness, &lt;1 MHz</span> <span>–3.0 dB</span> <span>(2)_____</span> <span>±0.284 dB</span> </div> <div style="display: flex; justify-content: space-between; padding: 2px 5px;"> <span>Positive Level Flatness, 1 MHz to 10 MHz</span> <span>(3)_____</span> <span>3.0 dB</span> <span>±0.142 dB</span> </div> <div style="display: flex; justify-content: space-between; padding: 2px 5px;"> <span>Negative Level Flatness, 1 MHz to 10 MHz</span> <span>–3.0 dB</span> <span>(4)_____</span> <span>±0.142 dB</span> </div> <div style="display: flex; justify-content: space-between; padding: 2px 5px;"> <span>Positive Level Flatness, &gt;10 MHz to 1.5 GHz</span> <span>(5)_____</span> <span>2.0 dB</span> <span>±0.142 dB</span> </div> <div style="display: flex; justify-content: space-between; padding: 2px 5px;"> <span>Negative Level Flatness, &gt;10 MHz to 1.5 GHz</span> <span>–2.0 dB</span> <span>(6)_____</span> <span>±0.142 dB</span> </div>  |         |                  |         |                         |  |

**Table 3-6 Agilent E7403A Performance Verification Test Record**

| <b>Agilent Technologies</b><br><br><b>Model E7403A</b> <span style="float: right;"><b>Report No.</b> _____</span><br><b>Serial No.</b> _____ <span style="float: right;"><b>Date</b> _____</span>   |                          |  |  |  |  |
|---|--------------------------|--|--|--|--|
| Test Description  | Minimum                  | Results Measured   | Maximum  | Measurement Uncertainty                              |  |
| Positive Level Flatness,<br>>1.5 GHz<br><br>Negative Level Flatness,<br>>1.5 GHz  | -2.0 dB                  | (7) _____<br><br>(8) _____                                   | 2.0 dB   | ±0.142 dB<br><br>±0.142 dB                           |  |
| <b>46. Tracking Generator Harmonic Spurious Outputs</b><br><i>(Option 1DN only)</i><br><br>2 <sup>nd</sup> Harmonic, <20 kHz<br><br>2 <sup>nd</sup> Harmonic, ≥ 20 kHz<br><br>3 <sup>rd</sup> Harmonic, <20 kHz<br><br>3 <sup>rd</sup> Harmonic, ≥ 20 kHz |                          | (1) _____<br><br>(2) _____<br><br>(3) _____<br><br>(4) _____ | -15 dBc<br><br>-25 dBc<br><br>-15 dBc<br><br>-25 dBc | ±2.6 dB<br><br>±2.6 dB<br><br>±2.6 dB<br><br>±2.6 dB |  |
| <b>48. Tracking Generator Non-Harmonic Spurious Outputs</b><br><i>(Option 1DN only)</i><br><br>Highest Non-Harmonic Spurious Output Amplitude, 9 kHz to 2 GHz<br><br>Highest Non-Harmonic Spurious Output Amplitude, 2 GHz to 3 GHz                       |                          | (1) _____<br><br>(2) _____                                   | -27 dBc<br><br>-23 dBc                               | ±2.63 dB<br><br>±3.14 dB                             |  |
| <b>49. Tracking Generator L.O. Feedthrough</b><br><i>(Option 1DN only)</i><br><br>9 kHz to 2.9 GHz<br><br>2.9 GHz to 3.0 GHz  |                          | (1) _____<br><br>(2) _____                                   | -16 dBm<br><br>-16 dBm                               | ±2.58 dB<br><br>±3.03 dB                             |  |
| <b>50. Gate Delay Accuracy and Gate Length Accuracy</b><br><i>(Option 1D6 only)</i><br><br>Minimum Gate Delay<br><br>Maximum Gate Delay   | 499.9 ns<br><br>499.9 ns | (1) _____<br><br>(2) _____                                   | 1.5001 μs<br><br>1.5001 μs                           | ±549 ps<br><br>±549 ps                               |  |

Table 3-6                      Agilent E7403A Performance Verification Test Record

|                      |   |                  |                  |                |                         |
|----------------------|---|------------------|------------------|----------------|-------------------------|
| Agilent Technologies |   |                  |                  |                |                         |
| Model E7403A         |   | Report No. _____ |                  |                |                         |
| Serial No. _____     |   | Date _____       |                  |                |                         |
| Test Description     |   | Minimum          | Results Measured | Maximum        | Measurement Uncertainty |
|                      | 1 $\mu$ s Gate Length   | 499.9 ns         | (3)_____         | 1.5001 $\mu$ s | $\pm$ 520 ps            |
|                      | 65 ms Gate Length   | 64.993 ms        | (4)_____         | 65.007 ms      | $\pm$ 647 ns            |
| 51.                  | Gate Mode Additional Amplitude Error ( <i>Option 1D6 only</i> ) |                  |                  |                |                         |
|                      | Amplitude Error   | -0.2 dB          | (1)_____         | 0.2 dB         | $\pm$ 0.023 dB          |

## Agilent E7404A Performance Verification Test Record

Tests for the Agilent E7404A only are included in this test record, therefore not all test numbers are included.

**Table 3-7 Agilent E7404A Performance Verification Test Record**

|  |                  |   |                     |
|--|------------------|---|---------------------|
| Agilent Technologies                     |                  |   |                     |
| Address: _____                           |                  | Report No. _____                              |                     |
| _____                                    |                  | Date _____                                    |                     |
| _____                                    |                  |   |                     |
| Model E7404A                             |                  |   |                     |
| Serial No. _____                         |                  | Ambient temperature _____ ° C                 |                     |
| Options _____                            |                  | Relative humidity _____ %                     |                     |
| Firmware Revision _____                  |                  | Power mains line frequency _____ Hz (nominal) |                     |
| Customer _____                           |                  | Tested by _____                               |                     |
| <b>Test Equipment Used:</b>              |                  |   |                     |
| <b>Description</b>                       | <b>Model No.</b> | <b>Trace No.</b>                              | <b>Cal Due Date</b> |
| Synthesized Signal Generator             | _____            | _____   | _____               |
| Wide Offset Phase Noise Signal Generator | _____            | _____   | _____               |
| Synthesized Sweeper #1                   | _____            | _____   | _____               |
| Synthesized Sweeper #2                   | _____            | _____   | _____               |
| Function Generator                       | _____            | _____   | _____               |
| Power Meter, Dual-Channel                | _____            | _____   | _____               |
| RF Power Sensor #1                       | _____            | _____   | _____               |
| RF Power Sensor #2                       | _____            | _____   | _____               |
| Microwave Power Sensor                   | _____            | _____   | _____               |
| Low-Power Power Sensor                   | _____            | _____   | _____               |
| Digital Multimeter                       | _____            | _____   | _____               |
| Universal Counter                        | _____            | _____   | _____               |
| Frequency Standard                       | _____            | _____   | _____               |
| Power Splitter                           | _____            | _____   | _____               |

Performance Verification Test Records  
**Agilent E7404A Performance Verification Test Record**

**Table 3-7                      Agilent E7404A Performance Verification Test Record**

|  |       |       |       |
|--|-------|-------|-------|
| 50 $\Omega$ Termination                          | _____ | _____ | _____ |
| 1 dB Step Attenuator                             | _____ | _____ | _____ |
| 10 dB Step Attenuator                            | _____ | _____ | _____ |
| Oscilloscope<br>(Option 1D6 only)                | _____ | _____ | _____ |
| Microwave Spectrum Analyzer<br>(Option 1DN only) | _____ | _____ | _____ |
| Notes/comments:                                  | _____ |       |       |
|  | _____ |       |       |

**Table 3-8                      Agilent E7404A Performance Verification Test Record**

| <b>Agilent Technologies</b><br><br><b>Model E7404A</b> <span style="float: right;"><b>Report No.</b> _____</span><br><b>Serial No.</b> _____ <span style="float: right;"><b>Date</b> _____</span>                  |   |  |   |  |  |
|--|---|--|---|--|--|
| Test Description   | Minimum   | Results Measured                             | Maximum   | Measurement Uncertainty  |  |
| <b>1.    10 MHz Reference Output Accuracy</b> <i>(Non-Option 1D5 only)</i><br><br>Settability  | -5.0 Hz   | (1)_____                                     | 5.0 Hz  | $\pm 293.3 \mu\text{Hz}$   |  |
| <b>2.    10 MHz High-Stability Frequency Reference Accuracy</b> <i>(Option 1D5 only)</i><br><br>5 Minute Warm-Up Error<br>15 Minute Warm-Up Error  | -0.1 ppm<br>-0.01 ppm   | (1)_____<br>(2)_____                         | 0.1 ppm<br>0.01 ppm                                       | $\pm 0.000072 \text{ ppm}$<br>$\pm 0.000070 \text{ ppm}$                             |  |
| <b>4.    Frequency Readout and Marker Frequency Count Accuracy</b><br><br>Frequency Readout Accuracy<br>Center Freq    Span<br>1500 MHz    20 MHz<br>1500 MHz    10 MHz<br>1500 MHz    1 MHz<br>4000 MHz    20 MHz | Note: Test Record Entries 10 through 15 do not apply to the Agilent E7404A. |  |   |  |  |
|  | 1499.83 MHz<br>1499.91 MHz<br>1499.991 MHz<br>3999.83 MHz                   | (1)_____<br>(2)_____<br>(3)_____<br>(4)_____ | 1500.17 MHz<br>1500.09 MHz<br>1500.009 MHz<br>4000.17 MHz | $\pm 0 \text{ Hz}$<br>$\pm 0 \text{ Hz}$<br>$\pm 0 \text{ Hz}$<br>$\pm 0 \text{ Hz}$ |  |

**Table 3-8 Agilent E7404A Performance Verification Test Record**

| <b>Agilent Technologies</b><br><br><b>Model E7404A</b> <span style="float: right;"><b>Report No.</b> _____</span><br><b>Serial No.</b> _____ <span style="float: right;"><b>Date</b> _____</span> |  |                 |                  |                 |                         |
|---|--|-----------------|------------------|-----------------|-------------------------|
| Test Description  |  | Minimum         | Results Measured | Maximum         | Measurement Uncertainty |
|   | 4000 MHz    10 MHz   | 3999.91 MHz     | (5)_____         | 4000.09 MHz     | ±0 Hz                   |
|   | 4000 MHz    1 MHz  | 3999.991 MHz    | (6)_____         | 4000.009 MHz    | ±0 Hz                   |
|   | 9000 MHz    20 MHz   | 8999.83 MHz     | (7)_____         | 9000.17 MHz     | ±0 Hz                   |
|   | 9000 MHz    10 MHz   | 8999.91 MHz     | (8)_____         | 9000.09 MHz     | ±0 Hz                   |
|   | 9000 MHz    1 MHz  | 8999.991 MHz    | (9)_____         | 9000.009 MHz    | ±0 Hz                   |
|   | Marker Count Accuracy  |                 |                  |                 |                         |
|   | Note: Enter results in the appropriate section below based upon the firmware revision of the analyzer. |                 |                  |                 |                         |
|   | Firmware Revision Prior to A.03.00   |                 |                  |                 |                         |
|   | Center Freq    Span  |                 |                  |                 |                         |
|   | 1500 MHz    20 MHz   | 1499.999998 MHz | (16)_____        | 1500.000002 MHz | ±0 Hz                   |
|   | 1500 MHz    1 MHz  | 1499.999998 MHz | (17)_____        | 1500.000002 MHz | ±0 Hz                   |
|   | 4000 MHz    20 MHz   | 3999.999998 MHz | (18)_____        | 4000.000002 MHz | ±0 Hz                   |
|   | 4000 MHz    1 MHz  | 3999.999998 MHz | (19)_____        | 4000.000002 MHz | ±0 Hz                   |
|   | 9000 MHz    20 MHz   | 8999.999997 MHz | (20)_____        | 9000.000003 MHz | ±0 Hz                   |
|   | 9000 MHz    1 MHz  | 8999.999997 MHz | (21)_____        | 9000.000003 MHz | ±0 Hz                   |
| Marker Count Accuracy   |  |                 |                  |                 |                         |
| Firmware Revision A.03.00 or later  |  |                 |                  |                 |                         |
| Center Freq    Span   |  |                 |                  |                 |                         |
| 1500 MHz    20 MHz  | 1499.999999 MHz  | (16)_____       | 1500.000001 MHz  | ±0 Hz           |                         |
| 1500 MHz    1 MHz   | 1499.999999 MHz  | (17)_____       | 1500.000001 MHz  | ±0 Hz           |                         |

Performance Verification Test Records  
**Agilent E7404A Performance Verification Test Record**

**Table 3-8 Agilent E7404A Performance Verification Test Record**

| <b>Agilent Technologies</b><br><b>Model E7404A</b><br><b>Serial No. _____</b> |  |  |  |  |  | <b>Report No. _____</b><br><b>Date _____</b> |  |  |  |  |  |
|---|--|--|--|--|--|--|--|--|--|--|--|
| Test Description  |  | Minimum  | Results Measured   | Maximum  | Measurement Uncertainty  |  |  |  |  |  |  |
|   | 4000 MHz    20 MHz   | 3999.999999 MHz  | (18)_____  | 4000.000001 MHz  | ±0 Hz  |  |  |  |  |  |  |
|   | 4000 MHz    1 MHz  | 3999.999999 MHz  | (19)_____  | 4000.000001 MHz  | ±0 Hz  |  |  |  |  |  |  |
|   | 9000 MHz    20 MHz   | 8999.999999 MHz  | (20)_____  | 9000.000001 MHz  | ±0 Hz  |  |  |  |  |  |  |
|   | 9000 MHz    1 MHz  | 8999.999999 MHz  | (21)_____  | 9000.000001 MHz  | ±0 Hz  |  |  |  |  |  |  |
| <b>6.</b>   | <b>Frequency Span Accuracy</b><br>Span      Start Freq<br>3000 MHz    0 Hz<br>100 MHz    10 MHz<br>100 kHz    10 MHz<br>100 MHz    800 MHz<br>100 kHz    800 MHz<br>100 MHz    1400 MHz<br>100 kHz    1499 MHz | 2370 MHz<br>79 MHz<br>79 kHz<br>79 MHz<br>79 kHz<br>79 MHz<br>79 kHz | (1)_____<br>(2)_____<br>(3)_____<br>(4)_____<br>(5)_____<br>(6)_____<br>(7)_____ | 2430 MHz<br>81 MHz<br>81 kHz<br>81 MHz<br>81 kHz<br>81 MHz<br>81 kHz | ±6.12 MHz<br>±204 kHz<br>±204 Hz<br>±204 kHz<br>±204 Hz<br>±204 kHz<br>±204 Hz |  |  |  |  |  |  |
| <b>7.</b>   | <b>Noise Sidebands</b><br>Offset from 1 GHz signal<br>10 kHz<br>20 kHz<br>30 kHz   |  | (1)_____<br>(2)_____<br>(3)_____   | –90 dBc/Hz<br>–100 dBc/Hz<br>–106 dBc/Hz                             | ±2.44 dB<br>±2.44 dB<br>±2.44 dB   |  |  |  |  |  |  |
| <b>8.</b>   | <b>Noise Sidebands - Wide Offsets</b><br>Offset from 1 GHz signal<br>100 kHz<br>1 MHz  |  |  |  |  |  |  |  |  |  |  |
|   |  |  | (1)_____<br>(2)_____   | –118 dBc/Hz<br>–125 dBc/Hz   | ±2.44 dB<br>±2.44 dB   |  |  |  |  |  |  |



**Table 3-8 Agilent E7404A Performance Verification Test Record**

| <b>Agilent Technologies</b><br><br><b>Model E7404A</b> <span style="float: right;"><b>Report No.</b> _____</span><br><b>Serial No.</b> _____ <span style="float: right;"><b>Date</b> _____</span>                                 |   |   |   |   |  |
|---|---|---|---|---|--|
| Test Description  | Minimum   | Results Measured  | Maximum   | Measurement Uncertainty   |  |
| <div style="text-align: center;">5 MHz</div> <div style="text-align: center;">10 MHz</div>  |   | <div style="text-align: center;">(3) _____</div> <div style="text-align: center;">(4) _____</div>   | <div style="text-align: center;">–127 dBc/Hz</div> <div style="text-align: center;">–131 dBc/Hz</div>                                   | <div style="text-align: center;">±2.44 dB</div> <div style="text-align: center;">±2.44 dB</div>   |  |
| <b>9. System-Related Sidebands</b><br><br>Offset from 500 MHz signal<br><br>30 kHz to 230 kHz<br><br>–30 kHz to –230 kHz  |   | <div style="text-align: center;">(1) _____</div> <div style="text-align: center;">(2) _____</div>   | <div style="text-align: center;">–65 dBc</div> <div style="text-align: center;">–65 dBc</div>   | <div style="text-align: center;">±1.30 dB</div> <div style="text-align: center;">±1.30 dB</div>   |  |
| <b>10. Residual FM</b><br><br>1 kHz Res BW<br><i>(Non-Option 1D5)</i><br><br>1 kHz Res BW<br><i>(Option 1D5)</i><br><br>10 Hz Res BW<br><i>(Option 1D5 only)</i>  |   | <div style="text-align: center;">(1) _____</div> <div style="text-align: center;">(1) _____</div> <div style="text-align: center;">(2) _____</div>  | <div style="text-align: center;">150 Hz</div> <div style="text-align: center;">100 Hz</div> <div style="text-align: center;">2 Hz</div> | <div style="text-align: center;">±21 Hz</div> <div style="text-align: center;">±21 Hz</div> <div style="text-align: center;">±0.27 Hz</div>   |  |
| <b>11. Sweep Time Accuracy</b><br><br>Sweep Time<br><br>5 ms<br><br>20 ms<br><br>100 ms<br><br>1 s<br><br>10 s<br><br>1 ms <i>(Option AYX only)</i><br><br>500 μs <i>(Option AYX only)</i><br><br>100 μs <i>(Option AYX only)</i> | –1.0%<br><br>–1.0%<br><br>–1.0%<br><br>–1.0%<br><br>–1.0%<br><br>–1.0%<br><br>–1.0% | <div style="text-align: center;">(1) _____</div> <div style="text-align: center;">(2) _____</div> <div style="text-align: center;">(3) _____</div> <div style="text-align: center;">(4) _____</div> <div style="text-align: center;">(5) _____</div> <div style="text-align: center;">(6) _____</div> <div style="text-align: center;">(7) _____</div> <div style="text-align: center;">(8) _____</div> | 1.0%<br><br>1.0%<br><br>1.0%<br><br>1.0%<br><br>1.0%<br><br>1.0%<br><br>1.0%  | <div style="text-align: center;">±0.16%</div> <div style="text-align: center;">±0.16%</div> <div style="text-align: center;">±0.16%</div> <div style="text-align: center;">±0.16%</div> <div style="text-align: center;">±0.16%</div> <div style="text-align: center;">±0.16%</div> <div style="text-align: center;">±0.16%</div> |  |
| <b>12. Display Scale Fidelity</b><br><br>Cumulative Log Fidelity,<br>Res BW ≥1 kHz<br><br>dB from Ref Level   |   |   |   |   |  |

Performance Verification Test Records  
**Agilent E7404A Performance Verification Test Record**

**Table 3-8 Agilent E7404A Performance Verification Test Record**

| <b>Agilent Technologies</b> |   |                         |                         |                |                                |
|-----------------------------|---|-------------------------|-------------------------|----------------|--------------------------------|
| <b>Model E7404A</b>         |   | <b>Report No.</b> _____ |                         |                |                                |
| <b>Serial No.</b> _____     |   | <b>Date</b> _____       |                         |                |                                |
| <b>Test Description</b>     |   | <b>Minimum</b>          | <b>Results Measured</b> | <b>Maximum</b> | <b>Measurement Uncertainty</b> |
|                             | -4  | -0.30 dB                | (1)_____                | 0.30 dB        | ±0.082 dB                      |
|                             | -8  | -0.30 dB                | (2)_____                | 0.30 dB        | ±0.078 dB                      |
|                             | -12   | -0.40 dB                | (3)_____                | 0.40 dB        | ±0.075 dB                      |
|                             | -16   | -0.40 dB                | (4)_____                | 0.40 dB        | ±0.073 dB                      |
|                             | -20   | -0.40 dB                | (5)_____                | 0.40 dB        | ±0.078 dB                      |
|                             | -24   | -0.50 dB                | (6)_____                | 0.50 dB        | ±0.074 dB                      |
|                             | -28   | -0.50 dB                | (7)_____                | 0.50 dB        | ±0.073 dB                      |
|                             | -32   | -0.60 dB                | (8)_____                | 0.60 dB        | ±0.077 dB                      |
|                             | -36   | -0.60 dB                | (9)_____                | 0.60 dB        | ±0.075 dB                      |
|                             | -40   | -0.60 dB                | (10)_____               | 0.60 dB        | ±0.081 dB                      |
|                             | -44   | -0.70 dB                | (11)_____               | 0.70 dB        | ±0.077 dB                      |
|                             | -48   | -0.70 dB                | (12)_____               | 0.70 dB        | ±0.076 dB                      |
|                             | -52   | -0.70dB                 | (13)_____               | 0.70 dB        | ±0.080 dB                      |
|                             | -56   | -0.70 dB                | (14)_____               | 0.70 dB        | ±0.078 dB                      |
|                             | -60   | -0.70 dB                | (15)_____               | 0.70 dB        | ±0.084 dB                      |
|                             | -64   | -0.80 dB                | (16)_____               | 0.80 dB        | ±0.081 dB                      |
|                             | -68   | -0.80 dB                | (17)_____               | 0.80 dB        | ±0.080 dB                      |
|                             | -72   | -0.80 dB                | (18)_____               | 0.80 dB        | ±0.084 dB                      |
|                             | -76   | -0.80 dB                | (19)_____               | 0.80 dB        | ±0.083 dB                      |
|                             | -80   | -0.80 dB                | (20)_____               | 0.80 dB        | ±0.089 dB                      |
|                             | -84   | -1.15 dB                | (21)_____               | 1.15 dB        | ±0.086 dB                      |
|                             | Incremental Log Fidelity,<br>Res BW ≥1 kHz<br>dB from Ref Level |                         |                         |                |                                |
|                             | -4  | -0.4 dB                 | (22)_____               | 0.4 dB         | ±0.082 dB                      |
|                             | -8  | -0.4 dB                 | (23)_____               | 0.4 dB         | ±0.078 dB                      |

**Table 3-8                      Agilent E7404A Performance Verification Test Record**

| <b>Agilent Technologies</b><br><br><b>Model E7404A</b> <span style="float: right;"><b>Report No.</b> _____</span><br><b>Serial No.</b> _____ <span style="float: right;"><b>Date</b> _____</span> |     |          |                  |         |                         |
|---|-----|----------|------------------|---------|-------------------------|
| Test Description  |     | Minimum  | Results Measured | Maximum | Measurement Uncertainty |
|   | –12 | –0.4 dB  | (24)_____        | 0.4 dB  | ±0.075 dB               |
|   | –16 | –0.4 dB  | (25)_____        | 0.4 dB  | ±0.073 dB               |
|   | –20 | –0.4 dB  | (26)_____        | 0.4 dB  | ±0.078 dB               |
|   | –24 | –0.4 dB  | (27)_____        | 0.4 dB  | ±0.074 dB               |
|   | –28 | –0.4 dB  | (28)_____        | 0.4 dB  | ±0.073 dB               |
|   | –32 | –0.4 dB  | (29)_____        | 0.4 dB  | ±0.077 dB               |
|   | –36 | –0.4 dB  | (30)_____        | 0.4 dB  | ±0.075 dB               |
|   | –40 | –0.4 dB  | (31)_____        | 0.4 dB  | ±0.081 dB               |
|   | –44 | –0.4 dB  | (32)_____        | 0.4 dB  | ±0.077 dB               |
|   | –48 | –0.4 dB  | (33)_____        | 0.4 dB  | ±0.076 dB               |
|   | –52 | –0.4 dB  | (34)_____        | 0.4 dB  | ±0.080 dB               |
|   | –56 | –0.4 dB  | (35)_____        | 0.4 dB  | ±0.078 dB               |
|   | –60 | –0.4 dB  | (36)_____        | 0.4 dB  | ±0.084 dB               |
|   | –64 | –0.4 dB  | (37)_____        | 0.4 dB  | ±0.081 dB               |
|   | –68 | –0.4 dB  | (38)_____        | 0.4 dB  | ±0.080 dB               |
|   | –72 | –0.4 dB  | (39)_____        | 0.4 dB  | ±0.084 dB               |
|   | –76 | –0.4 dB  | (40)_____        | 0.4 dB  | ±0.083 dB               |
|   | –80 | –0.4 dB  | (41)_____        | 0.4 dB  | ±0.089 dB               |
| Cumulative Log Fidelity,<br>Res BW ≤300 Hz<br>dB from Ref Level   |     |          |                  |         |                         |
|   | –4  | –0.34 dB | (43)_____        | 0.34 dB | ±0.082 dB               |
|   | –8  | –0.38 dB | (44)_____        | 0.38 dB | ±0.078 dB               |
|   | –12 | –0.42 dB | (45)_____        | 0.42 dB | ±0.075 dB               |
|   | –16 | –0.46 dB | (46)_____        | 0.46 dB | ±0.073 dB               |
|   | –20 | –0.50 dB | (47)_____        | 0.50 dB | ±0.078 dB               |

Performance Verification Test Records  
**Agilent E7404A Performance Verification Test Record**

**Table 3-8      Agilent E7404A Performance Verification Test Record**

| <b>Agilent Technologies</b><br><br><b>Model E7404A</b> <span style="float: right;"><b>Report No.</b> _____</span><br><b>Serial No.</b> _____ <span style="float: right;"><b>Date</b> _____</span> |          |                  |         |                         |  |
|---|----------|------------------|---------|-------------------------|--|
| Test Description  | Minimum  | Results Measured | Maximum | Measurement Uncertainty |  |
| –24   | –0.54 dB | (48)_____        | 0.54 dB | ±0.074 dB               |  |
| –28   | –0.58 dB | (49)_____        | 0.58 dB | ±0.073 dB               |  |
| –32   | –0.62 dB | (50)_____        | 0.62 dB | ±0.077 dB               |  |
| –36   | –0.66 dB | (51)_____        | 0.66 dB | ±0.075 dB               |  |
| –40   | –0.70 dB | (52)_____        | 0.70 dB | ±0.081 dB               |  |
| –44   | –0.74 dB | (53)_____        | 0.74 dB | ±0.077 dB               |  |
| –48   | –0.78 dB | (54)_____        | 0.78 dB | ±0.076 dB               |  |
| –52   | –0.82 dB | (55)_____        | 0.82 dB | ±0.080 dB               |  |
| –56   | –0.86 dB | (56)_____        | 0.86 dB | ±0.078 dB               |  |
| –60   | –0.90 dB | (57)_____        | 0.90 dB | ±0.084 dB               |  |
| –64   | –0.94 dB | (58)_____        | 0.94 dB | ±0.081 dB               |  |
| –68   | –0.98 dB | (59)_____        | 0.98 dB | ±0.080 dB               |  |
| –72   | –1.02 dB | (60)_____        | 1.02 dB | ±0.084 dB               |  |
| –76   | –1.06 dB | (61)_____        | 1.06 dB | ±0.083 dB               |  |
| –80   | –1.10 dB | (62)_____        | 1.10 dB | ±0.089 dB               |  |
| –84   | –1.14 dB | (63)_____        | 1.14 dB | ±0.086 dB               |  |
| –88   | –1.18 dB | (64)_____        | 1.18 dB | ±0.085 dB               |  |
| –92   | –1.22 dB | (65)_____        | 1.22 dB | ±0.100 dB               |  |
| –96   | –1.26 dB | (66)_____        | 1.26 dB | ±0.099 dB               |  |
| –98   | –1.28 dB | (67)_____        | 1.28 dB | ±0.098 dB               |  |
| Incremental Log Fidelity,<br>Res BW ≤300 Hz<br>dB from Ref Level  |          |                  |         |                         |  |
| –4  | –0.4 dB  | (68)_____        | 0.4 dB  | ±0.082 dB               |  |
| –8  | –0.4 dB  | (69)_____        | 0.4 dB  | ±0.078 dB               |  |
| –12   | –0.4 dB  | (70)_____        | 0.4 dB  | ±0.075 dB               |  |

**Table 3-8 Agilent E7404A Performance Verification Test Record**

| <b>Agilent Technologies</b><br><br><b>Model E7404A</b> <span style="float: right;"><b>Report No.</b> _____</span><br><b>Serial No.</b> _____ <span style="float: right;"><b>Date</b> _____</span> |  |         |                  |         |                         |
|---|--|---------|------------------|---------|-------------------------|
| Test Description  |  | Minimum | Results Measured | Maximum | Measurement Uncertainty |
|   | -16  | -0.4 dB | (71)_____        | 0.4 dB  | ±0.073 dB               |
|   | -20  | -0.4 dB | (72)_____        | 0.4 dB  | ±0.078 dB               |
|   | -24  | -0.4 dB | (73)_____        | 0.4 dB  | ±0.074 dB               |
|   | -28  | -0.4 dB | (74)_____        | 0.4 dB  | ±0.073 dB               |
|   | -32  | -0.4 dB | (75)_____        | 0.4 dB  | ±0.077 dB               |
|   | -36  | -0.4 dB | (76)_____        | 0.4 dB  | ±0.075 dB               |
|   | -40  | -0.4 dB | (77)_____        | 0.4 dB  | ±0.081 dB               |
|   | -44  | -0.4 dB | (78)_____        | 0.4 dB  | ±0.077 dB               |
|   | -48  | -0.4 dB | (79)_____        | 0.4 dB  | ±0.076 dB               |
|   | -52  | -0.4 dB | (80)_____        | 0.4 dB  | ±0.080 dB               |
|   | -56  | -0.4 dB | (81)_____        | 0.4 dB  | ±0.078 dB               |
|   | -60  | -0.4 dB | (82)_____        | 0.4 dB  | ±0.084 dB               |
|   | -64  | -0.4 dB | (83)_____        | 0.4 dB  | ±0.081 dB               |
|   | -68  | -0.4 dB | (84)_____        | 0.4 dB  | ±0.080 dB               |
|   | -72  | -0.4 dB | (85)_____        | 0.4 dB  | ±0.084 dB               |
|   | -76  | -0.4 dB | (86)_____        | 0.4 dB  | ±0.083 dB               |
|   | -80  | -0.4 dB | (87)_____        | 0.4 dB  | ±0.089 dB               |
|   | Linear Fidelity,<br>Res BW ≥1 kHz<br>dB from Ref Level |         |                  |         |                         |
|   | -4   | -2.0%   | (93)_____        | 2.0%    | ±0.064%                 |
|   | -8   | -2.0%   | (94)_____        | 2.0%    | ±0.064%                 |
|   | -12  | -2.0%   | (95)_____        | 2.0%    | ±0.064%                 |
|   | -16  | -2.0%   | (96)_____        | 2.0%    | ±0.064%                 |
|   | -20  | -2.0%   | (97)_____        | 2.0%    | ±0.063%                 |

Performance Verification Test Records  
**Agilent E7404A Performance Verification Test Record**

**Table 3-8 Agilent E7404A Performance Verification Test Record**

| <b>Agilent Technologies</b> |   |                         |                         |                |                                |
|-----------------------------|---|-------------------------|-------------------------|----------------|--------------------------------|
| <b>Model E7404A</b>         |   | <b>Report No.</b> _____ |                         |                |                                |
| <b>Serial No.</b> _____     |   | <b>Date</b> _____       |                         |                |                                |
| <b>Test Description</b>     |   | <b>Minimum</b>          | <b>Results Measured</b> | <b>Maximum</b> | <b>Measurement Uncertainty</b> |
|                             | Linear Fidelity,<br>Res BW $\leq$ 300 Hz<br>dB from Ref Level |                         |                         |                |                                |
|                             | -4  | -2.0%                   | (98)_____               | 2.0%           | $\pm 0.064\%$                  |
|                             | -8  | -2.0%                   | (99)_____               | 2.0%           | $\pm 0.064\%$                  |
|                             | -12   | -2.0%                   | (100)_____              | 2.0%           | $\pm 0.064\%$                  |
|                             | -16   | -2.0%                   | (101)_____              | 2.0%           | $\pm 0.064\%$                  |
|                             | -20   | -2.0%                   | (102)_____              | 2.0%           | $\pm 0.063\%$                  |
|                             | Zero Span,<br>Res BW $\leq$ 300 Hz<br>dB from Ref Level       |                         |                         |                |                                |
|                             | -4  | -0.36 dB                | (103)_____              | 0.36 dB        | $\pm 0.082$ dB                 |
|                             | -8  | -0.42 dB                | (104)_____              | 0.42 dB        | $\pm 0.078$ dB                 |
|                             | -12   | -0.48 dB                | (105)_____              | 0.48 dB        | $\pm 0.075$ dB                 |
|                             | -16   | -0.54 dB                | (106)_____              | 0.54 dB        | $\pm 0.073$ dB                 |
|                             | -20   | -0.60 dB                | (107)_____              | 0.60 dB        | $\pm 0.078$ dB                 |
|                             | -24   | -0.66 dB                | (108)_____              | 0.66 dB        | $\pm 0.074$ dB                 |
|                             | -28   | -0.72 dB                | (109)_____              | 0.72 dB        | $\pm 0.073$ dB                 |
|                             | -32   | -0.78 dB                | (110)_____              | 0.78 dB        | $\pm 0.077$ dB                 |
|                             | -36   | -0.84 dB                | (111)_____              | 0.84 dB        | $\pm 0.075$ dB                 |
|                             | -40   | -0.90 dB                | (112)_____              | 0.90 dB        | $\pm 0.081$ dB                 |
|                             | -44   | -0.96 dB                | (113)_____              | 0.96 dB        | $\pm 0.077$ dB                 |
|                             | -48   | -1.02 dB                | (114)_____              | 1.02 dB        | $\pm 0.076$ dB                 |
|                             | -52   | -1.08 dB                | (115)_____              | 1.08 dB        | $\pm 0.080$ dB                 |
|                             | -56   | -1.14 dB                | (116)_____              | 1.14 dB        | $\pm 0.078$ dB                 |
|                             | -60   | -1.20 dB                | (117)_____              | 1.20 dB        | $\pm 0.084$ dB                 |

### Table 3-8

| Agilent Technologies |  |                  |                  |         |                         |
|----------------------|--|------------------|------------------|---------|-------------------------|
| Model E7404A         |  | Report No. _____ |                  |         |                         |
| Serial No. _____     |  | Date _____       |                  |         |                         |
| Test Description     |  | Minimum          | Results Measured | Maximum | Measurement Uncertainty |
|                      | −64  | −1.5 dB          | (118)_____       | 1.5 dB  | ±0.081 dB               |
|                      | −68  | −1.5 dB          | (119)_____       | 1.5 dB  | ±0.080 dB               |
|                      | −70  | −1.5 dB          | (120)_____       | 1.5 dB  | ±0.084 dB               |
| 13.                  | <b>Input Attenuation Switching Uncertainty</b> |                  |                  |         |                         |
|                      | Input Attenuation Setting                      |                  |                  |         |                         |
|                      | 0 dB   | −0.3 dB          | (1)_____         | 0.3 dB  | ±0.101 dB               |
|                      | 5 dB   | −0.3 dB          | (2)_____         | 0.3 dB  | ±0.104 dB               |
|                      | 15 dB  | −0.3 dB          | (3)_____         | 0.3 dB  | ±0.102 dB               |
|                      | 20 dB  | −0.3 dB          | (4)_____         | 0.3 dB  | ±0.098 dB               |
|                      | 25 dB  | −0.35 dB         | (5)_____         | 0.35 dB | ±0.098 dB               |
|                      | 30 dB  | −0.40 dB         | (6)_____         | 0.40 dB | ±0.096 dB               |
|                      | 35 dB  | −0.45 dB         | (7)_____         | 0.45 dB | ±0.099 dB               |
|                      | 40 dB  | −0.50 dB         | (8)_____         | 0.50 dB | ±0.096 dB               |
|                      | 45 dB  | −0.55 dB         | (9)_____         | 0.55 dB | ±0.099 dB               |
|                      | 50 dB  | −0.60 dB         | (10)_____        | 0.60 dB | ±0.095 dB               |
|                      | 55 dB  | −0.65 dB         | (11)_____        | 0.65 dB | ±0.099 dB               |
|                      | 60 dB  | −0.70 dB         | (12)_____        | 0.70 dB | ±0.100 dB               |
|                      | 65 dB  | −0.75 dB         | (13)_____        | 0.75 dB | ±0.111 dB               |
| 15.                  | <b>Reference Level Accuracy</b>                |                  |                  |         |                         |
|                      | Log, Res BW ≥1 kHz                             |                  |                  |         |                         |
|                      | Reference Level                                |                  |                  |         |                         |
|                      | −10 dBm  | −0.3 dB          | (1)_____         | 0.3 dB  | ±0.091 dB               |
|                      | 0 dBm  | −0.3 dB          | (2)_____         | 0.3 dB  | ±0.100 dB               |
|                      | −30 dBm  | −0.3 dB          | (3)_____         | 0.3 dB  | ±0.092 dB               |
|                      | −40 dBm  | −0.3 dB          | (4)_____         | 0.3 dB  | ±0.094 dB               |

Performance Verification Test Records  
**Agilent E7404A Performance Verification Test Record**

**Table 3-8 Agilent E7404A Performance Verification Test Record**

| <b>Agilent Technologies</b><br><br><b>Model E7404A</b> <span style="float: right;"><b>Report No.</b> _____</span><br><b>Serial No.</b> _____ <span style="float: right;"><b>Date</b> _____</span> |   |         |                  |         |                         |
|---|---|---------|------------------|---------|-------------------------|
|   | Test Description                          | Minimum | Results Measured | Maximum | Measurement Uncertainty |
|   | –50 dBm                                   | –0.5 dB | (5)_____         | 0.5 dB  | ±0.095 dB               |
|   | –60 dBm                                   | –0.5 dB | (6)_____         | 0.5 dB  | ±0.097 dB               |
|   | –70 dBm                                   | –0.5 dB | (7)_____         | 0.5 dB  | ±0.099 dB               |
|   | –80 dBm                                   | –0.7 dB | (8)_____         | 0.7 dB  | ±0.101 dB               |
|   | Linear, Res BW ≥1 kHz<br>Reference Level  |         |                  |         |                         |
|   | –10 dBm                                   | –0.3 dB | (9)_____         | 0.3 dB  | ±0.091 dB               |
|   | 0 dBm                                     | –0.3 dB | (10)_____        | 0.3 dB  | ±0.100 dB               |
|   | –30 dBm                                   | –0.3 dB | (11)_____        | 0.3 dB  | ±0.092 dB               |
|   | –40 dBm                                   | –0.3 dB | (12)_____        | 0.3 dB  | ±0.094 dB               |
|   | –50 dBm                                   | –0.5 dB | (13)_____        | 0.5 dB  | ±0.095 dB               |
|   | –60 dBm                                   | –0.5 dB | (14)_____        | 0.5 dB  | ±0.097 dB               |
|   | –70 dBm                                   | –0.5 dB | (15)_____        | 0.5 dB  | ±0.099 dB               |
|   | –80 dBm                                   | –0.7 dB | (16)_____        | 0.7 dB  | ±0.101 dB               |
|   | Log, Res BW ≤300 Hz<br>Reference Level    |         |                  |         |                         |
|   | –10 dBm                                   | –0.3 dB | (17)_____        | 0.3 dB  | ±0.091 dB               |
|   | 0 dBm                                     | –0.3 dB | (18)_____        | 0.3 dB  | ±0.100 dB               |
|   | –30 dBm                                   | –0.3 dB | (19)_____        | 0.3 dB  | ±0.092 dB               |
|   | –40 dBm                                   | –0.3 dB | (20)_____        | 0.3 dB  | ±0.094 dB               |
|   | –50 dBm                                   | –0.5 dB | (21)_____        | 0.5 dB  | ±0.095 dB               |
|   | –60 dBm                                   | –0.5 dB | (22)_____        | 0.5 dB  | ±0.097 dB               |
|   | –70 dBm                                   | –0.5 dB | (23)_____        | 0.5 dB  | ±0.099 dB               |
|   | –80 dBm                                   | –0.7 dB | (24)_____        | 0.7 dB  | ±0.101 dB               |
|   | Linear, Res BW ≤300 Hz<br>Reference Level |         |                  |         |                         |



**Table 3-8 Agilent E7404A Performance Verification Test Record**

| <b>Agilent Technologies</b><br><br><b>Model E7404A</b> <span style="float: right;"><b>Report No.</b> _____</span><br><b>Serial No.</b> _____ <span style="float: right;"><b>Date</b> _____</span> |   |         |                  |         |                         |
|---|---|---------|------------------|---------|-------------------------|
| Test Description  |   | Minimum | Results Measured | Maximum | Measurement Uncertainty |
|   | –10 dBm   | –0.3 dB | (25)_____        | 0.3 dB  | ±0.091 dB               |
|   | 0 dBm   | –0.3 dB | (26)_____        | 0.3 dB  | ±0.100 dB               |
|   | –30 dBm   | –0.3 dB | (27)_____        | 0.3 dB  | ±0.092 dB               |
|   | –40 dBm   | –0.3 dB | (28)_____        | 0.3 dB  | ±0.094 dB               |
|   | –50 dBm   | –0.5 dB | (29)_____        | 0.5 dB  | ±0.095 dB               |
|   | –60 dBm   | –0.5 dB | (30)_____        | 0.5 dB  | ±0.097 dB               |
|   | –70 dBm   | –0.5 dB | (31)_____        | 0.5 dB  | ±0.099 dB               |
|   | –80 dBm   | –0.7 dB | (32)_____        | 0.7 dB  | ±0.101 dB               |
| <b>16.</b>  | <b>Resolution Bandwidth Switching Uncertainty</b><br><br>Resolution Bandwidth |         |                  |         |                         |
|   | 3 kHz   | –0.3 dB | (1)_____         | 0.3 dB  | ±0.048 dB               |
|   | 9 kHz   | –0.3 dB | (2)_____         | 0.3 dB  | ±0.048 dB               |
|   | 10 kHz  | –0.3 dB | (3)_____         | 0.3 dB  | ±0.048 dB               |
|   | 30 kHz  | –0.3 dB | (4)_____         | 0.3 dB  | ±0.048 dB               |
|   | 100 kHz   | –0.3 dB | (5)_____         | 0.3 dB  | ±0.048 dB               |
|   | 120 kHz   | –0.3 dB | (6)_____         | 0.3 dB  | ±0.048 dB               |
|   | 300 kHz   | –0.3 dB | (7)_____         | 0.3 dB  | ±0.048 dB               |
|   | 1 MHz   | –0.3 dB | (8)_____         | 0.3 dB  | ±0.048 dB               |
|   | 3 MHz   | –0.3 dB | (9)_____         | 0.3 dB  | ±0.048 dB               |
|   | 5 MHz   | –0.6 dB | (10)_____        | 0.6 dB  | ±0.076 dB               |
|   | 300 Hz  | –0.3 dB | (11)_____        | 0.3 dB  | ±0.048 dB               |
|   | 200 Hz  | –0.3 dB | (12)_____        | 0.3 dB  | ±0.048 dB               |
|   | 100 Hz  | –0.3 dB | (13)_____        | 0.3 dB  | ±0.048 dB               |
|   | 30 Hz   | –0.3 dB | (14)_____        | 0.3 dB  | ±0.048 dB               |
|   | 10 Hz   | –0.3 dB | (15)_____        | 0.3 dB  | ±0.048 dB               |

Performance Verification Test Records  
**Agilent E7404A Performance Verification Test Record**

**Table 3-8 Agilent E7404A Performance Verification Test Record**

| <b>Agilent Technologies</b><br><br><b>Model E7404A</b> <span style="float: right;"><b>Report No.</b> _____</span><br><b>Serial No.</b> _____ <span style="float: right;"><b>Date</b> _____</span>   |  |  |   |   |  |
|---|--|--|---|---|--|
| Test Description  | Minimum  | Results Measured   | Maximum   | Measurement Uncertainty   |  |
| <div style="display: flex; justify-content: space-between;"> <div style="width: 80%;"> 3 Hz (<i>Option 1D5 only</i>)<br/> Firmware Revision A.08.00 or later </div> <div style="width: 10%;">-0.3 dB</div> <div style="width: 10%;">(16)_____</div> <div style="width: 10%;">0.3 dB</div> <div style="width: 10%;">±0.048 dB</div> </div> <div style="display: flex; justify-content: space-between; margin-top: 10px;"> <div style="width: 80%;"> 1 Hz (<i>Option 1D5 only</i>)<br/> Firmware Revision A.08.00 or later </div> <div style="width: 10%;">-0.3 dB</div> <div style="width: 10%;">(17)_____</div> <div style="width: 10%;">0.3 dB</div> <div style="width: 10%;">±0.048 dB</div> </div> |  |  |   |   |  |
| <b>18. Absolute Amplitude Accuracy (Reference Settings)</b><br><br>Log, Preamp Off<br>Lin, Preamp Off<br>Log, Preamp On<br>Lin, Preamp On   | -0.34 dB<br>-0.34 dB<br>-0.37 dB<br>-0.37 dB   | (1)_____<br>(2)_____<br>(3)_____<br>(4)_____   | 0.34 dB<br>0.34 dB<br>0.37 dB<br>0.37 dB  | ±0.09 dB<br>±0.09 dB<br>±0.09 dB<br>±0.09 dB  |  |
| <b>20. Overall Absolute Amplitude Accuracy</b><br><br>0 dBm Reference Level<br><br>0 dBm input<br>-10 dBm input<br>-20 dBm input<br>-30 dBm input<br>-40 dBm input<br>-50 dBm input<br><br>-20 dBm Reference Level<br>-20 dBm input<br>-30 dBm input<br>-40 dBm input<br>-50 dBm input<br><br>-40 dBm Reference Level<br>-40 dBm input  | -0.54 dB<br>-0.54 dB<br>-0.54 dB<br>-0.54 dB<br>-0.54 dB<br>-0.54 dB<br><br>-0.54 dB<br>-0.54 dB<br>-0.54 dB<br>-0.54 dB<br><br>-0.54 dB | (1)_____<br>(2)_____<br>(3)_____<br>(4)_____<br>(5)_____<br>(6)_____<br><br>(7)_____<br>(8)_____<br>(9)_____<br>(10)_____<br><br>(11)_____ | 0.54 dB<br>0.54 dB<br>0.54 dB<br>0.54 dB<br>0.54 dB<br>0.54 dB<br><br>0.54 dB<br>0.54 dB<br>0.54 dB<br>0.54 dB<br><br>0.54 dB | ±0.234 dB<br>±0.115 dB<br>±0.110 dB<br>±0.109 dB<br>±0.109 dB<br>±0.109 dB<br><br>±0.109 dB<br>±0.109 dB<br>±0.109 dB<br>±0.109 dB<br><br>±0.087 dB |  |

**Table 3-8 Agilent E7404A Performance Verification Test Record**

| <b>Agilent Technologies</b><br><br><b>Model E7404A</b> <span style="float: right;"><b>Report No.</b> _____</span><br><b>Serial No.</b> _____ <span style="float: right;"><b>Date</b> _____</span>  |   |   |   |   |  |
|--|---|---|---|---|--|
| Test Description   | Minimum   | Results Measured  | Maximum   | Measurement Uncertainty   |  |
| <div style="display: flex; justify-content: space-between;"> <div>                     –50 dBm input<br/>–50 dBm Reference Level<br/>–50 dBm input                 </div> <div>                     –0.54 dB<br/><br/>–0.54 dB                 </div> <div>                     (12)_____<br/><br/>(13)_____                 </div> <div>                     0.54 dB<br/><br/>0.54 dB                 </div> <div>                     ±0.087 dB<br/><br/>±0.087 dB                 </div> </div> |   |   |   |   |  |
| <b>21. Resolution Bandwidth Accuracy</b><br><br>Resolution Bandwidth<br><br>5 MHz<br>3 MHz<br>1 MHz (–3 dB)<br>300 kHz<br>100 kHz<br>30 kHz<br>10 kHz<br>3 kHz<br>1 kHz<br>120 kHz<br>9 kHz<br>1 MHz (–6 dB)   | <br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br>3.5 MHz<br>2.55 MHz<br>0.85 MHz<br>255 kHz<br>85 kHz<br>25.5 kHz<br>8.5 kHz<br>2.55 kHz<br>850 Hz<br>96 kHz<br>7.2 kHz<br>900 kHz | <br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br>(1)_____<br>(2)_____<br>(3)_____<br>(4)_____<br>(5)_____<br>(6)_____<br>(7)_____<br>(8)_____<br>(9)_____<br>(10)_____<br>(11)_____<br>(12)_____ | <br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br>6.5 MHz<br>3.45 MHz<br>1.15 MHz<br>345 kHz<br>115 kHz<br>34.5 kHz<br>11.5 kHz<br>3.45 kHz<br>1.15 kHz<br>144 kHz<br>10.8 kHz<br>1.1 MHz | <br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br>±110 kHz<br>±66 kHz<br>±22 kHz<br>±6.6 kHz<br>±2.2 kHz<br>±660 Hz<br>±220 Hz<br>±66 Hz<br>±22 Hz<br>±2.17 kHz<br>±163 Hz<br>±22 kHz |  |
| <b>24. Frequency Response</b><br><br>20 to 30° C<br>Non-Option UKB<br>dc Coupled<br>Band 0<br>(9 kHz to 3.0 GHz)<br><br>Maximum Response<br>Minimum Response<br>Peak-to-Peak Response  | Note: Enter data in the appropriate section below depending upon the ambient temperature at which the test was performed and installed options.   |   |   |   |  |
| <br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br>(1)_____<br>(2)_____<br>(3)_____   | <br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br>–0.46 dB  | <br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br>0.46 dB<br><br>0.92 dB  | <br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br>±0.19 dB<br>±0.19 dB<br>±0.19 dB  |   |  |

Performance Verification Test Records  
**Agilent E7404A Performance Verification Test Record**

**Table 3-8                      Agilent E7404A Performance Verification Test Record**

| <b>Agilent Technologies</b><br><br><b>Model E7404A</b> <span style="float: right;"><b>Report No.</b> _____</span><br><b>Serial No.</b> _____ <span style="float: right;"><b>Date</b> _____</span> |          |                  |         |                         |  |
|---|----------|------------------|---------|-------------------------|--|
| Test Description  | Minimum  | Results Measured | Maximum | Measurement Uncertainty |  |
| Option UKB<br>dc Coupled<br>Band 0<br>(100 Hz to 3.0 GHz)   |          |                  |         |                         |  |
| Maximum Response  |          | (1)_____         | 0.50 dB | ±0.19 dB                |  |
| Minimum Response  | –0.50 dB | (2)_____         |         | ±0.19 dB                |  |
| Peak-to-Peak Response   |          | (3)_____         | 1.0 dB  | ±0.19 dB                |  |
| dc Coupled<br>Band 1<br>(3.0 GHz to 6.7 GHz)  |          |                  |         |                         |  |
| Maximum Response  |          | (4)_____         | 1.5 dB  | ±0.39 dB                |  |
| Minimum Response  | –1.5 dB  | (5)_____         |         | ±0.39 dB                |  |
| Peak-to-Peak Response   |          | (6)_____         | 2.6 dB  | ±0.39 dB                |  |
| dc Coupled<br>Band 2<br>(6.7 GHz to 13.2 GHz)   |          |                  |         |                         |  |
| Maximum Response  |          | (7)_____         | 2.0 dB  | ±0.40 dB                |  |
| Minimum Response  | –2.0 dB  | (8)_____         |         | ±0.40 dB                |  |
| Peak-to-Peak Response   |          | (9)_____         | 3.6 dB  | ±0.40 dB                |  |
| ac Coupled<br>Band 0<br>(100 kHz to 3.0 GHz)  |          |                  |         |                         |  |
| Maximum Response  |          | (10)_____        | 0.5 dB  | ±0.11 dB                |  |
| Minimum Response  | –0.5 dB  | (11)_____        |         | ±0.11 dB                |  |
| Peak-to-Peak Response   |          | (12)_____        | 1.0 dB  | ±0.11 dB                |  |

**Table 3-8 Agilent E7404A Performance Verification Test Record**

| <b>Agilent Technologies</b><br><b>Model E7404A</b> <span style="float: right;"><b>Report No.</b> _____</span><br><b>Serial No.</b> _____ <span style="float: right;"><b>Date</b> _____</span> |         |                  |         |                         |  |
|---|---------|------------------|---------|-------------------------|--|
| Test Description  | Minimum | Results Measured | Maximum | Measurement Uncertainty |  |
| ac Coupled<br>Band 0A<br>(800 MHz to 1.0 GHz)   |         |                  |         |                         |  |
| Maximum Response  |         | (13)_____        | 0.5 dB  | ±0.11 dB                |  |
| Minimum Response  | −0.5 dB | (14)_____        |         | ±0.11 dB                |  |
| Peak-to-Peak Response   |         | (15)_____        | 1.0 dB  | ±0.11 dB                |  |
| ac Coupled<br>Band 0B<br>(1.7 GHz to 2.0 GHz)   |         |                  |         |                         |  |
| Maximum Response  |         | (16)_____        | 0.5 dB  | ±0.11 dB                |  |
| Minimum Response  | −0.5 dB | (17)_____        |         | ±0.11 dB                |  |
| Peak-to-Peak Response   |         | (18)_____        | 1.0 dB  | ±0.11 dB                |  |
| ac Coupled<br>Band 1<br>(3.0 GHz to 6.7 GHz)  |         |                  |         |                         |  |
| Maximum Response  |         | (19)_____        | 1.5 dB  | ±0.39 dB                |  |
| Minimum Response  | −1.5 dB | (20)_____        |         | ±0.39 dB                |  |
| Peak-to-Peak Response   |         | (21)_____        | 2.6 dB  | ±0.39 dB                |  |
| ac Coupled<br>Band 2<br>(6.7 GHz to 13.2 GHz)   |         |                  |         |                         |  |
| Maximum Response  |         | (22)_____        | 2.0 dB  | ±0.40 dB                |  |
| Minimum Response  | −2.0 dB | (23)_____        |         | ±0.40 dB                |  |
| Peak-to-Peak Response   |         | (24)_____        | 3.6 dB  | ±0.40 dB                |  |

**Table 3-8 Agilent E7404A Performance Verification Test Record**

| <b>Agilent Technologies</b> |                       |                         |                         |                |                                |
|-----------------------------|-----------------------|-------------------------|-------------------------|----------------|--------------------------------|
| <b>Model E7404A</b>         |                       | <b>Report No.</b> _____ |                         |                |                                |
| <b>Serial No.</b> _____     |                       | <b>Date</b> _____       |                         |                |                                |
| <b>Test Description</b>     |                       | <b>Minimum</b>          | <b>Results Measured</b> | <b>Maximum</b> | <b>Measurement Uncertainty</b> |
|                             | 0 to 55° C            |                         |                         |                |                                |
|                             | Non-Option UKB        |                         |                         |                |                                |
|                             | dc Coupled            |                         |                         |                |                                |
|                             | Band 0                |                         |                         |                |                                |
|                             | (9 kHz to 3.0 GHz)    |                         |                         |                |                                |
|                             | Maximum Response      |                         | (1)_____                | 0.76 dB        | ±0.19 dB                       |
|                             | Minimum Response      | –0.76 dB                | (2)_____                |                | ±0.19 dB                       |
|                             | Peak-to-Peak Response |                         | (3)_____                | 1.52 dB        | ±0.19 dB                       |
|                             | Option UKB            |                         |                         |                |                                |
|                             | dc Coupled            |                         |                         |                |                                |
|                             | Band 0                |                         |                         |                |                                |
|                             | (100 Hz to 3.0 GHz)   |                         |                         |                |                                |
|                             | Maximum Response      |                         | (1)_____                | 1.0 dB         | ±0.19 dB                       |
|                             | Minimum Response      | –1.0 dB                 | (2)_____                |                | ±0.19 dB                       |
|                             | Peak-to-Peak Response |                         | (3)_____                | 2.0 dB         | ±0.19 dB                       |
|                             | dc Coupled            |                         |                         |                |                                |
|                             | Band 1                |                         |                         |                |                                |
|                             | (3.0 GHz to 6.7 GHz)  |                         |                         |                |                                |
|                             | Maximum Response      |                         | (4)_____                | 2.5 dB         | ±0.39 dB                       |
|                             | Minimum Response      | –2.5 dB                 | (5)_____                |                | ±0.39 dB                       |
|                             | Peak-to-Peak Response |                         | (6)_____                | 3.0 dB         | ±0.39 dB                       |
|                             | dc Coupled            |                         |                         |                |                                |
|                             | Band 2                |                         |                         |                |                                |
|                             | (6.7 GHz to 13.2 GHz) |                         |                         |                |                                |
|                             | Maximum Response      |                         | (7)_____                | 3.0 dB         | ±0.40 dB                       |

**Table 3-8 Agilent E7404A Performance Verification Test Record**

| <b>Agilent Technologies</b><br><b>Model E7404A</b> <span style="float: right;"><b>Report No.</b> _____</span><br><b>Serial No.</b> _____ <span style="float: right;"><b>Date</b> _____</span> |   |           |                  |          |                         |
|---|---|-----------|------------------|----------|-------------------------|
| Test Description  |   | Minimum   | Results Measured | Maximum  | Measurement Uncertainty |
|   | Minimum Response                              | −3.0 dB   | (8)_____         |          | ±0.40 dB                |
|   | Peak-to-Peak Response                         |           | (9)_____         | 4.0 dB   | ±0.40 dB                |
|   | ac Coupled<br>Band 0<br>(100 kHz to 3.0 GHz)  |           |                  |          |                         |
|   | Maximum Response                              |           | (10)_____        | 1.0 dB   | ±0.11 dB                |
|   | Minimum Response                              | −1.0 dB   | (11)_____        |          | ±0.11 dB                |
|   | Peak-to-Peak Response                         |           | (12)_____        | 2.0 dB   | ±0.11 dB                |
|   | ac Coupled<br>Band 0A<br>(800 MHz to 1.0 GHz) |           |                  |          |                         |
|   | Maximum Response                              |           | (13)_____        | 1.0 dB   | ±0.11 dB                |
|   | Minimum Response                              | −1.0 dB   | (14)_____        |          | ±0.11 dB                |
|   | Peak-to-Peak Response                         |           | (15)_____        | 2.0 dB   | ±0.11 dB                |
|   | ac Coupled<br>Band 0B<br>(1.7 GHz to 2.0 GHz) |           |                  |          |                         |
|   | Maximum Response                              |           | (16)_____        | 1.0 dB   | ±0.11 dB                |
|   | Minimum Response                              | −1.0 dB   | (17)_____        |          | ±0.11 dB                |
|   | Peak-to-Peak Response                         |           | (18)_____        | 2.0 dB   | ±0.11 dB                |
|   | ac Coupled<br>Band 1<br>(3.0 GHz to 6.7 GHz)  |           |                  |          |                         |
| Maximum Response  |   | (19)_____ | 2.5 dB           | ±0.39 dB |                         |

Performance Verification Test Records  
**Agilent E7404A Performance Verification Test Record**

**Table 3-8 Agilent E7404A Performance Verification Test Record**

| <b>Agilent Technologies</b><br><br><b>Model E7404A</b> <span style="float: right;"><b>Report No.</b> _____</span><br><b>Serial No.</b> _____ <span style="float: right;"><b>Date</b> _____</span> |  |   |  |  |  |
|---|--|---|--|--|--|
| Test Description  |  | Minimum   | Results Measured   | Maximum  | Measurement Uncertainty  |
|   | Minimum Response<br>Peak-to-Peak Response<br><br>ac Coupled<br>Band 2<br>(6.7 GHz to 13.2 GHz)<br><br>Maximum Response<br>Minimum Response<br>Peak-to-Peak Response  | -2.5 dB<br><br><br><br><br>-3.0 dB  | (20)_____<br>(21)_____<br><br><br>(22)_____<br>(23)_____<br>(24)_____                                | 3.0 dB<br><br><br>3.0 dB<br><br>4.0 dB           | ±0.39 dB<br>±0.39 dB<br><br><br>±0.40 dB<br>±0.40 dB<br>±0.40 dB         |
| <b>27.</b>  | <b>Frequency Response (Preamp On)</b><br><br>20 to 30° C<br>Band 0<br>(1 MHz to 3.0 GHz)<br><br>Maximum Response<br>Minimum Response<br>Peak-to-Peak Response<br><br>Band 0A<br>(800 MHz to 1.0 GHz)<br><br>Maximum Response<br>Minimum Response<br>Peak-to-Peak Response<br><br>Band 0B<br>(1.7 GHz to 2.0 GHz)<br><br>Maximum Response<br>Minimum Response | Note: Enter data in the appropriate section below depending upon the ambient temperature at which the test was performed and installed options. |  |  |  |
|   |  | -1.5 dB<br><br><br>-1.5 dB<br><br>-1.5 dB   | (1)_____<br>(2)_____<br>(3)_____<br><br>(4)_____<br>(5)_____<br>(6)_____<br><br>(7)_____<br>(8)_____ | 1.5 dB<br><br>3.0 dB<br><br>1.5 dB<br><br>3.0 dB | ±0.28 dB<br>±0.28 dB<br>±0.28 dB<br><br>±0.28 dB<br>±0.28 dB<br>±0.28 dB |



**Table 3-8 Agilent E7404A Performance Verification Test Record**

| <b>Agilent Technologies</b><br><b>Model E7404A</b> <span style="float: right;"><b>Report No.</b> _____</span><br><b>Serial No.</b> _____ <span style="float: right;"><b>Date</b> _____</span> |  |   |  |  |  |
|---|--|---|--|--|--|
| Test Description  |  | Minimum   | Results Measured   | Maximum  | Measurement Uncertainty  |
|   | Peak-to-Peak Response<br><br>0 to 55° C<br>Band 0<br>(1 MHz to 3.0 GHz)<br><br>Maximum Response<br>Minimum Response<br>Peak-to-Peak Response<br><br>Band 0A<br>(800 MHz to 1.0 GHz)<br><br>Maximum Response<br>Minimum Response<br>Peak-to-Peak Response<br><br>Band 0B<br>(1.7 GHz to 2.0 GHz)<br><br>Maximum Response<br>Minimum Response<br>Peak-to-Peak Response | <br><br><br><br>-2.0 dB<br><br><br><br>-2.0 dB<br><br><br><br>-2.0 dB | (9)_____<br><br><br>(1)_____<br>(2)_____<br>(3)_____<br><br>(4)_____<br>(5)_____<br>(6)_____<br><br>(7)_____<br>(8)_____<br>(9)_____ | 3.0 dB<br><br><br>2.0 dB<br><br>4.0 dB<br><br><br>2.0 dB<br><br>4.0 dB<br><br><br>2.0 dB<br><br>4.0 dB | ±0.28 dB<br><br><br>±0.28 dB<br>±0.28 dB<br>±0.28 dB<br><br>±0.28 dB<br>±0.28 dB<br>±0.28 dB<br><br>±0.28 dB<br>±0.28 dB<br>±0.28 dB |
| <b>29.</b>  | <b>Other Input-Related Spurious Responses</b><br><br>Center Freq Input Freq<br>2.0 GHz 2042.8 MHz<br>2.0 GHz 2642.8 MHz<br>2.0 GHz 1820.8 MHz<br>2.0 GHz 278.5 MHz   |   | <br><br>(1)_____<br>(2)_____<br>(3)_____<br>(4)_____   | <br><br>-65 dBc<br>-65 dBc<br>-65 dBc<br>-65 dBc   | <br><br>±.891 dB<br>±.891 dB<br>±.891 dB<br>±.891 dB   |

Performance Verification Test Records  
**Agilent E7404A Performance Verification Test Record**

**Table 3-8 Agilent E7404A Performance Verification Test Record**

| <b>Agilent Technologies</b><br><br><b>Model E7404A</b> <span style="float: right;"><b>Report No.</b> _____</span><br><b>Serial No.</b> _____ <span style="float: right;"><b>Date</b> _____</span> |          |                  |         |                         |  |
|---|----------|------------------|---------|-------------------------|--|
| Test Description  | Minimum  | Results Measured | Maximum | Measurement Uncertainty |  |
| 2.0 GHz 5600.0 MHz  |          | (5)_____         | –80 dBc | ±.891 dB                |  |
| 2.0 GHz 6242.8 MHz  |          | (6)_____         | –80 dBc | ±.891 dB                |  |
| 4.0 GHz 4042.8 MHz  |          | (7)_____         | –65 dBc | ±.891 dB                |  |
| 4.0 GHz 4642.8 MHz  |          | (8)_____         | –65 dBc | ±.891 dB                |  |
| 4.0 GHz 3742.9 MHz  |          | (9)_____         | –65 dBc | ±.891 dB                |  |
| 4.0 GHz 2242.8 MHz  |          | (10)_____        | –80 dBc | ±.891 dB                |  |
| 9.0 GHz 9042.8 MHz  |          | (11)_____        | –65 dBc | ±.891 dB                |  |
| 9.0 GHz 9642.8 MHz  |          | (12)_____        | –65 dBc | ±.891 dB                |  |
| 9.0 GHz 9342.8 MHz  |          | (13)_____        | –65 dBc | ±.891 dB                |  |
| 9.0 GHz 4982.1 MHz  |          | (14)_____        | –80 dBc | ±.891 dB                |  |
| <b>32. Spurious Responses</b>   |          |                  |         |                         |  |
| 300 MHz TOI,<br>1 kHz RBW   | 12.5 dBm | (1)_____         |         | ±0.93 dB                |  |
| 300 MHz TOI, 30 Hz<br>RBW   | 12.5 dBm | (2)_____         |         | ±0.93 dB                |  |
| 5 GHz TOI   | 11 dBm   | (3)_____         |         | ±0.93 dB                |  |
| 8 GHz TOI   | 7.5 dBm  | (4)_____         |         | ±0.93 dB                |  |
| 300 MHz SHI   | 35 dBm   | (5)_____         |         | ±0.41 dB                |  |
| 900 MHz SHI   | 45 dBm   | (6)_____         |         | ±0.41 dB                |  |
| 1.55 GHz SHI  | 75 dBm   | (7)_____         |         | ±0.41 dB                |  |
| 3.1 GHz SHI   | 90 dBm   | (8)_____         |         | ±0.41 dB                |  |
| <b>34. Gain Compression</b>   |          |                  |         |                         |  |
| Test Frequency  |          |                  |         |                         |  |
| 53 MHz  |          | (1)_____         | 1.0 dB  | ±0.123 dB               |  |
| 50.004 MHz  |          | (2)_____         | 1.0 dB  | ±0.123 dB               |  |
| 1403 MHz  |          | (3)_____         | 1.0 dB  | ±0.123 dB               |  |

**Table 3-8 Agilent E7404A Performance Verification Test Record**

| <b>Agilent Technologies</b><br><br><b>Model E7404A</b> <span style="float: right;"><b>Report No.</b> _____</span><br><b>Serial No.</b> _____ <span style="float: right;"><b>Date</b> _____</span> |   |   |                  |          |                         |
|---|---|---|------------------|----------|-------------------------|
| Test Description  |   | Minimum   | Results Measured | Maximum  | Measurement Uncertainty |
|   | 2503 MHz  |   | (4)_____         | 1.0 dB   | ±0.123 dB               |
|   | 4403 MHz  |   | (5)_____         | 1.0 dB   | ±0.123 dB               |
|   | 7603 MHz  |   | (6)_____         | 1.0 dB   | ±0.123 dB               |
| <b>37.</b>  | <b>Displayed Average Noise Level</b><br><br>1 kHz RBW, Preamp Off<br>10 MHz to 1 GHz<br>1 GHz to 2 GHz<br>2 GHz to 3 GHz<br>3 GHz to 6 GHz<br>6 GHz to 12 GHz<br>12 GHz to 13.2 GHz<br>1 kHz RBW, Preamp On,<br>0 to 55° C<br>10 MHz to 1 GHz<br>1 GHz to 2 GHz<br>2 GHz to 3 GHz<br>10 Hz RBW, Preamp Off<br>10 MHz to 1 GHz<br>1 GHz to 2 GHz<br>2 GHz to 3 GHz<br>3 GHz to 6 GHz<br>6 GHz to 12 GHz<br>12 GHz to 13.2 GHz<br>10 Hz RBW, Preamp On,<br>0 to 55° C | Note: Enter results with preamp on in the appropriate section based upon the ambient temperature when the test was performed. |                  |          |                         |
|   |   |   | (1)_____         | –116 dBm | ±1.23 dB                |
|   |   |   | (2)_____         | –116 dBm | ±1.23 dB                |
|   |   |   | (3)_____         | –112 dBm | ±1.23 dB                |
|   |   |   | (4)_____         | –112 dBm | ±1.23 dB                |
|   |   |   | (5)_____         | –111 dBm | ±1.23 dB                |
|   |   |   | (6)_____         | –107 dBm | ±1.23 dB                |
|   |   |   | (7)_____         | –131 dBm | ±1.23 dB                |
|   |   |   | (8)_____         | –131 dBm | ±1.23 dB                |
|   |   |   | (9)_____         | –127 dBm | ±1.23 dB                |
|   |   |   | (10)_____        | –135 dBm | ±1.23 dB                |
|   |   |   | (11)_____        | –135 dBm | ±1.23 dB                |
|   |   |   | (12)_____        | –131 dBm | ±1.23 dB                |
|   |   |   | (13)_____        | –131 dBm | ±1.23 dB                |
|   |   |   | (14)_____        | –130 dBm | ±1.23 dB                |
|   |   |   | (15)_____        | –120 dBm | ±1.23 dB                |

Performance Verification Test Records  
**Agilent E7404A Performance Verification Test Record**

**Table 3-8 Agilent E7404A Performance Verification Test Record**

| <b>Agilent Technologies</b><br><br><b>Model E7404A</b> <span style="float: right;"><b>Report No.</b> _____</span><br><b>Serial No.</b> _____ <span style="float: right;"><b>Date</b> _____</span>   |                                    |   |  |  |  |
|---|------------------------------------|---|--|--|--|
| Test Description  | Minimum                            | Results Measured  | Maximum  | Measurement Uncertainty  |  |
| 10 MHz to 1 GHz<br>1 GHz to 2 GHz<br>2 GHz to 3 GHz<br>1 kHz RBW, Preamp On,<br>20 to 30° C<br>10 MHz to 1 GHz<br>1 GHz to 2 GHz<br>2 GHz to 3 GHz<br>10 Hz RBW, Preamp On,<br>20 to 30° C<br>10 MHz to 1 GHz<br>1 GHz to 2 GHz<br>2 GHz to 3 GHz |                                    | (16)_____<br>(17)_____<br>(18)_____<br>(19)_____<br>(20)_____<br>(21)_____<br>(22)_____<br>(23)_____<br>(24)_____ | -150 dBm<br>-150 dBm<br>-146 dBm<br>-132 dBm<br>-132 dBm<br>-130 dBm<br>-151 dBm<br>-151 dBm<br>-149 dBm | ±1.23 dB<br>±1.23 dB<br>±1.23 dB<br>±1.23 dB<br>±1.23 dB<br>±1.23 dB<br>±1.23 dB<br>±1.23 dB<br>±1.23 dB |  |
| <b>39. Residual Responses</b><br>150 kHz to 6.7 GHz   |                                    | (1)_____  | -90 dBm  | ±0.87 dB   |  |
| <b>40. Fast Time Domain Amplitude Accuracy</b> ( <i>Option AYX only</i> )<br>Amplitude Error  | -0.3%                              | (1)_____  | 0.3%   | ±0.029%  |  |
| <b>42. Tracking Generator Absolute Amplitude and Vernier Accuracy</b> ( <i>Option 1DN only</i> )<br>Absolute Amplitude Accuracy<br>Absolute Vernier Accuracy<br>-2 dB<br>-3 dB  | -0.75 dB<br><br>-0.5 dB<br>-0.5 dB | (1)_____<br><br>(2)_____<br>(3)_____  | 0.75 dB<br><br>0.5 dB<br>0.5 dB  | ±0.096 dB<br><br>±0.008 dB<br>±0.008 dB  |  |

**Table 3-8 Agilent E7404A Performance Verification Test Record**

| <b>Agilent Technologies</b><br><br><b>Model E7404A</b> <span style="float: right;"><b>Report No.</b> _____</span><br><b>Serial No.</b> _____ <span style="float: right;"><b>Date</b> _____</span> |   |                                |  |                                    |   |
|---|---|--------------------------------|--|------------------------------------|---|
|   | Test Description  | Minimum                        | Results Measured   | Maximum                            | Measurement Uncertainty   |
|   | -5 dB   | -0.5 dB                        | (4)_____   | 0.5 dB                             | ±0.008 dB   |
|   | -6 dB   | -0.5 dB                        | (5)_____   | 0.5 dB                             | ±0.008 dB   |
|   | -7 dB   | -0.5 dB                        | (6)_____   | 0.5 dB                             | ±0.008 dB   |
|   | -8 dB   | -0.5 dB                        | (7)_____   | 0.5 dB                             | ±0.008 dB   |
|   | -9 dB   | -0.5 dB                        | (8)_____   | 0.5 dB                             | ±0.008 dB   |
|   | -10 dB  | -0.5 dB                        | (9)_____   | 0.5 dB                             | ±0.008 dB   |
|   | Incremental Vernier Accuracy  |                                |  |                                    |   |
|   | -2 dB   | -0.2 dB                        | (10)_____  | 0.2 dB                             | ±0.008 dB   |
|   | -3 dB   | -0.2 dB                        | (11)_____  | 0.2 dB                             | ±0.008 dB   |
|   | -5 dB   | -0.2 dB                        | (12)_____  | 0.2 dB                             | ±0.008 dB   |
|   | -6 dB   | -0.2 dB                        | (13)_____  | 0.2 dB                             | ±0.008 dB   |
|   | -7 dB   | -0.2 dB                        | (14)_____  | 0.2 dB                             | ±0.008 dB   |
|   | -8 dB   | -0.2 dB                        | (15)_____  | 0.2 dB                             | ±0.008 dB   |
|   | -9 dB   | -0.2 dB                        | (16)_____  | 0.2 dB                             | ±0.008 dB   |
|   | -10 dB  | -0.2 dB                        | (17)_____  | 0.2 dB                             | ±0.008 dB   |
| <b>44.</b>  | <b>Tracking Generator Level Flatness (Option 1DN only)</b><br><br>Positive Level Flatness, <1 MHz<br><br>Negative Level Flatness, <1 MHz<br><br>Positive Level Flatness, 1 MHz to 10 MHz<br><br>Negative Level Flatness, 1 MHz to 10 MHz<br><br>Positive Level Flatness, >10 MHz to 1.5 GHz | <br><br>-3.0 dB<br><br>-3.0 dB | (1)_____<br><br>(2)_____<br><br>(3)_____<br><br>(4)_____<br><br>(5)_____ | 3.0 dB<br><br>3.0 dB<br><br>2.0 dB | ±0.284 dB<br><br>±0.284 dB<br><br>±0.142 dB<br><br>±0.142 dB<br><br>±0.142 dB |

**Table 3-8**

**Agilent E7404A Performance Verification Test Record**

| <b>Agilent Technologies</b><br><br><b>Model E7404A</b><br><br><b>Serial No. _____</b><br><br><b>Report No. _____</b><br><br><b>Date _____</b> |   |          |  |  |  |
|---|---|----------|--|--|--|
| Test Description  |   | Minimum  | Results Measured   | Maximum  | Measurement Uncertainty                              |
|   | Negative Level Flatness,<br>>10 MHz to 1.5 GHz  | -2.0 dB  | (6)_____   |  | ±0.142 dB  |
|   | Positive Level Flatness,<br>>1.5 GHz  |          | (7)_____   | 2.0 dB   | ±0.142 dB  |
|   | Negative Level Flatness,<br>>1.5 GHz  | -2.0 dB  | (8)_____   |  | ±0.142 dB  |
| <b>46.</b>  | <b>Tracking Generator Harmonic Spurious Outputs</b><br><i>(Option 1DN only)</i><br><br>2 <sup>nd</sup> Harmonic, <20 kHz<br><br>2 <sup>nd</sup> Harmonic, ≥ 20 kHz<br><br>3 <sup>rd</sup> Harmonic, <20 kHz<br><br>3 <sup>rd</sup> Harmonic, ≥ 20 kHz |          | (1)_____<br><br>(2)_____<br><br>(3)_____<br><br>(4)_____ | -15 dBc<br><br>-25 dBc<br><br>-15 dBc<br><br>-25 dBc | ±2.6 dB<br><br>±2.6 dB<br><br>±2.6 dB<br><br>±2.6 dB |
| <b>48.</b>  | <b>Tracking Generator Non-Harmonic Spurious Outputs</b><br><i>(Option 1DN only)</i><br><br>Highest Non-Harmonic Spurious Output Amplitude, 9 kHz to 2 GHz<br><br>Highest Non-Harmonic Spurious Output Amplitude, 2 GHz to 3 GHz                       |          | (1)_____<br><br>(2)_____                                 | -27 dBc<br><br>-23 dBc                               | ±2.63 dB<br><br>±3.14 dB                             |
| <b>49.</b>  | <b>Tracking Generator L.O. Feedthrough</b><br><i>(Option 1DN only)</i><br><br>9 kHz to 2.9 GHz<br><br>2.9 GHz to 3.0 GHz  |          | (1)_____<br><br>(2)_____                                 | -16 dBm<br><br>-16 dBm                               | ±2.58 dB<br><br>±3.03 dB                             |
| <b>50.</b>  | <b>Gate Delay Accuracy and Gate Length Accuracy</b><br><i>(Option 1D6 only)</i><br><br>Minimum Gate Delay   | 499.9 ns | (1)_____   | 1.5001µs   | ±549 ps  |

**Table 3-8                      Agilent E7404A Performance Verification Test Record**

| <b>Agilent Technologies</b><br><br><b>Model E7404A</b> <span style="float: right;"><b>Report No.</b> _____</span><br><b>Serial No.</b> _____ <span style="float: right;"><b>Date</b> _____</span> |   |           |                  |           |                         |
|---|---|-----------|------------------|-----------|-------------------------|
| Test Description  |   | Minimum   | Results Measured | Maximum   | Measurement Uncertainty |
|   | Maximum Gate Delay  | 499.9 ns  | (2)_____         | 1.5001μs  | ±549 ps                 |
|   | 1 μs Gate Length  | 499.9 ns  | (3)_____         | 1.5001μs  | ±520 ps                 |
|   | 65 ms Gate Length   | 64.993 ms | (4)_____         | 65.007 ms | ±647 ns                 |
| <b>51.</b>  | <b>Gate Mode Additional Amplitude Error</b> ( <i>Option 1D6 only</i> )<br><br>Amplitude Error | -0.2 dB   | (1)_____         | 0.2 dB    | ±0.023 dB               |

# Agilent E7405A Performance Verification Test Record

Tests for the Agilent E7405A only are included in this test record, therefore not all test numbers are included.

Table 3-9 E7405A Performance Verification Test Record

|                                   |                  |   |                     |
|-----------------------------------|------------------|---|---------------------|
| Agilent Technologies              |                  |   |                     |
| Address: _____                    |                  | Report No. _____                              |                     |
| _____                             |                  | Date _____                                    |                     |
| _____                             |                  |   |                     |
| Model E7405A                      |                  |   |                     |
| Serial No. _____                  |                  | Ambient temperature _____ ° C                 |                     |
| Options _____                     |                  | Relative humidity _____ %                     |                     |
| Firmware Revision _____           |                  | Power mains line frequency _____ Hz (nominal) |                     |
| Customer _____                    |                  | Tested by _____                               |                     |
| <b>Test Equipment Used:</b>       |                  |   |                     |
| <b>Description</b>                | <b>Model No.</b> | <b>Trace No.</b>                              | <b>Cal Due Date</b> |
| Synthesized Signal Generator      | _____            | _____   | _____               |
| Wide Offset Phase Noise Generator | _____            | _____   | _____               |
| Synthesized Sweeper #1            | _____            | _____   | _____               |
| Synthesized Sweeper #2            | _____            | _____   | _____               |
| Function Generator                | _____            | _____   | _____               |
| Power Meter, Dual-Channel         | _____            | _____   | _____               |
| RF Power Sensor #1                | _____            | _____   | _____               |
| RF Power Sensor #2                | _____            | _____   | _____               |
| Microwave Power Sensor            | _____            | _____   | _____               |
| Low-Power Power Sensor            | _____            | _____   | _____               |
| Digital Multimeter                | _____            | _____   | _____               |
| Universal Counter                 | _____            | _____   | _____               |
| Frequency Standard                | _____            | _____   | _____               |
| Power Splitter                    | _____            | _____   | _____               |



**Table 3-9 E7405A Performance Verification Test Record**

|  |       |       |       |
|--|-------|-------|-------|
| 50 $\Omega$ Termination                          | _____ | _____ | _____ |
| 1 dB Step Attenuator                             | _____ | _____ | _____ |
| 10 dB Step Attenuator                            | _____ | _____ | _____ |
| Oscilloscope<br>(Option 1D6 only)                | _____ | _____ | _____ |
| Microwave Spectrum Analyzer<br>(Option 1DN only) | _____ | _____ | _____ |
| Notes/comments:                                  | _____ |       |       |
|  | _____ |       |       |

**Table 3-10 Agilent E7405A Performance Verification Test Record**

| <b>Agilent Technologies</b><br><br><b>Model E7405A</b> <span style="float: right;"><b>Report No.</b> _____</span><br><b>Serial No.</b> _____ <span style="float: right;"><b>Date</b> _____</span>                      |   |  |   |  |  |
|--|---|--|---|--|--|
| Test Description   | Minimum   | Results Measured                             | Maximum   | Measurement Uncertainty  |  |
| <b>1.</b> <b>10 MHz Reference Output Accuracy</b> (Non-Option 1D5 only)<br><br>Settability   | –5.0 Hz   | (1)_____                                     | 5.0 Hz  | $\pm 293.3 \mu\text{Hz}$   |  |
| <b>2.</b> <b>10 MHz High-Stability Frequency Reference Output Accuracy</b> (Option 1D5 only)<br><br>5 Minute Warm-Up Error<br>15 Minute Warm-Up Error  | –0.1 ppm<br>–0.01 ppm                                     | (1)_____<br>(2)_____                         | 0.1 ppm<br>0.01 ppm                                       | $\pm 0.000072 \text{ ppm}$<br>$\pm 0.000070 \text{ ppm}$                             |  |
| <b>4.</b> <b>Frequency Readout and Marker Frequency Count Accuracy</b><br><br>Frequency Readout Accuracy<br>Center Freq    Span<br>1500 MHz    20 MHz<br>1500 MHz    10 MHz<br>1500 MHz    1 MHz<br>4000 MHz    20 MHz | 1499.83 MHz<br>1499.91 MHz<br>1499.991 MHz<br>3999.83 MHz | (1)_____<br>(2)_____<br>(3)_____<br>(4)_____ | 1500.17 MHz<br>1500.09 MHz<br>1500.009 MHz<br>4000.17 MHz | $\pm 0 \text{ Hz}$<br>$\pm 0 \text{ Hz}$<br>$\pm 0 \text{ Hz}$<br>$\pm 0 \text{ Hz}$ |  |

Performance Verification Test Records  
**Agilent E7405A Performance Verification Test Record**

**Table 3-10 Agilent E7405A Performance Verification Test Record**

| <b>Agilent Technologies</b><br><b>Model E7405A</b><br><b>Serial No. _____</b><br><b>Report No. _____</b><br><b>Date _____</b> |                                    |                 |  |                  |                 |                         |
|---|------------------------------------|-----------------|--|------------------|-----------------|-------------------------|
| Test Description  |                                    |                 | Minimum  | Results Measured | Maximum         | Measurement Uncertainty |
|   | 4000 MHz                           | 10 MHz          | 3999.91 MHz  | (5)_____         | 4000.09 MHz     | ±0 Hz                   |
|   | 4000 MHz                           | 1 MHz           | 3999.991 MHz   | (6)_____         | 4000.009 MHz    | ±0 Hz                   |
|   | 9000 MHz                           | 20 MHz          | 8999.83 MHz  | (7)_____         | 9000.17 MHz     | ±0 Hz                   |
|   | 9000 MHz                           | 10 MHz          | 8999.91 MHz  | (8)_____         | 9000.09 MHz     | ±0 Hz                   |
|   | 9000 MHz                           | 1 MHz           | 8999.991 MHz   | (9)_____         | 9000.009 MHz    | ±0 Hz                   |
|   | 16000 MHz                          | 20 MHz          | 15999.83 MHz   | (10)_____        | 16000.17 MHz    | ±0 Hz                   |
|   | 16000 MHz                          | 10 MHz          | 15999.91 MHz   | (11)_____        | 16000.09 MHz    | ±0 Hz                   |
|   | 16000 MHz                          | 1 MHz           | 15999.991 MHz  | (12)_____        | 16000.009 MHz   | ±0 Hz                   |
|   | 21000 MHz                          | 20 MHz          | 20999.83 MHz   | (13)_____        | 21000.17 MHz    | ±0 Hz                   |
|   | 21000 MHz                          | 10 MHz          | 20999.91 MHz   | (14)_____        | 21000.09 MHz    | ±0 Hz                   |
|   | 21000 MHz                          | 1 MHz           | 20999.991 MHz  | (15)_____        | 21000.009 MHz   | ±0 Hz                   |
|   | Marker Count Accuracy              |                 | Note: Enter results in the appropriate section below based upon the firmware revision of the analyzer. |                  |                 |                         |
|   | Firmware Revision Prior to A.03.00 |                 |  |                  |                 |                         |
|   | Center Freq    Span                |                 |  |                  |                 |                         |
|   | 1500 MHz                           | 20 MHz          | 1499.999998 MHz  | (16)_____        | 1500.000002 MHz | ±0 Hz                   |
| 1500 MHz  | 1 MHz                              | 1499.999998 MHz | (17)_____  | 1500.000002 MHz  | ±0 Hz           |                         |
| 4000 MHz  | 20 MHz                             | 3999.999998 MHz | (18)_____  | 4000.000002 MHz  | ±0 Hz           |                         |
| 4000 MHz  | 1 MHz                              | 3999.999998 MHz | (19)_____  | 4000.000002 MHz  | ±0 Hz           |                         |
| 9000 MHz  | 20 MHz                             | 8999.999997 MHz | (20)_____  | 9000.000003 MHz  | ±0 Hz           |                         |

**Table 3-10 Agilent E7405A Performance Verification Test Record**

| <b>Agilent Technologies</b><br><b>Model E7405A</b><br><b>Serial No. _____</b> |                                    |        |                  |                  |                  |                         | <b>Report No. _____</b><br><b>Date _____</b> |  |  |  |  |  |  |
|---|------------------------------------|--------|------------------|------------------|------------------|-------------------------|--|--|--|--|--|--|--|
| Test Description  |                                    |        | Minimum          | Results Measured | Maximum          | Measurement Uncertainty |  |  |  |  |  |  |  |
|   | 9000 MHz                           | 1 MHz  | 8999.999997 MHz  | (21)_____        | 9000.000003 MHz  | ±0 Hz                   |  |  |  |  |  |  |  |
|   | 16000 MHz                          | 20 MHz | 15999.999995 MHz | (22)_____        | 16000.000005 MHz | ±0 Hz                   |  |  |  |  |  |  |  |
|   | 16000 MHz                          | 1 MHz  | 20999.999995 MHz | (23)_____        | 21000.000005 MHz | ±0 Hz                   |  |  |  |  |  |  |  |
|   | 21000 MHz                          | 20 MHz | 20999.999995 MHz | (24)_____        | 21000.000005 MHz | ±0 Hz                   |  |  |  |  |  |  |  |
|   | 21000 MHz                          | 1 MHz  | 20999.999995 MHz | (25)_____        | 21000.000005 MHz | ±0 Hz                   |  |  |  |  |  |  |  |
|   | Firmware Revision A.03.00 or later |        |                  |                  |                  |                         |  |  |  |  |  |  |  |
|   | Center Freq    Span                |        |                  |                  |                  |                         |  |  |  |  |  |  |  |
|   | 1500 MHz                           | 20 MHz | 1499.999999 MHz  | (16)_____        | 1500.000001 MHz  | ±0 Hz                   |  |  |  |  |  |  |  |
|   | 1500 MHz                           | 1 MHz  | 1499.999999 MHz  | (17)_____        | 1500.000001 MHz  | ±0 Hz                   |  |  |  |  |  |  |  |
|   | 4000 MHz                           | 20 MHz | 3999.999999 MHz  | (18)_____        | 4000.000001 MHz  | ±0 Hz                   |  |  |  |  |  |  |  |
|   | 4000 MHz                           | 1 MHz  | 3999.999999 MHz  | (19)_____        | 4000.000001 MHz  | ±0 Hz                   |  |  |  |  |  |  |  |
|   | 9000 MHz                           | 20 MHz | 8999.999999 MHz  | (20)_____        | 9000.000001 MHz  | ±0 Hz                   |  |  |  |  |  |  |  |
|   | 9000 MHz                           | 1 MHz  | 8999.999999 MHz  | (21)_____        | 9000.000001 MHz  | ±0 Hz                   |  |  |  |  |  |  |  |
|   | 16000 MHz                          | 20 MHz | 15999.999999 MHz | (22)_____        | 16000.000001 MHz | ±0 Hz                   |  |  |  |  |  |  |  |
|   | 16000 MHz                          | 1 MHz  | 20999.999999 MHz | (23)_____        | 21000.000001 MHz | ±0 Hz                   |  |  |  |  |  |  |  |
|   | 21000 MHz                          | 20 MHz | 20999.999999 MHz | (24)_____        | 21000.000001 MHz | ±0 Hz                   |  |  |  |  |  |  |  |

Performance Verification Test Records  
**Agilent E7405A Performance Verification Test Record**

**Table 3-10      Agilent E7405A Performance Verification Test Record**

| <b>Agilent Technologies</b> |                                       |                         |                  |                  |                         |
|-----------------------------|---------------------------------------|-------------------------|------------------|------------------|-------------------------|
| <b>Model E7405A</b>         |                                       | <b>Report No.</b> _____ |                  |                  |                         |
| <b>Serial No.</b> _____     |                                       | <b>Date</b> _____       |                  |                  |                         |
| Test Description            |                                       | Minimum                 | Results Measured | Maximum          | Measurement Uncertainty |
|                             | 21000 MHz    1 MHz                    | 20999.999999 MHz        | (25)_____        | 21000.000001 MHz | ±0 Hz                   |
| <b>6.</b>                   | <b>Frequency Span Accuracy</b>        |                         |                  |                  |                         |
|                             | Span            Start Freq            |                         |                  |                  |                         |
|                             | 3000 MHz            0 Hz              | 2370 MHz                | (1)_____         | 2430 MHz         | ±6.12 MHz               |
|                             | 100 MHz            10 MHz             | 79 MHz                  | (2)_____         | 81 MHz           | ±204 kHz                |
|                             | 100 kHz            10 MHz             | 79 kHz                  | (3)_____         | 81 kHz           | ±204 Hz                 |
|                             | 100 MHz            800 MHz            | 79 MHz                  | (4)_____         | 81 MHz           | ±204 kHz                |
|                             | 100 kHz            800 MHz            | 79 kHz                  | (5)_____         | 81 kHz           | ±204 Hz                 |
|                             | 100 MHz            1400 MHz           | 79 MHz                  | (6)_____         | 81 MHz           | ±204 kHz                |
|                             | 100 kHz            1499 MHz           | 79 kHz                  | (7)_____         | 81 kHz           | ±204 Hz                 |
| <b>7.</b>                   | <b>Noise Sidebands</b>                |                         |                  |                  |                         |
|                             | Offset from 1 GHz signal              |                         |                  |                  |                         |
|                             | 10 kHz                                |                         | (1)_____         | -90 dBc/Hz       | ±2.44 dB                |
|                             | 20 kHz                                |                         | (2)_____         | -100 dBc/Hz      | ±2.44 dB                |
|                             | 30 kHz                                |                         | (3)_____         | -106 dBc/Hz      | ±2.44 dB                |
| <b>8.</b>                   | <b>Noise Sidebands - Wide Offsets</b> |                         |                  |                  |                         |
|                             | Offset from 1 GHz signal              |                         |                  |                  |                         |
|                             | 100 kHz                               |                         | (1)_____         | -118 dBc/Hz      | ±2.44 dB                |
|                             | 1 MHz                                 |                         | (2)_____         | -125 dBc/Hz      | ±2.44 dB                |
|                             | 5 MHz                                 |                         | (3)_____         | -127 dBc/Hz      | ±2.44 dB                |
|                             | 10 MHz                                |                         | (4)_____         | -131 dBc/Hz      | ±2.44 dB                |
| <b>9.</b>                   | <b>System-Related Sidebands</b>       |                         |                  |                  |                         |
|                             | Offset from 500 MHz signal            |                         |                  |                  |                         |
|                             | 30 kHz to 230 kHz                     |                         | (1)_____         | -65 dBc          | ±1.30 dB                |

**Table 3-10**

**Agilent E7405A Performance Verification Test Record**

| <b>Agilent Technologies</b><br><b>Model E7405A</b><br><b>Serial No. _____</b> |   |   |  |   |  | <b>Report No. _____</b><br><b>Date _____</b> |  |  |  |  |  |
|---|---|---|--|---|--|--|--|--|--|--|--|
| Test Description  |   | Minimum   | Results Measured   | Maximum   | Measurement Uncertainty  |  |  |  |  |  |  |
|   | –30 kHz to –230 kHz   |   | (2)_____   | –65 dBc   | ±1.30 dB   |  |  |  |  |  |  |
| <b>10.</b>  | <b>Residual FM</b><br><br>1 kHz Res BW,<br><i>(Non-Option 1D5)</i><br><br>1 kHz Res BW,<br><i>(Option 1D5)</i><br><br>10 Hz Res BW<br><i>(Option 1D5 only)</i>  |   | (1)_____<br><br>(1)_____<br><br>(2)_____   | 150 Hz<br><br>100 Hz<br><br>2 Hz  | ±21 Hz<br><br>±21 Hz<br><br>±0.27 Hz   |  |  |  |  |  |  |
| <b>11.</b>  | <b>Sweep Time Accuracy</b><br><br>Sweep Time<br><br>5 ms<br><br>20 ms<br><br>100 ms<br><br>1 s<br><br>10 s<br><br>1 ms <i>(Option AXX only)</i><br><br>500 μs <i>(Option AXX only)</i><br><br>100 μs <i>(Option AXX only)</i> | –1.0%<br><br>–1.0%<br><br>–1.0%<br><br>–1.0%<br><br>–1.0%<br><br>–1.0%<br><br>–1.0% | (1)_____<br><br>(2)_____<br><br>(3)_____<br><br>(4)_____<br><br>(5)_____<br><br>(6)_____<br><br>(7)_____<br><br>(8)_____ | ±1.0%<br><br>±1.0%<br><br>±1.0%<br><br>±1.0%<br><br>±1.0%<br><br>±1.0%<br><br>±1.0% | ±0.16%<br><br>±0.16%<br><br>±0.16%<br><br>±0.16%<br><br>±0.16%<br><br>±0.16%<br><br>±0.16% |  |  |  |  |  |  |
| <b>12.</b>  | <b>Display Scale Fidelity</b><br><br>Cumulative Log Fidelity,<br>Res BW ≥1 kHz<br><br>dB from Ref Level<br><br>–4<br><br>–8<br><br>–12<br><br>–16<br><br>–20  | –0.30 dB<br><br>–0.30 dB<br><br>–0.40 dB<br><br>–0.40 dB<br><br>–0.40 dB            | (1)_____<br><br>(2)_____<br><br>(3)_____<br><br>(4)_____<br><br>(5)_____   | 0.30 dB<br><br>0.30 dB<br><br>0.40 dB<br><br>0.40 dB<br><br>0.40 dB                 | ±0.082 dB<br><br>±0.078 dB<br><br>±0.075 dB<br><br>±0.073 dB<br><br>±0.078 dB              |  |  |  |  |  |  |

Performance Verification Test Records  
**Agilent E7405A Performance Verification Test Record**

**Table 3-10      Agilent E7405A Performance Verification Test Record**

| <b>Agilent Technologies</b><br><br><b>Model E7405A</b> <span style="float: right;"><b>Report No.</b> _____</span><br><b>Serial No.</b> _____ <span style="float: right;"><b>Date</b> _____</span> |          |                  |         |                         |  |
|---|----------|------------------|---------|-------------------------|--|
| Test Description  | Minimum  | Results Measured | Maximum | Measurement Uncertainty |  |
| –24   | –0.50 dB | (6)_____         | 0.50 dB | ±0.074 dB               |  |
| –28   | –0.50 dB | (7)_____         | 0.50 dB | ±0.073 dB               |  |
| –32   | –0.60 dB | (8)_____         | 0.60 dB | ±0.077 dB               |  |
| –36   | –0.60 dB | (9)_____         | 0.60 dB | ±0.075 dB               |  |
| –40   | –0.60 dB | (10)_____        | 0.60 dB | ±0.081 dB               |  |
| –44   | –0.70 dB | (11)_____        | 0.70 dB | ±0.077 dB               |  |
| –48   | –0.70 dB | (12)_____        | 0.70 dB | ±0.076 dB               |  |
| –52   | –0.70dB  | (13)_____        | 0.70 dB | ±0.080 dB               |  |
| –56   | –0.70 dB | (14)_____        | 0.70 dB | ±0.078 dB               |  |
| –60   | –0.70 dB | (15)_____        | 0.70 dB | ±0.084 dB               |  |
| –64   | –0.80 dB | (16)_____        | 0.80 dB | ±0.081 dB               |  |
| –68   | –0.80 dB | (17)_____        | 0.80 dB | ±0.080 dB               |  |
| –72   | –0.80 dB | (18)_____        | 0.80 dB | ±0.084 dB               |  |
| –76   | –0.80 dB | (19)_____        | 0.80 dB | ±0.083 dB               |  |
| –80   | –0.80 dB | (20)_____        | 0.80 dB | ±0.089 dB               |  |
| –84   | –1.15 dB | (21)_____        | 1.15 dB | ±0.086 dB               |  |
| Incremental Log Fidelity,<br>Res BW ≥1 kHz<br>dB from Ref Level   |          |                  |         |                         |  |
| –4  | –0.4 dB  | (22)_____        | 0.4 dB  | ±0.082 dB               |  |
| –8  | –0.4 dB  | (23)_____        | 0.4 dB  | ±0.078 dB               |  |
| –12   | –0.4 dB  | (24)_____        | 0.4 dB  | ±0.075 dB               |  |
| –16   | –0.4 dB  | (25)_____        | 0.4 dB  | ±0.073 dB               |  |
| –20   | –0.4 dB  | (26)_____        | 0.4 dB  | ±0.078 dB               |  |
| –24   | –0.4 dB  | (27)_____        | 0.4 dB  | ±0.074 dB               |  |
| –28   | –0.4 dB  | (28)_____        | 0.4 dB  | ±0.073 dB               |  |

**Table 3-10                      Agilent E7405A Performance Verification Test Record**

| <b>Agilent Technologies</b><br><br><b>Model E7405A</b> <span style="float: right;"><b>Report No.</b> _____</span><br><b>Serial No.</b> _____ <span style="float: right;"><b>Date</b> _____</span> |   |          |                  |         |                         |
|---|---|----------|------------------|---------|-------------------------|
| Test Description  |   | Minimum  | Results Measured | Maximum | Measurement Uncertainty |
|   | -32   | -0.4 dB  | (29)_____        | 0.4 dB  | ±0.077 dB               |
|   | -36   | -0.4 dB  | (30)_____        | 0.4 dB  | ±0.075 dB               |
|   | -40   | -0.4 dB  | (31)_____        | 0.4 dB  | ±0.081 dB               |
|   | -44   | -0.4 dB  | (32)_____        | 0.4 dB  | ±0.077 dB               |
|   | -48   | -0.4 dB  | (33)_____        | 0.4 dB  | ±0.076 dB               |
|   | -52   | -0.4 dB  | (34)_____        | 0.4 dB  | ±0.080 dB               |
|   | -56   | -0.4 dB  | (35)_____        | 0.4 dB  | ±0.078 dB               |
|   | -60   | -0.4 dB  | (36)_____        | 0.4 dB  | ±0.084 dB               |
|   | -64   | -0.4 dB  | (37)_____        | 0.4 dB  | ±0.081 dB               |
|   | -68   | -0.4 dB  | (38)_____        | 0.4 dB  | ±0.080 dB               |
|   | -72   | -0.4 dB  | (39)_____        | 0.4 dB  | ±0.084 dB               |
|   | -76   | -0.4 dB  | (40)_____        | 0.4 dB  | ±0.083 dB               |
|   | -80   | -0.4 dB  | (41)_____        | 0.4 dB  | ±0.089 dB               |
|   | Cumulative Log Fidelity,<br>Res BW ≤300 Hz<br>dB from Ref Level |          |                  |         |                         |
|   | -4  | -0.34 dB | (43)_____        | 0.34 dB | ±0.082 dB               |
|   | -8  | -0.38 dB | (44)_____        | 0.38 dB | ±0.078 dB               |
|   | -12   | -0.42 dB | (45)_____        | 0.42 dB | ±0.075 dB               |
|   | -16   | -0.46 dB | (46)_____        | 0.46 dB | ±0.073 dB               |
|   | -20   | -0.50 dB | (47)_____        | 0.50 dB | ±0.078 dB               |
|   | -24   | -0.54 dB | (48)_____        | 0.54 dB | ±0.074 dB               |
|   | -28   | -0.58 dB | (49)_____        | 0.58 dB | ±0.073 dB               |
|   | -32   | -0.62 dB | (50)_____        | 0.62 dB | ±0.077 dB               |
|   | -36   | -0.66 dB | (51)_____        | 0.66 dB | ±0.075 dB               |
|   | -40   | -0.70 dB | (52)_____        | 0.70 dB | ±0.081 dB               |

Performance Verification Test Records  
**Agilent E7405A Performance Verification Test Record**

**Table 3-10      Agilent E7405A Performance Verification Test Record**

| <b>Agilent Technologies</b><br><br><b>Model E7405A</b> <span style="float: right;"><b>Report No.</b> _____</span><br><b>Serial No.</b> _____ <span style="float: right;"><b>Date</b> _____</span>  |         |                  |         |                         |  |
|--|---------|------------------|---------|-------------------------|--|
| Test Description   | Minimum | Results Measured | Maximum | Measurement Uncertainty |  |
| <div style="display: flex;"> <div style="width: 50px; text-align: right; padding-right: 10px;"> -44<br/>-48<br/>-52<br/>-56<br/>-60<br/>-64<br/>-68<br/>-72<br/>-76<br/>-80<br/>-84<br/>-88<br/>-92<br/>-96<br/>-98<br/><br/> Incremental Log Fidelity,<br/> Res BW ≤300 Hz<br/> dB from Ref Level </div> <div style="width: 450px;"> <div style="display: flex; justify-content: space-between; border-bottom: 1px solid black; margin-bottom: 5px;"> <span>-0.74 dB</span> <span>(53)_____</span> <span>0.74 dB</span> <span>±0.077 dB</span> </div> <div style="display: flex; justify-content: space-between; border-bottom: 1px solid black; margin-bottom: 5px;"> <span>-0.78 dB</span> <span>(54)_____</span> <span>0.78 dB</span> <span>±0.076 dB</span> </div> <div style="display: flex; justify-content: space-between; border-bottom: 1px solid black; margin-bottom: 5px;"> <span>-0.82 dB</span> <span>(55)_____</span> <span>0.82 dB</span> <span>±0.080 dB</span> </div> <div style="display: flex; justify-content: space-between; border-bottom: 1px solid black; margin-bottom: 5px;"> <span>-0.86 dB</span> <span>(56)_____</span> <span>0.86 dB</span> <span>±0.078 dB</span> </div> <div style="display: flex; justify-content: space-between; border-bottom: 1px solid black; margin-bottom: 5px;"> <span>-0.90 dB</span> <span>(57)_____</span> <span>0.90 dB</span> <span>±0.084 dB</span> </div> <div style="display: flex; justify-content: space-between; border-bottom: 1px solid black; margin-bottom: 5px;"> <span>-0.94 dB</span> <span>(58)_____</span> <span>0.94 dB</span> <span>±0.081 dB</span> </div> <div style="display: flex; justify-content: space-between; border-bottom: 1px solid black; margin-bottom: 5px;"> <span>-0.98 dB</span> <span>(59)_____</span> <span>0.98 dB</span> <span>±0.080 dB</span> </div> <div style="display: flex; justify-content: space-between; border-bottom: 1px solid black; margin-bottom: 5px;"> <span>-1.02 dB</span> <span>(60)_____</span> <span>1.02 dB</span> <span>±0.084 dB</span> </div> <div style="display: flex; justify-content: space-between; border-bottom: 1px solid black; margin-bottom: 5px;"> <span>-1.06 dB</span> <span>(61)_____</span> <span>1.06 dB</span> <span>±0.083 dB</span> </div> <div style="display: flex; justify-content: space-between; border-bottom: 1px solid black; margin-bottom: 5px;"> <span>-1.10 dB</span> <span>(62)_____</span> <span>1.10 dB</span> <span>±0.089 dB</span> </div> <div style="display: flex; justify-content: space-between; border-bottom: 1px solid black; margin-bottom: 5px;"> <span>-1.14 dB</span> <span>(63)_____</span> <span>1.14 dB</span> <span>±0.086 dB</span> </div> <div style="display: flex; justify-content: space-between; border-bottom: 1px solid black; margin-bottom: 5px;"> <span>-1.18 dB</span> <span>(64)_____</span> <span>1.18 dB</span> <span>±0.085 dB</span> </div> <div style="display: flex; justify-content: space-between; border-bottom: 1px solid black; margin-bottom: 5px;"> <span>-1.22 dB</span> <span>(65)_____</span> <span>1.22 dB</span> <span>±0.100 dB</span> </div> <div style="display: flex; justify-content: space-between; border-bottom: 1px solid black; margin-bottom: 5px;"> <span>-1.26 dB</span> <span>(66)_____</span> <span>1.26 dB</span> <span>±0.099 dB</span> </div> <div style="display: flex; justify-content: space-between; border-bottom: 1px solid black; margin-bottom: 5px;"> <span>-1.28 dB</span> <span>(67)_____</span> <span>1.28 dB</span> <span>±0.098 dB</span> </div> <div style="display: flex; justify-content: space-between; border-bottom: 1px solid black; margin-bottom: 5px;"> <span>-0.4 dB</span> <span>(68)_____</span> <span>0.4 dB</span> <span>±0.082 dB</span> </div> <div style="display: flex; justify-content: space-between; border-bottom: 1px solid black; margin-bottom: 5px;"> <span>-0.4 dB</span> <span>(69)_____</span> <span>0.4 dB</span> <span>±0.078 dB</span> </div> <div style="display: flex; justify-content: space-between; border-bottom: 1px solid black; margin-bottom: 5px;"> <span>-0.4 dB</span> <span>(70)_____</span> <span>0.4 dB</span> <span>±0.075 dB</span> </div> <div style="display: flex; justify-content: space-between; border-bottom: 1px solid black; margin-bottom: 5px;"> <span>-0.4 dB</span> <span>(71)_____</span> <span>0.4 dB</span> <span>±0.073 dB</span> </div> <div style="display: flex; justify-content: space-between; border-bottom: 1px solid black; margin-bottom: 5px;"> <span>-0.4 dB</span> <span>(72)_____</span> <span>0.4 dB</span> <span>±0.078 dB</span> </div> <div style="display: flex; justify-content: space-between; border-bottom: 1px solid black; margin-bottom: 5px;"> <span>-0.4 dB</span> <span>(73)_____</span> <span>0.4 dB</span> <span>±0.074 dB</span> </div> <div style="display: flex; justify-content: space-between; border-bottom: 1px solid black; margin-bottom: 5px;"> <span>-0.4 dB</span> <span>(74)_____</span> <span>0.4 dB</span> <span>±0.073 dB</span> </div> <div style="display: flex; justify-content: space-between; border-bottom: 1px solid black;"> <span>-0.4 dB</span> <span>(75)_____</span> <span>0.4 dB</span> <span>±0.077 dB</span> </div> </div> </div> |         |                  |         |                         |  |



**Table 3-10**

**Agilent E7405A Performance Verification Test Record**

| <b>Agilent Technologies</b> |   |                         |                  |         |                         |
|-----------------------------|---|-------------------------|------------------|---------|-------------------------|
| <b>Model E7405A</b>         |   | <b>Report No.</b> _____ |                  |         |                         |
| <b>Serial No.</b> _____     |   | <b>Date</b> _____       |                  |         |                         |
|                             | Test Description  | Minimum                 | Results Measured | Maximum | Measurement Uncertainty |
|                             | –36   | –0.4 dB                 | (76)_____        | 0.4 dB  | ±0.075 dB               |
|                             | –40   | –0.4 dB                 | (77)_____        | 0.4 dB  | ±0.081 dB               |
|                             | –44   | –0.4 dB                 | (78)_____        | 0.4 dB  | ±0.077 dB               |
|                             | –48   | –0.4 dB                 | (79)_____        | 0.4 dB  | ±0.076 dB               |
|                             | –52   | –0.4 dB                 | (80)_____        | 0.4 dB  | ±0.080 dB               |
|                             | –56   | –0.4 dB                 | (81)_____        | 0.4 dB  | ±0.078 dB               |
|                             | –60   | –0.4 dB                 | (82)_____        | 0.4 dB  | ±0.084 dB               |
|                             | –64   | –0.4 dB                 | (83)_____        | 0.4 dB  | ±0.081 dB               |
|                             | –68   | –0.4 dB                 | (84)_____        | 0.4 dB  | ±0.080 dB               |
|                             | –72   | –0.4 dB                 | (85)_____        | 0.4 dB  | ±0.084 dB               |
|                             | –76   | –0.4 dB                 | (86)_____        | 0.4 dB  | ±0.083 dB               |
|                             | –80   | –0.4 dB                 | (87)_____        | 0.4 dB  | ±0.089 dB               |
|                             | Linear Fidelity,<br>Res BW ≥1 kHz<br>dB from Ref Level  |                         |                  |         |                         |
|                             | –4  | –2.0%                   | (93)_____        | 2.0%    | ±0.064%                 |
|                             | –8  | –2.0%                   | (94)_____        | 2.0%    | ±0.064%                 |
|                             | –12   | –2.0%                   | (95)_____        | 2.0%    | ±0.064%                 |
|                             | –16   | –2.0%                   | (96)_____        | 2.0%    | ±0.064%                 |
|                             | –20   | –2.0%                   | (97)_____        | 2.0%    | ±0.063%                 |
|                             | Linear Fidelity,<br>Res BW ≤300 Hz<br>dB from Ref Level |                         |                  |         |                         |
|                             | –4  | –2.0%                   | (98)_____        | 2.0%    | ±0.064%                 |
|                             | –8  | –2.0%                   | (99)_____        | 2.0%    | ±0.064%                 |
|                             | –12   | –2.0%                   | (100)_____       | 2.0%    | ±0.064%                 |

Performance Verification Test Records  
**Agilent E7405A Performance Verification Test Record**

**Table 3-10 Agilent E7405A Performance Verification Test Record**

| <b>Agilent Technologies</b><br><b>Model E7405A</b><br><b>Serial No. _____</b><br><b>Report No. _____</b><br><b>Date _____</b> |   |            |                  |           |                         |
|---|---|------------|------------------|-----------|-------------------------|
| Test Description  |   | Minimum    | Results Measured | Maximum   | Measurement Uncertainty |
|   | -16   | -2.0%      | (101)_____       | 2.0%      | ±0.064%                 |
|   | -20   | -2.0%      | (102)_____       | 2.0%      | ±0.063%                 |
|   | Zero Span,<br>Res BW ≤300 Hz<br>dB from Ref Level |            |                  |           |                         |
|   | -4  | -0.36 dB   | (103)_____       | 0.36 dB   | ±0.082 dB               |
|   | -8  | -0.42 dB   | (104)_____       | 0.42 dB   | ±0.078 dB               |
|   | -12   | -0.48 dB   | (105)_____       | 0.48 dB   | ±0.075 dB               |
|   | -16   | -0.54 dB   | (106)_____       | 0.54 dB   | ±0.073 dB               |
|   | -20   | -0.60 dB   | (107)_____       | 0.60 dB   | ±0.078 dB               |
|   | -24   | -0.66 dB   | (108)_____       | 0.66 dB   | ±0.074 dB               |
|   | -28   | -0.72 dB   | (109)_____       | 0.72 dB   | ±0.073 dB               |
|   | -32   | -0.78 dB   | (110)_____       | 0.78 dB   | ±0.077 dB               |
|   | -36   | -0.84 dB   | (111)_____       | 0.84 dB   | ±0.075 dB               |
|   | -40   | -0.90 dB   | (112)_____       | 0.90 dB   | ±0.081 dB               |
|   | -44   | -0.96 dB   | (113)_____       | 0.96 dB   | ±0.077 dB               |
|   | -48   | -1.02 dB   | (114)_____       | 1.02 dB   | ±0.076 dB               |
|   | -52   | -1.08 dB   | (115)_____       | 1.08 dB   | ±0.080 dB               |
|   | -56   | -1.14 dB   | (116)_____       | 1.14 dB   | ±0.078 dB               |
|   | -60   | -1.20 dB   | (117)_____       | 1.20 dB   | ±0.084 dB               |
|   | -64   | -1.5 dB    | (118)_____       | 1.5 dB    | ±0.081 dB               |
|   | -68   | -1.5 dB    | (119)_____       | 1.5 dB    | ±0.080 dB               |
| -70   | -1.5 dB   | (120)_____ | 1.5 dB           | ±0.084 dB |                         |

**Table 3-10**

**Agilent E7405A Performance Verification Test Record**

| <b>Agilent Technologies</b><br><b>Model E7405A</b><br><b>Serial No. _____</b> |  |  |  |   |   | <b>Report No. _____</b><br><b>Date _____</b> |  |  |  |  |  |
|---|--|--|--|---|---|--|--|--|--|--|--|
| Test Description  |  | Minimum  | Results Measured   | Maximum   | Measurement Uncertainty   |  |  |  |  |  |  |
| <b>13.</b>  | <b>Input Attenuation Switching Uncertainty</b><br>Input Attenuation Setting<br>0 dB<br>5 dB<br>15 dB<br>20 dB<br>25 dB<br>30 dB<br>35 dB<br>40 dB<br>45 dB<br>50 dB<br>55 dB<br>60 dB<br>65 dB | -0.3 dB<br>-0.3 dB<br>-0.3 dB<br>-0.3 dB<br>-0.35 dB<br>-0.40 dB<br>-0.45 dB<br>-0.50 dB<br>-0.55 dB<br>-0.60 dB<br>-0.65 dB<br>-0.70 dB<br>-0.75 dB | (1)_____<br>(2)_____<br>(3)_____<br>(4)_____<br>(5)_____<br>(6)_____<br>(7)_____<br>(8)_____<br>(9)_____<br>(10)_____<br>(11)_____<br>(12)_____<br>(13)_____ | 0.3 dB<br>0.3 dB<br>0.3 dB<br>0.3 dB<br>0.35 dB<br>0.40 dB<br>0.45 dB<br>0.50 dB<br>0.55 dB<br>0.60 dB<br>0.65 dB<br>0.70 dB<br>0.75 dB | ±0.101 dB<br>±0.104 dB<br>±0.102 dB<br>±0.098 dB<br>±0.098 dB<br>±0.096 dB<br>±0.099 dB<br>±0.096 dB<br>±0.099 dB<br>±0.095 dB<br>±0.099 dB<br>±0.100 dB<br>±0.111 dB |  |  |  |  |  |  |
| <b>15.</b>  | <b>Reference Level Accuracy</b><br>Log, Res BW ≥1 kHz<br>Reference Level<br>-10 dBm<br>0 dBm<br>-30 dBm<br>-40 dBm<br>-50 dBm<br>-60 dBm<br>-70 dBm  | -0.3 dB<br>-0.3 dB<br>-0.3 dB<br>-0.3 dB<br>-0.5 dB<br>-0.5 dB<br>-0.5 dB  | (1)_____<br>(2)_____<br>(3)_____<br>(4)_____<br>(5)_____<br>(6)_____<br>(7)_____   | 0.3 dB<br>0.3 dB<br>0.3 dB<br>0.3 dB<br>0.5 dB<br>0.5 dB<br>0.5 dB  | ±0.091 dB<br>±0.100 dB<br>±0.092 dB<br>±0.094 dB<br>±0.095 dB<br>±0.097 dB<br>±0.099 dB   |  |  |  |  |  |  |

Performance Verification Test Records  
**Agilent E7405A Performance Verification Test Record**

**Table 3-10      Agilent E7405A Performance Verification Test Record**

| <b>Agilent Technologies</b><br><br><b>Model E7405A</b> <span style="float: right;"><b>Report No.</b> _____</span><br><b>Serial No.</b> _____ <span style="float: right;"><b>Date</b> _____</span> |         |                  |         |                         |  |
|---|---------|------------------|---------|-------------------------|--|
| Test Description  | Minimum | Results Measured | Maximum | Measurement Uncertainty |  |
| –80 dBm<br><br>Linear, Res BW ≥1 kHz<br><br>Reference Level   | –0.7 dB | (8)_____         | 0.7 dB  | ±0.101 dB               |  |
| –10 dBm<br><br>0 dBm  | –0.3 dB | (9)_____         | 0.3 dB  | ±0.091 dB               |  |
| –30 dBm<br><br>–40 dBm  | –0.3 dB | (10)_____        | 0.3 dB  | ±0.100 dB               |  |
| –50 dBm<br><br>–60 dBm  | –0.3 dB | (11)_____        | 0.3 dB  | ±0.092 dB               |  |
| –70 dBm<br><br>–80 dBm  | –0.3 dB | (12)_____        | 0.3 dB  | ±0.094 dB               |  |
| Log, Res BW ≤300 Hz<br><br>Reference Level  | –0.5 dB | (13)_____        | 0.5 dB  | ±0.095 dB               |  |
| –10 dBm<br><br>0 dBm  | –0.5 dB | (14)_____        | 0.5 dB  | ±0.097 dB               |  |
| –30 dBm<br><br>–40 dBm  | –0.5 dB | (15)_____        | 0.5 dB  | ±0.099 dB               |  |
| –50 dBm<br><br>–60 dBm  | –0.7 dB | (16)_____        | 0.7 dB  | ±0.101 dB               |  |
| –70 dBm<br><br>–80 dBm  | –0.3 dB | (17)_____        | 0.3 dB  | ±0.091 dB               |  |
| Linear, Res BW ≤300 Hz<br><br>Reference Level   | –0.3 dB | (18)_____        | 0.3 dB  | ±0.100 dB               |  |
| –10 dBm<br><br>0 dBm  | –0.3 dB | (19)_____        | 0.3 dB  | ±0.092 dB               |  |
| –30 dBm<br><br>–40 dBm  | –0.3 dB | (20)_____        | 0.3 dB  | ±0.094 dB               |  |
| –50 dBm<br><br>–60 dBm  | –0.5 dB | (21)_____        | 0.5 dB  | ±0.095 dB               |  |
| –70 dBm<br><br>–80 dBm  | –0.5 dB | (22)_____        | 0.5 dB  | ±0.097 dB               |  |
| Linear, Res BW ≤300 Hz<br><br>Reference Level   | –0.5 dB | (23)_____        | 0.5 dB  | ±0.099 dB               |  |
| –10 dBm<br><br>0 dBm  | –0.7 dB | (24)_____        | 0.7 dB  | ±0.101 dB               |  |
| –30 dBm   | –0.3 dB | (25)_____        | 0.3 dB  | ±0.091 dB               |  |
| –40 dBm   | –0.3 dB | (26)_____        | 0.3 dB  | ±0.100 dB               |  |
| –50 dBm   | –0.3 dB | (27)_____        | 0.3 dB  | ±0.092 dB               |  |

## Agilent E7405A Performance Verification Test Record

| Agilent Technologies               |   |         |                  |         |                         |
|------------------------------------|---|---------|------------------|---------|-------------------------|
| Model E7405A                       |   |         | Report No. _____ |         |                         |
| Serial No. _____                   |   |         | Date _____       |         |                         |
| Test Description                   |   | Minimum | Results Measured | Maximum | Measurement Uncertainty |
|                                    | –40 dBm   | –0.3 dB | (28)_____        | 0.3 dB  | ±0.094 dB               |
|                                    | –50 dBm   | –0.5 dB | (29)_____        | 0.5 dB  | ±0.095 dB               |
|                                    | –60 dBm   | –0.5 dB | (30)_____        | 0.5 dB  | ±0.097 dB               |
|                                    | –70 dBm   | –0.5 dB | (31)_____        | 0.5 dB  | ±0.099 dB               |
|                                    | –80 dBm   | –0.7 dB | (32)_____        | 0.7 dB  | ±0.101 dB               |
| 16.                                | <b>Resolution Bandwidth Switching Uncertainty</b> |         |                  |         |                         |
|                                    | Resolution Bandwidth                              |         |                  |         |                         |
|                                    | 3 kHz   | –0.3 dB | (1)_____         | 0.3 dB  | ±0.048 dB               |
|                                    | 9 kHz   | –0.3 dB | (2)_____         | 0.3 dB  | ±0.048 dB               |
|                                    | 10 kHz  | –0.3 dB | (3)_____         | 0.3 dB  | ±0.048 dB               |
|                                    | 30 kHz  | –0.3 dB | (4)_____         | 0.3 dB  | ±0.048 dB               |
|                                    | 100 kHz   | –0.3 dB | (5)_____         | 0.3 dB  | ±0.048 dB               |
|                                    | 120 kHz   | –0.3 dB | (6)_____         | 0.3 dB  | ±0.048 dB               |
|                                    | 300 kHz   | –0.3 dB | (7)_____         | 0.3 dB  | ±0.048 dB               |
|                                    | 1 MHz   | –0.3 dB | (8)_____         | 0.3 dB  | ±0.048 dB               |
|                                    | 3 MHz   | –0.3 dB | (9)_____         | 0.3 dB  | ±0.048 dB               |
|                                    | 5 MHz   | –0.6 dB | (10)_____        | 0.6 dB  | ±0.076 dB               |
|                                    | 300 Hz  | –0.3 dB | (11)_____        | 0.3 dB  | ±0.048 dB               |
|                                    | 200 Hz  | –0.3 dB | (12)_____        | 0.3 dB  | ±0.048 dB               |
|                                    | 100 Hz  | –0.3 dB | (13)_____        | 0.3 dB  | ±0.048 dB               |
|                                    | 30 Hz   | –0.3 dB | (14)_____        | 0.3 dB  | ±0.048 dB               |
|                                    | 10 Hz   | –0.3 dB | (15)_____        | 0.3 dB  | ±0.048 dB               |
| 3 Hz ( <i>Option 1D5 only</i> )    |   | –0.3 dB | (16)_____        | 0.3 dB  | ±0.048 dB               |
| Firmware Revision A.08.00 or later |   |         |                  |         |                         |

Performance Verification Test Records  
**Agilent E7405A Performance Verification Test Record**

**Table 3-10      Agilent E7405A Performance Verification Test Record**

| <b>Agilent Technologies</b><br><br><div style="display: flex; justify-content: space-between;"> <div> <b>Model E7405A</b><br/><br/> <b>Serial No.</b> _____         </div> <div> <b>Report No.</b> _____<br/><br/> <b>Date</b> _____         </div> </div>   |  |   |  |  |  |
|--|--|---|--|--|--|
| Test Description   | Minimum  | Results Measured  | Maximum  | Measurement Uncertainty  |  |
| 1Hz ( <i>Option 1D5 only</i> )<br>Firmware Revision A.08.00 or later   | −0.3 dB  | (17)_____   | 0.3 dB   | ±0.048 dB  |  |
| <b>18. Absolute Amplitude Accuracy (Reference Settings)</b><br><br><div style="padding-left: 20px;">           Log, Preamp Off<br/>           Lin, Preamp Off<br/>           Log, Preamp On<br/>           Lin, Preamp On         </div>   | −0.34 dB<br>−0.34 dB<br>−0.37 dB<br>−0.37 dB   | (1)_____<br>(2)_____<br>(3)_____<br>(4)_____  | 0.34 dB<br>0.34 dB<br>0.37 dB<br>0.37 dB   | ±0.09 dB<br>±0.09 dB<br>±0.09 dB<br>±0.09 dB   |  |
| <b>20. Overall Absolute Amplitude Accuracy</b><br>0 dBm Reference Level<br><br><div style="padding-left: 20px;">           0 dBm input<br/>           −10 dBm input<br/>           −20 dBm input<br/>           −30 dBm input<br/>           −40 dBm input<br/>           −50 dBm input         </div> −20 dBm Reference Level<br><br><div style="padding-left: 20px;">           −20 dBm input<br/>           −30 dBm input<br/>           −40 dBm input<br/>           −50 dBm input         </div> −40 dBm Reference Level<br><br><div style="padding-left: 20px;">           −40 dBm input<br/>           −50 dBm input         </div> | −0.54 dB<br>−0.54 dB<br>−0.54 dB<br>−0.54 dB<br>−0.54 dB<br>−0.54 dB<br><br>−0.54 dB<br>−0.54 dB<br>−0.54 dB<br>−0.54 dB<br><br>−0.54 dB<br>−0.54 dB | (1)_____<br>(2)_____<br>(3)_____<br>(4)_____<br>(5)_____<br>(6)_____<br><br>(7)_____<br>(8)_____<br>(9)_____<br>(10)_____<br><br>(11)_____<br>(12)_____ | 0.54 dB<br>0.54 dB<br>0.54 dB<br>0.54 dB<br>0.54 dB<br>0.54 dB<br><br>0.54 dB<br>0.54 dB<br>0.54 dB<br>0.54 dB<br><br>0.54 dB<br>0.54 dB | ±0.234 dB<br>±0.115 dB<br>±0.110 dB<br>±0.109 dB<br>±0.109 dB<br>±0.109 dB<br><br>±0.109 dB<br>±0.109 dB<br>±0.109 dB<br>±0.109 dB<br><br>±0.087 dB<br>±0.087 dB |  |

## Agilent E7405A Performance Verification Test Record

| Agilent Technologies |  |  |   |   |   |
|----------------------|--|--|---|---|---|
| Model E7405A         |  |  | Report No. _____  |   |   |
| Serial No. _____     |  |  | Date _____  |   |   |
| Test Description     |  | Minimum  | Results Measured  | Maximum   | Measurement Uncertainty   |
|                      | -50 dBm Reference Level<br>-50 dBm input   | -0.54 dB   | (13)_____   | 0.54 dB   | ±0.087 dB   |
| <b>21.</b>           | <b>Resolution Bandwidth Accuracy</b><br><br>Resolution Bandwidth<br>5 MHz<br>3 MHz<br>1 MHz (-3 dB)<br>300 kHz<br>100 kHz<br>30 kHz<br>10 kHz<br>3 kHz<br>1 kHz<br>120 kHz<br>9 kHz<br>1 MHz (-6 dB) | <br><br><br>3.5 MHz<br>2.55 MHz<br>0.85 MHz<br>255 kHz<br>85 kHz<br>25.5 kHz<br>8.5 kHz<br>2.55 kHz<br>850 Hz<br>96 kHz<br>7.2 kHz<br>900 kHz  | <br><br><br>(1)_____<br>(2)_____<br>(3)_____<br>(4)_____<br>(5)_____<br>(6)_____<br>(7)_____<br>(8)_____<br>(9)_____<br>(10)_____<br>(11)_____<br>(12)_____ | <br><br><br>6.5 MHz<br>3.45 MHz<br>1.15 MHz<br>345 kHz<br>115 kHz<br>34.5 kHz<br>11.5 kHz<br>3.45 kHz<br>1.15 kHz<br>144 kHz<br>10.8 kHz<br>1.1 MHz | <br><br><br>±110 kHz<br>±66 kHz<br>±22 kHz<br>±6.6 kHz<br>±2.2 kHz<br>±660 Hz<br>±220 Hz<br>±66 Hz<br>±22 Hz<br>±2.17 kHz<br>±163 Hz<br>±22 kHz |
| <b>24.</b>           | <b>Frequency Response</b><br><br>20 to 30° C<br>Non-Option UKB<br>dc Coupled<br>Band 0<br>(9 kHz to 3.0 GHz)<br><br>Maximum Response<br>Minimum Response<br>Peak-to-Peak Response                    | Note: Enter data in the appropriate section below depending upon the ambient temperature at which the test was performed and installed options.<br><br><hr/> <div style="display: flex; justify-content: space-between;"> <span>-0.46 dB</span> <span>(1)_____</span> <span>0.46 dB</span> <span>±0.19 dB</span> </div> <div style="display: flex; justify-content: space-between;"> <span></span> <span>(2)_____</span> <span></span> <span>±0.19 dB</span> </div> <div style="display: flex; justify-content: space-between;"> <span></span> <span>(3)_____</span> <span>0.92 dB</span> <span>±0.19 dB</span> </div> |   |   |   |

Performance Verification Test Records  
**Agilent E7405A Performance Verification Test Record**

**Table 3-10      Agilent E7405A Performance Verification Test Record**

| <b>Agilent Technologies</b><br><br><b>Model E7405A</b> <span style="float: right;"><b>Report No.</b> _____</span><br><b>Serial No.</b> _____ <span style="float: right;"><b>Date</b> _____</span> |          |                  |         |                         |  |
|---|----------|------------------|---------|-------------------------|--|
| Test Description  | Minimum  | Results Measured | Maximum | Measurement Uncertainty |  |
| Option UKB<br>dc Coupled<br>Band 0<br>(100 Hz to 3.0 GHz)   |          |                  |         |                         |  |
| Maximum Response  |          | (1) _____        | 0.5 dB  | ±0.19 dB                |  |
| Minimum Response  | −0.5 dB  | (2) _____        |         | ±0.19 dB                |  |
| Peak-to-Peak Response   |          | (3) _____        | 1.0 dB  | ±0.19 dB                |  |
| Non-Option UKB<br>dc Coupled<br>Band 0A<br>(800 MHz to 1.0 GHz)   |          |                  |         |                         |  |
| Maximum Response  |          | (4) _____        | 0.46 dB | ±0.11 dB                |  |
| Minimum Response  | −0.46 dB | (5) _____        |         | ±0.11 dB                |  |
| Peak-to-Peak Response   |          | (6) _____        | 0.92 dB | ±0.11 dB                |  |
| Non-Option UKB<br>dc Coupled<br>Band 0B<br>(1.7 GHz to 2.0 GHz)   |          |                  |         |                         |  |
| Maximum Response  |          | (7) _____        | 0.46 dB | ±0.11 dB                |  |
| Minimum Response  | −0.46 dB | (8) _____        |         | ±0.11 dB                |  |
| Peak-to-Peak Response   |          | (9) _____        | 0.92 dB | ±0.11 dB                |  |
| dc Coupled<br>Band 1<br>(3.0 GHz to 6.7 GHz)  |          |                  |         |                         |  |
| Maximum Response  |          | (10) _____       | 1.5 dB  | ±0.39 dB                |  |
| Minimum Response  | −1.5 dB  | (11) _____       |         | ±0.39 dB                |  |
| Peak-to-Peak Response   |          | (12) _____       | 2.6 dB  | ±0.39 dB                |  |



**Table 3-10 Agilent E7405A Performance Verification Test Record**

| <b>Agilent Technologies</b><br><br><b>Model E7405A</b> <span style="float: right;"><b>Report No.</b> _____</span><br><b>Serial No.</b> _____ <span style="float: right;"><b>Date</b> _____</span> |         |                  |         |                         |  |
|---|---------|------------------|---------|-------------------------|--|
| Test Description  | Minimum | Results Measured | Maximum | Measurement Uncertainty |  |
| dc Coupled<br>Band 2<br>(6.7 GHz to 13.2 GHz)   |         |                  |         |                         |  |
| Maximum Response  |         | (13)_____        | 2.0 dB  | ±0.40 dB                |  |
| Minimum Response  | –2.0 dB | (14)_____        |         | ±0.40 dB                |  |
| Peak-to-Peak Response   |         | (15)_____        | 3.6 dB  | ±0.40 dB                |  |
| dc Coupled<br>Band 3<br>(13.2 GHz to 26.5 GHz)  |         |                  |         |                         |  |
| Maximum Response  |         | (16)_____        | 2.0 dB  | ±0.59 dB                |  |
| Minimum Response  | –2.0 dB | (17)_____        |         | ±0.59 dB                |  |
| Peak-to-Peak Response   |         | (18)_____        | 3.6 dB  | ±0.59 dB                |  |
| Option UKB<br>ac Coupled<br>Band 0<br>(10 MHz to 3.0 GHz)   |         |                  |         |                         |  |
| Maximum Response  |         | (19)_____        | 0.5 dB  | ±0.11 dB                |  |
| Minimum Response  | –0.5 dB | (20)_____        |         | ±0.11 dB                |  |
| Peak-to-Peak Response   |         | (21)_____        | 1.0 dB  | ±0.11 dB                |  |
| Option UKB<br>ac Coupled<br>Band 0A<br>(800 MHz to 1.0 GHz)   |         |                  |         |                         |  |
| Maximum Response  |         | (22)_____        | 0.5 dB  | ±0.11 dB                |  |
| Minimum Response  | –0.5 dB | (23)_____        |         | ±0.11 dB                |  |
| Peak-to-Peak Response   |         | (24)_____        | 1.0 dB  | ±0.11 dB                |  |

Performance Verification Test Records  
**Agilent E7405A Performance Verification Test Record**

**Table 3-10      Agilent E7405A Performance Verification Test Record**

| <b>Agilent Technologies</b>                                 |         |                         |         |                         |  |
|---|---------|-------------------------|---------|-------------------------|--|
| <b>Model E7405A</b>   |         | <b>Report No. _____</b> |         |                         |  |
| <b>Serial No. _____</b>                                     |         | <b>Date _____</b>       |         |                         |  |
| Test Description  | Minimum | Results Measured        | Maximum | Measurement Uncertainty |  |
| Option UKB<br>ac Coupled<br>Band 0B<br>(1.7 GHz to 2.0 GHz) |         |                         |         |                         |  |
| Maximum Response  |         | (25)_____               | 0.5 dB  | ±0.11 dB                |  |
| Minimum Response  | −0.5 dB | (26)_____               |         | ±0.11 dB                |  |
| Peak-to-Peak Response                                       |         | (27)_____               | 1.0 dB  | ±0.11 dB                |  |
| ac Coupled<br>Band 1<br>(3.0 GHz to 6.7 GHz)                |         |                         |         |                         |  |
| Maximum Response  |         | (28)_____               | 1.5 dB  | ±0.39 dB                |  |
| Minimum Response  | −1.5 dB | (29)_____               |         | ±0.39 dB                |  |
| Peak-to-Peak Response                                       |         | (30)_____               | 2.6 dB  | ±0.39 dB                |  |
| ac Coupled<br>Band 2<br>(6.7 GHz to 13.2 GHz)               |         |                         |         |                         |  |
| Maximum Response  |         | (31)_____               | 2.0 dB  | ±0.40 dB                |  |
| Minimum Response  | −2.0 dB | (32)_____               |         | ±0.40 dB                |  |
| Peak-to-Peak Response                                       |         | (33)_____               | 3.6 dB  | ±0.40 dB                |  |
| ac Coupled<br>Band 3<br>(13.2 GHz to 26.5 GHz)              |         |                         |         |                         |  |
| Maximum Response  |         | (34)_____               | 2.0 dB  | ±0.59 dB                |  |
| Minimum Response  | −2.0 dB | (35)_____               |         | ±0.59 dB                |  |
| Peak-to-Peak Response                                       |         | (36)_____               | 3.6 dB  | ±0.59 dB                |  |

**Table 3-10**

**Agilent E7405A Performance Verification Test Record**

| <b>Agilent Technologies</b> |  |                         |                  |         |                         |
|-----------------------------|--|-------------------------|------------------|---------|-------------------------|
| <b>Model E7405A</b>         |  | <b>Report No.</b> _____ |                  |         |                         |
| <b>Serial No.</b> _____     |  | <b>Date</b> _____       |                  |         |                         |
|                             | Test Description   | Minimum                 | Results Measured | Maximum | Measurement Uncertainty |
|                             | 0 to 55° C<br><br>Non-Option UKB<br>dc Coupled<br>Band 0<br>(9 kHz to 3.0 GHz) |                         |                  |         |                         |
|                             | Maximum Response   |                         | (1)_____         | 0.76 dB | ±0.19 dB                |
|                             | Minimum Response   | −0.76 dB                | (2)_____         |         | ±0.19 dB                |
|                             | Peak-to-Peak Response  |                         | (3)_____         | 1.52 dB | ±0.19 dB                |
|                             | Option UKB<br>dc Coupled<br>Band 0<br>(100 Hz to 3.0 GHz)                      |                         |                  |         |                         |
|                             | Maximum Response   |                         | (1)_____         | 1.0 dB  | ±0.19 dB                |
|                             | Minimum Response   | −1.0 dB                 | (2)_____         |         | ±0.19 dB                |
|                             | Peak-to-Peak Response  |                         | (3)_____         | 2.0 dB  | ±0.19 dB                |
|                             | Non-Option UKB<br>dc Coupled<br>Band 0A<br>(800 MHz to 1.0 GHz)                |                         |                  |         |                         |
|                             | Maximum Response   |                         | (4)_____         | 0.76 dB | ±0.11 dB                |
|                             | Minimum Response   | −0.76 dB                | (5)_____         |         | ±0.11 dB                |
|                             | Peak-to-Peak Response  |                         | (6)_____         | 1.52 dB | ±0.11 dB                |
|                             | Non-Option UKB<br>dc Coupled<br>Band 0B<br>(1.7 GHz to 2.0 GHz)                |                         |                  |         |                         |
|                             | Maximum Response   |                         | (7)_____         | 0.76 dB | ±0.11 dB                |
|                             | Minimum Response   | −0.76 dB                | (8)_____         |         | ±0.11 dB                |

Performance Verification Test Records  
**Agilent E7405A Performance Verification Test Record**

**Table 3-10      Agilent E7405A Performance Verification Test Record**

| <b>Agilent Technologies</b><br><b>Model E7405A</b> <span style="float: right;"><b>Report No.</b> _____</span><br><b>Serial No.</b> _____ <span style="float: right;"><b>Date</b> _____</span> |         |                  |         |                         |  |
|---|---------|------------------|---------|-------------------------|--|
| Test Description  | Minimum | Results Measured | Maximum | Measurement Uncertainty |  |
| Peak-to-Peak Response   |         | (9)_____         | 1.52 dB | ±0.11 dB                |  |
| dc Coupled<br>Band 1<br>(3.0 GHz to 6.7 GHz)  |         |                  |         |                         |  |
| Maximum Response  |         | (10)_____        | 2.5 dB  | ±0.39 dB                |  |
| Minimum Response  | –2.5 dB | (11)_____        |         | ±0.39 dB                |  |
| Peak-to-Peak Response   |         | (12)_____        | 3.0 dB  | ±0.39 dB                |  |
| dc Coupled<br>Band 2<br>(6.7 GHz to 13.2 GHz)   |         |                  |         |                         |  |
| Maximum Response  |         | (13)_____        | 3.0 dB  | ±0.40 dB                |  |
| Minimum Response  | –3.0 dB | (14)_____        |         | ±0.40 dB                |  |
| Peak-to-Peak Response   |         | (15)_____        | 4.0 dB  | ±0.40 dB                |  |
| dc Coupled<br>Band 3<br>(13.2 GHz to 26.5 GHz)  |         |                  |         |                         |  |
| Maximum Response  |         | (16)_____        | 3.0 dB  | ±0.59 dB                |  |
| Minimum Response  | –3.0 dB | (17)_____        |         | ±0.59 dB                |  |
| Peak-to-Peak Response   |         | (18)_____        | 4.0 dB  | ±0.59 dB                |  |
| Option UKB<br>ac Coupled<br>Band 0<br>(10 MHz to 3.0 GHz)   |         |                  |         |                         |  |
| Maximum Response  |         | (19)_____        | 1.0 dB  | ±0.11 dB                |  |
| Minimum Response  | –1.0 dB | (20)_____        |         | ±0.11 dB                |  |

**Table 3-10                      Agilent E7405A Performance Verification Test Record**

| <b>Agilent Technologies</b> |   |                         |                  |         |                         |
|-----------------------------|---|-------------------------|------------------|---------|-------------------------|
| <b>Model E7405A</b>         |   | <b>Report No.</b> _____ |                  |         |                         |
| <b>Serial No.</b> _____     |   | <b>Date</b> _____       |                  |         |                         |
|                             | Test Description  | Minimum                 | Results Measured | Maximum | Measurement Uncertainty |
|                             | Peak-to-Peak Response                                       |                         | (21)_____        | 2.0 dB  | ±0.11 dB                |
|                             | Option UKB<br>ac Coupled<br>Band 0A<br>(800 MHz to 1.0 GHz) |                         |                  |         |                         |
|                             | Maximum Response  |                         | (22)_____        | 1.0 dB  | ±0.11 dB                |
|                             | Minimum Response  | –1.0 dB                 | (23)_____        |         | ±0.11 dB                |
|                             | Peak-to-Peak Response                                       |                         | (24)_____        | 2.0 dB  | ±0.11 dB                |
|                             | Option UKB<br>ac Coupled<br>Band 0B<br>(1.7 GHz to 2.0 GHz) |                         |                  |         |                         |
|                             | Maximum Response  |                         | (25)_____        | 1.0 dB  | ±0.11 dB                |
|                             | Minimum Response  | –1.0 dB                 | (26)_____        |         | ±0.11 dB                |
|                             | Peak-to-Peak Response                                       |                         | (27)_____        | 2.0 dB  | ±0.11 dB                |
|                             | ac Coupled<br>Band 1<br>(3.0 GHz to 6.7 GHz)                |                         |                  |         |                         |
|                             | Maximum Response  |                         | (28)_____        | 2.5 dB  | ±0.39 dB                |
|                             | Minimum Response  | –2.5 dB                 | (29)_____        |         | ±0.39 dB                |
|                             | Peak-to-Peak Response                                       |                         | (30)_____        | 3.0 dB  | ±0.39 dB                |
|                             | ac Coupled<br>Band 2<br>(6.7 GHz to 13.2 GHz)               |                         |                  |         |                         |
|                             | Maximum Response  |                         | (31)_____        | 3.0 dB  | ±0.40 dB                |
|                             | Minimum Response  | –3.0 dB                 | (32)_____        |         | ±0.40 dB                |

Performance Verification Test Records  
**Agilent E7405A Performance Verification Test Record**

**Table 3-10      Agilent E7405A Performance Verification Test Record**

| <b>Agilent Technologies</b><br><br><div style="display: flex; justify-content: space-between;"> <div> <b>Model E7405A</b><br/><br/> <b>Serial No.</b> _____         </div> <div> <b>Report No.</b> _____<br/><br/> <b>Date</b> _____         </div> </div> |   |                  |         |                         |  |
|--|---|------------------|---------|-------------------------|--|
| Test Description   | Minimum   | Results Measured | Maximum | Measurement Uncertainty |  |
| Peak-to-Peak Response  |   | (33)_____        | 4.0 dB  | ±0.40 dB                |  |
| ac Coupled<br>Band 3<br>(13.2 GHz to 26.5 GHz)   |   |                  |         |                         |  |
| Maximum Response   |   | (34)_____        | 3.0 dB  | ±0.59 dB                |  |
| Minimum Response   | –3.0 dB   | (35)_____        |         | ±0.59 dB                |  |
| Peak-to-Peak Response  |   | (36)_____        | 4.0 dB  | ±0.59 dB                |  |
| <b>27. Frequency Response (Preamp On)</b>  | Note: Enter data in the appropriate section below depending upon the ambient temperature at which the test was performed and installed options. |                  |         |                         |  |
| 20 to 30° C  |   |                  |         |                         |  |
| Non-Option UKB<br>dc Coupled<br>Band 0<br>(1 MHz to 3.0 GHz)   |   |                  |         |                         |  |
| Maximum Response   |   | (1)_____         | 1.5 dB  | ±0.28 dB                |  |
| Minimum Response   | –1.5 dB   | (2)_____         |         | ±0.28 dB                |  |
| Peak-to-Peak Response  |   | (3)_____         | 3.0 dB  | ±0.28 dB                |  |
| Non-Option UKB<br>dc Coupled<br>Band 0A<br>(800 MHz to 1.0 GHz)  |   |                  |         |                         |  |
| Maximum Response   |   | (4)_____         | 1.5 dB  | ±0.28 dB                |  |
| Minimum Response   | –1.5 dB   | (5)_____         |         | ±0.28 dB                |  |
| Peak-to-Peak Response  |   | (6)_____         | 3.0 dB  | ±0.28 dB                |  |
| Non-Option UKB<br>dc Coupled<br>Band 0B<br>(1.7 GHz to 2.0 GHz)  |   |                  |         |                         |  |

**Table 3-10**

**Agilent E7405A Performance Verification Test Record**

| <b>Agilent Technologies</b> |   |                         |                  |         |                         |
|-----------------------------|---|-------------------------|------------------|---------|-------------------------|
| <b>Model E7405A</b>         |   | <b>Report No.</b> _____ |                  |         |                         |
| <b>Serial No.</b> _____     |   | <b>Date</b> _____       |                  |         |                         |
|                             | Test Description  | Minimum                 | Results Measured | Maximum | Measurement Uncertainty |
|                             | Maximum Response  |                         | (7)_____         | 1.5 dB  | ±0.28 dB                |
|                             | Minimum Response  | –1.5 dB                 | (8)_____         |         | ±0.28 dB                |
|                             | Peak-to-Peak Response                                       |                         | (9)_____         | 3.0 dB  | ±0.28 dB                |
|                             | Option UKB<br>ac Coupled<br>Band 0<br>(10 MHz to 3.0 GHz)   |                         |                  |         |                         |
|                             | Maximum Response  |                         | (10)_____        | 1.5 dB  | ±0.28 dB                |
|                             | Minimum Response  | –1.5 dB                 | (11)_____        |         | ±0.28 dB                |
|                             | Peak-to-Peak Response                                       |                         | (12)_____        | 3.0 dB  | ±0.28 dB                |
|                             | Option UKB<br>ac Coupled<br>Band 0A<br>(800 MHz to 1.0 GHz) |                         |                  |         |                         |
|                             | Maximum Response  |                         | (13)_____        | 1.5 dB  | ±0.28 dB                |
|                             | Minimum Response  | –1.5 dB                 | (14)_____        |         | ±0.28 dB                |
|                             | Peak-to-Peak Response                                       |                         | (15)_____        | 3.0 dB  | ±0.28 dB                |
|                             | Option UKB<br>ac Coupled<br>Band 0B<br>(1.7 GHz to 2.0 GHz) |                         |                  |         |                         |
|                             | Maximum Response  |                         | (16)_____        | 1.5 dB  | ±0.28 dB                |
|                             | Minimum Response  | –1.5 dB                 | (17)_____        |         | ±0.28 dB                |
|                             | Peak-to-Peak Response                                       |                         | (18)_____        | 3.0 dB  | ±0.28 dB                |

Performance Verification Test Records  
**Agilent E7405A Performance Verification Test Record**

**Table 3-10 Agilent E7405A Performance Verification Test Record**

| <b>Agilent Technologies</b><br><b>Model E7405A</b><br><b>Serial No. _____</b><br><b>Report No. _____</b><br><b>Date _____</b> |   |         |                  |         |                         |
|---|---|---------|------------------|---------|-------------------------|
| Test Description  |   | Minimum | Results Measured | Maximum | Measurement Uncertainty |
|   | 0 to 55° C  |         |                  |         |                         |
|   | Non-Option UKB<br>dc Coupled<br>Band 0<br>(1 MHz to 3.0 GHz)    |         |                  |         |                         |
|   | Maximum Response  |         | (1)_____         | 2.0 dB  | ±0.28 dB                |
|   | Minimum Response  | –2.0 dB | (2)_____         |         | ±0.28 dB                |
|   | Peak-to-Peak Response   |         | (3)_____         | 4.0 dB  | ±0.28 dB                |
|   | Non-Option UKB<br>dc Coupled<br>Band 0A<br>(800 MHz to 1.0 GHz) |         |                  |         |                         |
|   | Maximum Response  |         | (4)_____         | 2.0 dB  | ±0.28 dB                |
|   | Minimum Response  | –2.0 dB | (5)_____         |         | ±0.28 dB                |
|   | Peak-to-Peak Response   |         | (6)_____         | 4.0 dB  | ±0.28 dB                |
|   | Non-Option UKB<br>dc Coupled<br>Band 0B<br>(1.7 GHz to 2.0 GHz) |         |                  |         |                         |
|   | Maximum Response  |         | (7)_____         | 2.0 dB  | ±0.28 dB                |
|   | Minimum Response  | –2.0 dB | (8)_____         |         | ±0.28 dB                |
|   | Peak-to-Peak Response   |         | (9)_____         | 4.0 dB  | ±0.28 dB                |
|   | Option UKB<br>ac Coupled<br>Band 0<br>(10 MHz to 3.0 GHz)       |         |                  |         |                         |
|   | Maximum Response  |         | (10)_____        | 2.0 dB  | ±0.28 dB                |



**Table 3-10**

**Agilent E7405A Performance Verification Test Record**

| <b>Agilent Technologies</b><br><br><b>Model E7405A</b> <span style="float: right;"><b>Report No.</b> _____</span><br><b>Serial No.</b> _____ <span style="float: right;"><b>Date</b> _____</span> |   |  |                  |          |                         |  |
|---|---|--|------------------|----------|-------------------------|--|
| Test Description  |   | Minimum  | Results Measured | Maximum  | Measurement Uncertainty |  |
|   | Minimum Response  | −2.0 dB  | (11)_____        | 4.0 dB   | ±0.28 dB                |  |
|   | Peak-to-Peak Response                                       |  | (12)_____        |          | ±0.28 dB                |  |
|   | Option UKB<br>ac Coupled<br>Band 0A<br>(800 MHz to 1.0 GHz) |  |                  |          |                         |  |
|   | Maximum Response  | −2.0 dB  | (13)_____        | 2.0 dB   | ±0.28 dB                |  |
|   | Minimum Response  |  | (14)_____        | ±0.28 dB |                         |  |
|   | Peak-to-Peak Response                                       |  | (15)_____        | 4.0 dB   | ±0.28 dB                |  |
|   | Option UKB<br>ac Coupled<br>Band 0B<br>(1.7 GHz to 2.0 GHz) |  |                  |          |                         |  |
|   | Maximum Response  | −2.0 dB  | (16)_____        | 2.0 dB   | ±0.28 dB                |  |
|   | Minimum Response  |  | (17)_____        | ±0.28 dB |                         |  |
|   | Peak-to-Peak Response                                       |  | (18)_____        | 4.0 dB   | ±0.28 dB                |  |
|   | <b>29.</b>  | <b>Other Input-Related Spurious Responses</b><br><br>Center Freq Input Freq<br><br>2.0 GHz 2042.8 MHz<br>2.0 GHz 2642.8 MHz<br>2.0 GHz 1820.8 MHz<br>2.0 GHz 278.5 MHz<br>2.0 GHz 5600.0 MHz<br>2.0 GHz 6242.8 MHz<br>4.0 GHz 4042.8 MHz |                  |          |                         |  |
|   |   | (1)_____   | −65 dBc          | ±.891 dB |                         |  |
|   | (2)_____  | −65 dBc  | ±.891 dB         |          |                         |  |
|   | (3)_____  | −65 dBc  | ±.891 dB         |          |                         |  |
|   | (4)_____  | −65 dBc  | ±.891 dB         |          |                         |  |
|   | (5)_____  | −80 dBc  | ±.891 dB         |          |                         |  |
|   | (6)_____  | −80 dBc  | ±.891 dB         |          |                         |  |
|   | (7)_____  | −65 dBc  | ±.891 dB         |          |                         |  |

Performance Verification Test Records  
**Agilent E7405A Performance Verification Test Record**

**Table 3-10 Agilent E7405A Performance Verification Test Record**

| <b>Agilent Technologies</b><br><b>Model E7405A</b><br><b>Serial No. _____</b><br><b>Report No. _____</b><br><b>Date _____</b> |          |                  |         |                         |  |
|---|----------|------------------|---------|-------------------------|--|
| Test Description  | Minimum  | Results Measured | Maximum | Measurement Uncertainty |  |
| 4.0 GHz 4642.8 MHz  |          | (8)_____         | -65 dBc | ±.891 dB                |  |
| 4.0 GHz 3742.9 MHz  |          | (9)_____         | -65 dBc | ±.891 dB                |  |
| 4.0 GHz 2242.8 MHz  |          | (10)_____        | -80 dBc | ±.891 dB                |  |
| 9.0 GHz 9042.8 MHz  |          | (11)_____        | -65 dBc | ±.891 dB                |  |
| 9.0 GHz 9642.8 MHz  |          | (12)_____        | -65 dBc | ±.891 dB                |  |
| 9.0 GHz 9342.8 MHz  |          | (13)_____        | -65 dBc | ±.891 dB                |  |
| 9.0 GHz 4982.1 MHz  |          | (14)_____        | -80 dBc | ±.891 dB                |  |
| 15.0 GHz 15042.8 MHz  |          | (15)_____        | -65 dBc | ±.891 dB                |  |
| 15.0 GHz 15642.8 MHz  |          | (16)_____        | -65 dBc | ±.891 dB                |  |
| 15.0 GHz 18830.35 MHz   |          | (17)_____        | -65 dBc | ±.891 dB                |  |
| 15.0 GHz 4151.75 MHz  |          | (18)_____        | -80 dBc | ±.891 dB                |  |
| 21.0 GHz 21042.8 MHz  |          | (19)_____        | -65 dBc | ±.971 dB                |  |
| 21.0 GHz 21642.8 MHz  |          | (20)_____        | -65 dBc | ±.971 dB                |  |
| 21.0 GHz 21342.8 MHz  |          | (21)_____        | -65 dBc | ±.971 dB                |  |
| 21.0 GHz 5008.95 MHz  |          | (22)_____        | -80 dBc | ±.971 dB                |  |
| <b>32. Spurious Responses</b>   |          |                  |         |                         |  |
| 300 MHz TOI,<br>1 kHz RBW   | 12.5 dBm | (1)_____         |         | ±0.93 dB                |  |
| 300 MHz TOI, 30 Hz RBW  | 12.5 dBm | (2)_____         |         | ±0.93 dB                |  |
| 5 GHz TOI   | 11 dBm   | (3)_____         |         | ±0.93 dB                |  |
| 8 GHz TOI   | 7.5 dBm  | (4)_____         |         | ±0.93 dB                |  |
| 300 MHz SHI   | 35 dBm   | (5)_____         |         | ±0.41 dB                |  |
| 900 MHz SHI   | 45 dBm   | (6)_____         |         | ±0.41 dB                |  |
| 1.55 GHz SHI  | 75 dBm   | (7)_____         |         | ±0.41 dB                |  |
| 3.1 GHz SHI   | 90 dBm   | (8)_____         |         | ±0.41 dB                |  |
| <b>34. Gain Compression</b>   |          |                  |         |                         |  |

**Table 3-10**

**Agilent E7405A Performance Verification Test Record**

| <b>Agilent Technologies</b><br><br><b>Model E7405A</b> <span style="float: right;"><b>Report No.</b> _____</span><br><b>Serial No.</b> _____ <span style="float: right;"><b>Date</b> _____</span> |  |   |                  |          |                         |
|---|--|---|------------------|----------|-------------------------|
| Test Description  |  | Minimum   | Results Measured | Maximum  | Measurement Uncertainty |
|   | Test Frequency   |   |                  |          |                         |
|   | 53 MHz   |   | (1)_____         | 1.0 dB   | ±0.123 dB               |
|   | 50.004 MHz   |   | (2)_____         | 1.0 dB   | ±0.123 dB               |
|   | 1403 MHz   |   | (3)_____         | 1.0 dB   | ±0.123 dB               |
|   | 2503 MHz   |   | (4)_____         | 1.0 dB   | ±0.123 dB               |
|   | 4403 MHz   |   | (5)_____         | 1.0 dB   | ±0.123 dB               |
|   | 7603 MHz   |   | (6)_____         | 1.0 dB   | ±0.123 dB               |
|   | 14003 MHz  |   | (7)_____         | 1.0 dB   | ±0.123 dB               |
| <b>38.</b>  | <b>Displayed Average Noise Level</b><br><br>1 kHz RBW, Preamp Off<br>10 MHz to 1 GHz<br>1 GHz to 2 GHz<br>2 GHz to 3 GHz<br>3 GHz to 6 GHz<br>6 GHz to 12 GHz<br>12 GHz to 22 GHz<br>22 GHz to 26.5 GHz<br><br>1kHz RBW, Preamp On,<br>0 to 55° C<br>10 MHz to 1 GHz<br>1 GHz to 2 GHz<br>2 GHz to 3 GHz<br><br>10 Hz RBW, Preamp Off<br>10 MHz to 1 GHz<br>1 GHz to 2 GHz | Note: Enter results with preamp on in the appropriate section based upon the ambient temperature when the test was performed. |                  |          |                         |
|   |  |   |                  |          |                         |
|   |  |   | (1)_____         | -116 dBm | ±1.23 dB                |
|   |  |   | (2)_____         | -116 dBm | ±1.23 dB                |
|   |  |   | (3)_____         | -112 dBm | ±1.23 dB                |
|   |  |   | (4)_____         | -112 dBm | ±1.23 dB                |
|   |  |   | (5)_____         | -111 dBm | ±1.23 dB                |
|   |  |   | (6)_____         | -107 dBm | ±1.23 dB                |
|   |  |   | (7)_____         | -106 dBm | ±1.23 dB                |
|   |  |   | (8)_____         | -131 dBm | ±1.23 dB                |
|   |  |   | (9)_____         | -131 dBm | ±1.23 dB                |
|   |  |   | (10)_____        | -133 dBm | ±1.23 dB                |
|   |  |   | (11)_____        | -135 dBm | ±1.23 dB                |
|   |  |   | (12)_____        | -135 dBm | ±1.23 dB                |

Performance Verification Test Records  
**Agilent E7405A Performance Verification Test Record**

**Table 3-10      Agilent E7405A Performance Verification Test Record**

| <b>Agilent Technologies</b><br><div style="display: flex; justify-content: space-between; margin-top: 10px;"> <div> <b>Model E7405A</b><br/> <b>Serial No.</b> _____         </div> <div> <b>Report No.</b> _____<br/> <b>Date</b> _____         </div> </div>   |   |   |   |   |  |
|--|---|---|---|---|--|
| Test Description   | Minimum                                   | Results Measured  | Maximum   | Measurement Uncertainty   |  |
| <div style="margin-bottom: 5px;">2 GHz to 3 GHz</div> <div style="margin-bottom: 5px;">3 GHz to 6 GHz</div> <div style="margin-bottom: 5px;">6 GHz to 12 GHz</div> <div style="margin-bottom: 5px;">12 GHz to 22 GHz</div> <div style="margin-bottom: 5px;">22 GHz to 26.5 GHz</div> <div style="margin-bottom: 5px;">10 Hz RBW, Preamp On,<br/>0 to 55° C</div> <div style="margin-bottom: 5px;">10 MHz to 1 GHz</div> <div style="margin-bottom: 5px;">1 GHz to 2 GHz</div> <div style="margin-bottom: 5px;">2 GHz to 3 GHz</div> <div style="margin-bottom: 5px;">1kHz RBW, Preamp On,<br/>20 to 30° C</div> <div style="margin-bottom: 5px;">10 MHz to 1 GHz</div> <div style="margin-bottom: 5px;">1 GHz to 2 GHz</div> <div style="margin-bottom: 5px;">2 GHz to 3 GHz</div> <div style="margin-bottom: 5px;">10 Hz RBW, Preamp On,<br/>20 to 30° C</div> <div style="margin-bottom: 5px;">10 MHz to 1 GHz</div> <div style="margin-bottom: 5px;">1 GHz to 2 GHz</div> <div style="margin-bottom: 5px;">2 GHz to 3 GHz</div> |   | <div style="margin-bottom: 5px;">(13)_____</div> <div style="margin-bottom: 5px;">(14)_____</div> <div style="margin-bottom: 5px;">(15)_____</div> <div style="margin-bottom: 5px;">(16)_____</div> <div style="margin-bottom: 5px;">(17)_____</div> <div style="margin-bottom: 5px;">(18)_____</div> <div style="margin-bottom: 5px;">(19)_____</div> <div style="margin-bottom: 5px;">(20)_____</div> <div style="margin-bottom: 5px;">(21)_____</div> <div style="margin-bottom: 5px;">(22)_____</div> <div style="margin-bottom: 5px;">(23)_____</div> <div style="margin-bottom: 5px;">(24)_____</div> <div style="margin-bottom: 5px;">(25)_____</div> <div style="margin-bottom: 5px;">(26)_____</div> | <div style="margin-bottom: 5px;">–131 dBm</div> <div style="margin-bottom: 5px;">–131 dBm</div> <div style="margin-bottom: 5px;">–130 dBm</div> <div style="margin-bottom: 5px;">–126 dBm</div> <div style="margin-bottom: 5px;">–125 dBm</div> <div style="margin-bottom: 5px;">–150 dBm</div> <div style="margin-bottom: 5px;">–150 dBm</div> <div style="margin-bottom: 5px;">–146 dBm</div> <div style="margin-bottom: 5px;">–132 dBm</div> <div style="margin-bottom: 5px;">–132 dBm</div> <div style="margin-bottom: 5px;">–130 dBm</div> <div style="margin-bottom: 5px;">–151 dBm</div> <div style="margin-bottom: 5px;">–151 dBm</div> <div style="margin-bottom: 5px;">–149 dBm</div> | <div style="margin-bottom: 5px;">±1.23 dB</div> <div style="margin-bottom: 5px;">±1.23 dB</div> <div style="margin-bottom: 5px;">±1.23 dB</div> <div style="margin-bottom: 5px;">±1.23 dB</div> <div style="margin-bottom: 5px;">±1.23 dB</div> <div style="margin-bottom: 5px;">±1.23 dB</div> <div style="margin-bottom: 5px;">±1.23 dB</div> <div style="margin-bottom: 5px;">±1.23 dB</div> <div style="margin-bottom: 5px;">±1.23 dB</div> <div style="margin-bottom: 5px;">±1.23 dB</div> <div style="margin-bottom: 5px;">±1.23 dB</div> <div style="margin-bottom: 5px;">±1.23 dB</div> <div style="margin-bottom: 5px;">±1.23 dB</div> <div style="margin-bottom: 5px;">±1.23 dB</div> |  |
| <b>39. Residual Responses</b><br><div style="margin-top: 5px;">150 kHz to 6.7 GHz</div>  |   | <div style="margin-top: 5px;">(1)_____</div>  | <div style="margin-top: 5px;">–90 dBm</div>   | <div style="margin-top: 5px;">±0.87 dB</div>  |  |
| <b>40. Fast Time Domain<br/>Amplitude Accuracy</b> ( <i>Option<br/>AYX only</i> )<br><div style="margin-top: 5px;">Amplitude Error</div>   | <div style="margin-top: 5px;">–0.3%</div> | <div style="margin-top: 5px;">(1)_____</div>  | <div style="margin-top: 5px;">0.3%</div>  | <div style="margin-top: 5px;">±0.029%</div>   |  |

**Table 3-10                      Agilent E7405A Performance Verification Test Record**

| <b>Agilent Technologies</b> |  |   |  |   |   |
|-----------------------------|--|---|--|---|---|
| <b>Model E7405A</b>         |  | <b>Report No.</b> _____   |  |   |   |
| <b>Serial No.</b> _____     |  | <b>Date</b> _____   |  |   |   |
|                             | Test Description   | Minimum   | Results Measured   | Maximum   | Measurement Uncertainty   |
| <b>42.</b>                  | <b>Tracking Generator Absolute Amplitude and Vernier Accuracy (<i>Option 1DN only</i>)</b><br><br>Absolute Amplitude Accuracy<br><br>Absolute Vernier Accuracy<br><br>-2 dB<br>-3 dB<br>-5 dB<br>-6 dB<br>-7 dB<br>-8 dB<br>-9 dB<br>-10 dB<br><br>Incremental Vernier Accuracy<br>-2 dB<br>-3 dB<br>-5 dB<br>-6 dB<br>-7 dB<br>-8 dB<br>-9 dB<br>-10 dB | -0.75 dB<br><br><br><br>-0.5 dB<br>-0.5 dB<br>-0.5 dB<br>-0.5 dB<br>-0.5 dB<br>-0.5 dB<br>-0.5 dB<br>-0.5 dB<br>-0.5 dB<br><br>-0.2 dB<br>-0.2 dB<br>-0.2 dB<br>-0.2 dB<br>-0.2 dB<br>-0.2 dB<br>-0.2 dB<br>-0.2 dB | (1)_____<br><br><br><br>(2)_____<br>(3)_____<br>(4)_____<br>(5)_____<br>(6)_____<br>(7)_____<br>(8)_____<br>(9)_____<br><br>(10)_____<br>(11)_____<br>(12)_____<br>(13)_____<br>(14)_____<br>(15)_____<br>(16)_____<br>(17)_____ | 0.75 dB<br><br><br><br>0.5 dB<br>0.5 dB<br>0.5 dB<br>0.5 dB<br>0.5 dB<br>0.5 dB<br>0.5 dB<br>0.5 dB<br><br>0.2 dB<br>0.2 dB<br>0.2 dB<br>0.2 dB<br>0.2 dB<br>0.2 dB<br>0.2 dB<br>0.2 dB | ±0.096 dB<br><br><br><br>±0.008 dB<br>±0.008 dB<br>±0.008 dB<br>±0.008 dB<br>±0.008 dB<br>±0.008 dB<br>±0.008 dB<br>±0.008 dB<br><br>±0.008 dB<br>±0.008 dB<br>±0.008 dB<br>±0.008 dB<br>±0.008 dB<br>±0.008 dB<br>±0.008 dB<br>±0.008 dB |
| <b>43.</b>                  | <b>Tracking Generator Output Level Flatness (<i>Option 1DN only</i>)</b>   |   |  |   |   |

Performance Verification Test Records  
**Agilent E7405A Performance Verification Test Record**

**Table 3-10      Agilent E7405A Performance Verification Test Record**

| <b>Agilent Technologies</b><br><br><div style="display: flex; justify-content: space-between;"> <div> <b>Model E7405A</b><br/><br/> <b>Serial No.</b> _____         </div> <div> <b>Report No.</b> _____<br/><br/> <b>Date</b> _____         </div> </div> |   |         |  |  |  |
|--|---|---------|--|--|--|
| Test Description   |   | Minimum | Results Measured                             | Maximum                                  | Measurement Uncertainty                  |
|  | Positive Level Flatness, <1 MHz   |         | (1)_____                                     | 3.0 dB                                   | ±0.284 dB                                |
|  | Negative Level Flatness, <1 MHz   | -3.0 dB | (2)_____                                     |  | ±0.284 dB                                |
|  | Positive Level Flatness, 1 MHz to 10 MHz  |         | (3)_____                                     | 3.0 dB                                   | ±0.142 dB                                |
|  | Negative Level Flatness, 1 MHz to 10 MHz  | -3.0 dB | (4)_____                                     |  | ±0.142 dB                                |
|  | Positive Level Flatness, >10 MHz to 1.5 GHz   |         | (5)_____                                     | 2.0 dB                                   | ±0.142 dB                                |
|  | Negative Level Flatness, >10 MHz to 1.5 GHz   | -2.0 dB | (6)_____                                     |  | ±0.142 dB                                |
|  | Positive Level Flatness, >1.5 GHz   |         | (7)_____                                     | 2.0 dB                                   | ±0.142 dB                                |
|  | Negative Level Flatness, >1.5 GHz   | -2.0 dB | (8)_____                                     |  | ±0.142 dB                                |
| <b>46.</b>   | <b>Tracking Generator Harmonic Spurious Outputs</b><br><i>(Option 1DN only)</i><br><br>2 <sup>nd</sup> Harmonic, <20 kHz<br><br>2 <sup>nd</sup> Harmonic, ≥20 kHz<br><br>3 <sup>rd</sup> Harmonic, <20 kHz<br><br>3 <sup>rd</sup> Harmonic, ≥20 kHz |         | (1)_____<br>(2)_____<br>(3)_____<br>(4)_____ | -15 dBc<br>-25 dBc<br>-15 dBc<br>-25 dBc | ±2.6 dB<br>±2.6 dB<br>±2.6 dB<br>±2.6 dB |
| <b>48.</b>   | <b>Tracking Generator Non-Harmonic Spurious Outputs</b> <i>(Option 1DN only)</i><br><br>Highest Non-Harmonic Spurious Output Amplitude, 9 kHz to 2 GHz  |         | (1)_____                                     | -27 dBc                                  | ±2.63 dB                                 |

Table 3-10

Agilent E7405A Performance Verification Test Record

| <b>Agilent Technologies</b><br><b>Model E7405A</b><br><b>Serial No.</b> _____ <b>Report No.</b> _____<br><b>Date</b> _____                                     |  |  |  |  |  |
|--|--|--|--|--|--|
| Test Description   | Minimum                                      | Results Measured                             | Maximum                                      | Measurement Uncertainty                  |  |
| Highest Non-Harmonic Spurious Output Amplitude, 2 GHz to 3 GHz   |  | (2)_____                                     | −23 dBc                                      | ±3.14 dB                                 |  |
| <b>49. Tracking Generator L.O. Feedthrough</b> ( <i>Option 1DN only</i> )<br>9 kHz to 2.9 GHz<br>2.9 GHz to 3.0 GHz  |  | (1)_____<br>(2)_____                         | −16 dBm<br>−16 dBm                           | ±2.58 dB<br>±3.03 dB                     |  |
| <b>50. Gate Delay and Gate Length Accuracy</b> ( <i>Option 1D6 only</i> )<br>Minimum Gate Delay<br>Maximum Gate Delay<br>1 μs Gate Length<br>65 ms Gate Length | 499.9 ns<br>499.9 ns<br>499.9 ns<br>64.993ms | (1)_____<br>(2)_____<br>(3)_____<br>(4)_____ | 1.5001μs<br>1.5001μs<br>1.5001μs<br>65.007ms | ±549 ps<br>±549 ps<br>±520 ps<br>±647 ns |  |
| <b>51. Gate Mode Additional Amplitude Error</b> ( <i>Option 1D6 only</i> )<br>Amplitude Error  | −0.2 dB                                      | (1)_____                                     | 0.2 dB                                       | ±0.023 dB                                |  |





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## **4**

# **If You Have a Problem**

This chapter includes information on how to check for a problem with your Agilent EMC Series Analyzer, and how to return it for service. It also includes descriptions of the types of built-in messages.

## What You'll Find in This Chapter

This chapter includes information on how to check for a problem with your Agilent EMC Series Analyzer, and how to return it for service. It also includes descriptions of all of the analyzer built-in messages.

Your analyzer is built to provide dependable service. However, if you experience a problem, desire additional information, or wish to order parts, options, or accessories, Agilent Technologies' worldwide sales and service organization is ready to provide the support you need.

In general, a problem can be caused by a hardware failure, a software error, or a user error. Follow these general steps to determine the cause and to resolve the problem.

1. Perform the quick checks listed in [“Check the Basics”](#) in this chapter. It is possible that a quick check may eliminate your problem altogether.
2. If the problem is a hardware problem, you have several options:
  - Return the analyzer to Agilent Technologies for repair; if the analyzer is still under warranty or is covered by an Agilent Technologies maintenance contract, it will be repaired under the terms of the warranty or plan (the warranty is at the front of this manual).
  - If the analyzer is no longer under warranty or is not covered by an Agilent Technologies maintenance plan, Agilent Technologies will notify you of the cost of the repair after examining the instrument. See [“How to Call Agilent Technologies”](#) and [“How to Return Your Analyzer for Service”](#) for more information.

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### WARNING

**No operator serviceable parts inside the analyzer. Refer servicing to qualified personnel. To prevent electrical shock do not remove covers.**

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## Before You Call Agilent Technologies

### Check the Basics

A problem can often be resolved by repeating the procedure you were following when the problem occurred. Before calling Agilent Technologies or returning the analyzer for service, please make the following checks:

- ☐ Check the line fuse.
- ☐ Is there power at the receptacle?
- ☐ Is the analyzer turned on? Make sure the fan is running, which indicates that the power supply is on.
- ☐ If the display is dark or dim, press the upper **Viewing Angle** key in the upper-left corner of the front panel. If the display is too bright, adjust the lower **Viewing Angle** key in the upper-left corner of the front panel.
- ☐ If other equipment, cables, and connectors are being used with your Agilent EMC Series Analyzer, make sure they are connected properly and operating correctly.
- ☐ Review the procedure for the measurement being performed when the problem appeared. Are all the settings correct?
- ☐ If the analyzer is not functioning as expected, return the analyzer to a known state by pressing the **Preset** key.

Some analyzer settings are not affected by a Preset. If you wish to reset the analyzer configuration to the state it was in when it was originally sent from the factory, press **System, Power On/Preset, Factory Preset** (if it is displayed).

- ☐ Is the measurement being performed, and the results that are expected, within the specifications and capabilities of the analyzer? Refer to the “Specifications and Characteristics” chapters in the Specifications Guide.
- ☐ In order to meet specifications, the analyzer must be aligned. Either Auto Align All must be selected (press **System, Alignments, Auto Align, All**), or the analyzer must be manually aligned at least once per hour, or whenever the temperature changes more than 3° C. When **Auto Align, All** is selected, AA appears on the left edge of the display.
- ☐ If the necessary test equipment is available, perform the tests listed in [Chapter 1, “Calibrating,”](#) for your instrument. Record all results on the appropriate form in [Chapter 3, “Performance Verification Test Records,”](#) which follows the performance verification tests chapter.
- ☐ If the equipment to perform the performance verification tests is not available, you may still be able to perform the functional checks in the *Agilent EMC Series Analyzers User’s Guide*.

## Read the Warranty

The warranty for your analyzer is at the front of this manual. Please read it and become familiar with its terms.

If your analyzer is covered by a separate maintenance agreement, please be familiar with its terms.

## Service Options

Agilent Technologies offers several optional maintenance plans to service your analyzer after the warranty has expired. Call your Agilent Technologies sales and service office for full details.

## How to Call Agilent Technologies

Agilent Technologies has sales and service offices around the world to provide you with complete support for your analyzer. To obtain servicing information or to order replacement parts, contact the nearest Agilent Technologies sales and service office listed in [Table 4-1](#). In any correspondence or telephone conversations, refer to your analyzer by its product number, full serial number, and firmware revision. (Press **System**, **More 1 of 3**, **Show System**, and the product number, serial number, and firmware revision information will be displayed on your analyzer screen.) A serial number label is also attached to the rear panel of the analyzer.

**Table 4-1                      Agilent Technologies Sales and Service Offices**

| UNITED STATES   |   |   |
|---|---|---|
| Instrument Support Center<br>Agilent Technologies, Inc.<br>(800) 403-0801   |   |   |
| EUROPEAN FIELD OPERATIONS   |   |   |
| Headquarters<br>Agilent Technologies S.A.<br>150, Route du Nant-d'Avril<br>1217 Meyrin 2/ Geneva<br>Switzerland<br>(41 22) 780.8111   | France<br>Agilent Technologies France<br>1 Avenue Du Canada<br>Zone D'Activite De Courtaboeuf<br>F-91947 Les Ulis Cedex<br>France<br>(33 1) 69 82 60 60 | Germany<br>Agilent Technologies GmbH Agilent<br>Technologies Strasse<br>61352 Bad Homburg v.d.H<br>Germany<br>(49 6172) 16-0                                |
| Great Britain<br>Agilent Technologies Ltd.<br>Eskdale Road, Winnersh Triangle<br>Wokingham, Berkshire RG41 5DZ<br>England<br>(44 118) 9696622   |   |   |
| INTERCON FIELD OPERATIONS   |   |   |
| Headquarters<br>Agilent Technologies, Inc.<br>3495 Deer Creek Rd.<br>Palo Alto, CA 94304-1316<br>USA<br>(415) 857-5027  | Australia<br>Agilent Technologies<br>Australia Ltd.<br>31-41 Joseph Street<br>Blackburn, Victoria 3130<br>(61 3) 895-2895                               | Canada<br>Agilent Technologies<br>(Canada) Ltd.<br>17500 South Service Road<br>Trans-Canada Highway<br>Kirkland, Quebec H9J 2X8<br>Canada<br>(514) 697-4232 |
| Japan<br>Agilent Technologies Japan, Ltd.<br>Measurement Assistance Center<br>9-1, Takakura-Cho, Hachioji-Shi,<br>Tokyo 192-8510, Japan<br>TEL (81) -426-56-7832<br>FAX (81) -426-56-7840 | Singapore<br>Agilent Technologies Singapore<br>(Pte.) Ltd.<br>150 Beach Road<br>#29-00 Gateway West<br>Singapore 0718<br>(65) 291-9088                  | Taiwan<br>Agilent Technologies Taiwan<br>8th Floor, H-P Building<br>337 Fu Hsing North Road<br>Taipei, Taiwan<br>(886 2) 712-0404                           |
| China<br>China Agilent Technologies, Inc.<br>38 Bei San Huan X1 Road<br>Shuang Yu Shu<br>Hai Dian District<br>Beijing, China<br>(86 1) 256-6888   |   |   |

## How to Return Your Analyzer for Service

### Service Tag

If you are returning your analyzer to Agilent Technologies for servicing, fill in and attach a blue service tag. Several service tags are supplied at the rear of this chapter. Please be as specific as possible about the nature of the problem. If you have recorded any error messages that appeared on the display, or have completed a Performance Test Record, or have any other specific data on the performance of your analyzer, please send a copy of this information with your return.

### Original Packaging

Before shipping, pack the unit in the original factory packaging materials if they are available. If the original materials were not retained, see [“Other Packaging”](#).

---

|             |  |
|-------------|--|
| <b>NOTE</b> | Ensure that the instrument handle is in the rear-facing position in order to reduce the possibility of damage during shipping. Refer to <a href="#">Figure 4-1</a> . |
|-------------|--|

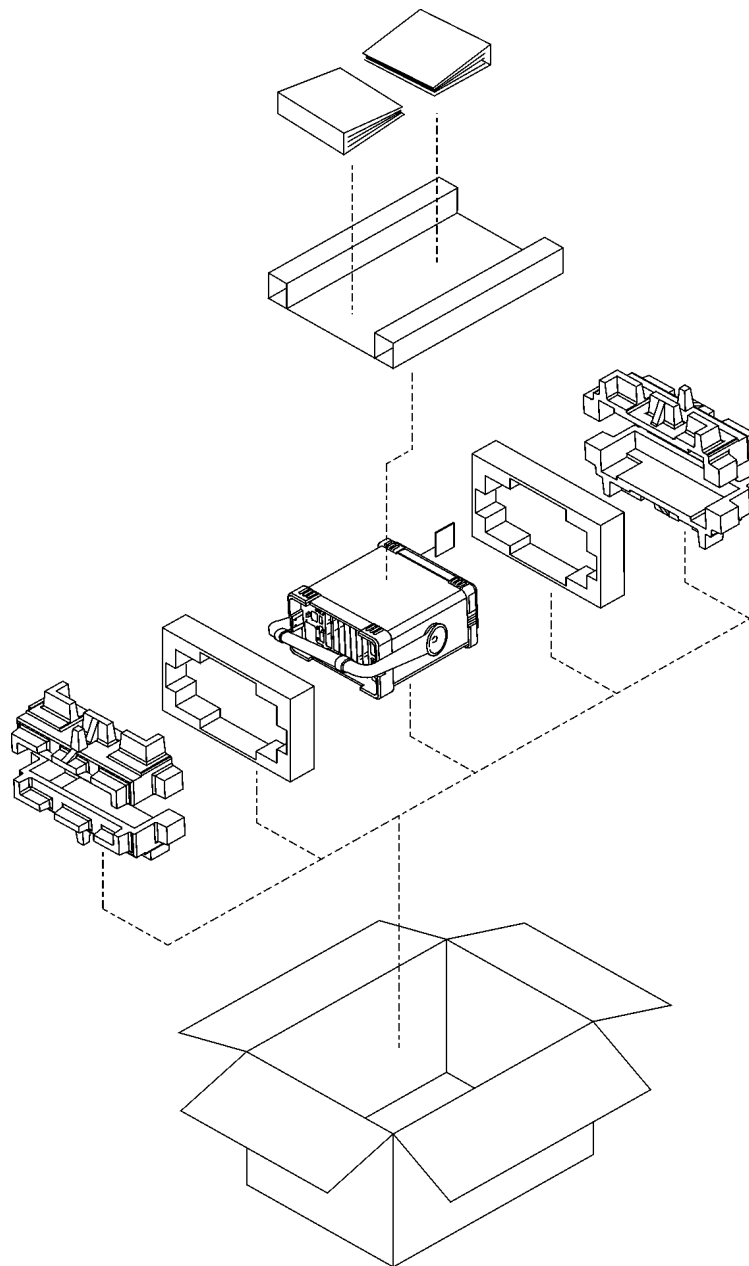
---

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|             |   |
|-------------|---|
| <b>NOTE</b> | Install the transportation disk into the floppy drive to reduce the possibility of damage during shipping. If the original transportation disk is not available, a blank floppy may be substituted. |
|-------------|---|

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**Figure 4-1**



formt122

## Other Packaging

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**CAUTION**

Analyzer damage can result from using packaging materials other than those specified. Never use styrene pellets in any shape as packaging materials. They do not adequately cushion the equipment or prevent it from shifting in the carton. They cause equipment damage by generating static electricity and by lodging in the analyzer louvers, blocking airflow.

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You can repack the instrument with commercially available materials, as follows:

1. Attach a completed service tag to the instrument.
2. Install the transportation disk or a blank floppy disk into the disk drive.
3. If you have a front-panel cover, install it on the instrument. If you do not have a front panel cover, make sure the instrument handle is in the forward-facing position to protect the control panel.
4. Wrap the instrument in antistatic plastic to reduce the possibility of damage caused by electrostatic discharge.
5. Use a strong shipping container. A double-walled, corrugated cardboard carton with 159 kg (350 lb) bursting strength is adequate. The carton must be both large enough and strong enough to accommodate the analyzer. Allow at least 3 to 4 inches on all sides of the analyzer for packing material.
6. Surround the equipment with three to four inches of packing material and prevent the equipment from moving in the carton. If packing foam is not available, the best alternative is S.D.-240 Air Cap™ from Sealed Air Corporation (Hayward, California, 94545). Air Cap looks like a plastic sheet filled with 1-1/4 inch air bubbles. Use the pink-colored Air Cap to reduce static electricity. Wrapping the equipment several times in this material should both protect the equipment and prevent it from moving in the carton.
7. Seal the shipping container securely with strong nylon adhesive tape.
8. Mark the shipping container “FRAGILE, HANDLE WITH CARE” to assure careful handling.
9. Retain copies of all shipping papers.