

Test and Measurement Division

Manual

EMI Test Software for the EMI Test Receiver ESIB 7/26/40 GHz

ESIB-K1

1108.0188.02



Dear Customer,

throughout this operating manual, the abbreviation ESIB-K1 is used for the EMI test software. The abbreviation ESI is used for your EMI Test Receiver ESIB7/26/40. These abbreviations are also used as internal names in the software and on the display.

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1

Contents

1.1	Overv	ew	1-
	1.1.1	Introduction to the Manual	1.
	112	Short Description	1.
	1.1.2	1.1.2.1 Graphical User Interface	1-
		1.1.2.2 Operating Modes of the Software	1-
		1.1.2.3 Measuring and Analyzing Functions	1-
		1.1.2.4 Graphics and Report	1-
1.2	Install	ation	1-
	1.2.1	System Requirements	1-
	1.2.2	Components of the Software	1-
	1.2.3	Installation Instructions	1-
		1.2.3.1 Manuals on the CD-ROM	1-
		1.2.3.2 ESI-K1 on the Controller Function of the EMI Analyzer ESI	1·
		1.2.3.3 Preparation for Installation	1-
		1.2.3.4 Starting the Installation	1-
		1.2.3.5 Installation Options	-1 1
		1.2.3.6 De-Installation of ESI-KT Software	- ۱ -1
1.3	Introd	iction to Operation	
	131	Starting Software FSI-K1 under Windows NT 4.0	1-1
	132	Direct Device Control	
	133	Familiarization with the Measurements	
	1.0.0	1.3.3.1 Starting a Preconfigured Scan Table	1-1
1.4	Introd	uction to Operation - Measurement Examples	1-2
	1.4.1	Description of Some Terms	1-2
	1.4.2	Performance of Measurements	1-2
		1.4.2.1 Selection of Measurement Sequence Control	1-2
		1.4.2.2 Operating Software ESI-K1 under Windows NT on ESI	1-2
	1.4.3	Measuring the RFI Voltage in the Frequency Range up to 30 MHz (example)	1-2
		1.4.3.1 Introduction	1-2
		1.4.3.2 Measurement Procedure	1-2
		1.4.3.3 Progamming the Measurement with Software ESI-K1	1-2
	1.4.4	Measuring the RFI Field Strength in the Frequency Range	
		trom 30 MHz (example)	1-4
		1 / / 1 Introduction	
		1.4.4.1 Introduction	1-4

Gra	phical	User Interface	2-0
2.1	Overvi	iew	2-1
2.2	Files		2-2
2.3	Filetyp	Des	2-6
	2.3.1	Script	2-6
	2.3.2	Script Parameters	2-6
	2.3.3	Measurement Result	2-6
	2.3.4	Limit Line	2-6
	2.3.5	Transducer and System Transducer	2-7
	2.3.6	Graphics Configuration	2-7
	2.3.7	Report Header	2-7
	2.3.8	Report Configuration	2-7
	2.3.9	Scan/Sweep Table	2-7
	2.3.10	Frequency List	2-8
	2.3.11	Test Configuration	2-8
	2.3.12	Text File	2-8
2.4	Editors	S	2-9
	2.4.1	Script Parameter Editor	2-9
	2.4.2	Table Editor	2-10
	2.4.3	Graphics Configuration Editor	2-13
	2.4.4	Report Header Editor	2-17
	2.4.5	Report Configuration Editor	2-18
	2.4.6	Scan/Sweep Editor	2-19
	2.4.7	Test Configuration Editor	2-21
	2.4.8	Text Editor	2-22
2.5	Report	t	2-23
	2.5.1	Print	2-23
	2.5.2	Printer Setup	2-24
2.6	Specia	al Functions	2-25
2.0	261	O_{uit} (Alt-F4)	2-25
o 7	0	G M	0.00
2.7	Option		2-26
	2.7.1	Main Toolbar, Device Toolbar and Status Bar	2-26
	2.7.2	Background	2-20 2-26
	2.7.3	Change Language	2-20
2.8	Measu	rement Functions	2-27
	2.8.1	Interactive Device Dialog	2-27
	2.8.2	Script	2-27
	2.8.3	Measurement Functions	2-28
		2.8.3.1 Scan and Sweep Functions with Automatically Generated Graphic 2.8.3.2 Single Measurement	s 2-28 2-30
2.9	Evalua	ation Functions	2-32
-	2.9.1	Acceptance Analysis	2-33
	2.9.2	Peak Reduction	2-34
	2.9.3	Subrange Maxima Reduction	2-35
	2.9.4	Maxima Reduction	2-36
	2.9.5	Merge Data	2-36
	2.9.6	S-LINE Correlation	2-37

3	Sta	ndard Scripts	3-0
	3.1	Voltage Mains Test	3-6
		3.1.1 Description	3-6
		3.1.2 Parameter Sets	3-6
		3.1.3 List of the Script Parameters	
	3.2	Power Test	3-14
		3.2.1 Description	3-14
		3.2.2 Parameter Sets	
		3.2.3 List of the Script Parameters	
	3.3	Field Strength Test	
		3.3.1 Description	
		3.3.2 Parameter Sets	
		3.3.3 List of the Script Parameters	
	3.4	Magnetic Field Strength Test	
		3.4.1 Description	
		3.4.2 Parameter Sets	
	3.5	Overview Test	
		3.5.1 Description	
	3.6	Semi Interactive Test	
		3.6.1 Description	
		3.6.2 List of the Script Parameters	
	3.7	Cable Calibration	
		3.7.1 Description	
		3.7.2 List of the Script Parameters	
	3.8	S-LINE Test	3-57
		3.8.1 Description	
		3.8.2 Parameter Sets	
4	Dev	/ice Driver ESI	4-0
	4.1	Overview	
	10	Interactive Mode	A_2
	4.2	4.2.1 Single Measurement	4-2
		4.2.2 Sweep Mode	
	43	System Mode	4-4
	7.5	4.3.1 Scan, Sweep and Single Measurement	4-4 4-4
		4.3.2 Dependencies	
5	Sta	ndard Device Drivers	5-0
	5.1	V Networks ESH2-Z5 / ENV 4200 and ES-H3-Z5	5-1



Before putting the product into operation for the first time, make sure to read the following



Safety Instructions

Rohde & Schwarz makes every effort to keep the safety standard of its products up to date and to offer its customers the highest possible degree of safety. Our products and the auxiliary equipment required for them are designed and tested in accordance with the relevant safety standards. Compliance with these standards is continuously monitored by our quality assurance system. This product has been designed and tested in accordance with the EC Certificate of Conformity and has left the manufacturer's plant in a condition fully complying with safety standards. To maintain this condition and to ensure safe operation, observe all instructions and warnings provided in this manual. If you have any questions regarding these safety instructions, Rohde & Schwarz will be happy to answer them.

Furthermore, it is your responsibility to use the product in an appropriate manner. This product is designed for use solely in industrial and laboratory environments or in the field and must not be used in any way that may cause personal injury or property damage. You are responsible if the product is used for an intention other than its designated purpose or in disregard of the manufacturer's instructions. The manufacturer shall assume no responsibility for such use of the product.

The product is used for its designated purpose if it is used in accordance with its operating manual and within its performance limits (see data sheet, documentation, the following safety instructions). Using the products requires technical skills and knowledge of English. It is therefore essential that the products be used exclusively by skilled and specialized staff or thoroughly trained personnel with the required skills. If personal safety gear is required for using Rohde & Schwarz products, this will be indicated at the appropriate place in the product documentation.

	18 kg						
Observe operating instructions	Weight indication for units >18 kg	Danger of electric shock	Warning! Hot surface	PE terminal	Ground	Ground terminal	Attention! Electrostatic sensitive devices

Symbols and safety labels

10	Û		\sim	2	
Supply voltage ON/OFF	Standby indication	Direct current (DC)	Alternating current (AC)	Direct/alternating current (DC/AC)	Device fully protected by double/reinforced insulation

Safety Instructions

Observing the safety instructions will help prevent personal injury or damage of any kind caused by dangerous situations. Therefore, carefully read through and adhere to the following safety instructions before putting the product into operation. It is also absolutely essential to observe the additional safety instructions on personal safety that appear in other parts of the documentation. In these safety instructions, the word "product" refers to all merchandise sold and distributed by Rohde & Schwarz, including instruments, systems and all accessories.

Tags and their meaning

- DANGER This tag indicates a safety hazard with a high potential of risk for the user that can result in death or serious injuries.
- WARNING This tag indicates a safety hazard with a medium potential of risk for the user that can result in death or serious injuries.
- CAUTION This tag indicates a safety hazard with a low potential of risk for the user that can result in slight or minor injuries.
- ATTENTION This tag indicates the possibility of incorrect use that can cause damage to the product.
- NOTE This tag indicates a situation where the user should pay special attention to operating the product but which does not lead to damage.

These tags are in accordance with the standard definition for civil applications in the European Economic Area. Definitions that deviate from the standard definition may also exist. It is therefore essential to make sure that the tags described here are always used only in connection with the associated documentation and the associated product. The use of tags in connection with unassociated products or unassociated documentation can result in misinterpretations and thus contribute to personal injury or material damage.

Basic safety instructions

- 1. The product may be operated only under the operating conditions and in the positions specified by the manufacturer. Its ventilation must not be obstructed during operation. Unless otherwise specified, the following requirements apply to Rohde & Schwarz products: prescribed operating position is always with the housing floor facing down, IP protection 2X, pollution severity 2, overvoltage category 2, use only in enclosed spaces, max. operation altitude max. 2000 m. Unless specified otherwise in the data sheet, a tolerance of ±10% shall apply to the nominal voltage and of ±5% to the nominal frequency.
- 2. Applicable local or national safety regulations and rules for the prevention of accidents must be observed in all work performed. The product may be opened only by authorized, specially trained personnel. Prior to performing any work on the product or opening the product, the

product must be disconnected from the supply network. Any adjustments, replacements of parts, maintenance or repair must be carried out only by technical personnel authorized by Rohde & Schwarz. Only original parts may be used for replacing parts relevant to safety (e.g. power switches, power transformers, fuses). A safety test must always be performed after parts relevant to safety have been replaced (visual inspection, PE conductor test, insulation resistance measurement, leakage current measurement, functional test).

3. As with all industrially manufactured goods, the use of substances that induce an allergic reaction (allergens, e.g. nickel) such as aluminum cannot be generally excluded. If you develop an allergic reaction (such as a skin rash, frequent sneezing, red eyes or respiratory difficulties), consult a physician immediately to determine the cause.

- 4. If products/components are mechanically and/or thermically processed in a manner that goes beyond their intended use, hazardous substances (heavy-metal dust such as lead, beryllium, nickel) may be released. For this reason, the product may only be disassembled, e.g. for disposal purposes, by specially trained personnel. Improper disassembly may be hazardous to your health. National waste disposal regulations must be observed.
- 5. If handling the product yields hazardous substances or fuels that must be disposed of in a special way, e.g. coolants or engine oils that must be replenished regularly, the safety instructions of the manufacturer of the hazardous substances or fuels and the applicable regional waste disposal regulations must be observed. Also observe the relevant safety instructions in the product documentation.
- 6. Depending on the function, certain products such as RF radio equipment can produce an elevated level of electromagnetic radiation. Considering that unborn life requires increased protection, pregnant women should be protected by appropriate measures. Persons with pacemakers may also be endangered by electromagnetic radiation. The employer is required to assess workplaces where there is a special risk of exposure to radiation and, if necessary, take measures to avert the danger.
- 7. Operating the products requires special training and intense concentration. Make certain that persons who use the products are physically, mentally and emotionally fit enough to handle operating the products; otherwise injuries or material damage may occur. It is the responsibility of the employer to select suitable personnel for operating the products.
- Prior to switching on the product, it must be ensured that the nominal voltage setting on the product matches the nominal voltage of the AC supply network. If a different voltage is to be set, the power fuse of the product may have to be changed accordingly.
- 9. In the case of products of safety class I with movable power cord and connector, operation is permitted only on sockets with earthing contact and protective earth connection.

- 10. Intentionally breaking the protective earth connection either in the feed line or in the product itself is not permitted. Doing so can result in the danger of an electric shock from the product. If extension cords or connector strips are implemented, they must be checked on a regular basis to ensure that they are safe to use.
- 11. If the product has no power switch for disconnection from the AC supply, the plug of the connecting cable is regarded as the disconnecting device. In such cases, it must be ensured that the power plug is easily reachable and accessible at all times (length of connecting cable approx. 2 m). Functional or electronic switches are not suitable for providing disconnection from the AC supply. If products without power switches are integrated in racks or systems, a disconnecting device must be provided at the system level.
- 12. Never use the product if the power cable is damaged. By taking appropriate safety measures and carefully laying the power cable, ensure that the cable cannot be damaged and that no one can be hurt by e.g. tripping over the cable or suffering an electric shock.
- The product may be operated only from TN/TT supply networks fused with max. 16 A.
- 14. Do not insert the plug into sockets that are dusty or dirty. Insert the plug firmly and all the way into the socket. Otherwise this can result in sparks, fire and/or injuries.
- 15. Do not overload any sockets, extension cords or connector strips; doing so can cause fire or electric shocks.
- For measurements in circuits with voltages V_{rms} > 30 V, suitable measures (e.g. appropriate measuring equipment, fusing, current limiting, electrical separation, insulation) should be taken to avoid any hazards.
- 17. Ensure that the connections with information technology equipment comply with IEC 950/EN 60950.
- 18. Never remove the cover or part of the housing while you are operating the product. This will expose circuits and components and can lead to injuries, fire or damage to the product.

- 19. If a product is to be permanently installed, the connection between the PE terminal on site and the product's PE conductor must be made first before any other connection is made. The product may be installed and connected only by a skilled electrician.
- 20. For permanently installed equipment without built-in fuses, circuit breakers or similar protective devices, the supply circuit must be fused in such a way that suitable protection is provided for users and products.
- 21. Do not insert any objects into the openings in the housing that are not designed for this purpose. Never pour any liquids onto or into the housing. This can cause short circuits inside the product and/or electric shocks, fire or injuries.
- 22. Use suitable overvoltage protection to ensure that no overvoltage (such as that caused by a thunderstorm) can reach the product. Otherwise the operating personnel will be endangered by electric shocks.
- 23. Rohde & Schwarz products are not protected against penetration of water, unless otherwise specified (see also safety instruction 1.). If this is not taken into account, there exists the danger of electric shock or damage to the product, which can also lead to personal injury.
- 24. Never use the product under conditions in which condensation has formed or can form in or on the product, e.g. if the product was moved from a cold to a warm environment.
- 25. Do not close any slots or openings on the product, since they are necessary for ventilation and prevent the product from overheating. Do not place the product on soft surfaces such as sofas or rugs or inside a closed housing, unless this is well ventilated.
- 26. Do not place the product on heatgenerating devices such as radiators or fan heaters. The temperature of the environment must not exceed the maximum temperature specified in the data sheet.
- 27. Batteries and storage batteries must not be exposed to high temperatures or fire. Keep batteries and storage batteries away from children. If batteries or storage batteries are improperly replaced, this can cause an explosion (warning: lithium cells). Replace the battery or storage battery only with the

matching Rohde & Schwarz type (see spare parts list). Batteries and storage batteries are hazardous waste. Dispose of them only in specially marked containers. Observe local regulations regarding waste disposal. Do not short-circuit batteries or storage batteries.

- 28. Please be aware that in the event of a fire, toxic substances (gases, liquids etc.) that may be hazardous to your health may escape from the product.
- Please be aware of the weight of the product. Be careful when moving it; otherwise you may injure your back or other parts of your body.
- 30. Do not place the product on surfaces, vehicles, cabinets or tables that for reasons of weight or stability are unsuitable for this purpose. Always follow the manufacturer's installation instructions when installing the product and fastening it to objects or structures (e.g. walls and shelves).
- 31. Handles on the products are designed exclusively for personnel to hold or carry the product. It is therefore not permissible to use handles for fastening the product to or on means of transport such as cranes, fork lifts, wagons, etc. The user is responsible for securely fastening the products to or on the means of transport and for observing the safety regulations of the manufacturer of the means of transport. Noncompliance can result in personal injury or material damage.
- 32. If you use the product in a vehicle, it is the sole responsibility of the driver to drive the vehicle safely. Adequately secure the product in the vehicle to prevent injuries or other damage in the event of an accident. Never use the product in a moving vehicle if doing so could distract the driver of the vehicle. The driver is always responsible for the safety of the vehicle; the manufacturer assumes no responsibility for accidents or collisions.
- 33. If a laser product (e.g. a CD/DVD drive) is integrated in a Rohde & Schwarz product, do not use any other settings or functions than those described in the documentation. Otherwise this may be hazardous to your health, since the laser beam can cause irreversible damage to your eyes. Never try to take such products apart, and never look into the laser beam.



Por favor lea imprescindiblemente antes de la primera puesta en funcionamiento las siguientes informaciones de seguridad



Informaciones de seguridad

Es el principio de Rohde & Schwarz de tener a sus productos siempre al día con los estandards de seguridad y de ofrecer a sus clientes el máximo grado de seguridad. Nuestros productos y todos los equipos adicionales son siempre fabricados y examinados según las normas de seguridad vigentes. Nuestra sección de gestión de la seguridad de calidad controla constantemente que sean cumplidas estas normas. Este producto ha sido fabricado y examinado según el comprobante de conformidad adjunto según las normas de la CE y ha salido de nuestra planta en estado impecable según los estandards técnicos de seguridad. Para poder preservar este estado y garantizar un funcionamiento libre de peligros, deberá el usuario atenerse a todas las informaciones, informaciones de seguridad y notas de alerta. Rohde&Schwarz está siempre a su disposición en caso de que tengan preguntas referentes a estas informaciones de seguridad.

Además queda en la responsabilidad del usuario utilizar el producto en la forma debida. Este producto solamente fue elaborado para ser utilizado en la indústria y el laboratorio o para fines de campo y de ninguna manera deberá ser utilizado de modo que alguna persona/cosa pueda ser dañada. El uso del producto fuera de sus fines definidos o despreciando las informaciones de seguridad del fabricante queda en la responsabilidad del usuario. El fabricante no se hace en ninguna forma responsable de consecuencias a causa del maluso del producto.

Se parte del uso correcto del producto para los fines definidos si el producto es utilizado dentro de las instrucciones del correspondiente manual del uso y dentro del margen de rendimiento definido (ver hoja de datos, documentación, informaciones de seguridad que siguen). El uso de los productos hace necesarios conocimientos profundos y el conocimiento del idioma inglés. Por eso se deberá tener en cuenta de exclusivamente autorizar para el uso de los productos a personas péritas o debidamente minuciosamente instruidas con los conocimientos citados. Si fuera necesaria indumentaria de seguridad para el uso de productos de R&S, encontrará la información debida en la documentación del producto en el capítulo correspondiente.

Ver manua de instruccior del uso	I Informaciones para maquinaria con uns peso de > 18kg	Peligro de golpe de corriente	¡Advertencia! Superficie caliente	Conexión a conductor protector	Conexión a tierra	Conexión a masa conductora	¡Cuidado! Elementos de construción con peligro de carga electroestática

Símbolos y definiciones de seguridad

10	Û		\sim	\geq	
potencia EN MARCHA/PARADA	Indicación Stand-by	Corriente continua DC	Corriente alterna AC	Corriente continua/alterna DC/AC	El aparato está protegido en su totalidad por un aislamiento de doble refuerzo

Tener en cuenta las informaciones de seguridad sirve para tratar de evitar daños y peligros de toda clase. Es necesario de que se lean las siguientes informaciones de seguridad concienzudamente y se tengan en cuenta debidamente antes de la puesta en funcionamiento del producto. También deberán ser tenidas en cuenta las informaciones para la protección de personas que encontrarán en otro capítulo de esta documentación y que también son obligatorias de seguir. En las informaciones de seguridad actuales hemos juntado todos los objetos vendidos por Rohde&Schwarz bajo la denominación de "producto", entre ellos también aparatos, instalaciones así como toda clase de accesorios.

Palabras de señal y su significado

- PELIGRO Indica un punto de peligro con gran potencial de riesgo para el ususario.Punto de peligro que puede llevar hasta la muerte o graves heridas.
- ADVERTENCIA Indica un punto de peligro con un protencial de riesgo mediano para el usuario. Punto de peligro que puede llevar hasta la muerte o graves heridas .
- ATENCIÓN Indica un punto de peligro con un protencial de riesgo pequeño para el usuario. Punto de peligro que puede llevar hasta heridas leves o pequeñas
- CUIDADO Indica la posibilidad de utilizar mal el producto y a consecuencia dañarlo.
- INFORMACIÓN Indica una situación en la que deberían seguirse las instrucciones en el uso del producto, pero que no consecuentemente deben de llevar a un daño del mismo.

Las palabras de señal corresponden a la definición habitual para aplicaciones civiles en el ámbito de la comunidad económica europea. Pueden existir definiciones diferentes a esta definición. Por eso se debera tener en cuenta que las palabras de señal aquí descritas sean utilizadas siempre solamente en combinación con la correspondiente documentación y solamente en combinación con el producto correspondiente. La utilización de las palabras de señal en combinación con productos o documentaciones que no les correspondan puede llevar a malinterpretaciones y tener por consecuencia daños en personas u objetos.

Informaciones de seguridad elementales

- 1. El producto solamente debe ser utilizado según lo indicado por el fabricante referente a la situación y posición de funcionamiento sin que se obstruya la ventilación. Si no se convino de otra manera, es para los productos R&S válido lo que sigue: como posición de funcionamiento se define principialmente la posición con el suelo de la caja para abajo, modo de protección IP 2X, grado de suciedad 2. categoría de sobrecarga eléctrica 2, utilizar solamente en estancias interiores, utilización hasta 2000 m sobre el nivel del mar. A menos que se especifique otra cosa en la hoja de datos, se aplicará una tolerancia de ±10% sobre el voltaje nominal y de ±5%
 - P 2X, reparación deberán ser solamente efectuadas por electricistas autorizados por R&S. Si se reponen partes con importancia para los aspectos de seguridad (por ejemplo el enchufe, los transformadores o los fusibles), solamente podrán ser sustituidos a de por partes originales. Despues de cada recambio de partes elementales para la seguridad deberá ser efectuado un control de

2. En todos los trabajos deberán ser tenidas en cuenta las normas locales de seguridad de

trabajo y de prevención de accidentes. El

producto solamente debe de ser abierto por

personal périto autorizado. Antes de efectuar

trabajos en el producto o abrirlo deberá este

ser desconectado de la corriente. El ajuste.

el cambio de partes, la manutención y la

sobre la frecuencia nominal.

seguridad (control a primera vista, control de conductor protector, medición de resistencia de aislamiento, medición de medición de la corriente conductora, control de funcionamiento).

- 3. Como en todo producto de fabricación industrial no puede ser excluido en general de que se produzcan al usarlo elementos que puedan generar alergias, los llamados elementos alergénicos (por ejemplo el níquel). Si se producieran en el trato con productos R&S reacciones alérgicas, como por ejemplo urticaria, estornudos frecuentes, irritación de la conjuntiva o dificultades al respirar, se deberá consultar inmediatamente a un médico para averigurar los motivos de estas reacciones.
- 4. Si productos / elementos de construcción son tratados fuera del funcionamiento definido de forma mecánica o térmica, pueden generarse elementos peligrosos (polvos de sustancia de metales pesados como por ejemplo plomo, berilio, níquel). La partición elemental del producto, como por ejemplo sucede en el tratamiento de materias residuales, debe de ser efectuada solamente por personal especializado para estos tratamientos. La partición elemental efectuada inadecuadamente puede generar daños para la salud. Se deben tener en cuenta las directivas nacionales residuales.
- 5. En el caso de que se produjeran agentes de peligro o combustibles en la aplicación del producto que debieran de ser transferidos a un tratamiento de materias residuales, como por ejemplo agentes refrigerantes que deben ser repuestos en periodos definidos, o aceites para motores, deberan ser tenidas en cuenta las prescripciones de seguridad del fabricante de estos agentes de peligro o combustibles y las regulaciones regionales para el tratamiento de materias residuales. Cuiden también de tener en cuenta en caso dado las prescripciones de seguridad especiales en la descripción del producto.
- Ciertos productos, como por ejemplo las instalaciones de radiación HF, pueden a causa de su función natural, emitir una radiación electromagnética aumentada. En vista a la protección de la vida en desarrollo deberían ser protegidas personas embarazadas debidamente. También las personas con un bypass pueden correr

peligro a causa de la radiación electromagnética. El empresario está comprometido a valorar y señalar areas de trabajo en las que se corra un riesgo de exposición a radiaciones aumentadas de riesgo aumentado para evitar riesgos.

- La utilización de los productos requiere instrucciones especiales y una alta concentración en el manejo. Debe de ponerse por seguro de que las personas que manejen los productos estén a la altura de los requerimientos necesarios referente a sus aptitudes físicas, psíquicas y emocionales, ya que de otra manera no se pueden excluir lesiones o daños de objetos. El empresario lleva la responsabilidad de seleccionar el personal usuario apto para el manejo de los productos.
- Antes de la puesta en marcha del producto se deberá tener por seguro de que la tensión preseleccionada en el producto equivalga a la del la red de distribución. Si es necesario cambiar la preselección de la tensión también se deberán en caso dabo cambiar los fusibles correspondientes del prodcuto.
- Productos de la clase de seguridad I con alimentación móvil y enchufe individual de producto solamente deberán ser conectados para el funcionamiento a tomas de corriente de contacto de seguridad y con conductor protector conectado.
- 10. Queda prohibida toda clase de interrupción intencionada del conductor protector, tanto en la toma de corriente como en el mismo producto ya que puede tener como consecuencia el peligro de golpe de corriente por el producto. Si se utilizaran cables o enchufes de extensión se deberá poner al seguro, que es controlado su estado técnico de seguridad.
- 11. Si el producto no está equipado con un interruptor para desconectarlo de la red, se deberá considerar el enchufe del cable de distribución como interruptor. En estos casos deberá asegurar de que el enchufe sea de fácil acceso y nabejo (medida del cable de distribución aproximadamente 2 m). Los interruptores de función o electrónicos no son aptos para el corte de la red eléctrica. Si los productos sin interruptor están integrados en construciones o instalaciones, se deberá instalar el interruptor al nivel de la instalación.

- 12. No utilice nunca el producto si está dañado el cable eléctrico. Asegure a través de las medidas de protección y de instalación adecuadas de que el cable de eléctrico no pueda ser dañado o de que nadie pueda ser dañado por él, por ejemplo al tropezar o por un golpe de corriente.
- 13. Solamente está permitido el funcionamiento en redes de distribución TN/TT aseguradas con fusibles de como máximo 16 A.
- 14. Nunca conecte el enchufe en tomas de corriente sucias o llenas de polvo. Introduzca el enchufe por completo y fuertemente en la toma de corriente. Si no tiene en consideración estas indicaciones se arriesga a que se originen chispas, fuego y/o heridas.
- No sobrecargue las tomas de corriente, los cables de extensión o los enchufes de extensión ya que esto pudiera causar fuego o golpes de corriente.
- 16. En las mediciones en circuitos de corriente con una tensión de entrada de Ueff > 30 V se deberá tomar las precauciones debidas para impedir cualquier peligro (por ejemplo medios de medición adecuados, seguros, limitación de tensión, corte protector, aislamiento etc.).
- 17. En caso de conexión con aparatos de la técnica informática se deberá tener en cuenta que estos cumplan los requisitos de la EC950/EN60950.
- Nunca abra la tapa o parte de ella si el producto está en funcionamiento. Esto pone a descubierto los cables y componentes eléctricos y puede causar heridas, fuego o daños en el producto.
- Si un producto es instalado fijamente en un lugar, se deberá primero conectar el conductor protector fijo con el conductor protector del aparato antes de hacer cualquier otra conexión. La instalación y la conexión deberán ser efecutadas por un electricista especializado.

- 20. En caso de que los productos que son instalados fijamente en un lugar sean sin protector implementado, autointerruptor o similares objetos de protección, deberá la toma de corriente estar protegida de manera que los productos o los usuarios estén suficientemente protegidos.
- 21. Por favor, no introduzca ningún objeto que no esté destinado a ello en los orificios de la caja del aparato. No vierta nunca ninguna clase de líquidos sobre o en la caja. Esto puede producir corto circuitos en el producto y/o puede causar golpes de corriente, fuego o heridas.
- 22. Asegúrese con la protección adecuada de que no pueda originarse en el producto una sobrecarga por ejemplo a causa de una tormenta. Si no se verá el personal que lo utilice expuesto al peligro de un golpe de corriente.
- 23. Los productos R&S no están protegidos contra el agua si no es que exista otra indicación, ver también punto 1. Si no se tiene en cuenta esto se arriesga el peligro de golpe de corriente o de daños en el producto lo cual también puede llevar al peligro de personas.
- 24. No utilice el producto bajo condiciones en las que pueda producirse y se hayan producido líquidos de condensación en o dentro del producto como por ejemplo cuando se desplaza el producto de un lugar frío a un lugar caliente.
- 25. Por favor no cierre ninguna ranura u orificio del producto, ya que estas son necesarias para la ventilación e impiden que el producto se caliente demasiado. No pongan el producto encima de materiales blandos como por ejemplo sofás o alfombras o dentro de una caja cerrada, si esta no está suficientemente ventilada.
- 26. No ponga el producto sobre aparatos que produzcan calor, como por ejemplo radiadores o calentadores. La temperatura ambiental no debe superar la temperatura máxima especificada en la hoja de datos.

- 27. Baterías y acumuladores no deben de ser expuestos a temperaturas altas o al fuego. Guardar baterías v acumuladores fuera del alcance de los niños. Si las baterías o los acumuladores no son cambiados con la debida atención existirá peligro de explosión (atención celulas de Litio). Cambiar las baterías o los acumuladores solamente por los del tipo R&S correspondiente (ver lista de piezas de recambio). Baterías y acumuladores son deshechos problemáticos. Por favor tirenlos en los recipientes especiales para este fín. Por favor tengan en cuenta las prescripciones nacionales de cada país referente al tratamiento de deshechos. Nunca sometan las baterías o acumuladores a un corto circuito.
- Tengan en consideración de que en caso de un incendio pueden escaparse gases tóxicos del producto, que pueden causar daños a la salud.
- 29. Por favor tengan en cuenta que en caso de un incendio pueden desprenderse del producto agentes venenosos (gases, líquidos etc.) que pueden generar daños a la salud.
- 30. No sitúe el producto encima de superficies, vehículos, estantes o mesas, que por sus características de peso o de estabilidad no sean aptas para él. Siga siempre las instrucciones de instalación del fabricante cuando instale y asegure el producto en objetos o estructuras (por ejemplo paredes y estantes).

- 31. Las asas instaladas en los productos sirven solamente de ayuda para el manejo que solamente está previsto para personas. Por eso no está permitido utilizar las asas para la sujecion en o sobre medios de transporte como por ejemplo grúas, carretillas elevadoras de horquilla, carros etc. El usuario es responsable de que los productos sean sujetados de forma segura a los medios de transporte y de que las prescripciones de seguridad del fabricante de los medios de transporte sean tenidas en cuenta. En caso de que no se tengan en cuenta pueden causarse daños en personas y objetos.
- 32. Si llega a utilizar el producto dentro de un vehículo, queda en la responsabilidad absoluta del conductor que conducir el vehículo de manera segura. Asegure el producto dentro del vehículo debidamente para evitar en caso de un accidente las lesiones u otra clase de daños. No utilice nunca el producto dentro de un vehículo en movimiento si esto pudiera distraer al conductor. Siempre queda en la responsabilidad absoluta del conductor la seguridad del vehículo y el fabricante no asumirá ninguna clase de responsabilidad por accidentes o colisiones.
- 33. Dado el caso de que esté integrado un producto de laser en un producto R&S (por ejemplo CD/DVD-ROM) no utilice otras instalaciones o funciones que las descritas en la documentación. De otra manera pondrá en peligro su salud, ya que el rayo laser puede dañar irreversiblemente sus ojos. Nunca trate de descomponer estos productos. Nunca mire dentro del rayo laser.

1 Introduction

1.1 Overview

1.1.1 Introduction to the Manual

The following chapters provide a complete description of the EMI Application Software ESI-K1. Users working with the EMI Application Software ESI-K1 for the first time are recommended to read through chapters 1 to 4 one after the other.

- Chapter 1 "Introduction", provides a general overview.
- Chapter 2 "Graphical User Interface", describes the elements of the graphical user interface.
- Chapter 3 "Standard Script Description", provides information on the enclosed standard scripts.
- Chapter 4 "Device Drivers", describes the function of the Rohde & Schwarz devices ESI and Vnetworks.

1.1.2 Short Description

The Rohde&Schwarz EMI Software package ESI-K1 is an up-to-date and user-friendly software which can be ideally used for all EMI measurements of conducted and radiated interference.

The number of measurements required to ensure electromagnetic compatibility (EMV) is continuously increasing, along with the demand for reliability, reproducibility and economic efficiency of these measurements.

Features of the EMI Application Software ESI-K1:

- User-friendly software for WINDOWS[™] 3.1 / 3.11 / 95 / 98 / NT 4.0
- EMI measurements according to international **commercial standards** (CISPR, VDE, FCC, VCCI, ANSI, EN)
- Possible adaptation to other standards
- Automatic and interactive mode
- Transmission factors and limit lines are automatically considered in the calculation of the results
- Evaluation of narrowband and broadband interference
- Calibration of the test setup
- Comfortable and flexible documentation of measurement results
- Various ways of data export
- Future extensions can be easily implemented due to the option concept

1.1.2.1 Graphical User Interface

The EMI Application Software ESI-K1 for WINDOWSTM is equipped with a **graphical user interface**, which permits to start with the program immediately and can be readily operated by the user.

1.1.2.2 Operating Modes of the Software

The measurement procedures can be executed either in interactive mode or automatically, depending on the application of the software.

a) Interactive mode

In interactive mode, each device can be controlled individually by means of its own window. All other functions such as measuring and analyzing functions can also be operated interactively.

b) Automatic mode

The automatic measurement runs are implemented by scripts of a macro language, thus releasing the user from routine tasks. The scripts control the measurement run, evaluate the measurement results and produce the necessary reports for documentation of the measurement results.

1.1.2.3 Measuring and Analyzing Functions

The Software ESI-K1 supports a number of measuring and analyzing functions. This is necessary to minimize the number of measurements to be performed again, which are very time-consuming.

Possible measurements are the scan, the execution of a fast overview measurement (sweep) and the measurement performed at discrete frequencies.

The most important **ways of evaluation** (data reduction) are the acceptance analysis, peak reduction, subrange maxima reduction and maxima reduction.

Further possible evaluations are used to combine measurement results.

A very particular type of data handling is the S-LINE correlation, which permits to convert measurement results to open-area conditions using the S-LINE cell.

1.1.2.4 Graphics and Report

Measurement results, limit lines and transducer factors can be displayed in a manifold and flexible way as **table** or **graphics**. Up to eight different traces can be shown in a window with linear or logarithmic frequency axis. The shape, line style and colour of the graphical elements can be optimally adapted to the requirements of the documentation.

For interactive, graphical evaluation of the measurement results, a marker and a delta marker are available, which can be easily positioned using the mouse. The zoom function permits to enlarge any section of the measurement. The measurement results can be displayed simultaneously in various windows.

The measurement results are summed up in a report which is configured by the user himself. In addition to a report header, all data relevant to the measurement can be output, e.g. scan and sweep table. The output of the measurement results, limit lines and transducers is possible both in tabular and graphical form.

1.2 Installation

1.2.1 System Requirements

EMI Application Software ESI-K1 can be used with any computer fulfilling the following system requirements:

- Microsoft Windows[™] 3.1 / 3.11 / 95 / 98 / NT 4.0
- CPU: 486; PENTIUM recommended
- 16 Mbyte RAM (NT 4.0: 32 Mbyte)
- At least 30 Mbytes free memory on the harddisk
- SVGA graphics adapter (800x600 pixels); XVGA (1024x768 pixels) recommended
- GPIB interface compatible with National Instruments GPIB interface with Windows device driver (PCII/IIA, AT-GPIB, AT-GPIB/TNT, PCI-GPIB, PCMCIA-GPIB) for operation with an external PC; if installed on an ESI then the internal interface RSIB can be used instead

EMI Software ESI-K1 fitted with the associated drivers for GPIB interface can be used with the operating systems listed above.

The installation software automatically considers the conditions depending on the operating system.

Note: All path indications generated in the ESI-K1 have to comply with DOS conventions, i.e. meet the rule <8 characters>.<3 extension> .

1.2.2 Components of the Software

EMI Software **ESI-K1** comprise the following components:

- EMI software core under Windows[™] contains the graphics user interface, standard scripts for automated test sequences and other standard data (limit values, etc.)
- Driver for R&S EMI test receivers ESI and spectrum analyzers FSE
- Drivers for R&S artificial-mains networks ESH2-Z5, ENV4200 and ESH3-Z5
- Internal database for data management (scripts, limit-value lines, transducers, graphics, scan tables, test results, etc.)

The data of ESI-K1 internal database can be exported for transfer and filing operations, new data can be imported.

The internal database will be configured with the supplied standard data during the installation.

1.2.3 Installation Instructions

Scope of supply of EMI Software ESI-K1:

- CD-ROM (or set of four disks) for installing the software
- Operating manual (not with an update)

The EMI Software ESI-K1 is installed on the PC from the the CD-ROM (or from the set of disks). If necessary then a set of installation disks can be generated from the CD-ROM through starting the batch file 'DISKS.BAT'. Four formatted disks will be needed then.

1.2.3.1 Manuals on the CD-ROM

On the CD-ROM there's a subdirectory 'Manuals' which holds PDF files that represent the manuals. Those files can be viewed and printed with the "Acrobat Reader" from Adobe Systems Inc. It also enables to perform full text searches.

The "Acrobat Reader" is an application which is available free of charge (freeware) and also included on the CD-ROM. If that application is already installed on the PC then PDF files can be viewed without further action. In the Internet there are many documents stored as PDF files. The latest version of the "Acrobat Reader" can also be downloaded from the Internet (http://www.adobe.com).

To install the "Acrobat Reader" (version 3.0) from the CD-ROM on your computer proceed as follows (drive D: refers to the CD-ROM drive):

a) for Windows 3.1 / 3.11 :

Open the "File" menu of the Windows program manager and select "Run". Enter 'D:\AcroRd16\setup ' and follow the instructions of the installation program.

b) for Windows 95 / 98 / NT4.0 :

Go to the "Start" button and select "Run". Enter 'D:\AcroRd32\setup ' and follow the instructions of the installation program.

1.2.3.2 ESI-K1 on the Controller Function of the EMI Analyzer ESI

If the application ESI-K1 shall be installed on the controller function (Windows NT) of the EMI analyzer ESI then the following topics have to be considered:

The built-in LCD display has a resolution of 640x480 pixels (VGA), but the application requires a resolution of minimum 800x600 pixels (SVGA). Therefore the application can only be operated with an external monitor for which a higher resolution can be selected. To do so the softkey "Ext. Monitor" in the general setup of the instrument firmware has to be activated and then on the PC side (Windows NT) the property settings of the 'Display' ('Control Panel') have to be modified. Further details can be found in the ESI manual (chapter 1.7: Connecting an External Monitor).

If the application runs on the ESI then a second GPIB interface is not necessary because it can be replaced by the internal software interface "RSIB". Further details can be found in chapter 4 (Operation with the RSIB Interface).

1.2.3.3 Preparation for Installation

Prior to installation, check the GPIB configuration for correct settings (using the configuration program supplied with the GPIB card):

DMA Channel:	NONE, driver setting and interface setting should match
	(PCI / PCMCIA cards: DMA is not available)
Base I/O Address:	driver setting and interface setting must match
Interrupt Line:	driver setting and interface setting should match; may alsobe
	set to NONE since it is not used by the application
Enable Auto Serial Polling:	NO
Assert REN when System Controller	YES

All settings can be performed indepedent of the operating system using the associated configuration programs. This can be done in the 'Control Panel' under Windows 3.1 / 3.11. Under Windows 95 / 98 the configuration is to be set in the 'Control Panel' under 'System' using the 'Device Manager', under Windows NT 4.0 in the 'Control Panel'.

If the software is operated on a computer without GPIB driver, the ESI-K1 displays the error message ("Data error - Data GPIB.DLL not found."). This message can be ignored, the software runs in the demo mode in this case.

1.2.3.4 Starting the Installation

The EMI Application Software ESI-K1 has to be installed under Windows. To do this, the first installation disk is to be inserted in the corresponding drive.

The installation is performed via the taskbar under Windows 95 / 98 / NT4.0 (for Windows NT4.0 administrator access privileges are required for the installation!):

- 1. Open the **Start** menu. Select the menu item **settings** and **system control** to open the associated window.
- 2. The dialog is opened by clicking the icon **Software** and the **setup.exe** program is automatically selected from the disk by clicking the Installation key.

The installation under Windows 3.x is performed with the program manager or the file manager:

- 1. Open the **File** menu. When menu item **Execute...** is selected, a window is opened to start the setup program. All executable files are displayed in the selection window by clicking the **Search...** key and selecting the source drive (A: or the suitable drive letter).
- 2. Select the **setup.exe** file and confirm the settings with the **OK** key.
- **Note:** The installation language is in English. Prior to starting the setup program terminate all other Windows applications.

When re-installing EMI Software ESI-K1 all presettings offered in the queries and dialogs of the installation program can be accepted with **Next** or **Continue**.

1.2.3.5 Installation Options

After starting the setup program the following is displayed on the screen:

Database Installation O	ptions 🛛
	 This will perform an installation of the ESI-K1 EMI software database. Select one of the following database installations: Install 'Standard Database No database installation - use existing database
	< <u>B</u> ack <u>N</u> ext> Cancel

This dialog field selects the directory, in which EMI Software ESI-K1 is to be installed. Use the **Browse.** key to change the directory or to enter a new directory.

Note: The path name under which the ESI-K1 software is to be installed should not exceed a length of 30 characters.

Select EMI Program Con	nponents	×
	Select the components you want to install, clear the components you do not want to install. Components Program Files 34179 K	Sector Se
Ś	Description This component includes all executables of the ESI-K1 EMI software. Space Required: 34179 K Space Available: 586240 K	
	<pre></pre>]
	Space Required: 34179 K Space Available: 586240 K]

After selecting the corresponding components and clicking the **Change...** key, another dialog field allows the specific selection of options by a click:

If an existing ESI-K1 database (from an earlier installation) is detected, either the existing database is saved in a backup directory before creating the new database or this step is skipped by selecting the option **No Database Installation**.



EMI Software ESI-K1, the associated Readme files of the installed components and options as well as the Help files are combined in a **program group**, which can be selected via the next dialog: Program group **EMI** is offered as a default setting:

Select Program Folder	X
	Setup will add program icons to the Program Folder listed below. You may type a new folder name, or select one from the existing Folders list. Click Next to continue. Program Folders: Existing Folders: Existing Folders: EXIST Folders:
	< <u>B</u> ack <u>N</u> ext > Cancel

Before the installation is performed by transferring the files from the installation disks, the setup program again indicates the selected installation options, the selected components and options, the program path and the program group for verification:

Start Copying Files	X
Start Copying Files	Setup has enough information to start copying ESI-K1 files. If you want to review or change any settings, click 'Back'. If you are satisfied with the settings, click 'Next' to begin copying files. Current Settings: Selected Installation Mode Demo Installation ESI-K1 : Program Kernel Files Database Standard Data Application L constinu
	C:\ESI-K1.100
	Program Folder
	<u> ۲</u>
	< Back Next > Cancel

The current state of the file transfer to the harddisk is displayed during the subsequent installation through a progress bar.

Setup Complete	X
	Setup has finished the ESI-K1 V1.00 installation on your computer.
	Please view the contents of the ReadMe files before starting the application.
	▼ Yes, I want to view the ESI-K1 ReadMe File.
Ś	Click 'Finish' to complete Setup.
	< Back Finish

The ESI-K1 program can be started in the selected program group by clicking the R&S icon after termination of the setup program:

🧰 C	🧧 C:\WINNT\Profiles\All Users\Startmenu\Programs\ESI-K1 📃 🗖					
<u>D</u> al	al <u>B</u> oerboltan	<u>A</u> asiahi <u>2</u>				
		/ =]	S	S		
		-	2	₹ <mark>-</mark> 5		
	ESI-K1 V1.00	ESI-K1 Readme File	ESI-K1 Help	ESI-K1 Hilfe	Un-Install ESI-K1	

The **ESI-K1** Readme File contains general and additional current information on EMI Software ESI-K1, which must be taken into account before using the ESI-K1 software.

Directory structure of EMI Software ESI-K1:



The database of EMI Software ESI-K1 is installed in the DATA directory or in the directories below. All relevant data such as limit lines, transducers, scan and sweep data, test results, scripts, etc. are stored here.

The executable program components (binaries, DLLs etc.) are located in the subdirectories EXECUTE, DEVICES and ESI-K1.

The supplied database which is pre-installed by the setup program is available under the **subdirectory IMP** (Import).

The background pictures for the ESI-K1 software are stored in the WMF directory.

Note: The installation of a later version of EMI Software ESI-K1 should always be carried out in its own directory (without overwriting of an existing version).

Existing data sets can be exported from an older version and imported into a newer version of ESI-K1.

1.2.3.6 De-installation of ESI-K1 Software

To de-install EMI Software ESI-K1, double-click the **Un-Install ESI-K1** icon. The de-installation software clears all subdirectories generated under the installation directory and files, except the database files created by the user after the installation as well as the file ESI-K1.INI in the subdirectory ..\EXECUTE\. The above-mentioned files or the paths created after the installation are to be manually cleared, as required.

1.2.3.7 First Steps after Installation

If the application ESI-K1 is installed on an external PC (Windows 3.1 / 3.11 / 95 / 98 / NT4) then after being started, a messagebox comes up which indicates that a file 'RSIB.DLL' could not be found. The missing file represents the internal interface on the ESI which connects the application with the instrument. The application first tries to communicate over this interface to control the ESI. On an external PC this messagebox can be ignored (click OK) and so the application will continue with the GPIB interface (file 'GPIB.DLL' of the GPIB device driver for Windows).

Note: When the application window is minimized under Windows NT 4.0, then the window cannot be restored with the left mouse button, but with the right mouse button instead.

Important Note:

The databases generated by the application are not designed for multi user access, i.e. only one user may access such a database at a time.

1.3 Introduction to Operation

This section describes the menus and functions calls offered by the EMI Application Software ESI-K1. Section 1.4 gives some examples to describe standard EMI measurements, a part of these menus and function calls being required for the interactive mode.

1.3.1 Starting Software ESI-K1 under Windows NT 4.0

Following the installation of the ESI-K1 software (provided it has not been factory-installed on the internal controller), the icon/symbol of the software appears in the Windows NT Explorer.

In the Windows-NT Explorer the ESI-K1 icon is called by double click or **Start - Programs - EMI - ESI-K1** is activated.

The program package ESI-K1 is then loaded and activated.



The devices connected in the automatically created device configuration are queried whether there is an IEC/IEEE-bus connection under the preset IEC/IEEE-bus address. In the basic version, these are Test Receiver ESI 7/26/40, Four-Line V-Network ESH2-Z5 and Two-Line V-Network ESH3-Z5.

After detection of the IEC/IEEE-bus installation, the ESI-K1 window is displayed as follows:



The background can be switched off via OPTIONS / BACKGROUND or replaced by any other *.WMF file.



Background <u>N</u> ame e:\wmf\esi-k1.	wmf	Browse		?×
<u> 0K</u>	Default Background Default Background Default Background Default Background	Eile Name e:\wmf\esik1.wmf ESI.K1.wMF PC.WMF SPOT.WMF SPOT.WMF	Directories e:\wmf È e:\ È wmf	 <u>D</u> K Cancel Network
		File Type Windows Metafile	Drive	

When the software is started without active IEC/IEEE-bus connection, error messages which can be acknowleged with are displayed. It is however possible to edit/open/close files available in the database such as graphics, test results, test reports without physical connection of the devices.

The software is started automatically, ie a log-in by means of user name or password is not required.

Caution: In the absence of IEC/IEEE-bus connections (GPIB drivers), the program outputs the following error messages:

Device Co	onfiguration	×
8	Cannot initialize : Symbolic Name : Address : HDI Error :	ESIX ESIX 20 Command error during device call.
	Physical mode of device	e handler is changed into virtual mode !
	OK	<u>R</u> etry
Device (Configuration	×
<u>.</u>	HDI Interface GPII Device handler ES	30 not available ! H2-Z5 is changed into virtual mode

Error message:

ESI Test Receiver driver cannot be driven.

Error message: Four-line V-network cannot be driven.



Error message:

Two-line V-network cannot be driven.

1.3.2 Direct Device Control

The icons on the background for Test Receiver ESI and V-networks ESH2-Z5/ESH3-Z5 can be directly selected by mouse click for setting the devices.







Basically, differentiation is made whether Test Receiver ESI is to make a single-frequency measurement or a sweep sequence. Parameters such as center frequency, bandwidth, measurement time, detector(s), etc. can be set individually. The parameters are adopted and activated by pressing

Measure. Due to the preset measurement time, the updated detector level values appear on the

display which permanently flashes. On pressing ______ the operation is stopped and other entries/parameter modifications can then be made.

ESIX (virtuell)	
Einzelmessung Sweep Modus	
Pegel Detektor 1 MaxPeak	dBuV
Max Hold -50.0	150.0 Nach oben Nach unten
Detektor 2 RMS EEL-C	dBµV
Max Hold -50.0	150.0 <u>Kurz-Kal</u> <u>Iotal-Kal</u>
Lransducer	
Audio	Dämpfung
Demodulation FM MeBzeit	0.1 ms V UE D innf
Lautstärke 30 % ZF-Bandbro	site 100 kHz Yoryerstärker.
	HE-Eingang TAC © 2AC C 2DC C
Messen	<u>DDP</u>

With SWEEP MODE selected in the upper menu line, a complete spectrum with preset parameters can be measured.

Caution: The instrument operates in the SWEEP MODE in the **spectrum analyzer mode**, ie for example bandwidth entries are 3 dB values and the resolution of the values measured during the sweep is limited.

🛃 ESIX (virtual)		
Single Measurement Sweep Mode		
+++ + 110 ♥ 78.93 dBµN ++ + 100- ++ + 90-	V	j
Marker Frequency 50- 99.979960 MHz Trace 30- O - MaxHold 10- Save 0- -10 -10	KMAMAKAAMAAMAANAANAANAANAA	Mr.M.W. MMM.M.M.M.M.
Sweeptable	300 400 500 600	700 800 900 100 <u>0</u>
<none> Start Frequency 30.000000 MHz Stop Frequency 1000.000000 MHz Sweep Time 1000.0 ms Time Coupled</none>		
Sweep Listen Stop	2	<u>D</u> K <u>C</u> ancel

The internal demodulation path is switched on with Listen for aural monitoring. All values are adopted by clicking the Sweep key and the updated measured values are indicated on the upper graphic display. On pressing Stop the operation is stopped and all parameters can be modified. After STOP the OK and Cancel keys which cannot be accessed before are displayed and can be used to quit the menu.

The result display or the measured values can be stored with **Save** under a file name.

Save Measurement	×
Single Measurement	
EN 55011 Field Avg	Save
Sweep Measurement	
EN 55011 Field Avg	S <u>a</u> ve
Exit	

A further way of quick recording in the SWEEP MODE is with the use of the button SCHREIBER. After

the above procedure and selecting <u>**Chart**</u> the lower half of the diagram is used to record the level intensity (with different colours) and frequency band occupancy versus time. Signals occuring permanently or sporadically can thus be recorded.

🛃 ESIX (virtual)		_ [] ×
<u>S</u> ingle Measurement S <u>w</u> eep	Mode	
+++ + +. <u>C</u> hart	¹⁰ ⊽ 78.93 dBµV ⁰⁰⁻ ⁸⁰⁻ ⁷⁰⁻ ⁶⁰⁻	ľ
Mar <u>k</u> er Frequency 99.979960 MHz Trace ⓒ Clear <u>W</u> rite ○ + <u>M</u> axHold Save	20- 20- 20- 20- 20- 20- 20- 20-	y d
Sweeptable	100 200 300 400 300 600 700 800 900	1000
toptane <none> Start Frequency 30.000000 MHz Stop Frequency 1000.000000 MHz Sweep Time 1000.0 ms Time Coupled</none>		
Sw <u>e</u> ep	Listen <u>St</u> op <u>O</u> K <u>C</u> ancel	

The fast device control via SWEEP sequences can be extended after opening the pre-installed database by selecting SWEEP TABLE. The user can call up the prepared sweep tables which are assigned to the associated standards.

<u>S</u> weeptable			
<none></none>	•		
EN 55011 Field			
EN 55011 Voltage			
EN 55013 Field			
EN 55013 Power			
EN 55013 Voltage			
EN 55014 Power			
EN 55014 Voltage	-		

To measure conducted emission on network feed lines, the setup is completed by artificial mains networks ESH2-Z5 (four-line artificial mains network for each phase max. 25 A) and ESH3-Z5 (two-line artificial mains network for each phase max. 10 A) which can be selected in the toolbar. For remote-controlling the two artificial mains networks their control cable should be connected to the USER PORT of Test Receiver ESI.

Test Receiver ESI and associated control cables:

193 199 1	
014 m 1 1 1 1 1	

EZ-4 Control cable (.03) 3 meter	to ESH3-Z5
EZ-5 Control cable (.03) 10 meter	to ESH2-Z5
EZ-6 Control cable (.03) 10 meter	to ESH3-Z5



If the toolbar is not available as required after installation or starting ESI-K1, it can be activated by



The same settings for individual devices as offered under the icons of the toolbar can be accessed via TEST - SET DEVICE.



clicking under OPTIONS.

1.3.3 Familiarization with the Measurements

For standard-conforming measurements the simplest way is to use the information contained in the ESI-K1 database concerning frequency scan or sweep, transducer characteristics (eg of the artificial mains networks) and limit values of the different standards. The database of ESI-K1 is routed via a **Navigator** which can be directly called from the **File** menu.

🚸 El	MI Me	easure	ement Sa	ftware E	SI-K1	
<u>F</u> ile	<u>E</u> dit	<u>T</u> est	<u>O</u> ptions	$\underline{W} indow$	<u>H</u> elp	
<u>N</u> a <u>C</u> lo Sa Sa	<mark>vigato</mark> ise ve ve As.	f 	43			:
Na	<u>v</u> igato	r (Back	up Datab	ase)		
<u>P</u> rir P <u>r</u> ir	nt nter Se	etup				
E <u>x</u> i	t			Alt	-F4	

The configuration of software ESI-K1 allows the commenting/description of created or modified files.

 Description...
 gives the user short information including modification made by the user or the deviation from the default setting.

Navigator				×
F <u>u</u> nction				
Open	-	Short Description	EN 55011 Field S	trength
, File Type	Filter	Owner Type		-
Scan Table	T	Owner	07 10 00	
File Name		Date	07.12.99 10:01:02	
EN 55011 Field		User Group	Public	
		Attribute	read/write	
EN 55011 Field	-	Displau		
EN 55011 Field fin			De <u>s</u> cript	ion
EN 55011 Fleid max EN 55011 Voltage		• Fil <u>e</u> Name		
EN 55013 Field		O Shor <u>t</u> Description	n	
EN 55013 Power	Description			
EN 55014 Power	Description		0	<u>^</u>
EN 55014 Voltage	File Name		U <u>w</u> ner	
EN 55015 Voltage	EN 55011 Field	d		Y
EN 55022 Field fin	Short Descripti	on	U <u>s</u> er Group	<u>Attribute</u>
EN 55022 Field max	EN 55011 Field	d Strength	Public	🗾 read/write 🛛 🚬
IEN 55022 S-LINE	DEL Cieldateres	-14 T1.		read/write
				not removable
	Frequency Rar	nge: 30 - 1000 MHz		
	Detectors: Belated Stand	UP arde: VDF 0875 Part 1	1 CISPB 11	
	Test Samples:	ISM: Class B; Gr	oup 1	▼.
	<u>-</u>		Þ	
	Application Info	0		
				A
				<u>0</u> K
	4		Þ	<u> </u>

The **Navigator** function "Open" and file type "Scan table" is used to access the internal database. The desired scan table described with the standard names is marked and opened with **DK**.

Maujaatar	
Naviyatui	
F <u>u</u> nction	
Open	•
Delete	
Export	
Move	
New	
Open	
Rename	
Save As	



In the following example the scan table is to be opened for European standard EN 55011 to perform a field-strength measurement in the range of 30 MHz to 1000 MHz. Depending on the antenna measuring range, the scan tables contain antenna correction factors for the corresponding subrange. If other antennas are used, transducer tables should be created and assigned to the associated subrange.

Navigator		×
F <u>u</u> nction		
Open 🔹	Short Description	EN 55011 Field Strength
File Type <u>F</u> ilter	Owner Type	
Scan Table 💌 🎽	Uwner Date	07 12 99
File Name	Time	10:01:02
EN 55011 Field	User Group	Public
CAL	Attribute	read/write
EN 55011 Field EN 55011 Field fin EN 55011 Field max EN 55011 Voltage EN 55013 Field EN 55013 Power EN 55013 Voltage EN 55014 Voltage EN 55014 Voltage EN 55015 Voltage EN 55015 Voltage EN 55022 Field	Display Fil <u>e</u> Name Shor <u>t</u> Description Path E:\DATA	Description
EN 55022 Field fin EN 55022 Field max EN 55022 S-LINE	, 999968 kBy	te <u>C</u> ancel

The selected scan table is opened. For the modification of the above scan table, see section 1.1.3.2. When the parameters of the selected scan table are known, the direct start as described under 1.1.3.1 can be initialized.

1.3.3.1 Starting a Preconfigured Scan Table

Since a scan table adapted or modified as to measurement bandwidth, step size, measurement time and detector selection is often used for the same DUT, it is recommended to start directly from the menu bar



or via

🚸 EMI Meas	urement Softw	ware ESI-K1 -	[EN 55011 Field]
<u> </u> Eile <u>E</u> dit	<u>T</u> est <u>O</u> ptions	<u>W</u> indow <u>H</u> e	elp
ا کے 🧲	ă 🗟 🍫	5	
💽 🗖 🔼	J 🚺 🖸 🛛	1 🖉 🚮	Scan 🛛 🛃

The advantage is that a corresponding graphics configuration and report configuration is immediately generated. One has to be careful in case of a repeated measurement because files recorded previously are automatically overwritten. On the other hand, it is convenient not to make again a complete measurement of already existing data, but to repeat the measurement only in some critical subranges and to transfer subrange results to the total result file. The final measurement in a subrange can be preset by entering the start and stop frequency, the same scan table with the same antenna corrections being automatically included in the result in the background.

an Settings			
Sca <u>n</u> Table	EN 55011 Field		
Frequency List	<none></none>		
Start Fr <u>e</u> quency	30.000000 MHz V	🛛 🖸 verwrite	
Stop Frequency	1000.000000 MHz V	🗙 <u>A</u> utosave	
		Mode	Detector
Result <u>1</u>	EN 55011 Field MaxPk 💌	ClearWrite	MaxPeak
Result <u>2</u>	EN 55011 Field Avg	Clear₩rite	Average
<u>G</u> raphical Display	EN 55011 Field 💌		
Report Configuration	EN 55011 Field	Lieate	

The same procedure applies to the use of prepared sweep tables for operating the spectrum analyzer mode of Test Receiver ESI.


The default settings made in scan table EN 55011 FIELD are transferred to the test receiver. The active transducer tables are not downloaded to the receiver but the read-out results are set off against the correction tables per software.

Note: ESI always displays uncorrected values. Since the correction is made only within the software, level differences occur between the values shown on ESI and those on the PC.

After entering <u>Start</u> a new/old graphic is opened and a scan is immediately started which writes the measurement data from the above case to the two result files FIELD MAX PK and FIELD AVG (the figure shown here contains virtually generated traces).



The scan can be stopped with **Stop Immediately** and so the results are not complete or are terminated according to the called scan table. When a new test is started, the recorded results are overwritten. With **Break** it is possible to stop the scan, to measure at the obtained preset frequency or to pass onto another subrange or to continue the measurement at the subrange start frequency used there. When HALT is activated, the grey keys OTHER FREQUENCIES and NEXT SUBRANGE shown in the above figure are highlighted active.

Assuming that a measurement was completely performed, the result files are available in tabulated form as well as graphical representation.

Call the **Navigator** from **File menu**, select the navigator under **Function** "**Open**" and "**Test result**" as **type of file**. After selecting **file name EN 55011 Field MaxPk** and clicking **OK**, the **result list** appears.



The test results can be printed in tabular form. Modification is performed by clicking the associated frequency and further processing DELETE / CHANGE. The display and sorting within the table can be preset as increasing/decreasing order depending on the type of columns. The standard two-colum result file can be re-configured as required by adding one or several columns.

Selection of incremental/decremental sorting:

	Measurement Re	sult - EN 5501	1 Field 💶 🔳 🗙
Eil	e <u>E</u> dit		
[<u>F:</u> <u>S</u> ort <u>C</u> opy → M= <u>A</u> dd Column	Ctrl+Ins	
	<u>M</u> odify Column	+ [≛	<u>I</u> nsert
	30.120000	37.65	<u>M</u> odify
	30.180000	32.49	Edit
	30.240000 30.300000	35.71 33.54	Delete
	30.360000	30.82	
	30.420000	29.60	
	30.480000	32.68	

Parameter preset for sorting:

Sort: Measurement Result - I	EN 55011 Field MaxPk		×
A <u>v</u> ailable Columns Level	Add > 1. 2. 3. < <u>R</u> emove 4. 5.	<u>S</u> ort keys Frequency	Descending
		ancel	

Creating an additional column:

E P	🏢 Measurement Result - EN 55011 Field 💻 🗖 🗙					
<u>F</u> ile	<u>E</u> dit					
F	<u>S</u> ort <u>C</u> opy	Ctrl+Ins				
ĺ	Modify Column		<u>I</u> nsert			
	30.120000	37.65	<u>M</u> odify			
	30.180000	32.49	E <u>d</u> it			
	30.240000 30.300000	35.71	Delete			
	30.360000	30.82				

Text/unit and display range of additional column:

1	Measurement Res	ult - EN 55011	Field	Add Column 🛛 🗙
E	ile <u>E</u> dit			Heading 1
	Frequency	Level		3rd column
	MHz 🗖 @But	7/m 🔽		
	30,000000	33 48 •	- In cash	H <u>e</u> ading 2
	30.060000	36.53	Insert	additional information
	30.120000	37.65	<u>M</u> odify	
	30.180000	32.49	Edit	<u>D</u> ata type
	30.240000	35.71		Real
	30.300000	33.54	De <u>l</u> ete	Unit
	30.360000	30.82		
	30.420000	29.60		шаµ¥7ш <u> </u>
	30.480000	32.68		No. of Digits
	30.540000	29.05		<auto></auto>
	30.600000	20.40		
	30.720000	31.80		Precision
	30.780000	36.81		V
	30.840000	34.25		
	30.900000	32.03		
	30.960000	31.04 🗸		<u>O</u> K <u>C</u> ancel
			Clear	
	I	L	<u></u>	

For further operation, eg of graphical elements, scan/sweep editor or limit value lines, refer to chapter 2 "Graphical User Interface" and following ones.

Graphical controls:



The above actions for menu and functions calls are to be called as complete measurement examples, such as in spurious emission measurements, ie automatic program SCRIPT. Standard measurements for RFI voltage, RFI power and RFI field-strength measurement can be started from the preset default settings. Individual parameter sets which are adapted to the DUT or modified are useful for conclusive reproducible measurements with the least possible measurement time.

1.4 Introduction to Operation - Measurement Examples

This section describes the operation of the software. The two examples used are explained step by step to familiarize the user.

The main advantages of a measurement using ESI-Software ESI-K1 are:

- Reliability and reproducibility of results
- Detailed display of results
- Time saving with standard measurements

The two described examples are based on two typical tasks of EMI measurements. They can be immediately performed with the equipment represented in the test setup and therefore be put to practical use.

Normally, software ESI-K1 is installed on the integrated Microsoft Windows NT[™] controller of Test Receiver ESI (if not already done in the factory). To install the software on the internal controller, see section **1.11 Installing Windows NT Software** in the ESI operating manual.

Alternatively, the software can be installed on a separate controller (PC) and - eg for subsequent report generation - be used without an ESI receiver being connected.

If ESI is not connected to the separate controller or if no IEC/IEEE-bus interface is installed in the PC, the software automatically switches to a so-called "virtual mode" on start-up. After software start-up (see section 1.1.1), several windows are displayed.

In this case, the section Test Setup is irrelevant. The measurements are just simulated and measured values generated by an internal PRBS generator (settable) are entered in the graphics configuration.

1.4.1 Description of Some Terms

Some terms are explained which are often used in connection with ESI-K1 are clarified in the following.

- Transducers are twoports located between the input of the test setup and the test receiver, eg the test antenna in the RFI field-strength measurement. The antenna converts the RFI field-strength level (to be indicated in dB(µV/m) for electrical field strength) to a voltage level (measured in dB(µV)) which is displayed by the test receiver. The difference between the two numeric values is referred to as transducer factor (unit dB(1/m)) which is generally frequency-dependent. Therefore, the stored transducer values always contain the frequency-dependent transducer factor and the conversion of the unit so that the final result represents the measured quantity in size and unit.
- Standards (EN, FCC, VDE) listed in the ESI-K1 database contain information on the spurious emission limit values, on the frequency range specified by the standard and on the ESI setting. These are so-called product-family standards, eg standard EN55014 for "Electric Facilities and Systems" including household appliances and electric tools. Military standards are not implemented in ESI-K1.
- **Scanning** is the stepwise tuning of the test receiver over the frequency. The stepwidth (absolute or in percent of the corresponding tuning frequency), the dwell time on each frequency as well as the start and stop frequency are to be defined. This procedure is used by Test Receivers ESI in the EMI Receiver mode.
- **Sweep** is the (quasi) continuous tuning of an analyzer over the frequency. The parameters are the start and stop frequency and also the time required by the anayzer to sweep the frequency range. ESI receivers use this type of frequency control in the analyzer mode.

1.4.2 Performance of Measurements

1.4.2.1 Selection of Measurement Sequence Control

The sequence control of a measurement with ESI-K1 software can be either interactive or automatic. Normally, the automatic mode is used with so-called scripts (see below) if the interference is stable over the measurement time. It is recommended to perform the different measurement steps in the interactive mode for intermittent, quickly drifting interferences with long cycle periods.

• Interactive mode (see section 1.3.2)

In the interactive mode, all settings and analysis functions for the test sequence, such as the definitions of the scan or sweep tables, the selection or editing of limit or transducer values or the generation of the report configuration, are performed stepwise and interactively.

The simplest way to carry out a measurement is to use the data sets contained in the ESI-K1 database concerning frequency scan or sweep, transducer characteristics (eg of the test antennas) and limit values for a large number of commercial standards.

The semi-interactive script can also be selected in this case.

• Automatic mode

The measurement sequence is automatically performed by scripts (a macro language). The scripts control the measurement sequence, evaluate the results and generate the necessary reports for the documentation of results.

For ensuring maximum flexibility the scripts are parameterized, thus allowing optimum adaptation of a test to the user's requirements and thus effective performance. The script parameters can be edited either directly or on start-up of the script and can be completely stored as a parameter set. Various parameters of this type can be created for each script (see section).

The following applications were selected as **measurement examples**:

- Measuring the RFI voltage in the frequency range up to 30 MHz
- Measuring the RFI field-strength in the frequency range as from 30 MHz

The measurement examples are performed in the automatic mode.

1.4.2.2 Operating Software ESI-K1 under Windows NT on ESI

Changeover between measurement screen and controller screen

Key combination <ALT><SYSREQ> (US keyboard) calls the controller function with the Windows NT desktop on the ESI screen.

The maximum resolution of the ESI internal display is 640 x 480 pixels (VGA). Since the ESI-K1 software requires a minimum resolution of 800 x 600 pixels (SVGA) for full-screen display, it is recommended to connect a separate PC monitor to the rear-panel connector.



External monitor operation should then be selected.

Setting is performed in the menu *SETUP-GENERAL SETUP* (key group CONFIGURATION, see further information in ESI operating manual, section 1.7 " Connecting an External Monitor"):

If no monitor is available, the setting of the internal mask can be adapted to the required resolution via

🋃 Start



🛛 Control Pa	nel				
<u>Eile E</u> dit ⊻ier	w <u>H</u> elp	170.000	11. Dente		
6	200	MS US	B	Ť	P
Accessibility Options	Add/Remove Programs	Console	Date/Time	Devices	Display



The screen can then be scrolled with the mouse cursor via the ESI-K1 user interface.

Starting ESI-K1 software

Double-clicking the icon



on the PC screen or selecting Start - Programs - EMI - ESI-K1 starts the software. After info window



and - in operation on an external PC - remark on a virtual mode, the default background of ESI-K1 showing the basis for all further operating steps is displayed:



1.4.3 Measuring the RFI Voltage in the Frequency Range up to 30 MHz (example)

1.4.3.1 Introduction

The RFI voltage measurement includes conducted interferences caused by electrical coupling and occur in the lower range of the RF spectrum. The coupling device for spurious signals is usually an artificial mains network to which the AC lines are connected. The artificial mains network represents a standardized terminating impedance for the DUT and decouples the high-frequency spurious signal from the test receiver.

In RFI voltage measurements, a field-coupled geometry-dependent influence on measured values caused by the near-field components of the EMI field strength is to be expected in the , especially in the upper frequency range.

A reproducible standard-conforming setup is therefore essential.

At present, European standards specify limit values in the frequency range of 9 kHz to 30 MHz (see test setup figure).

In addition to artificial mains networks, probes with an impedance of 1.5 k Ω or \geq 100 k Ω are used for RFI voltage measurements up to 30 MHz.

R&S offers the following accessories for the measurement of conducted interferences:

- Four-Line V-Network ESH2-Z5 (max. 4 x 25 A)
- Two-Line V-Network ESH3-Z5 (max. 2 x 10 (16) A)
- V-Network 5 μH//50Ω ESH2-Z6 (max 150 A)
- Active probe, $R_{in} \ge 100 k\Omega$ ESH2-Z2
- Passive probe, $R_{in} = 1.5 k\Omega$ ESH2-Z3
- 2 x 2-wire ISN to CISPR 22 ENY22
- 4-wire ISN to CISPR 22 ENY41

The probes and V-networks are used for measuring the asymmetrical RFI voltage on supply lines and coupling networks (ISN) ENY for measuring asymmetrical RFI voltage on non-shielded symmetrical telecommunication interfaces.

Generally, the frequency range for RFI voltage measurements is limited to the above frequency range of 9 kHz to 30 MHz in national and international standards. On vehicle accessories, RFI voltage measurements are performed up to 108 MHz.

Detailed information on the type of artificial mains network to be used in specific cases is contained in the last versions of the standards (CISPR standards, European standards, VDE regulations, FCC Rules & Regulations, VCCI recommendations, etc.).

1.4.3.2 Measurement Procedure

The following example describes the measurement of RFI voltage on AC supply lines, optionally with automatic line switchover when using an artificial mains network (also known as LISN) from R&S.

Test setup to CISPR 16-2, Figure 2:



To avoid measurement errors caused by ambient interference, the DUT and measuring head (artificial mains network or probe) should be operated in a shielded cell whereas Test Receiver ESI with keyboard, mouse and printer remains outside.

For controlling phase selection and the protective-earth simulating network of networks ESH2-Z5, ENV4200 and ESH3-Z5, route the +5 V supply voltage and some control lines through the wall of the shielded room.

Cables EZ-4 and EZ-5 are available for the Four-Line V-Network ESH2-Z5, EZ-4 and EZ-6 for Two-Line V-Network ESH3-Z5 and EZ-4 and EZ-22 for Four-Line V-Network ENV4200.

During the RFI voltage measurement with artificial mains networks, leakage currents of several 100 mA flow due to the requirements. Moreover, voltage peaks can be generated, especially on switching the measured lines, and may overload or destroy the test receiver input. Pulse-limiting components (as incoporated or external module) should be used for protection.

Block diagram of a RFI voltage measurement setup:



1.4.3.3 Progamming the Measurement with Software ESI-K1

In the following example, the measurement is performed in the automatic mode using the Voltage Mains script.

To do this, submenu Execute script... is to be clicked:

🔜 EMI Measurement Software ESI-K1 V1.00 BETA						
<u>F</u> ile <u>B</u>	dit	<u>Test</u> <u>Options</u>	₩i	ndow <u>H</u> elp		
1	r-t	<u>S</u> et Device	⊁		9 🚮	
	<u> </u>	<u>R</u> un Script			<u> </u>	
		<u>M</u> easurement	►			
		<u>E</u> valuation	⊁			

The corresponding script selection menu is opened in which the Voltage Mains script can be selected

Open			×
File Type	<u>F</u> ilter		
Script	×	Short Description	Voltage Mains 1.00
F <u>i</u> le Name		Owner Type	
Voltage Mains		Owner	
		Date	07.08.00
Cable Calibration		Time	11:50:43
Field Strength		User Group	Public
Magn. Field Strength		Attribute	not removable
Bower			
S-LINE		Display	Description
Semi Interactive		🖲 Fil <u>e</u> Name	Description
Voltage Mains		O Short Description	
_SUB_STD_CAL1			
_SUB_STD_CAL2			
SUB_STD_CAL3		<u>P</u> ath	
		U:\PROGRA~1\ESI-K	<u>. o</u> k
SUB STD FIS3		999934 kBy	te
SUB_STD_MFS1	-	,	<u>C</u> ancel
1_308_310_MF31			

and started by clicking



If the program is in the virtual mode (see introduction to this section), a message is displayed again:

Devices Check				X
The followi virtual mod Device Handler	ng devi e	ice hand	lers are ir	1
ESIX				
Start		<u>S</u> I	ор]

A mouse click on

S<u>t</u>art

starts the script and a window is opened which continuously informs on the script sequence:

Script - Voltage Mains	_ 🗆 🗵
<u>File Edit View Options</u>	
Start Interpreter Scanning Script	<u> </u>
<u>।</u>	
	▼ S <u>t</u> art <u>W</u> ait <u>S</u> top

Another window is then displayed for selecting or defining the script parameters:

📲 Script Parameter ['Voltage Mains' : ' <default>']</default>						
Pa <u>r</u> ameter Set KDefault >		<u> </u>				
Test						
0 <u>1</u> : ID (max. 12 chars) to be included in filen	names vol_0001	<u></u>				
0 <u>2</u> : global start frequency [MHz] for the test	0.150000	S <u>a</u> ve As				
0 <u>3</u> : global stop frequency [MHz] for the test	30.000000	Dia				
0 <u>4</u> : suppress queries as far as possible						
0 <u>5</u> : split frequency range into test ranges	×	S <u>t</u> op				
0 <u>6</u> : if splitting of frequency range: do with lo	g. scale 🗵	Canool				
0 <u>7</u> : min. no. of test ranges for splitting of free	qu. range 1					
08: test configuration, <none>: ID</none>	<pre>knone></pre>					
Additional Topics						
Preview	DataBeduction					
<u> </u>	<u> </u>					
<u>R</u> eport	Report <u>H</u> eader					
LISN.						

This menu comprises the selection window of the parameter set to be used for the measurement which can be defined beforehand,

Parameter Set CDefault>

Test - then submenu and the following submenus (Topics) for defining or modifying script parameters:

Additional Topics						
Pr <u>e</u> view	DataReduction					
<u> </u>	<u>G</u> raphic					
<u>R</u> eport	Report <u>H</u> eader					
LISI	N					

As far as parameter sets are concerned, ESI-K1 presently supports the following factory-set standards:

📲 Script Parameter ["V	oltage Mains' : 'EN 5501	1 V']	×
Pa <u>r</u> ameter Set	EN 55011 V	_	<u> </u>
Test	<default> EN 55011 V</default>		 Save
0 <u>1</u> : ID (max. 12 cha	EN 55013 V EN 55014 V		
0 <u>2</u> : global start freq	EN 55015 V EN 55022 V		 S <u>a</u> ve As
0 <u>3</u> : global stop frequ 0 <u>4</u> : suppress querie:	s as far as possible	,	Print

On selecting a parameter set, eg **EN 55011 V**oltage, in line with the product standard for industrial, scientific and medical high-frequency instruments (ISM devices)

EN 55011	
Frequency range:	0.15 to 30 MHz
Detectors/limit values:	QP and AV
Standards used:	VDE 0875 Part 11, CISPR 11
DUTs:	ISM: Class B; Group 1

the associated frequency run (sweep/scan tables) and the corresponding limit lines (quasipeak, average) are automatically loaded to the relevant submenus.

If required, the preset data sets can then be edited again in the corresponding submenus or replaced by other existing data sets.

Alternatively, complete parameter sets can be pre-edited as required and directly loaded after starting the script by its selection in the above parameter set window.

In addition, the ES-K1 database containing the different file types is directly called from the File menu via the file manager named by means of the navigator.

🔜 EMI I	leasur	ement Sa	oftware ES	5I-K1	V1.00	BETA		
<u>File</u> <u>E</u> di	<u>T</u> est	<u>O</u> ptions	<u>W</u> indow	<u>H</u> elp				
<u>N</u> aviga Close	tor				# 사사	🔛 🔀]	2 🚺
<u>S</u> ave							_	
S <u>a</u> ve A	S							
Na <u>v</u> iga	tor (Bacl	kup Datab	ase)					
<u>P</u> rint P <u>r</u> inter	Setup							
E <u>x</u> it			Alte	+F4				

lavigator				
F <u>u</u> nction				
Open	_	Short Description	EN 5	i5011 Voltage
File Tune F	ilter	Owner Type	Scrip	ot
		Owner	Volta	age Mains
Script Parameter		Date	07.0	8.00
F <u>i</u> le Name		Time	11:3	1:58
EN 55011 V		User Group	Publi	ic
		Attribute	read	/write
Cable Cal	<u>▲</u>		1000	
EN 55011 F	FD)isplay		
EN 55011 V				Description
EN 55013 F		Fil <u>e</u> Name		
EN 55013 P		Short Description	n	
EN 55014 P		O SHOLE DESCRIPTION		
EN 55014 V				
EN 55015 V				
EN 55022 F		<u>P</u> ath		
EN 55022 Radiated				
EN 55022 S		D:\PROGRA~1\ESI	-K1.	ок
EN 55022 V				
FCC 15 ClassA F		999934 kB	lyte 👘	Cancel
FCC 15 ClassB F			-	<u></u> ancer

The selected parameter set for the RFI voltage measurement in the frequency range up to 30 MHz in line with product family standard EN 55011 offers the following settings for the script parameters (script parameters are described in detail in section xxx of this manual):

Topic 'Test'

🖁 Script Parameter ['Voltage Mains' : 'EN 55011 V']				
Parameter Set EN 55011 V	_	<u>0</u> K		
Test				
0 <u>1</u> : ID (max. 12 chars) to be included in filen	names Voltage 0001	<u>S</u> ave		
0 <u>2</u> : global start frequency [MHz] for the test	0.150000	S <u>a</u> ve As		
0 <u>3</u> : global stop frequency [MHz] for the test	30.000000			
0 <u>4</u> : suppress queries as far as possible		Print		
0 <u>5</u> : split frequency range into test ranges		<u>C</u> ancel		
0 <u>6</u> : if splitting of frequency range: do with lo	g. scale 🔲			
0 <u>7</u> : min. no. of test ranges for splitting of free	qu. range 1			
08: test configuration, <none>: ID</none>	<pre>knone></pre>			
Additional Topics				
Pr <u>e</u> view	DataReduction			
<u> </u>	<u>G</u> raphic			
<u>R</u> eport	Repor <u>t</u> Header			
LISN.				

Parameter 01, here: 'Voltage 0001', is a character string used to identify the files belonging to the same test. The upper and lower test limits are selected according to the standard (parameters 02 and 03). If required, the whole frequency range can be divided into subranges which can be completely measured (preview measurement, data reduction, final measurement). This reduces for example the interval between the preview measurement and final measurement, which is an advantage for the detection of drifting interference (parameters 05 and 06). However, a division into subranges was not set in this example.

Selecting parameter 04 ("suppress queries as far as possible") suppresses standard queries during the script sequence such as:



(prerequisite for an almost interruption-free measurement procedure).

Topic 'Preview'

()用		×
Preview		<u> </u>
01: preview result file, <none>: ID + '_pre PK'</none>	<none> ▼</none>	
02: 2nd result file, <none>: ID + '_pre AV'</none>	<pre><none></none></pre>	<u> </u>
<u>0</u> 3: scan table for preview	EN 55011 Voltage	
0 <u>4</u> : sweep table for preview	<none></none>	
05: insert results into existing result file		

If parameter 05 is marked, an existing result file of the same name is overwritten for the specified frequency range so that it is possible to measure again specific bands of the spectrum, the rest remaining unchanged.

Topic 'DataReduction'

200	a .		×
	DataReduction		<u>0</u> K
	<u>0</u> 1: QP limit line	EN 55011 V QP	
	0 <u>2</u> : AV limit line	EN 55011 V AV	<u> </u>
	0 <u>3</u> : max. no. of results kept per test range	1E	
	04: decision threshold [dB] for peak reduction	6.000000	
	0 <u>5</u> : level offset [dB] for acceptance analysis	-10.000000	
	0 <u>6</u> : max. no. of results kept from partial scans	2	
	0 <u>7</u> : partial scan width: no. of IF-BWs (O=use ratio)	0	
	0 <u>8</u> : partial scan width: ref. frequ. ratio	0.010000	

The ESI-K1 data reduction for the final measurement with quasipeak and average detector is of flexible design:

The scan or sweep results of the preview measurement can be processed both with

subrange-maxima reduction

(parameter 03: defining a maximum number of results determined by data reduction for each script subrange; here eg 15) and with

peak reduction

(parameter 04).

After combining the determined points (only one entry is formed for identical frequencies) the result is transferred to an

acceptance analysis,

ie all points below the imaginary acceptance line (parameter 05) are not taken into account in the final measurement. If a

partial scan (parameters 07, 08) is performed, more than one critical RFI frequency can be determined for each partial scan with the above data reduction procedures; parameter 06 limits the number of results of a partial scan (after the data reduction performed with it).

Topic 'Final'

201	B		×
	Final		
	01: <u>f</u> inal result file, <none>: ID + '_fin QP'</none>	<none></none>	
	02: 2 <u>n</u> d result file, <none>: ID + '_fin AV'</none>	Knone>	<u> </u>
	0 <u>3</u> : scan table for partial scans + single meas.	EN 55011 Voltage	
	04: perform partial scans		
	0 <u>5</u> : complete search (all accessory settings)	×	
	0 <u>6</u> : insert results into existing result file		
	0 <u>7</u> : time [sec] for final measurements	1.000000	
	08: optional input: preview result file	<none></none>	
	09: optional input: preview result file (2nd det.)	<none></none>	
	10: optional input: frequency list	<none></none>	
	11: optional input: frequency list (2nd det.)	<none></none>	
	1 <u>2</u> : optional input: final result file	<none></none>	
	13: optional input: final result file (2nd det.)	<none></none>	

The final measurement settings (either as single measurement or with additional partial scans (selection via parameter 04)) are performed according to a preset scan table (selection via parameter 03). If parameter 04 is activated (eg when the preview measurement was performed with a sweep or if drifting interferers are expected), partial scans are first carried out at the critical frequencies found during the preview measurements are then performed at the (current) frequencies resulting from the partial scans (with data reduction).

The settings defined in the scan table is always used for the individual measurement with QP (and AV) detector. If required, these settings can be modified as to the test detector and measuring time. For this reason, it is possible to select a short measurement time in the scan table for the PK (and AV) detector whereas the other settings (eg IF bandwidth, demodulation, etc.) should be adapted to the measurement with QP detector. The QP measurement time is separately selected under parameter 07.

Topic 'Graphic'

θ Ξ		×
Graphic 0 <u>1</u> : graphics configuration, <none>: ID 0<u>2</u>: optional graphics template (new graph only) 03: split result display</none>	EN 55011 Voltage	<u>O</u> K <u>C</u> ancel
<u>0</u> 3: split result display		

The graphics configuration describes the appearance of the graphic, ie the display of measured values (level) versus the frequency axis. In addition, the number and display form (eg colour) of traces, limit lines or transducers are defined in the graphics configuration. Markers, delta markers or legend are also specified here.

The file name for the graphics configuration used in this test is entered or selected under parameter 01 (eg EN 55011 Voltage).

If the current graphics configuration is to be derived from an existing graphics configuration (eg its line and colour settings), it can be selected under parameter 02.

Parameter 03 should be activated (ticked) to display the PEAK/QUASIPEAK results with the corresponding QUASIPEAK limit line and the AVERAGE results with the AVERAGE limit line on two separate diagrams.

Topic 'Report'

8 8		×
Report <u>0</u> 1: generate printer hardcopy 0 <u>2</u> : report config. for printing, <none>: ID + '_prnt' 0<u>3</u>: footnote, empty field: ID</none>	X EN 55011 V Footnote text	<u>D</u> K <u>C</u> ancel

The documentation of a test usually comprises a report header and the graphical display of results (graphics configuration). The test report layout is set by means of a report configuration in which, for example, the report header, the graphic and the type of representation of results are defined. The contents of the printout with this report configuration is thus specified.

Selecting parameter 01 generated a report configuration for printing and a printout is started on the printer defined for the ESI-K1 software. The file name for the report configuration to be used in the test is selected in parameter 02. An optional text can be entered under parameter 03 for the footer on the test report.

Topic 'Report Header'

A report usually contains different information which are relevant for the test and can be specified in detail in the report header. This includes in addition to the header line the test conditions, the test location or the DUT description, for example.

Optionally, the file name of an existing report header can be called under parameter 02. The file name is to be used as a template for the test report header and, if required, modified in only some lines.

A character string which is to be taken over in the report header as further comment line can be entered in the field for parameter 12. If this is not used, the test start time is automatically entered here.

Topic 'LISN'

徳田		×
LISN		
01: use manual LISN switching		
02: <u>u</u> se a two line LISN (manual or 'ESH3-Z5')	X	<u> </u>
03: use a four line LISN (manual or 'ESH2-Z5')		
04: 2/4: preview measurements with PE floating		
05: 2/4: preview measurements with PE grounded	×	
06: 2/ <u>4</u> : preview measurements on line N		
07: 2/4: preview measurements on line L1	×	
08: 4: preview measurements on line L2		
0 <u>9</u> : 4: preview measurements on line L3		
10: 2/4: final measurements with PE floating		
11: 2/4: final measurements with PE grounded	×	
12: 2/4: final measurements on line N	X	
1 <u>3</u> : 2/4: final measurements on line L1	×	
14: 4: final measurements on line L2		
1 <u>5</u> : 4: final measurements on line L3		
1 <u>6</u> : use single line LISN (manual only)		
17: sgl.: no. of lines to be measured for preview	x	
18: sgl.: no. of lines to be measured for finals	x	

With script parameter set LISN it is possible to set the automatic control of the used artificial mains network (NNB or LISN). Otherwise, manual operation of NNB is performed using dialog windows.

Depending on the type of the used NNB, the parameters for automatic phase selection should be set (parameter 01 deactivated).

- Two-Line NNB ESH3-Z5 (parameter 02): switchover is performed between lines N and L1; The protective earth is earthed and open (high-impedance). Relevant settings under parameters 04, 05, 06 and 07 for the preview measurements and 10, 11, 12 and 13 for the final measurements.
- Four-Line NNB ESH2-Z5 or ENV4200 (parameter 03): switchover is performed between lines N, L1, L2 and L3; The protective earth is earthed and open (high-impedance). Relevant settings under parameters 04, 05, 06, 07, 08 and 09 for the preview measurements and 10, 11, 12, 13, 14 and 15 for the final measurements.

In our example (RFI voltage measurement with Two-Line NNB ESH3-Z5), the preview measurement (to find critical frequencies), as usual, is carried out with only one setting of the artificial mains network (eg phase L1 with open protective earth). The final measurement is then performed on all lines. With automatic line selection, artificial mains networks ESH2-Z5, ENV4200 and ESH3-Z5 are controlled via the user port of the receiver.

• Single-Line NNB (eg ESH3-Z6) or probe (eg ESH3-Z4): in this case, a number of supply lines (AC or DC) are normally measured; switchover between the lines can be effected manually only.

For standards stipulating RFI current measurements, instead of the RFI voltage the RFI current can be measured with an RF current transformer by entering the transducer factor with the unit dBµA. In this case too, automatic line selection is not necessary.

With an active artificial mains networks, a minimum RF attenuation is always switched on to reduce the risk of damaging the receiver input which is high especially with measurements performed with artificial mains networks.

If parameter 04 is activated (PE floating), the protective earth choke is switched on. The PE grounded/floating control is not provided for Four-Line NNB ENV4200. Its protective earth is always connected to ground (PE grounded).

Parameters 16 and 17 specify the number of lines to be measured in the preview measurement and final measurement using a single-line V-network.

Transducer factors are normally not required in the case of artificial mains networks since they output the correct voltage levels.

Start of the measurement

After defining all script parameters the measurement is started by clicking on

📲 Script Parameter ['Voltage Mains' : 'EN 55	011 V']	×
Parameter Set EN 55011 V		<u>o</u> k
0 <u>1</u> : ID (max. 12 chars) to be included in fil	enames Voltage 0001	<u>S</u> ave
02: global start frequency [MHz] for the te	st 0.150000	S <u>a</u> ve As
0 <u>3</u> : global stop frequency [MHz] for the tes 0 <u>4</u> : suppress queries as far as possible	st 30.00000	Print
0 <u>5</u> : split frequency range into test ranges		<u>C</u> ancel
0 <u>6</u> : if splitting of frequency range: do with	log. scale 🗌	
0 <u>7</u> : min. no. of test ranges for splitting of f	requ. range 1	
08: test configuration, <none>: ID</none>	<none></none>	
Additional Topics		
Preview	DataReduction	
<u> </u>	<u>G</u> raphic	
<u>R</u> eport	Repor <u>t</u> Header	
LISI	V	
		1

A preview test is first performed to determine the critical frequencies. The test receiver setting and the test run are defined by the selected script parameters.

Script - Voltage Mains	_ D ×
Start Interpreter Scanning Script Running VOLTAGE MAINS TEST (Version 1.00)	
Closing files Deleting temporary data Checking script parameters, please preparing files	wait Preview Test
	Perform preview test ?
 	Start Wait Stop

After this preview test, a final measurement can be performed at the found critical frequencies with the selected detectors.



After confirming the final measurement, the user is asked to set the DUT to the required mode.



The preview measurement is then performed followed by the data reduction with the settings selected under topic 'Data reduction'.

Peak reduction / subrange-maxima reduction

 $\mathbf{\Phi}$

Data combination ↓

Acceptance analysis

Ψ

Maxima reduction

The steps of the script are continuously reported in a window which is automatically displayed after starting the script.

Script - Voltage Mains	
<u>File Edit View Options</u>	
current frequency (11/15): 9.65 MHz LISN line = N	
measurement with final detector no.1 at => level: 49.111 dBμV	9.65 MHz
current frequency (12/15): 9.71 MHz measurement with final detector no.1 at => level: 50.586 dBμV	9.71 MHz
current frequency (13/15): 9.98 MHz measurement with final detector no.1 at => level: 71.211 dBμV	9.98 MHz
current frequency (14/15): 10.07 MHz measurement with final detector no.1 at => level: 68.506 dBμV	10.07 MHz
current frequency (15/15): 10.265 MHz measurement with final detector no.1 at => level: 50.96 dBμV sorting for pe/line	10.265 MHz
current frequency (1/1): 10.03 MHz LISN line = L1	
measurement with final detector no.2 at => level: 71.233 dBμV	10.03 MHz
LISN line = N sorting frequencies merging results sorting frequencies merging results	
	-
<u> </u>	4
	▼ S <u>t</u> art <u>W</u> ait <u>S</u> top

A script run can be halted by clicking

wait continued by clicking

Start and aborted by clicking



Note that a currently active sweep or scan should prior be aborted.

The test results obtained until that time may only be usable to a limited extent. After an abort it is no longer possible to continue the script routine.

Following the preview measurement and data reduction, a final measurement can be carried out at the critical frequencies.



The final measurement takes place in the settings made in topic 'Final'.

At all critical frequencies determined with the peak detector during the preview measurement and data reduction (ie the frequencies of the corresponding peak subrange maxima), the quasipeak values are compared for all phases defined in the parameter set and the PE configuration(s) and the phase with the highest quasipeak level is determined and recorded.

The following applies analogously:

At all critical frequencies determined with the average detector during the pre-measurement and data reduction (ie the frequencies of the corresponding average subrange maxima), the average values are compared for all phases defined in the parameter set and the PE configuration(s) and the phase with the highest average level is determined and recorded.

After completion of the final measurement, a graphical printout of results can be started.



The script routine is thus terminated

Test complete	
Extracting frequency list(s) from results LISN line = local LISN PE = local	
Closing files Deleting temporary data [Ferminated normally	
<u> </u>	
Start Wait Stor	þ

and the result is displayed graphically (in this example in the virtual mode with simulated test results):



It may be useful to omit the test report in order to re-define some elements in the graphics configuration (eg line attributes), in the report header or in the report configuration and then to start the modified printout by selecting menu items Print... in the <u>F</u>ile menu.

<u>N</u> avigator		
Save		
S <u>a</u> ve As		
Na <u>v</u> igator (Backup Database)		
<u>P</u> rint		
P <u>r</u> inter Setup		
E <u>x</u> it	Alt+F4	

Alternatively, the test report can be stored as a RTF file.

Print Rep	port		×	
Printer				
<u>N</u> ame	\\RS\pq_I	np_dj850c_fossy	<u>Properties</u>	
Status	: Bereit		<u>N</u> etwork	
Туре	HP DeskJe	HP DeskJet 850C		
Where	e \\RS\pq_h	p_dj850c_fossy		
Comm	ent			
Report				
B	eport Header	Report Configuration	EN 55011 Field 🗾	
× Re	direct to RTF file	P <u>r</u> eview	Print <u>C</u> ancel	

1.4.4 Measuring the RFI Field Strength in the Frequency Range from 30 MHz (example)

1.4.4.1 Introduction

Many electrical and electronic products generate interference in the form of electromagnetic radiation. Electronic circuits, for example, act as a signal source whereas internal and external lines and casing openings act as radiation antennas.

In the frequency range up to 30 MHz, interference coupling for the observed distances to the DUT is separated by the electrical and magnetic field components (near-field coupling). At higher frequencies, however, the E and H field are permanently coupled (electromagnetic wave), ie far-field conditions prevail in this case.

Receive antennas convert electromagnetic free-space waves into conducted waves. It is required for measuring antennas that their frequency-dependent transfer response which is expressed by the antenna factor (or logarithmized: transducer factor) is specified in detail. CISPR 16 stipulates an error limit of 3 dB for field-strength measurement with a maximum uncertainty of 2 dB for the test receiver. Electrically short dipoles or monopoles are used for the measurement of electrical RFI field strength below 30 MHz. Their dimensions should be 1 m at maximum for measurement distances up to 10 m. The magnetic RFI field strength is measured by means of loop antennas which should have a decoupling against the electrical field of at least 20 dB. Linear-polarized broadband antennas or tuned dipoles are used for the frequency range of 30 MHz to 1 GHz.

Rohde & Schwarz offers the following antennas for the RFI measurement:

•	Broadband dipole	20 to 80 MHz	HUF-Z1
•	Log-periodic broadband antenna	80 to 1300 MHz	HL023A1
•	Biconical antenna	20 to 300 MHz	HK116
•	Log-periodic antenna	200 to 1300 MHz	HL223
•	Log-periodic antenna	400 to 3000 MHz	HL040
•	Ultra-broadband antenna	30 to 3000 MHz	HL562

Strictly speaking, RFI field-strength measurements deliver valid results only on so-called open-area setups which should meet a setup attenuation within a tight tolerance.

Depending on the standard, the antenna is installed at distances of 3 m, 10 m and 30 m from the DUT. Apart from a ground plate, no additional reflecting object should be located within an ellipse with the antenna and DUT located at the focus points (CISPR ellipse).

10 m open-area setup for RFI measurement:



The ground plate has a defined minimum size, it should be well conducting and should not include openings larger than 3 cm. Since it generates reflections in the measurement frequency range (30 to 1000 MHz) which are superimposed on to the direct interference signal, the measured RFI field strength depends on polarization as well as on the height. The measurement antenna should therefore be located at a height between 1 and 4 m (6 m for a 30 m test setup) to determine the maximum RFI. Since the RFI radiation of the DUT is also directional, it should be rotated in all planes and, if necessary,

The ambient interference which is often not constant in time is a major problem for open-area RFI measurements. For this reason, the measurements are often performed in shielded anechoic chambers. However, there are no valid standards for this type of measurements.

Since the test setup in the anechoic chamber should have the same field-attenuation characteristic as that of the open area, the metallic walls are cladded with suitable absorber materials. In case of reduced hall and absorber sizes (for cost reasons), problems arise in the lower frequency range due to chamber resonances so that such test setups cannot be used in the whole frequency range.

1.4.4.2 Measurement Procedure

measured in all possible modes.

The following example describes the measurement of the electromagnetic RFI field strength using suitable antennas. The antenna mast and turntable control for setting the antenna height and polarization as well as for DUT positioning (azimuth) is not performed via the ESI-K1 software but separately (manually or via a seapate controller). To do this, the measurement should be carried out at the critical frequencies in all settings of the three parameters which influence the result (antenna height, antenna polarization and turntable angle). The test may be very time-consuming depending on the step width selected for these parameters.

1.4.4.3 Progamming the Measurement with Software ESI-K1

In this example, the measurement is performed in the automatic mode using the Field Strength script. To do this, submenu Execute script... in main menu Test is to be clicked:



The script selection menu is opened in which the script can be selected

Open			x
File Type	<u>Filter</u>		
Script	×	Short Description	Field Strength 1.00
F <u>i</u> le Name		Owner Type	
Field Strength		Uwner Date	14.06.00
Cable Calibration		Time	17:41:23
Field Strength		User Group	Public
Overview		Attribute	not removable
Power		Display	
S-LINE Semi Interactive		File Name	Description
Voltage Mains		O Shor <u>t</u> Description	1
_SUB_STD_CAL1			
SUB_STD_LAL2		Path	
_SUB_STD_ERROR			
		D:\PROGRA~1\ESI-	К1. <u>о</u> к
SUB STD FIS3		999934 kB	yte
SUB_STD_MFS1	•		<u>C</u> ancel

and started by clicking



If the program is in the virtual mode (see introduction to this section), a message is displayed again:

Devices Check	×
The following device handlers are virtual mode Device Handler	in
ESIX	
<u>Start</u> <u>S</u> top	
A mouse click on	
Start	

starts the script and a window is opened which continuously informs on the script sequence and reports:



Another window is then displayed for selecting or defining the script parameters:

😹 Script Parameter ['Field Strength' : ' <default>']</default>		
Parameter Set <a>Comparison		<u>0</u> K
Test		
0 <u>1</u> : ID (max. 12 chars) to be included in filer	names field_0001	<u>5</u> ave
0 <u>2</u> : global start frequency [MHz] for the test	30.00000	S <u>a</u> ve As
0 <u>3</u> : global stop frequency [MHz] for the test	1000.000000	
0 <u>4</u> : suppress queries as far as possible		
0 <u>5</u> : split frequency range into test ranges	×	S <u>t</u> op
0 <u>6</u> : if splitting of frequency range: do with lo	g. scale 🗵	
0 <u>7</u> : min. no. of test ranges for splitting of fre	qu. range 1	
08: test configuration, <none>: ID</none>	Knone>	
Additional Topics		
Pr <u>e</u> view	DataReduction	
<u> </u>	<u>G</u> raphic	
<u>R</u> eport	Report <u>H</u> eader	
<u>M</u> ast	T <u>u</u> rntable	
Polarisat	ion	

This menu comprises the selection window of the parameter set to be used for the measurement and which can be defined beforehand,

Parameter Set EN 55011 F

then submenu Test -

and the following submenus (Topics) for defining or modifying script parameters:

Additional Topics		
Pr <u>e</u> view	DataReduction	
<u>F</u> inal		
Report Report <u>H</u> eader		
Mast Turntable		
Polarisation		

As far as parameter sets are concerned, ESI-K1 presently supports the following factory-set standards:

2	B Script Parameter ['F	ield Strength' : 'EN 55011	F']		×
	Pa <u>r</u> ameter Set	EN 55011 F		-	ОК
	Test	<default></default>	-		
	0 <u>1</u> : ID (max. 12 cha	EN 55013 F			Save
	0 <u>2</u> : global start freq	EN 55022 F FCC 15 ClassA F			Save As
	0 <u>3</u> : global stop frequ	FCC 15 ClassB F	1000.000000		
	0 <u>4</u> : suppress queries	s as far as possible	×		<u>Print</u>

On selecting an available parameter set, eg **EN 55011 F**ieldstrength, in line with the product standard for industrial, scientific and medical high-frequency instruments (ISM devices)

EN 55011

Frequency range:	30 to 1000 MHz
Detectors/limit values:	QP
Standards used:	VDE 0875 Part 11 , CISPR 11
DUTs:	ISM: Class B; Group 1
Distance:	10 m

the associated frequency run (sweep/scan tables) and the corresponding limit lines (quasipeak, average) are automatically loaded to the relevant submenus.

If required, the preset data sets can then be edited again in the corresponding submenus or replaced by other data sets.

Alternatively, complete parameter sets can be pre-edited as required and directly loaded after starting the script by its selection in the above parameter set window.

In this case, the ES-K1 database containing the different file types is directly called from the File menu via the file manager named by means of the navigator.

🔜 E	MI Me	easure	ement So	ftware E	V1.00 BETA			
<u>F</u> ile	<u>E</u> dit	<u>T</u> est	<u>O</u> ptions	$\underline{W}\text{indow}$	<u>H</u> elp			
<u>N</u> a Di	avigato ose	ſ				i 🔐 🛄 🛛	ИП #В	? 👪
<u>5</u> 8	ive we As							
Na	Navigator (Backup Database)							
<u>P</u> rint P <u>r</u> inter Setup								
Ež	E <u>x</u> it Alt+F4							

avigator			
F <u>u</u> nction			
New	-	Short Description	EN 55011 Field Strength
File Type	Filter	Owner Type	Script
Corint Barameter	1 🗵	Owner	Field Strength
		Date	14.06.00
Script Parameter		Time	17:36:12
Measurement Hesult		User Group	Public
Graphics Configuration		Attribute	read/write
Limit Line Transducer	▲		
Sustem Transducer		Display	
Text		0 57 11	Description
Report Header		File Name	
Report Configuration		O Short Description	n
Scan Table		1 ° • • • • • • • • • • • • • • • • • •	
Sweep Table			
Frequency List			
Test Configuration		<u>P</u> ath	
EN 55022 Radiated			
EN 55022 S		D:\PROGRA~1\ESI	-K1. OK
EN 55022 V			
FCC 15 ClassA F	_	999934 kB	lyte Cancel
FCC 15 ClassB F			

The selected parameter set for the RFI voltage measurement in the frequency range of 30 MHz to 1000 MHz in line with product family standard EN 55011 offers the following settings for the script parameters (script parameters are described in detail in section xxx of this manual):

Topic 'Test'

🖁 Script Parameter ['Field Strength' : 'EN 55011 F']							
Parameter Set EN 55011 F		<u> </u>					
Test		Save					
01: ID (max. 12 chars) to be included in filer	names Field 0001						
0 <u>2</u> : global start frequency [MHz] for the test	30.00000	S <u>a</u> ve As					
0 <u>3</u> : global stop frequency [MHz] for the test	1000.000000	Print					
0 <u>4</u> : suppress queries as far as possible							
0 <u>5</u> : split frequency range into test ranges	×	S <u>t</u> op					
0 <u>6</u> : if splitting of frequency range: do with lo	g. scale 🕱	Cancel					
0 <u>7</u> : min. no. of test ranges for splitting of fre	qu. range 1						
08: test configuration, <none>: ID</none>	knone>						
Additional Topics		1					
Pr <u>e</u> view	DataReduction						
<u> </u>	<u>G</u> raphic						
<u>R</u> eport	Report <u>H</u> eader						
<u>M</u> ast	T <u>u</u> rntable						
Polarisat	ion						
		1					

Parameter 01, here: 'Field 0001' is a character string used to identify the files belonging to the same test. The upper and lower test limits are selected according to the standard. If required, the whole frequency range can be divided into subranges which can be completely measured (preview measurement, data reduction, final measurement). This reduces for example the interval between the preview measurement and final measurement, which is an advantage for the detection of drifting interference. The value entered under parameter 07 is a minum value. If the value (as in this example) is set to 1, each **sub**range defined in the scan/sweep table is divided into a single subrange (**test** range). Example: An RFI field-strength measurement with two antennas and the two associated scan subranges yields one test range per antenna range. In this case (ie without splitting), the whole frequency range of the scan/sweep table is measured in one sequence (for preview and final measurement) but it is interrupted by the request to change the antenna (if selected).

Selecting parameter 04 ("suppress queries as far as possible") suppresses standard queries during the script sequence such as:

Test Report 🛛 🕅	Start 🗙	Final Test 🛛 🔀	Preview Test 🛛 🕅
Generate printer hardcopy ?	Setup E.u.T. now	Perform final test ?	Perform preview test ?
<u>Lein</u> <u>N</u> ein			

Only the request is displayed to set manually the mast, turntable and antenna (type, change of polarization) such as:

×	X	Mount probe:	х
move TURNTABLE to 0 deg	move MAST to 100 cm	🔥 нк116	
OK		OK	

and the query for the final measurement results.

Topic 'Preview'

御田			×
Preview			<u> </u>
0 <u>1</u> : preview result file, <none>: ID</none>	+ '_pre PK'	<none></none>	Canad
0 <u>2</u> : optional 2nd result file, <none></none>	: ID + '_pre AV'	Knone>	Lancer
<u>0</u> 3: scan table for preview		EN 55011 Field	
04: optional 2nd scan table (vertic	al)	<none></none>	
0 <u>5</u> : sweep table for preview		<none></none>	
0 <u>6</u> : optional 2nd sweep table (vert	ical)	<none></none>	
0 <u>7</u> : complete search (all accessory	settings)	×	
08: insert results into existing resu	lt file		

Under parameter 04, a second scan table can be defined for preview measurements with vertical polarization; the preview scan table (parameter 03) is then used for the measurement with horizontal polarization. The same applies to sweep tables.

If parameter 07 is marked, the scans/sweeps of the preview measurements are performed for **all** accessory settings (as defined in the corresponding parameters related to the topics 'mast'/'polarization'/'turntable'). Otherwise only a preview measurement (scan/sweep) is performed with a **fixed accessory setting** according to the parameter preset related to the corresponding topics.

If parameter 08 is also marked, an existing result file of the same name is overwritten for the specified frequency range so that it is possible to measure again specific bands of the spectrum, the rest remaining unchanged.

Topic 'DataReduction'

^波 用		×
DataReduction		
<u>0</u> 1: QP limit line	EN 55011 F QP	
02: optional QP acceptance line (no offset)	<none></none>	<u> </u>
0 <u>3</u> : optional AV limit line	<none></none>	
0 <u>4</u> : optional AV acceptance line (no offset)	<none></none>	
0 <u>5</u> : final measurements according to FCC standard		
0 <u>6</u> : max. no. of results kept per test range	10	
07: decision threshold [dB] for peak reduction	6.000000	
08: level offset [dB] for acceptance analysis	-10.000000	
0 <u>9</u> : max. no. of results kept from partial scans	1	
10: <u>p</u> artial scan width: no. of IF-BWs (0=use ratio)	0	
$\underline{1}$ 1: partial scan width: ref. frequ. ratio	0.010000	

The ESI-K1 data reduction for the final measurement with quasipeak and average detector is of flexible design:

The scan or sweep results of the preview measurement can be processed both with

subrange-maxima reduction

(parameter 06: defining a maximum number of results determined by data reduction for each script subrange; here eg 10 **per** scan subrange) and with

peak reduction (parameter 07 defines the decision level for data reduction with "peak reduction").

After combining the determined points (only one entry is formed for identical frequencies) the result is transferred to an

acceptance analysis

, ie all points below the imaginary acceptance line (parameter 08) are no longer taken into account in the final measurement.

If an additional limit line is called under parameter 02, it is used instead of the above imaginary acceptance line for the acceptance analysis in the data reduction of the PEAK preview results; the value set for the acceptance offset is ignored in this case. This applies analogously to a possible final measurement with the average detector.

Partial scans (parameters 10, 11) are also performed in this example. The above data reduction methods can be used to determine more than one critical RFI frequency per partial scan; parameter 09 limits the number of results of a partial scan (after the data reduction performed with it). The frequency range of partial scans can be defined either in multiples of the measurement (IF) bandwidth (parameter 10) or, as in the present case, in percent of the corresponding test frequency (parameter 11: 0.01 = 1%).

Topic 'Final'

		×
r Final		
01: <u>fi</u> nal result file, <none>: ID + '_fin QP'</none>	<none></none>	
0 <u>2</u> : optional 2nd result file, <none>: ID + '_fin AV'</none>	<pre>knone></pre>	<u> </u>
03: sc <u>a</u> n table for partial scans + maximizing	<none></none>	
0 <u>4</u> : optional 2nd scan table (vertical)	<none></none>	
05: <u>s</u> can table for final measurements	EN 55011 Field	
0 <u>6</u> : optional 2nd scan table (vertical)	<none></none>	
<u>0</u> 7: perform partial scans	x	
0 <u>8</u> : complete search (all accessory settings)	×	
0 <u>9</u> : insert results into existing result file		
10: time [sec] for final measurements	1.000000	
11: perform accessory adjustment	X	
<u>1</u> 2: adjustment full range		
1 <u>3</u> : optional input: preview result file	<none></none>	
14: optional input: preview result file (2nd det.)	<none></none>	
1 <u>5</u> : optional input: frequency list	<none></none>	
16: optional input: frequency list (2nd det.)	<none></none>	
1 <u>7</u> : optional input: final result file	<none></none>	
18: optional input: final result file (2nd det.)	<none></none>	

The final measurement settings (single measurement and, if required, partial scans (parameter 07)) are performed according to a preset scan table (parameter 03). If parameter 07 is activated (eg when drifting interferers are expected), additional partial scans are first carried out at the critical frequencies found during the preview measurement. The final measurements are then performed at the frequencies obtained as a local maximum from the partial scans (with data reduction).

If parameter 08 (complet search) is marked as in this example, the final measurement is performed for **all** accessory settings (as defined in the corresponding parameters related to topics 'mast'/'polarization'/'turntable'). If no item is selected here, the measurement is performed with the mast, polarization and turntable settings which were determined in a **complete** preview measurement at the corresponding frequencies. In addition, the search for the local maximum can be optimized for the mast and turntable either within a small setting range (parameter 11) or performed again over the whole possible range (parameter 12).

If no preview measurement is performed, an existing file can be used as a preview result for the final measurements either jointly for the QP/QP+AV final measurement or as separate results files for the quasipeak and average detectors (parameters 13 and 14). This is performed in the same way with existing frequency lists (parameters 15 and 16) or with previous final measurement results (parameters 17 and 18).

Topic 'Graphic'

	×
EN 55011 Field <none></none>	<u>D</u> K <u>C</u> ancel
	EN 55011 Field

The graphics configuration describes the appearance of the graphic, ie the display of measured values (level) versus the frequency axis. In addition, the number and display form (eg colour) of traces, limit values lines or transducers are defined in the graphics configuration. Markers, delta markers or legend are also specified here.

The file name for the graphics configuration used in this test is entered or selected under parameter 01 (eg EN 55011 Field).

If the current graphics configuration is to be derived from an existing graphics configuration (eg its line and colour settings), it can be selected under parameter 02.

Topic 'Report'

総理		×
Report <u>0</u> 1: generate printer hardcopy 0 <u>2</u> : report config. for printing, <none>: ID + '_prnt' 0<u>3</u>: footnote, empty field: ID</none>	× EN 55011 Field Footnote text	<u>D</u> K <u>C</u> ancel

The documentation of a test usually comprises a report header and the graphical display of results (graphics configuration). The test report layout is set by means of a report configuration in which, for example, the report header, the graphic and the type of representation of results are defined. The contents of the printout with this report configuration is thus specified.

Selecting parameter 01 generated a report configuration for printing and a printout is started via the printer defined for the ESI-K1 software. The file name for the report configuration to be used in the test is selected in parameter 02. An optional text can be entered under parameter 03 for the footer on the test report.
Topic 'Report Header'

ReportHeader Image: Constraint of the state in the	×
03: 1st header line Radiated emission test to EN ! 04: 2nd header line	cel
0 <u>5</u> : E.u. 1. name 101 0 <u>6</u> : manufacturer 101 0 <u>7</u> : operating conditions 101 0 <u>8</u> : test site 101	
0 <u>8</u> : test site	
09: operator Donald Duck	
10: test specification 11: comment line 12: 2nd comment line (empty field: start time)	

A report usually contains different information which are relevant for the test and can be specified in detail in the report header. This includes in addition to the header line the test conditions, the test location or the DUT description, for example.

Optionally, the file name of an existing report header can be called under parameter 02. The file name is to be used as a template for the test report header and, if required, modified in only some lines.

A character string which is to be taken over in the report header as further comment line can be entered in the field for parameter 12. If this is not used, the test start time is automatically entered here.

Topic 'Mast'

1	4		×
	Mast		
	<u>0</u> 1: use mast positioning	×	
	0 <u>2</u> : control priority level (1=highest)	1	<u> </u>
	0 <u>3</u> : min. height [cm] to be measured for preview	100	
	0 <u>4</u> : max. height [cm] to be measured for preview	300	
	0 <u>5</u> : height stepsize [cm] for previe w	200	
	0 <u>6</u> : min. height [cm] to be measured for finals	100	
	0 <u>7</u> : max. height [cm] to be measured for finals	400	
	0 <u>8</u> : height stepsize [cm] for finals	50	

The script parameter set Mast can be used to support the manual operation of the antenna mast by means of dialog windows (parameter 01).

The setting values for antenna height indicated in the dialog windows are defined by the script parameters 03 to 08 separately for preview and final measurement.

For the mast-height control (the priority of this setting related to the setting of turntable angle and antenna polarization can be preset with parameter 02. Value 1 is the highest priority, value 3 the lowest one.

Topic 'Turntable'

後日 		×
Turntable		OK
<u>0</u> 1: use turntable positioning	X	
02: control priority level (1=highest)	2	<u> </u>
0 <u>3</u> : min. azimuth [deg] to be measured for preview	0	
04: max. azimuth [deg] to be measured for preview	180	
0 <u>5</u> : azimuth stepsize [deg] for preview	180	
0 <u>6</u> : min. azimuth [deg] to be measured for finals	0	
0 <u>7</u> : max. azimuth [deg] to be measured for finals	315	
08: azimuth stepsize [deg] for finals	45	

The script parameter set Turntable can be used to support the manual operation of the turntable for positioning the DUT by means of dialog windows (parameter 01).

The setting values for turntable angle indicated in the dialog windows are defined by the values of script parameters 03 to 08 separately for preview and final measurement.

For the turntable position control (the priority of this setting related to the setting of antenna mast height and antenna polarization can be preset with parameter 02. Value 1 means the highest priority, value 3 the lowest one.

Topic 'Polarisation'

(1)		×
Polarisation		
<u>0</u> 1: use polarisation switching	X	
02: control priority level (1=highest)	3	<u> </u>
0 <u>3</u> : preview measurements with horizontal polaris.	×	
0 <u>4</u> : preview measurements with vertical polaris.		
0 <u>5</u> : final measurements with horizontal polaris.	×	
0 <u>6</u> : final measurements with vertical polaris.	× X	

The script parameter set Polarization can be used to support the manual switchover of the antenna polarization by means of dialog windows (parameter 01).

The two polarization settings are defined (separately for preview and final measurement) by marking script parameters 03 to 06.

The priority of this polarization switchover can be preset with respect to the setting of antenna mast heigt and turntable angle using parameter 02. Again, value 1 means the highest priority, value 3 the lowest one.

Start of the measurement

After defining all script parameters the measurement is started by clicking on

	<u>o</u> k					
ti <mark>n</mark> Sc	ript Parameter ['F	Field Strength' : 'EN 5501	1 F']			X
Pa <u>r</u> a	meter Set	EN 55011 F		-		<u><u> </u></u>
Test	t ID (max. 12 cha	rs) to be included in filer	names	Field 0001	_	<u>S</u> ave
0 <u>2</u> :	global start freq	uency [MHz] for the test		30.000000		S <u>a</u> ve As
0 <u>3</u> : 04:	global stop frequestion suppress queries	uency [MHz] for the test s as far as possible		1000.000000		<u>P</u> rint
0 <u>5</u> :	split frequency r	ange into test ranges		×		<u>St</u> op
0 <u>6</u> : 07:	if splitting of free min. no. of test	quency range: do with lo ranges for splitting of fre	ig. scale gu. range	x 1	_	<u>C</u> ancel
<u>0</u> 8:	test configuratio	on, <none>: ID</none>		knone>	_	
Add	itional Topics					
	Pr <u>e</u>	view		DataReduction		
	<u> </u>	inal		<u>G</u> raphic		
	<u>R</u> e	port		Report <u>H</u> eader		
	M	ast		T <u>u</u> rntable		
		Polarisat	ion)			

A **preview test** is first performed to determine the critical frequencies.

Script - Field Strength		
Eile <u>E</u> dit <u>V</u> iew <u>O</u> ptions		
Start Interpreter		
Scanning Script		
FIELD STRENGTH TEST (Nersion 1 00)		
Closing files		
Deleting temporary data		
Checking script parameters, please wa	ait	
preparing files		
	Preview Test 🛛 🕅	
	Perform preview test ?	
	1	
	Ja Nein	
		<u> </u>
	▼ Start Wait	<u>S</u> top

This preview measurement may be omitted and instead of it the result of a previous preview can be used as input data set for data reduction and subsequent final test. This also applies to frequency lists or previous final measurement results.

The settings shown below apply as standard to the preview scan table to EN 55011 Field for the two scan subranges 30 to 200 MHz and 200 MHz to 1 GHz.

File		
<u>U</u> nit	Detector Mode <u>Subranges</u>	
dBµV/m ▼ Cu <u>r</u> ve 1	MaxPeak ClearWrite MaxPeak ClearWrite MaxPeak	00.0 MHz 120 kHz ESIX
Curve 2	NONE ClearWrite < < End of table	
Curve 3	NONE ClearWrite	
Curve 4	NONE ClearWrite	<u>D</u> elete
Subrange		
Receiver ESIX	Transducer HK116	Start Freguency 30.000000 MHz V
Signal Path NONE	 System Transd. 	Stop Frequency 200.000000 MHz V
Scan Mode Lin	Add. Transd. 1 NONE	Step Size 60.000 kHz 💌
Input 1	Add. Transd. 2 NONE	IF Bandwidth 120 kHz 💌
Tracking Gen. Off	Add. Transd. 3 NONE	Measure Time 10.000 ms 💌
Attenuation/ <u>G</u> ain	Control	Demodulation
🗵 Autora	nge 🛛 🖾 Curve 1 📄 Curve 3	Demodulation FM
Preamplifier 20 dB	Curve 2 Curve 4	Volume [%] 30
RF Att. 0 dB	Repetition Single -	
	Stop Mark	
	X Stop Message	Option None 🗾
Ref. Level [dBm] -10.0	HK116	Subrange Check Cancel
	OK C <u>a</u> ncel	<u>C</u> heck
🗰 Scan Editor - EN 55011 Eield		
<u>F</u> ile		
Eile Unit	d Detector <u>Mode <u>S</u>ubranges</u>	
Eile Unit dBµV/m ▼ Curve 1	d Detector Mode <u>Subranges</u> MaxPeak V ClearWrite V 30.0 MHz 2 200 0 MHz 1	00.0 MHz 120 kHz ESIX
Eile <u>U</u> nit dBµ¥/m ▼ Curve 1 Curve 2	Detector Mode <u>Subranges</u> MaxPeak I ClearWrite I 30.0 MHz 2 NONE I ClearWrite I <end of="" table<="" td=""><td>00.0 MHz 120 kHz ESIX 0 GHz 120 kHz ESIX</td></end>	00.0 MHz 120 kHz ESIX 0 GHz 120 kHz ESIX
Eile Unit dBµV/m ▼ Curve 1 Curve 2 Curve 3	d Detector Mode <u>Subranges</u> MaxPeak <u>ClearWrite</u> 30.0 MHz 2 200.0 MHz 1 NONE <u>ClearWrite</u> ClearWrite NONE <u>ClearWrite</u>	00.0 MHz 120 kHz ESIX 0 GHz 120 kHz ESIX 0 GHz 120 kHz ESIX
Eile Unit dBµV/m ▼ Curve 1 Curve 2 Curve 3 Curve 4	d Detector Mode <u>Subranges</u> MaxPeak ▼ ClearWrite ▼ 30.0 MHz 2 200.0 MHz 1 200.0 MHz 1 ClearWrite ▼ NONE ▼ ClearWrite ▼ NONE ▼ ClearWrite ▼	00.0 MHz 120 kHz ESIX 0 GHz 120 kHz ESIX Modify Delete
Eile Unit dBµ∀/m ▼ Curve 1 Curve 2 Curve 3 Curve 4	Detector Mode <u>Subranges</u> MaxPeak V ClearWrite V 30.0 MHz 2 200.0 MHz 1 NONE V ClearWrite V NONE V ClearWrite V NONE V ClearWrite V	00.0 MHz 120 kHz ESIX 0 GHz 120 kHz ESIX Modify Delete
Eile Unit dBµV/m ▼ Curve 1 Curve 2 Curve 3 Curve 4 Subrange Receiver ESIX	d Detector Mode <u>Subranges</u> MaxPeak <u>ClearWrite</u> <u>30.0 MHz</u> 2 200.0 MHz 1 200.0 MHz 1 ClearWrite <u>ClearWrite</u> NONE <u>ClearWrite</u> NONE <u>ClearWrite</u> Transducer HL223	00.0 MHz 120 kHz ESIX 0 GHz 120 kHz ESIX Modify Delete Start Freguency 200.000000 MHz V
Elle Unit dBµV/m ▼ Curve 1 Curve 2 Curve 3 Curve 4 Subrange Receiver ESIX Signal Path NONE	d Detector Mode Subranges MaxPeak ClearWrite 30.0 MHz 2 200.0 MHz 1 NONE ClearWrite ClearWrite ClearWrite T NONE ClearWrite ClearWrite ClearWrite S Transducer HL223 System Transd.	00.0 MHz 120 kHz ESIX 0 GHz 120 kHz ESIX Modify Delete Start Freguency 200.000000 MHz Stop Frequency 1000.000000 MHz
Eile Unit dBµV/m ▼ Curve 1 Curve 2 Curve 3 Curve 4 Subrange Receiver ESIX Signal Path NONE Scan Mode Lin	Detector Mode Subranges MaxPeak ClearWrite 30.0 MHz 2 NONE ClearWrite 200.0 MHz 1 NONE ClearWrite Kend of table NONE ClearWrite Y Transducer HL223 Y System Transd.	00.0 MHz 120 kHz ESIX 0 GHz 120 kHz ESIX Modify Delete Start Frequency 200.000000 MHz Stop Frequency 1000.000000 MHz Step Size 60.000 kHz
Elle Unit dBµV/m ▼ Curve 1 Curve 2 Curve 3 Curve 4 Subrange Receiver ESIX Signal Path NONE Scan Mode Lin Input 2DC	Detector Mode Subranges MaxPeak ClearWrite 30.0 MHz 2 NONE ClearWrite 200.0 MHz 1 NONE ClearWrite NONE ClearWrite NONE ClearWrite Y Transducer HL223 Y System Transd. Y Add. Transd. 1 NONE	OD. 0 MHz 120 kHz ESIX OGHz 120 kHz ESIX Modify Delete Start Freguency 200.000000 MHz ▼ Stop Frequency 1000.000000 MHz ▼ Step Size 60.000 kHz ▼ IF Bandwidth 120 kHz ▼
Elle Unit dBµV/m ▼ Curve 1 Curve 2 Curve 3 Curve 4 Subrange Rgceiver ESIX Signal Path NONE Scan Mode Lin Input 2DC Tracking Gen. [Dff	Detector Mode Subranges MaxPeak ClearWrite 30.0 MHz 2 NONE ClearWrite 200.0 MHz 1 NONE ClearWrite NONE ClearWrite NONE ClearWrite Y Transducer HL223 Y System Transd. Y Add. Transd. 1 NONE Y Add. Transd. 3 NONE	00.0 MHz 120 kHz ESIX Insert 0 GHz 120 kHz ESIX Modify >
<u>File</u> <u>Unit</u> <u>dBμV/m</u> ▼ Curve 1 Curve 2 Curve 3 Curve 4 Subrange Receiver ESIX Signal Path NONE Scan Mode Lin Input 2DC Tracking Gen. <u>Off</u> Attenuation/ <u>Gain</u>	Detector Mode Subranges MaxPeak ClearWrite 30.0 MHz 2 NONE ClearWrite 200.0 MHz 2 NONE ClearWrite NONE ClearWrite NONE ClearWrite Y Transducer HL223 Y System Transd. Y Add. Transd. 1 NONE Y Add. Transd. 2 NONE Y Add. Transd. 3 NONE	00.0 MHz 120 kHz ESIX 0 GHz 120 kHz ESIX Modify Delete Start Freguency 200.000000 MHz Stop Frequency 1000.000000 MHz Stop Size 60.000 kHz IF Bandwidth 120 kHz Measure Time 10.000 ms Demodulation
<u>File</u> <u>Unit</u> <u>dBµV/m</u> ▼ Curve 1 Curve 2 Curve 3 Curve 4 Subrange Receiver ESIX Signal Path NONE Scan Mode Lin Input 2DC Tracking Gen. [Diff Attenuation/ <u>G</u> ain ▼ Autora	Detector Mode Subranges MaxPeak ClearWrite 30.0 MHz 2 NONE ClearWrite 200.0 MHz 2 NONE ClearWrite Kend of table NONE ClearWrite ClearWrite Y Transducer HL223 Y System Transd. Y Add. Transd. 1 NONE Y Add. Transd. 2 NONE Y Add. Transd. 3 NONE	00.0 MHz 120 kHz ESIX Insert 0 GHz 120 kHz ESIX Modify Delete Delete Delete Start Frequency 200.000000 MHz ¥ Stop Frequency 1000.000000 MHz ¥ Step Size 60.000 kHz ¥ IF Bandwidth 120 kHz ¥ Measure Time 10.000 ms ¥ Demodulation FM ¥
Eile Unit dBµV/m ▼ Curve 1 Curve 2 Curve 3 Curve 3 Curve 4 Subrange Receiver ESIX Signal Path NONE Scan Mode Lin Input 2DC Tracking Gen. Off Attenuation/Gain Freamplifier 20 dB	Detector Mode Subranges MaxPeak ClearWrite 30.0 MHz 2 NONE ClearWrite 200.0 MHz 2 NONE ClearWrite Kend of table NONE ClearWrite NONE ClearWrite Y Transducer HL223 Y System Transd. Y Add. Transd. 1 NONE Add. Transd. 2 Y Add. Transd. 3 Y Add. Transd. 4 Y Control X Curve 1 Curve 3 Y Curve 4	00.0 MHz 120 kHz ESIX Insert 0 GHz 120 kHz ESIX Modify Delete Delete Delete Stop Frequency 1000.000000 MHz MHz Step Size 60.000 kHz If Bandwidth 120 kHz Time 10.000 ms Demodulation FM Volume [%] 30
Eile Unit dBµV/m ▼ Curve 1 Curve 2 Curve 3 Curve 4 Subrange Receiver ESIX Signal Path NONE Scan Mode Lin Input 2DC Tracking Gen. [Diff Attenuation/ <u>G</u> ain FX Autora Preamplifier 20 dB RF Att. [0 dB	Detector Mode Subranges MaxPeak ClearWrite 30.0 MHz 2 NONE ClearWrite 200.0 MHz 2 NONE ClearWrite NONE ClearWrite NONE ClearWrite Y Transducer HL223 Y System Transd. Y Add. Transd. 1 NONE Y Add. Transd. 2 NONE Y Add. Transd. 3 NONE Y Add. Transd. 3 Y Y Control Y Curve 1 Curve 3 Y Curve 2 Curve 4 Y Repetition Single	00.0 MHz 120 kHz ESIX Insert 0 GHz 120 kHz ESIX Modify Delete Delete Start Frequency 200.000000 MHz ▼ Stop Frequency 1000.000000 MHz ▼ Step Size 60.000 kHz ▼ IF Bandwidth 120 kHz ▼ Demodulation FM ▼ Volume [%] 30 30
Ele Unit dBµV/m ▼ Curve 1 Curve 2 Curve 3 Curve 4 Subrange Receiver ESIX Signal Path NONE Scan Mode Lin Input 2DC Tracking Gen. Off Attenuation/Gain Preamplifier 20 dB RF Att. 0 dB	Detector Mode Subranges MaxPeak ClearWrite 30.0 MHz 2 200.0 MHz 1 200.0 MHz 1 200.0 MHz 1 ClearWrite ClearWrite Clea	00.0 MHz 120 kHz ESIX 0 GHz 120 kHz ESIX Modify Delete Start Freguency 200.000000 MHz ▼ Stop Frequency 1000.000000 MHz ▼ Step Size 60.000 kHz ▼ IF Bandwidth 120 kHz ▼ Measure Time 10.000 ms ▼ Demodulation Demodulation FM ▼ Volume [%] 30
Elle Unit dBµV/m ▼ Curve 1 Curve 2 Curve 3 Curve 4 Subrange Receiver ESIX Signal Path NONE Scan Mode Lin Input 2DC Tracking Gen. Off Attenuation/Gain Preamplifier 20 dB RF Att. 0 dB	Detector Mode Subranges MaxPeak ClearWrite 30.0 MHz 2 NONE ClearWrite 200.0 MHz 2 NONE ClearWrite Kend of table NONE ClearWrite Y Transducer HL223 ¥ Y System Transd. ¥ Y Add. Transd. 1 NONE ¥ Y Add. Transd. 2 NONE ¥ Y Add. Transd. 3 NONE ¥ Y Add. Transd. 3 NONE ¥ Y Add. Transd. 4 Y Y Y Add. Transd. 3 Y Y Y Add. Transd. 3 Y Y Y Add. Transd. 3 Y Y	00.0 MHz 120 kHz ESIX Insert 0 GHz 120 kHz ESIX Modify Delete Start Frequency 200.000000 MHz Stop Frequency 1000.000000 MHz Step Size 60.000 kHz IF Bandwidth 120 kHz Demodulation FM Demodulation FM Option None
Elle Unit dBµV/m ▼ Curve 1 Curve 2 Curve 3 Curve 3 Curve 4 Subrange Receiver ESIX Signal Path NONE Scan Mode Lin Input 2DC Tracking Gen. Øff Attenuation/Gain Preamplifier 20 dB RF Att. 0 dB	Detector Mode Subranges MaxPeak ClearWrite 30.0 MHz 2 NONE ClearWrite 200.0 MHz 2 NONE ClearWrite Kend of table NONE ClearWrite NONE ClearWrite Y Transducer HL223 Y System Transd. Y Add. Transd. 1 NONE Add. Transd. 2 Y Add. Transd. 3 NONE Control Image Curve 1 Curve 2 Curve 4 Repetition Single Stop Mark Image Stop Mark Image HL223	00.0 MHz 120 kHz ESIX Insert 0 GHz 120 kHz ESIX Modify Delete Delete Delete Stop Frequency 1000.000000 MHz MHz Step Size 60.000 kHz MHz IF Bandwidth 120 kHz Measure Time 10.000 Demodulation FM Volume [%] 30 Option None Subtrange Check Cancel
Eile Unit dBµV/m ▼ Curve 1 Curve 2 Curve 3 Curve 3 Curve 4 Subrange Receiver ESIX Signal Path NONE Scan Mode Lin Input 2DC Tracking Gen. [Diff Attenuation/ <u>G</u> ain Freamplifier 20 dB RF Att. [0 dB RF Att. [0 dB	Detector Mode Subranges MaxPeak ClearWrite 30.0 MHz 2 NONE ClearWrite 200.0 MHz 2 NONE ClearWrite NONE ClearWrite NONE ClearWrite Y Transducer HL223 Y System Transd. Y Add. Transd. 1 NONE Y Add. Transd. 2 NONE Y Add. Transd. 3 NONE	00.0 MHz 120 kHz ESIX Insert 0 GHz 120 kHz ESIX Modify Delete Delete Delete Stop Frequency 1000.000000 MHz MHz Step Size 60.000 kHz If IF Bandwidth 120 kHz If Demodulation FM Image: Check Cancel

These settings can of course be modified before carrying out measurement so that the measurement can be adapted to the user's requirements and optimized.

R&S antennas HK116 (30 to 200 MHz) and HL223 (200 to 1000 MHz) are preprogrammed for this measurement in the above scan table EN 55011 F. The change between the antennas at 200 MHz is

automatically performed by differently defining the inputs for the two scan subranges. Input 1 for HK116 and input 2 (DC-coupled) for HL223. This change of antenna is not necessary when a broadband antenna (eg R&S HL562 'Ultralog') is used.

Typical open-area values of the two antennas are also preprogrammed as transducer factors. For optimizing the measurement uncertainty, these preprogrammed value pairs can be replaced by the actual antenna calibration values. The values can be defined in advance as follows:

Mavigator Piore Bave Save Short Description Broadband Biconic Antenna Owner Date Owner Date Date Short Description HK116 EX-11 EX-12 EX-21 HFH2-221 HFH2-221 HFH2-221 HFH2-221 HFH2-221 HFH2-221 HFH2-221 HFH2-221	<u>File</u> Edit <u>T</u> est <u>O</u> ptions <u>W</u> indow <u>H</u> elp	
Close Bave Bave Bave Brint Printer Setup Egit Alt+F4 Navigator Image: Short Description Function Image: Short Description Open Image: Short Description File Type Filter File Type Filter File Type Filter File Name Owner HK116 Image: Short Description ESH3-Z6 Image: Short Description ESH3-Z6 Image: Short Description EZ-17 Mod.02 File Name HFH2-Z2 (dBµA/m) File Name HFH2-Z3 (dBµA/m) Hert-22 (dBµA/m) HFH2-Z3 (dBµA/m) Path	<u>N</u> avigator	
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HFH2-Z3 (dBµA/m) HFH2-Z3 (dBµV/m) HFH2-Z3 (dBµV/m) HFH2-Z3 (dBµV/m)	HFH2-Z2 (dBµV/m)	
	HFH2-Z3 (dBµA/m)	Path
HFH/-/& I(1500/m)	HFH2-Z3 (dBµ¥/m) HFH2-Z4 (dBµ4/m)	Lau
HFH2-Z4 (dBµV/m)	HFH2-Z4 (dBµ¥/m)	D-\PB0GBA~1\ESI-K1 OK
HFH2-Z6	HFH2-Z6	
HK116 999934 kByte <u>C</u> ancel	HK116	999934 kByte <u>C</u> ancel

Using

🏢 Trans	ducer - HK1	16	_ 🗆 ×
<u>Eile</u> <u>E</u> dit			
<u>0</u> pen		ection	Source Unit-
<u>S</u> ave		V/m V	dBuy
S <u>a</u> ve A	S		
Print		ear 🔻	
		17.50	▲ <u>I</u> nsert
E <u>x</u> it	Alt+F4	15.00	
30	.000000	13.20	Modify

they are created as additional transducer sets.

If the whole frequency range is divided into **subranges** (as in this example) for the test. The subranges are **completely** measured (preview measurement, data reduction, final measurement). This considerably reduces the time interval between preview measurement and final measurement, which is an advantage for the detection of drifting interferers. In addition, this method reduces manipulation during the measurement when several antennas are used (ie only one change of antenna during the whole test).

After the preview measurement, a final measurement can be performed with the selected detectors at the found critical frequencies.



After confirming the final measurement, the user is asked to set the DUT to the required mode.



The measurement sequence is started with the request to connect the antenna (HK116 here) selected for the first subrange.



In the further interactive operation the user is guided step by step by means of dialog windows. The different steps of the script run are reported at the same time:



The following script run applies to the preview measurement in the scan subrange of 30 to 200 MHz:

睯 Script - Field Strength _ 🗆 × File Edit View Options Start Interpreter ... ٠ Scanning Script ... Running .. FIELD STRENGTH TEST (Version 1.00) Closing files ... Deleting temporary data ... Checking script parameters, please wait ... preparing files ... Calculating test range: ESIX: input protection settings ... Mount probe: HK116 200 MHz current test range: 30 -Preview test: preparing preview test ... MAST height = 100 cm TURNTABLÉ azimuth = 0 deq POLARISATION = HORIZONTAL scanning ... merging results ... MAST height = 300 cm scanning .. merging results ... TURNTABLE azimuth = 180 deq scanning .. merging results ... MAST height = 100 cm scanning ... merging results ... TURNTABLE azimuth = 0 deq merging results ... Data reduction: peak reduction . subrange maxima reduction ... merging results ... acceptance analysis ... maxima reduction remaining entries: 10 -1 Þ ▼ Start Wait <u>S</u>top

The preview scans are performed at an antenna height of 1 m and 3 m at a turntable angle of 0° und 180° respectively. In this example the scans are however performed only in the horizontal polarization.

After each scan the result list is updated, ie for each test frequency the existing level value is compared to the currently measured level value and overwritten with it:

merging results ...

The values associated with this level value concerning antenna height, turntable angle and antenna polarization are automatically stored.

Thus, only **one** result list with a preset **fixed number** of value pairs (frequency/level) is obtained depending on the definition of start/stop frequency and stepwidth of the (sub) scan with the relevant settings for mast, turntable and polarization. This method generally applies to all measurement sequences within ESI-K1 both to the preview and the final measurement results at the critical frequencies.

A script routine can be stopped by clicking wait

continued by clicking Start

and aborted by clicking Stop

Note that a currently active sweep or scan should prior be aborted.

The test results obtained until that time may only be usable to a limited extent. After an abort it is no longer possible to continue the script routine.

Following the preview measurement and data reduction, a final measurement can be carried out for the frequency subrange (30 to 200 MHz here) at the critical frequencies.



If, like in this example, partial scans around the critical frequencies determined in a preview were selected in connection with the final measurement for accurate detection of drifting interferers, these scans will now be carried out. The mast/turntable/polarization settings correspond to those of the preview measurement. In our example a value of 1% of the corresponding final measurement frequency is defined as a partial scan range.

🚆 Script - Field Strength			
<u>File Edit View Options</u>			
Final test: preparing final test			
Partial scans: sorting for Height/Azimuth/Polarisation			
partial scan around 67.26 MHz			
Data reduction: peak reduction subrange maxima reduction merging results acceptance analysis maxima reduction remaining entries: 1			
partial scan around 67.68 MHz			
Data reduction: peak reduction subrange maxima reduction merging results acceptance analysis maxima reduction remaining entries: 1 merging results			
partial scan around 112.32 MHz			

For these updated frequencies, the actual final measurement (complete search) is performed for all antenna heights between 1 m and 4 m at distances of 50 cm in all turntable positions between 0° and 315° (in 45° steps). This operation is first completely carried out for one polarization plane (vertical here) and then repeated for the other polarization plane (horizontal here).

The mast and turntable control is programmed in such a way that an effective and continuous movement is ensured in order to minimize the duration of the required mast/turntable settings.

🖺 Script - Field Strength

<u>E</u>dit <u>V</u>iew <u>O</u>ptions Complete search: MAST height = 100 cm TURNTABLE azimuth = 0 deg POLARISATION = VERTICAL measuring complete set ... MAST height = 150 cm measuring complete set ... MAST height = 200 cm measuring complete set ... MAST height = 250 cm measuring complete set ... MAST height = 300 cm measuring complete set ... MAST height = 350 cm measuring complete set ... MAST height = 400 cm measuring complete set ... TURNTABLE azimuth = 45 deg measuring complete set ... MAST height = 350 cm measuring complete set ... MAST height = 300 cm measuring complete set ... MAST height = 250 cm

The results are then optimized again by manually changing settings of the mast and turntable. A quasianalog bargraph display of the measured level value facilitates the search for maximum values. The measurement result is stored by clicking

<u> (</u> Search level maximum !	_ 🗆 X			
_dBµ∀/m				
60.0				
	ESIX			
20.0				
20.0				
38.0985				
OK				

The numeric values for the turntable angle and the mast height are manually entered after each measurement.

Enter turntable position of local level maximum !				
Position [deg]:				
45				
	Cancel			

Enter mast position of local level maximum !	×
Position [cm]:	
350	
OK Cancel	

This procedure is repeated for all final test frequencies. The corresponding default settings for mast height, turntable angle and antenna polarization are reported in advance.

Script - Field Strength		<u>- </u>
<u>File Edit View Options</u>		
Height variation around 300 cm : Move mast to local level maximum (275 - 325 cm) ? measurement with final detector no.1 at 100.14 MHz => level: 72.092 dBµV/m		_
current frequency (8/10): 67.38 MHz MAST height = 200 cm TURNTABLE azimuth = 90 deg Azimuth variation around 90 deg : Move turntable to local level maximum (68 - 112 deg) Height variation around 200 cm :	×	
Move mast to local level maximum (175 - 225 cm) measurement with final detector no.1 at 67.38 MHz => level: 36.3 dBµV/m current frequency (9/10): 87.48 MHz TURNTABLE azimuth = 180 deg	move TURNTABLE to 180 deg	
	∑ S <u>t</u> art <u>W</u> ait	▼ <u> <u> </u> </u>

After completion of the final measurement for this scan subrange, the whole procedure described above is repeated for the next range with the request to change the antenna (HL223 here).

current frequency (9/10): 88.08 MHz Azimuth variation around 270 deg : Move turntable to local level maximum (248 - 292 deg) Height variation around 300 cm : Move mast to local level maximum (275 - 325 cm) ! measurement with final detector no.1 at 88.08 MHz 36.717 dBuV/m => level: current frequency (10/10): 57 MHz MAST height = 150 cm TURNTABLĒ azimuth = 315 deg Azimuth variation around 315 deq : Move turntable to local level maximum (293 - 337 deg) Height variation around 150 cm : Move mast to local level maximum (125 - 175 cm) ! 57 MHz measurement with final detector no.1 at => level: 33.937 dBµV/m MAST height = 100 cm TURNTABLĒ azimuth = 0 deg Mount probe: X POLARISATION = VERTICAL sorting frequencies ... merging results ... HL223 Calculating test range: ESIX: input protection settings ... OK. Mount probe: HL223

After completion of the final measurement for this subrange, the measurement is now terminated in this example and a printout of the graphical result display can be started.



The script routine is then terminated



and the result is graphically displayed (in this example in the virtual mode with simulated test results):



It may be useful to omit the test report in order to re-define some elements in the graphics configuration (eg line attributes), in the report header or in the report configuration and then to start the modified printout by selecting menu items Print... in the <u>F</u>ile menu.

<u>File</u> <u>E</u> dit	<u>T</u> est	<u>O</u> ptions	<u>₩</u> indow	<u>H</u> elp		
<u>N</u> avigato	r					9 🚹
<u>C</u> lose					* ****	
<u>S</u> ave						
S <u>a</u> ve As.						
Na <u>v</u> igato	r (Back	up Datab	ase)			
Print						
P <u>r</u> inter Se	etup					
E <u>x</u> it			Alte	F4		

Alternatively, the test report can be stored as a RTF file:

Print Report	×
Printer	
<u>N</u> ame	\\RS\pq_hp_dj850c_fossy
Status	Bereit <u>N</u> etwork
Туре	HP DeskJet 850C
Where	\\RS\pq_hp_dj850c_fossy
Comment	
Report	
<u>R</u> eport H	eader Report Configuration EN 55011 Field
X <u>Be</u> direct to	<u>Print</u>

2 Graphical User Interface

2.1 Overview

The graphical user interface is very similar to the widely used standard interface for MS-WINDOWS. This environment permits the user to perform all operations in interactive mode. The dialogs and input masks provide a complete overview of all possible settings, such as file and graphics operations, parameter settings, measuring and analyzing functions, etc. The measurement results can be easily transferred to other WINDOWS programs in tabular or graphical format.

When using the mouse (or the trackball), various functions are very easily accessible by means of the fields in the **Main Toolbar**. The same is true for the **Device Toolbar**, which permits to start the device dialogs (activation in the menu **Options)**:



As soon as the mouse cursor rests one second on an icon then an explanation is displayed next to the icon. Note: At that moment the global Windows system keys like e.g. ALT+TAB are not effective.

The status bar is used to display short help texts for various menu items:

ESI-K1 is active

The background of the main window of the application can be assigned a graphics of the WMF type (Windows Metafile Format), i.e. a vector graphics. E.g. a representation of the test setup generated with a respective graphics program could be displayed there. Any WMF file can be defined as **Background** display via a file selection window.

The graphical user interface contains the following submenus:

- File
- Edit
- Test
- Options
- Window
- Help

The submenus are explained in greater detail in the following chapters.

2.2 Files

The core of the software contains a local database for management of all occurring file types. This data base uses its own file names and file attributes, which are not directly derived from a DOS file system. Thus it is possible to use longer file names and any additional descriptional texts for each database element.

In the following, database elements are referred to as files, however, they are not to be understood in the sense of DOS files.

By exporting database elements, a new external database is created or extended (e.g. on a floppy disk), from where these data can be imported again at a later point in time.

File functions are selected from two **Navigators** in the **File** menu. One Navigator provides functions on the **internal** (local) database whereas the other one offers the functions on **external** (exported) databases.

File functions on the **internal** database:

- Delete
- Export
- Move
- New
- Open
- Rename
- Save As

Navigator		×
F <u>u</u> nction		
Open 🔹	Short Description	FCC ClassA, field strength
Fi <u>l</u> e Type <u>F</u> ilter	Owner Type	
Limit Line 🔽 fcc*	Uwner Date	20.06.97
F <u>i</u> le Name	Time	16:56:31
FCC ClassA F QP/AV	User Group	Public
FCC ClassA F QP/AV	Attribute	read/write
FCC ClassA V QP FCC ClassB F QP/AV FCC ClassB V QP	Display	De <u>s</u> cription
	Path D:\ESI-K1.100\DATA 999934 kBy	nte <u>C</u> ancel

File functions on the **external** database:

Delete Backup Files

Import

Note: File names should not contain special characters and should not start with a blank or an underscore.

Navigator (Backup Database)		×
F <u>u</u> nction		
Import 💌	Short Description	
File Type	Owner Type	
Limit Line 💌 💌	Owner	
File Name	Date Time	
	User Group	
	Attribute	
EN 55013 V QP	Dialas	
EN 55014 P QP	Display	Description
EN 55014 V AV	File <u>N</u> ame	
EN 55014 Y QP EN 55015 V AV	O Short Description	All Files
EN 55015 V QP		All Files of <u>Type</u>
EN 55022 F QP		🔲 Attri <u>b</u> ute "read/write"
EN 55022 V AV EN 55022 V OP	Path Browse	
FCC ClassA F QP/AV	DI0#36	
FCC ClassA V QP	D:\ESI-K1.100\IMP	Execute
	000024 hB-t-	
	555534 KByte	E <u>x</u> it

The submenu New offers all kinds of file types.

Open is possible only with files that already exist.

If a new or existing file of any file type is opened for editing then the matching editor will be automatically loaded.

If a new file has been created or modified, this modification has usually not been stored yet. Using **Save** or **Save As** the file is saved under its existing name or under a new name (in the local database).

Rename simply changes the name of a file.

Using **Delete** a file can be deleted from the local database, unless it can be modified by an editor at this point in time (e.g. an opened graphic). It is also possible to mark several files of the same file type and delete them at the same time.

The function **Export** permits to export files. To this end, a drive must be selected first. The files to be exported are marked and copied to the external database by means of **Execute**; should this database not exist yet, it is newly created there. If retention of the user name is not activated, the file is copied with the attribute Public.

Move means that files are exported and right after deleted. This way it is possible to easily archive data that are currently not being used, e.g. onto a server.

The function **Import** permits files to be copied from external databases to the local database. To this end, a drive must be specified and the required file type selected (depending on the contents of the external database). The individual files can then be marked and imported using **OK**. A prompt protects against unintentional overwriting of the files in the local database.

For **Import** the drive and the directory path can be set by making use of the **Browse...** dialogue. The total pathname will be shown in a text field.

The same is true for **Export** and **Move**. With these functions the pathname can also be edited. If the given path doesn't exist then it will be automatically created with the first file transfer. Note that the maximum length of the path must not exceed 37 characters.

Export and **Move** can optionally be done in a way so that all transferred files in the external database will have the file attribute *'read only'* thus automatically protecting those files against overwriting. On the other hand **Import** can change the file attribute of all transferred files to *'read/write'* thus enabling immediate editing of those files.

Besides, with **Export**, **Import** and **Move** either all files of the current filetype or the whole source database can be selected for the transfer. This way a complete backup can easily be done (also see filetype 'Test Configuration').

The menu item **Delete Backup Files** is used to delete specific files in an external database (i.e. exported files).

The field **Filter** allows to reduce the displayed file names to those which match the string characters, with an asterisk representing any sequence of characters (similar to MS-DOS wildcards for file names).

File type	Function	Editor
Script	An automatic test procedure	not available
Script Parameters	Definition of script parameters	Script parameter editor
Measurement result	Display of measurement results	Table editor
Graphics configuration	Definition and displayof graphics	Graphics configuration editor
Limit line	Definition of limit line	Table editor
Transducer	Definition of probe transducer (e.g. for antenna, absorbing clamp)	Table editor
System transducer	Definition of system transducer	Table editor
	(e.g. for cables, paths)	
Report header	Definition of report header	Report header editor
Report configuration	Definition of report configuration	Report configuration editor
Scan table	Definition of scan table	Scan editor
Sweep table	Definition of sweep table	Sweep editor
Frequency list	Definition of frequency list	Table editor
Test configuration	Definition of files belonging to a test	Test configuration editor
Text file	Definition of a description text	Text editor

The following table shows all available **File Types** including their function:

The associated files are displayed in the selection window **File Name**. When a file is selected (when a letter is entered, the mark slips to the first file with the same intial, if provided), file-specific information is output in an extra field. This information is user-defined and can be edited by clicking on the key **Description** (see below).

In a further field, the drive (belonging to the local database) and the available storage capacity are displayed.

OK is used to check the entries; when a file is created or opened, the respective editor is loaded. **Abort** closes the dialog window without saving the settings.

The key **Description** permits to edit specific file information. The following dialog window appears on the screen:

Des	scription
<u>F</u> ile Name	O <u>w</u> ner
HK116	*
Short Description	User Group <u>Attribute</u>
Broadband Biconic Antenna	Public 🔬 read/write 👤
Broadband Biconic Antenna 20 - 300 MHz	↑ ↓
Application Info	

The user may enter the purpose of the file in the editable field **Short Description**. For a detailed description, use the input field below.

The access status of the file ("read/write", "read only", "not removable") can be set in the window Attribute.

The window **Owner** refers to a fixed reference of the respective file, at the moment only for script parameter sets. It indicates with which script the respective parameter set is connected.

In the text field **Application Info** the user name of the original user of the file is additionally recorded; this text field cannot be edited.

With **User Group**, the file is either assigned to the user group which includes the original user of the file, or defined as "Public", i.e. generally accessible.

OK is used to check and save the settings, **Abort**, on the other hand, ignores them; in both cases, the window is closed.

Close (menu **File**) is used to close an open text file or graphics configuration, which means that it is no longer available for processing for the time being. If the file has been modified, the user is asked whether he wishes to store the modifications in the file. Without storage, the modifications will be lost for good.

2.3 Filetypes

2.3.1 Script

A script constitutes an automatic program run which is controlled by the program text (FSL = Flexsys Script Language; similar to the programming language PASCAL) (Interpreter). Thus, almost all functions that are accessible in interactive mode can be automated so that even complex measurement runs can still be operated and reproduced.

2.3.2 Script Parameters

A script can be assigned parameters. The script parameters can be edited directly or when the script is started and can be stored as a complete parameter set. Various parameter sets can be created for each script that uses script parameters. During execution of a script, all parameters are constant, i.e. they cannot be changed any more.

2.3.3 Measurement Result

A measurement result (trace) consists of a list (thousands of lines are possible) with columns for frequency and level. A measurement result is produced by functions such as scan or sweep, which is why the name of the respective scan or sweep table is also recorded internally.

2.3.4 Limit Line

Complying with a specification, limit lines are frequency-dependent maximum values for measured values, displayed as lines. They are defined as frequency/level pairs, the level being assigned the required unit.

2.3.5 Transducer and System Transducer

Since the measuring instruments only measure the voltage at the input, the measured values must be corrected in order to take into account the frequency characteristic of sensors and cables.

The (probe) transducer describes the frequency-dependent correction (represented as frequency/level pairs) of sensors, i.e. antennas, current probes, etc., the associated level unit (dB μ V, dB μ A, dB μ V/m, etc.) having to be specified for the transducer.

System transducers, on the other hand, are correction values (frequency/level pairs) with the unit dB, defining the frequency-dependent characteristics of cables, amplifiers, attenuators, power dividers, etc.

Note: When opening a transducer file then a so called "source unit" will be displayed which cannot be modified. It is the level unit found at the input of the measuring instruments, $dB\mu V$ with EMI measurements.

2.3.6 Graphics Configuration

A graphics configuration describes the appearance of the graphics (always level versus frequency). Thus frequency range and level range are defined on the one hand and the elements to be displayed such as traces, limit lines, transducers with type of display and colour on the other hand. Furthermore, marker, deltamarker or legend are determined here.

2.3.7 Report Header

The report that is part of the test typically contains various specifications that are relevant to the test. This includes e.g. test conditions, test site, designation of the EUT or name of the user. This information is recorded as report header.

2.3.8 Report Configuration

For generation of a test report, a report configuration is used, which permits to vary the appearance of the report. It permits to define a combination of e.g. report header, graphics and measurement results which is to be included in the printout with this report configuration.

2.3.9 Scan/Sweep Table

A scan or sweep is used to record a section of the frequency spectrum.

In the case of a **Scan**, the test frequency is repeatedly increased by the defined step size (or, as an alternative, set to the next frequency of a frequency list), and a (peak and/or average) level is measured until the end of the specified frequency range has been reached. Depending on the specifications, a single sweep may contain thousands of test points. A scan is usually a time-consuming procedure, however, it permits to measure the spectrum in detail.

Contrary to this, a **Sweep** (only with analyzers) permits fast measurement of the spectrum (only with the PEAK detector): the spectrum is also measured completely, however, with a limited frequency resolution of e.g. 900 pixels per sweep. This resolution is usually not sufficient to analyze the spectrum thoroughly.

Sweeps therefore constitute an appropriate means for obtaining a fast overview of the spectrum, whereas scans are required for a detailed analysis, not least because of the detectors defined in the specifications.

All test parameters required for a scan or sweep - e.g. the setting of the attenuation, test bandwidth or correction values to be used - are defined in a scan/sweep table which must always be selected for such a measurement run.

2.3.10 Frequency List

A frequency list serves various purposes. It may be used, e.g., to display a list of ambients at an openarea test site, but also to list critical frequency points of a EUT, which are to be measured by means of a frequency list scan.

2.3.11 Test Configuration

The filetype Test Configuration provides a link between files to export, move or import these files bundled. For instance, a Test Configuration could contain a link to all those files that belong to a test or to a test series.

Besides it is possible to create a kind of "test template":

On a server (in a directory that can only be read) there could be a number of test configurations including all the linked files, ready for use with the Import function. By importing of one of those Test Configurations, all files that are necessary to run a test (e.g. scan tables, transducers, limit lines, scripts) could then be transferred into the local database.

Using the same Test Configuration - extended by the measurement results - could then enable to export or move all the files from the test into a certain directory on e.g. a file server.

A Test Configuration is a kind of bracket around selected files with those files being listed only, i.e. without the file contents. Through exporting, moving or importing of a Test Configuration those files listed inside will also be transferred.

2.3.12 Text File

The filetype Text can hold any kind of text or comment (max. 30000 characters) that shall be part of the application's database. Text files can be directly printed, be stored as a DOS text file (default extension is .LOG) or be part of a test report.

2.4 Editors

2.4.1 Script Parameter Editor

If a script parameter set or a script containing script parameters is opened, the following dialog is displayed (only with extended syntax for the parameter definition; without extended syntax, a less complex dialog similar to the one in versions 1.3x appears):

_	Script Parameter ['Cable Calibration' : 'Cable Cal']							
Pa	rameter Set Cable Cal				<u>OK</u>			
-To (((est <u>1</u> : ID (max. 12 chars) to be included in filenam <u>2</u> : global start frequency for the test 3: global stop frequency for the test		Save					
A	ditional Topics							
	Calibration		<u>G</u> raphics		<u>C</u> ancel			
	<u>R</u> eport		R <u>e</u> portHeader					

The heading of the dialog contains both the name of the associated script and the name of the selected script parameter set. The parameter set to be used is set using the selection menu at the very top of the dialog window. The main parameters are shown below, the short description at the left and a select or edit element at the right. In the lower area of the dialog, additional keys for further topics can be offered depending on the syntax of the associated script. Thus, further groups of parameters are accessible.

The total script parameter set can be stored (maybe under another name) or printed out by means of **Print**. If a script has been started, it is actually only run after the dialog has been left (the last modifications are saved using OK or ignored using Cancel), unless the run is interrupted by means of the additional **Stop** key.

Notes: If a new parameter set is to be created using **New...**, an existing script must be defined as **Owner** in the dialog **Description...**.

If new parameters are added to a script, the old parameter set remains compatible. The additional parameters are assigned their standard values.

If parameters are deleted from a parameter set, the parameter set can still be used.

If a script is deleted, all parameter sets assigned to the script are deleted as well.

2.4.2 Table Editor

The table editor permits the user to generate or modify frequency lists, limit lines, measurement results, probe transducers and system transducers.

The editor is always loaded when a file of the given file types is opened or newly created.

	L	imit	Line - EN 5	502	2 F	QP 🔹
<u>F</u> ile	e <u>E</u> dit					
:	Frequency		Level			
MHz	:	Ŧ	dBµV/m	Ŧ		
log	garithmic	Ŧ	linear			
	30.00000	0	30.00		Ť	<u>I</u> nsert
	230.00000	0 0	30.00 37.00			Edit
1	.000.00000	0	37.00			
<en< td=""><td>nd of tabl</td><td>e></td><td></td><td></td><td></td><td><u>M</u>odify</td></en<>	nd of tabl	e>				<u>M</u> odify
						De <u>l</u> ete
						·
				_	÷	
						<u>C</u> lear

The dialog window is divided into three areas. The upper area contains the selection window, where the user may define e.g. units. The table contents are displayed in the middle area. The lower area contains input fields.

The frequency unit is always offered, whereas a level unit is not available for frequency lists. The intermodulation mode for the frequency can be set to linear or logarithmic for limit lines and transducers (interpolated lines with linear or logarithmic display). The source unit is always $dB\mu V$ (in the case of transducers), the correction level unit is always dB for system transducers.

The lower input fields permit to enter new lines, which can be inserted into the list ahead of the active line using **Insert**. As an alternative, the active line in the list can be overwritten by means of **Modify**. **Edit** (or a double-click) permits to copy the contents of the active line into the input fields. The active line can be removed from the list by means of **Delete**, which causes the next line in the list to become active.

Copy permits to copy the complete contents into the clipboard. If particular lines have been selected (marked), only these are copied. Thus data can be very easily transferred to other applications.

The menu item **Print** permits the complete list to be directly output to the printer without the need for a report configuration.

The **column layout** can be extended (**Add Column...**) or modified (**Modify Column x...**) in various ways: Up to ten columns can be represented, the elements of which can be edited almost at will (the file types limit line, transducer and system transducer require rising frequencies). Added columns can again be deleted "from back to front" (**Delete Column**). The longer one of the two headings determines the width of the column. Possible file types are floating-point numbers, integers or character strings (max. 15 characters); a large number of physical units is available for the unit of numerical values.

For **Sorting** of lists (only for file types measurement result and frequency list), a very flexible window dialog is available:

	Sort:	Measurement Re	esult -	field_0001_fin QP	
A <u>v</u> ailable Columns Level Limit Exceed Height Azimuth	↑	<u>A</u> dd >	1. 2. 3. 4. 5.	<u>S</u> ort keys Margin Frequency	Descending
		<u>0</u> K	<u>C</u> £	incel	

Up to five columns can be defined as **sorting keys** (decreasing priority) with optionally rising or falling values for the elements. Measurements which are not sorted with rising frequency, however, should not be displayed with line graphics display, since the sequence in the list is valid for the graphics.

The columns described in the left field can be selected individually and entered or added as sorting criterion by means of **Add**. Likewise, they can be removed again by means of **Remove**, the subsequent entries being shifted accordingly.

Sorting is always accomplished with falling values if the associated select box has been marked, otherwise, rising values are used. **OK** starts the sorting procedure.

The file type **Limit Line** also permits to define gaps by entering just a minus sign into the edit fields for frequency and level:

— Limi [:]	t Line - Example	e Limit Line 🔹 💌
<u>F</u> ile <u>E</u> dit		
Frequency	Level	
MHz	↓ dBμV	Ŧ
logarithmic	↓ linear	*.
20.000000	60.00 45.00	+ Insert
25.000000	40.00	E <u>d</u> it
30.000000 <end of="" table<="" td=""><td>40.00</td><td><u>M</u>odify</td></end>	40.00	<u>M</u> odify
		Delete
		*
-	-	<u>C</u> lear

The file type **Frequency List** is provided with a special function which allows comfortable editing of a frequency list: **Connect Input...** determines from which of the opened graphics the marker frequency is to be transferred to the edit field:

Conne	ect Input
🗵 Co <u>n</u> nect Input	
Select Connection	
Example Graphic	Ŧ
<u>0</u> K	<u>C</u> ancel

If there is such a connection, the frequency is continuously updated in the edit field of the frequency list when the marker is shifted.

Data lists are often available as files. For example, ever more antennas are delivered along with a floppy disk that contains the correction factor as a DOS (text) file in an ASCII format. Such a list can be easily transferred into the ESI-K1:

When creating a new table file (transducer, system transducer, limit line, measurement result list, frequency list), then the empty columns (including those that are added) can be filled with the content of the ASCII file. Before starting the import, the units for frequency, level, etc. have to be selected according to those in the ASCII file. By selecting **File => Import ASCII Table...** the following dialogue comes up:

	ort ASCII Table	
<u>N</u> ame		
e:\transduc.txt		
į	Browse	
H <u>e</u> ader Lines to Skip	3	Ŧ
Separation Characters		
Columns	Lines	
<u>B</u> lank	🛛 C <u>a</u> rriage Return	\boxtimes
<u>T</u> ab	🛛 Line Feed	\boxtimes
Ot <u>h</u> ers ;		
<u></u> K	<u>C</u> ancel	

The DOS filename (including pathname) of the ASCII file to be imported has to be entered in the field *Name*. Alternatively the file can be searched in the file system by pressing **Browse...**. The number of header lines to be skipped enables to ignore those lines that include header information - therefore a modification of the ASCII file is not necessary.

The type of separators between numbers as well as between lines has to be defined. Separators between numbers are blanks (spaces), tabulators or any other user defined character; carriage return or line feed can be selected as line separators. Characters that cannot be part of a number will be ignored until a valid field separator will be found. For example, a line like

+5.6789E+007MHz +2.345E+001dBµV/m 3:45p.m.

will be correctly be interpreted if there is an extra string column defined. If a column within a line cannot be filled then this will be indicated with an asterisk.

2.4.3 Graphics Configuration Editor

This editor permits the user to generate or modify a graphic. Graphics are used for presentation of the measurement results. To this end, a number of functions such as Zoom, Marker, Legend and Element configuration are available.

If the editor is loaded via **New...**, a standard value is assigned to each element and a standard graphics appears on the screen.



The name of the graphic is indicated in the heading of the dialog window.

The dialog window is divided into two areas. The upper area contains the function bar for configuration of the graphics elements. Up to 8 trace elements can be edited independently of each other. The lower field displays the configured graphics. A complete graphics configuration comprises the elements grid, traces 1 to 8, marker and legend.

All graphics settings are accessible via the menu item Edit.

The status information on marker and delta marker are then displayed in the graphics window above the diagram.

Grid 🔳

The function Grid... permits the user to configure the grid on his own.

1	• Grid - New Graphic 💌							
Unit Scale Type	X Axis Hz log.	*		Y Axis dBμV lin.	±			
Minimum	1	MHz	Ŧ	0	dBμV			
Maximum	1	GHz	Ŧ	80	dBμV	*		
Label	Label Frequency				Level			
Grid	Grid							
Line Style	solid line		±	X Vertica	al Lines			
<u>C</u> olour	black		Ŧ	🛛 <u>H</u> orizo	ntal Lines			
		OK	C <u>a</u> r	icel				

Value range, unit and label can be selected for the two axes separately. Besides, the scale type of the X-axis may be defined as linear or logarithmic, whereas the Y-axis is aways linear. In addition, the dialog permits to set the colour of the grid as well as to fade out the horizontal or vertical lines.

The frequencies of a diagram can easily be modified through shortcuts for the frequency units. A frequency of e.g. 300 MHz can be entered as *300M*.

The line style of the diagram grid can be selected. A doted line for example makes it easier to recognise horizontal limit lines as well as harmonic signals from a quartz oscillator.

The (linear or logarithmic) display of voltages is also possible.



Using the function **Trace x...** the user can determine the graphics configuration on his own. When selecting the trace element 1 to 8 the following dialog window is loaded:

	Trace 5 - New Graphic					
F <u>i</u> le Type	Limit Line	₹	<u>O</u> K			
<u>F</u> ile Name	Example Limit Line	Ŧ	C <u>a</u> ncel			
<u>L</u> ine Style	Line 🛓 bold line	Ŧ				
<u>C</u> olour	dark blue					

Possible **File Types** for the display are measurement result, limit line, probe transducer and system transducer. The appropriate file is selected in the field **File Name**; the trace can only be displayed if the level unit corresponds to that of the diagram.

The alternative type of trace "constant" is used to display a horizontal line; instead of a file name, the associated level will be entered then.

The line style and the colour can be set for each trace; various options are possible for line and dotted display.

Note: The active traces are always drawn "from back to front", i.e. trace 8 is always at the very bottom (but still on the grid), trace 1 is always at the very top.

Autoscale X 🚇 , Autoscale Y 🚺

Automatic scaling of the graphic - for the two axes separately - leads to a complete display of all displayed traces. The associated value range of the grid is changed accordingly.

Marker 🔄 , Deltamarker 💌

The functions **Marker** and **Deltamarker** permit the user to position two markers in the graphics for interactive graphical evaluation of the measurement results. First, the marker is activated and positioned. Then, the deltamarker can be added; however, it cannot be used without the marker.

The status information on marker and deltamarker is indicated inside the graphics window above the diagram. The markers can be shifted using the mouse or the *Cursor keys Left* and *Right*. If the mouse is used, the active marker can be moved by selecting the marker with the left mouse key and shifting it to the new position with the mouse key depressed. When using the cursor keys Left and Right, the marker is shifted in the desired direction on the trace. The speed at which the marker is moved can be increased by means of the key combination Ctrl + Cursor key left / right. If **Pixel Mode** is activated, the markers are not shifted on the trace points, but in the pixel grid of the graphics display. The function **Marker Coupled** synchronizes the deltamarker to the marker. The currently active marker can also be set to a particular frequency using **Set Marker...** (Ctrl + M) or to the maximum of the examined trace using **Marker -> Max** and to the minimum using **Marker -> Min.** If more than one trace element is displayed, the markers can be set to the next trace element using **Next Trace** or **Previous Trace** or by means of the cursor keys Up/Down.



Zoom 🖸

The function **Zoom** permits the user to enlarge any section of a graphics area. The area is selected by pressing the left mouse key and shifting to the opposite corner with the mouse key depressed. After releasing the mouse key, the zoomed part of the graphics is displayed on the screen. Zooming is possible several times. If the zoom is active, the function symbol is emphasized and permits to return to the original display. Zooming enables to achieve better presentations, however, it is not taken into account when the graphics configuration is saved.

Сору 🔯

A graphic can be copied to the clipboard with all included elements. It is not copied as a rigid pixel graphic which requires a lot of storage capacity, but in a more complex and flexible WINDOWS-internal vector format. The memory requirements are dependent on the contents of the diagram.

Print 🔳

If a printer driver has been installed for printing, a diagram can also be directly output as a whole-page graphic without the need for a report configuration.

Legend 🖪

The function **Legend** provides a short description of the displayed trace elements.

Both the line style (short designation) and trace name are indicated for a trace element. It is possible to change to the next trace element by clicking on the arrow keys. The key can then be switched on or off; if it is switched on, the function symbol is emphasized.

The following short forms are used:

- LIM Limit line
- MESMeasurement result
- XTP Probe transducer
- XTS System transducer.

2.4.4 Report Header Editor

This editor permits the user to generate or modify a report header.

		Report Header - Example ReportHeader
<u>F</u> il	e	
_		
1.	Heading	Example Report Header
2.	Heading	
E	т	Dummy
м	anufacturer	Rohde & Schwarz
0	perating Condition	Normal
Te	est Site	Munich
0	perator	Donald Duck
Te	est Specification	Virtual Mode
C	omment	Simulation with Function Generator
		<u>OK</u> ancel

The text for the report header is entered into the editable fields. A text of max. 20 characters can be entered in the left column, a text of max. 50 characters in the right column.

2.4.5 Report Configuration Editor

Report Configuration - Example Report					
Selection / Lines		Available			
Report <u>H</u> eader	Measurement Result	File Type			
Example 14	0	Text 👤			
Scan Table 🗵 Compact EN 55022 Field 8	T <u>r</u> ansducer				
EN 55022 Voltage	l	F <u>i</u> le Name			
Sweep Table Compact EN 55022 Field 8 EN 55022 Voltage	System Transducer	abc 🛃			
Graphics Configuration Example Graphic 20	T <u>ext</u> Example Description 15	Add <u>D</u> elete			
Frequency List	Limit Li <u>n</u> e				
Graphic Arrangement	<u>F</u> ootnote				
User defined	lx Text footnote				
Legend 4 Marker 2	<u>0</u> K	<u>C</u> ancel			

This editor permits the user to generate or modify a report configuration:

The actual configuration is indicated in the "Selection" field, whereas the individual elements can be selected in the "Available" field.

The entries for the "selection" are performed by means of **Add**. Each element (report header (max. 1), scan or sweep table (max. 16 each), graphics configuration (max. 2), measurement result (max. 16), probe or system transducer (max. 4 each), limit line (max. 4)) is determined in the selection windows File Type and File Name in the "Available" field. An element selected in the "Selection" field can be removed using the **Delete** key.

The **Graphic Arrangement** can be set such that the diagrams are arranged half-page, at least half-page until the end of page or whole-page.

Besides, all pages can be provided with a **footnote** consisting of date, time and a predefined text (max. 40 characters).

The layout of the test report can be defined to a certain extent.

For each part of the test report (e.g. report header, graphics, result list) a number of lines can optionally be reserved. A value of '0' means no reservation, i.e., the number of printed lines simply depends on the content of the referring part. If a number of lines is given, then exactly this number of lines will be printed, which means that depending on the content of the current part there will be either empty lines at the end or some lines may be cut off. The legend and the marker of a graphics diagram are handled separately from the diagram, i.e., the graphics diagram can be printed in a reproducible size. Scan and seep tables can optionally be printed in a compact format (the main parameters in a single line per range and per detector).

The most recently defined layout will automatically be used as a default for a new report configuration. When starting a printout with a report configuration then the content as well as the report header selected inside can be edited (a shortcut for editing).

2.4.6 Scan/Sweep Editor

These editors permit the user to generate or modify a scan or sweep table. Such a table determines the settings of the test receivers used for performing the scan/sweep.

The two editors are very similar, so that the differences will only be mentioned if required in the following.

Scan Editor - EN 55022 Field 💌							
Eile							
Unit Detector Mode <u>S</u> ubranges							
dB _₽ ¥/m 👲	dB _p ¥/m						SXI <u>I</u> nsert
	Curve 2 NONE ClearWrite Clea						
	Curve 3 N	ONE	🛨 Clear	Vrite 👤			<u>:Moairy</u>
	Curve 4 N	ONE	🛨 Clear	Vrite 🛨			elete
Subrange							
Receiver ESX	KI :	↓ Trans	ducer	HK116	Ŧ	Start Fre <u>q</u> uency	30.000000 MHz 🛨
Signal Path NO	NE	↓ Syster	n			Stop Frequency	199.999999 MHz 🛨
Scan Mode Lin		🔸 🗛 Add. 1	'ransd. 1	NONE	<u>+</u>	Step Size	80.000 kHz 🛨
Input 2D0	C .	🛨 Add. 1	'ransd. 2	NONE	<u>+</u>	IF Bandwidth	120 kHz 🛨
Tracking Gen. Off		↓ Add. 1	'ransd. 3	NONE	Ŧ	Measure Time	0.010000 s 🛨
Attenuation/ <u>G</u> ain			Con <u>t</u> rol	, 		Demodulatior	· · · ·
	X Autorang	je	X Curve	I L	Curve 3	Demodulation	FM Broad
Preamplifier	10 dB	Ŧ	Curve	2	Curve 4	Volume [%]	0
RF Att.	Coupled	-	Repetition	5	ingle	•	
Min.BF Att.	0 dB	- 🗐	Stop M	lark			
	1		X Stop M	lessage		Option	None 👤
Bef. Level [dBm] _10.0						beck Cancel	
OK C <u>a</u> ncel <u>C</u> heck							

The dialog window is divided into two areas. The upper area displays the general settings of the scan table. The settings of a selected subrange are indicated in the lower area (the appearance of the dialog varies according to the selected receiver). For modification, the selection can be made by a *double-click* on the selection window **Subranges**. The subranges (max. 30) can be edited independently of each other.

Note: The frequency ranges of the various subranges must not overlap. The frequency ranges must be arranged in increasing order.

When a new table is created, the appropriate unit for the level and all required detectors (only peak in the case of sweeps) are determined first. The detector mode MaxHold (maxima reduction) only makes sense in conjunction with multiple scans/sweeps, otherwise the mode ClearWrite (overwrite) is used.

Subsequently, the subranges defined in the lower area can be lined up by means of Insert or subsequently overwritten by means of Modify. By double-clicking on an existing subrange, the associated parameters are transferred into the lower area.

For definition of a subrange, the appropriate **receiver** must be determined first, which causes the remaining fields to be adapted to the facilities of the hardware and be assigned standard values.

The probe transducer must comply with the subrange with respect to frequency range and level unit, but it can also be set to *NONE* for the time being. If various switching paths have been defined by means of the RSU superhandler, they can be selected as **Signal Path**, a **System Transducer** defined to this end being displayed to the right (grey, i.e. cannot be changed). Up to three **additional system transducers** for cable attenuations, etc. can also be activated.

Settings for the **scan/sweep mode** and for the receiver input used are also dependent on the hardware, e.g. in the case of the **Tracking Generator**, which is only required for measurements on four-terminal networks.

The fields for the **start and stop frequency** are to be defined such that the selected transducers match the frequency range. Note that the settings of the next subrange are valid for the stop frequency if this stop frequency is identical with the start frequency of the next subrange.

A **step size** can only be entered for scans; normally, it is determined by the IF bandwidth (factor of approx. 0.5 to 0.7).

The **IF bandwidth** (resolution bandwidth), in turn, results from the specification; in the case of sweeps, the video bandwidth may also be set.

The **measuring time** (for scans) or the **sweep time** is also dependent on the IF bandwidth, but also on the detectors used.

The settings for **attenuation/gain** are dependent on the device used, of course. In particular in the case of analyzers, note that the signal levels to be expected lie within the dynamic range. In the case of scans, this can in most cases be achieved by activating the **autorange** function, which causes the attenuation to be matched accordingly as soon as the signal exceeds the dynamic range.

Usually, **demodulation** of the test signal is only of interest for single measurements which are based on a scan table.

In the case of analyzers, measurements according to the standard require the use of the **Preselection**. The entries made for **Setting** control the procedure. On the one hand, it is possible to determine which of the preselected detectors is to be used in the current subrange, on the other hand, a multiple scan/sweep (**repetition**) can be defined, i.e. instead of "Single" any multiple or even "Continuous" (must be aborted explicitly), which is also possible in combination with maxima reduction for the detector. In the case of a few receivers, this may be performed by the device itself (**Repetition by device**), which accelerates the procedure, however without updating the graphics.

If the procedure is to be aborted when changing from one subrange to the next, e.g. in order to be able to mount another antenna, the **stop mark** must be activated. Thus, the procedure is stopped before this subrange is executed and must be continued by the user (or, as an alternative, be aborted for good). In addition, a **stop message** can be activated, so that the entered text (up to approx. 15 characters) is also output; e.g. a prompt to mount a particular antenna may thus be output.

Check subrange is used to determine whether the specifications for the subrange are consistent. Then the subrange can be transferred to the list of all subranges (appropriate position must be preselected) by means of **Insert** or **Modify**; the table will be definitely stored when the dialog is closed with **OK**. A scan or sweep table can also be defined with voltage as the measurement unit, a non-level unit. In this case the transducers works as a linear factor (levels: the transducers are simply added to the raw reading). Any additional system transducers (e.g. a cable loss or a preamplifier) can still be included (as with levels) through the normal level definitions.
2.4.7 Test Configuration Editor

This editor can be used to generate or modify a test configuration (see 2.3).

_	Test Configuration - TEST			
<u>F</u> i	le			
Se	elected Scan Table	Sween Table	Available	
Ē	EN 55022 Field		F <u>i</u> le Type	
ר	ransducer	System Transducer		
	1K116 1L223		Fi <u>l</u> e List	
	Aeas <u>u</u> rement Result EN 55022 Field MaxPk	Li <u>m</u> it Line	Example Description	
	Grap <u>h</u> ics Configuration EN 55022 Field	Freguency List	Add Delete	
F	Report Header	Report Configuration		
5	Script	S <u>e</u> quence		
I	[ext			
Ľ				

The actual configuration is indicated in the "Selection" field, whereas the individual elements can be selected in the "Available" field.

The entries for the "selection" are performed by means of **Add**. Each element is determined in the selection windows "File Type" and "File Name" in the "Available" field. An element selected in the "Selection" field can be removed using the **Delete** key.

2.4.8 Text Editor

The text editor is quite similar to the Windows text editor "Notepad". Text can be inserted at the current cursor position. The position of the cursor (line ; column) is displayed in the right lower corner of the editor window. Edit -> Wrap toggles the automatic line wrapping. The typical clipboard functions are available in the same menu. The 'search' menu contains the function *Search...* and *Replace...* . *F3* repeats a search or replace downwards, *F4* upwards. *Goto...* enables to position the cursor into any line.

- Text - Example Description	-
<u>F</u> ile <u>E</u> dit F <u>i</u> nd	
This test was performed in the lab. A simple wire was used as an antenna. The graphics diagram shows the FM band which serves as a popular signal source.	+
•	3;28 ↓

2.5 Report

The 'test report' function generates an output of test relevant results either onto a printer or into a file.

2.5.1 Print...

This function is used to output a report on the selected printer. Before the output can be started, the report configuration to be used has to be selected (the layout of the dialog depends on the operating system):

Print Report	×
Printer	
<u>N</u> ame	HP LaserJet 4MP
Status	Bereit <u>N</u> etwork
Туре	HP LaserJet 4MP
Where	LPT1:
Comment	laser printer at LPT1
Report	
<u>R</u> eport H	eader Report Configuration demo fast
R <u>e</u> direct to	o RTF file <u>Preview</u> <u>Print</u> <u>Cancel</u>

From this dialog it is possible to edit the content of the report configuration as well as the report header selected inside (a shortcut for editing).

If a graphics configuration or a list file only shall be printed, then the dialog looks quite similar, but without any selections referring to report configurations.

With **Preview** a print preview of the hardcopy layout will be started. The preview window enables to display the pages either separate or two at a time.

Pressing the **Print** button starts the normal hardcopy on the selected printer.

If the option "**Redirect to RTF file**" is selected, then with **Print** no hardcopy will be created, but instead a file dialog will come up (with **Preview** after closing of the preview window) which enables to specify the file name (and the path) of the RTF file to be created.

An RTF file ("Rich Text Format") stores texts and graphics in a generic Windows format which can directly be imported into any text processing software with the ability to <u>edit</u> the file further in any way.

This way a complete test report can be stored in a single file which can be used at a later time (maybe on another PC) to generate documentation on the test.

2.5.2 Printer Setup...

This function is used for selection of the printer device driver only. The available device drivers are displayed. The selection is made by *clicking* on the device driver name. The associated interface is also shown.

Properties... permits to specify the settings of the selected printer (e.g. output format, paper feed, etc.)

Notes: In the event that the provided printer is not listed in the selection window, the respective device driver must be installed. A detailed description is to be found in the WINDOWS operating manual or can be optained by the WINDOWS online help.

A report can be output into a file in ASCII format. For this purpose, the device driver **Generic/Text only** must be provided together with the interface **FILE:**, installed as continuous printer without formfeeds. During the output, an additional window for entering a DOS file name is opened. This ASCII file can be easily imported into other software applications.

2.6 Special Functions

2.6.1 Quit (Alt-F4)

Terminates the program ESI-K1 and saves various general settings. If files have been modified but not saved yet, an additional prompt is displayed.

2.7 Options Menu

The menu **Options** is used for setting general parameters, e.g. the dialog language. The menu consists of the following functions:

- Main Toolbar Visible
- Device Toolbar Visible
- Toolbar Strings Visible
- Status Bar Visible
- Background
- Change Language

The functions will be explained in detail on the following pages.

2.7.1 Main Toolbar, Device Toolbar and Status Bar

see 2.1 Overview

2.7.2 Background

see 2.1 Overview

2.7.3 Change Language

This function permits the user to change the language used in the dialog; at the moment, only English and German are offered.

	Change Language
<u>S</u>	election
Г	English +
	Deutsch
	English

2.8 Measurement Functions

The menu **Test** is used e.g. for execution of the various measurement functions, for starting of scripts and for operation of the devices.

2.8.1 Interactive Device Dialog

Set Device permits to select the receiver or a LISN for single operation. This function is identical with the selection of a device with the (activated) Device Toolbar. The dialog window of the respective device driver is opened and the settings can be made by the user in interactive mode. A detailed description of the dialog windows can be obtained from the respective description of the device driver.

2.8.2 Script

Execute Script... offers all provided scripts, however, only "main scripts" (MAINSCRIPT) can be started, whereas all other scripts are included in the main scripts (INCLUDE"...", SUBSCRIPT). After confirming the selection by means of **OK**, the devices are checked. The devices that are in virtual mode are indicated in a window.

	Devices Check
STOP	The following device handlers are in virtual mode
Devi	ice Handler
	ESXI
C	Start <u>S</u> top

Subsequently, the dialog for the script parameter editor is displayed. It permits to select and edit the desired parameter set (see 2.4.2)

The script is executed using **OK** or **Cancel** (the last modifications on the parameter set are saved or ignored) or aborted using **Stop**. During the script run, the script can be interrupted and continued again or aborted for good.

2.8.3 Measurement Functions

The submenu **Measurement** permits to select the EMI measurement functions. The following measurement functions are offered:

- Scan
- Sweep
- Single measurement

2.8.3.1 Scan and Sweep Functions with Automatically Generated Graphics

As soon as a table has been selected in the dialog for starting a scan or a sweep, the remaining fields are assigned names (derived from the table names) and the entire frequency range of the table is set. It is then possible to vary these entries at will, e.g. to define a limited frequency range or skip a suggested detector by deleting the result name. If the receiver is not capable of measuring in parallel with various detectors, the traces are recorded sequentially.

-	2	ę	Scan Setti	ngs		
	Sca <u>n</u> Table <u>F</u> requency List Start Fr <u>e</u> quency S <u>t</u> op Frequency Result <u>1</u> Result <u>2</u>	EN 55022 Volt <none> 0.15 30 EN 55022 Volt EN 55022 Volt</none>	age MHz MHz a MaxPk age Avg	* * *	IX <u>O</u> verwrite IX <u>A</u> utosave Mode ClearWrite ClearWrite	Detector MaxPeak Average
	<u>G</u> raphical Display Re <u>p</u> ort Configuration Test Conf <u>ig</u> uration	EN 55022 Volt	age	± ± ± ⊇ancel	Create	

In the case of scans, it is additionally possible to select a **frequency list**. In this case, the measurement is not made with the step size specified in the scan table, but only at the frequencies of the frequency list that lie within the given frequency range.

If **Overwrite** is set, already existing measured values are completely deleted and overwritten. Otherwise, existing measured data are only overwritten or supplemented in the given frequency range. If **Autosave** is set, the results are automatically saved. If the selection switch is not set, the data are lost unless they are displayed as a list or graphically.

Besides, the dialog permits to generate a **graphics configuration** for all data (traces) produced in the measurement run. For this purpose, a name for a configuration must be given for graphical display of the measurement results. If there is no graphics configuration under the given name yet, a new configuration with appropriate settings with respect to frequency range, level unit and traces is created. Otherwise, the existing graphic is only opened and the traces are entered; this however means that it might become necessary to adjust the diagram, thus making a currently measured curve visible.

When starting a scan or a sweep, then besides the graphics configuration the software also can create a default **test configuration** or a default **report configuration**.

The test configuration holds all referring files: The scan/sweep range table, the transducer and system transducers inside the range table, the graphics configuration, measurement results and the selected report configuration (incl. its report header if defined).

If 'Overwrite' is selected then a new test configuration will be created. If not, then the entries will simply be added into an existing test configuration.

As a report configuration either an existing one can be selected which will simply be added to the test configuration, or a new one can be *created* which by default contains the following file entries: The scan/sweep range table, the graphics configuration and scan measurement results if those results were gained with a frequency list.

Once started, the progress of the scan or sweep can additionally be observed in a field at the current frequency; note that scan results are supplemented in blocks, whereas in the case of sweeps, only complete sweep subranges (according to the sweep table) are added.

— S	can Running
Meas. State	
Subrange 2	Scan 1
Current Frequency	225.920000 MHz 🛓
<u>S</u> top Immediately	Continue Current Frequency
Break	<u>C</u> ontinue Next Subrange

A scan or sweep can be interrupted by the user and continued again. As soon as the scan or sweep has been aborted, it can be continued exactly at this position (frequency display), in the next subrange (if provided) or at a given frequency: For this purpose, the frequency display must be edited appropriately; depending on the set value, existing measurement results will be overwritten or there will be a gap in the measurement run. Thus, a test does not have to be repeated completely if a sudden change in the measurement conditions is detected immediately. The measurement run is simply aborted and continued at a lower frequency after correction of the measurement conditions.

If the stop frequency of a subrange and the start frequency of the next subrange are identical, this frequency is measured with the settings of the upper subrange. If both subranges are used, e.g. with different antennas (transducers), the stop frequency of the lower subrange should be slightly reduced (e.g. by one step size).

At the end of a scan or sweep, the frequency dependent transducer factor of the last range can optionally be programmed into the receiver - depending on the instrument's capabilities (if the number of correction values in the receiver is not sufficient then they will be interpolated). This way measurements can be done from the front panel of the instrument without any control from the software, but still with level readings that include a transducer correction. As long as the software controls the instrument, any transducer correction will be done in the software only which is much faster. The **transducer download** can be activated in the device properties dialogues of the receivers.

2.8.3.2 Single Measurement

The dialog for interactive single measurements offers the following functions:

- a frequency variation is immediately set on the receiver with the next measurement
- the frequency variation by means of keys uses either the step size of the given scan table or the frequencies of a selected **frequency list**
- · a measurement result is always produced or an existing measurement result varied or extended
- the frequency display can be coupled to a marker located on a trace for display of the measurement result

When a single measurement is started, the **Scan Table** to be used and an optional **Frequency List** are to be selected:

- Single Measurement			
Sc <u>a</u> n Table	EN 55022 Field		
<u>Frequency List</u>	<none></none>		
Test Configuration	± 🗵 Overwrite		
	<u>Start</u>		

When starting a single measurement, then the software can optionally create a default **Test Configuration** which holds all referring files (scan/sweep table, transducer, system transducers, measurement result file).

If *Overwrite*' is selected then a new test configuration will be created. If not, then the entries will simply be added into an existing test configuration.

Then the actual **Single Measurement dialog** is displayed, which is used to control the respective receiver and to store measurement results:

Single Measurement - EN 55022 Field				
Level	Erequency			
	Hz t			
Measureme <u>n</u> t	Up Down Coupled Marker			
Measuremen <u>t</u>	Save			
Detector MaxPeak	Result Field Str. Results			
Measure T <u>i</u> me 1.000000 s 👤	Mode ClearWrite Save			
Accessory	<u>O</u> K <u>C</u> ancel			

The frequency may vary throughout the entire frequency range of the associated scan table. Besides, the detector and the measuring time can be varied; all other test parameters result from the settings of the scan table.

The value for the measurement time can be defined at will; however, depending on the receiver used, the next higher possible measuring time may be set on the instrument.

Using the key **Measurement**, the first measurement run is started and repeated continuously. Each frequency variation causes a corresponding change on the receiver (a variation of detector or measuring time is transferred by means of **Measurement** or a further frequency variation). **Save** is used to insert the current measured value in the measurement result.

The frequency display can be coupled to the marker of a diagram. For this purpose, the **Coupled Marker** function must be activated in the dialog window on the one hand and an appropriate result file opened on the other hand, in which the specified measurement result is indicated and on the trace of which the marker is located. For already existing test points, the marker frequency and the test frequency shown in the single measurement dialog correspond to each other, i.e. shifting of the marker also causes a frequency variation in the receiver.

If a frequency list has been selected with the scan table, the **Up/Down** keys only permit to set the frequencies of the list lying inside the frequency range of the scan table; of course, additional intermediate values can be set by editing the frequency display, and the measurement result can be extended accordingly.

2.9 Evaluation Functions

The menu **Test** is used e.g. for execution of the various analyzing functions. The submenu **Evaluation** includes the following functions:

- Acceptance Analysis
- Peak Reduction
- Subrange Maxima Reduction
- Maxima Reduction
- Merge Data
- Reduce to Freq.List
- S-LINE Correlation

Most evaluation functions permit to generate a **Graphics Configuration** including all data relevant to the evaluation (e.g. input/output files, limit line). To this end, a name for a configuration for graphical display of the data must be specified. If there is no existing graphics configuration under the specified name yet, a new configuration with appropriate settings of frequency range, level unit, traces, etc. is created (if an evaluation function uses two different level units at the same time, two graphics configurations are created accordingly); otherwise, the existing graphics is only opened.

The duration of the evaluation functions is usually a few seconds; however, it may be longer if large input files are involved and if they are to be displayed graphically at the same time. The S-LINE Correlation requires very time-consuming calculations so that the size of the input file makes itself felt clearly.

Evaluation functions with a specified limit line ignore all test points of the input file for which the limit value is no longer defined.

2.9.1 Acceptance Analysis

The acceptance analysis is used to filter off signals which are further off a specified limit line. This includes in particular the background noise of the receiver. The acceptance analysis is implemented by means of an imaginary acceptance line which cuts off all measured values falling below it. The acceptance line runs parallel to a limit line with a specified offset (e.g. an offset of -10 dB means 10 dB below the limit line).

If the offset is very large (e.g. 200 dB), all signals are cut off, if it is very small (e.g. -200 dB), they are all maintained.

	cceptance Analysis
Input File	
Scan Results	Ŧ
Output File	
Acceptance Resu	lts 🛛 🛛 🗮 Autosave
Limit Line	
EN 55022 F QP	Ŧ
Acceptance Offset	-6.0 dB
<u>G</u> raphical Display	
Example Graphic	Ŧ
Sta	rt <u>C</u> ancel



2.9.2 Peak Reduction

This function is used to determine all "Peaks" (preferably narrowband interference) depending on a user-defined decision level. For this purpose, the trace is analyzed by means of a special algorithm. The decision level determines how far a local maximum must exceed the adjacent lower test points to be considered as a "Peak" and appear in the output file (see flowchart on next page).

If a limit line is also specified, not the absolute level characteristic of the trace is examined, but the distance between the test point and the respective limit value.

With a decision level of 0 dB, all local maxima are detected as "Peaks", wereas, with a value of e.g. 20 dB, only distinctive narrowband signals are detected.

- Peak Reduction
Input File
Scan Results
Output File
Limit Line
EN 55022 F QP
Decision Level 6.0 dB
Graphical Display
Example Craphie
<u>Start</u> <u>C</u> ancel



2.9.3 Subrange Maxima Reduction

This function is used to split the trace of the input file into a given number (max. 1000) of subranges. The maximum is determined for each subrange and transferred to the output file. If a limit line is also specified, not the absolute level characteristic of the trace is examined, but the distance between the test points and the respective limit value. The limits of the subrange are equidistant for linear or logarithmic scales.

The function is suitable for detecting broadband signals in addition to narrowband signals over the complete measured spectrum.

Subrange Maxima Reduction
Input File
Scan Results
Output File
Subrange Maxima 🛛 🖾 Autosave
Limit Line
EN 55022 F QP
Subrange
Number 41 Linear 🛨
<u>G</u> raphical Display
Example Graphic
<u>Start</u> <u>C</u> ancel



2.9.4 Maxima Reduction

This function is used to transfer a given number (max. 1000) of maximum levels of the input file into the output file. If a limit line is also specified, not the absolute level characteristic of the trace is examined, but the distance between the test points and the respective limit value. Thus it is possible to focus e.g. on the 10 most critical points of a measurement result.

2.9.5 Merge Data

This function is used to merge all values of two measurement result lists. If the frequencies are the same, the complete line will be entered into the data list with the maximum level (Maxhold). If the frequencies are not the same, both lines will be entered into the data list. The columns in the two data lists must comply with each other.

2.9.6 S-LINE Correlation

This function is used for converting emitted EMI that has been measured by an EUT in a S-LINE cell (Gigahertz Transverse Electromagnetic). This function permits to compare the data with the measured electrical field of an open-area test site (OATS).

The correlation algorithm is based on the following model:

- a) The test item is measued in the directions x, y and z in the S-LINE cell. The respective results are referred to as V_x, V_v and V_z.
- b) Based on V_X, V_y and V_z the interfering power of the test item is calculated depending on the S-LINE dimensions.
- c) The calculated interfering power is simulated as follows:

The test item is replaced by a dipole which is aligned according to the polarization of the test antenna and corresponds to the calculated interfering power. The corresponding electrical fieldstrength is calculated at the position of the antenna.

Two methods can be selected:

a) Measurement result conversion

The interfering voltages V_x , V_y and V_z are measured. The fieldstrength characteristic is obtained by means of correlation and can be directly compared with the respective fieldstrength limit line.

The input files correspond to the interfering voltages of the test item measured in three orthogonal directions. All three input file must be specified. The scan or sweep tables of the input files must be identical.

The output file corresponds to the fieldstrength.

Algorithm:

S in [V²], U_{Meas} in [dBµV] S = $10^{\frac{U_{Meas,x} - 120}{10}} + 10^{\frac{U_{Meas,y} - 120}{10}} + 10^{\frac{U_{Meas,z} - 120}{10}}$

L in $[dB\mu V/m]$, f in [MHz], S in $[V^2]$ C1: Cell Correction Factor C2: OATS Correction Factor

 $L = 106 + C1 + C2 + 20 \log (f) + 10 \log (S)$

S-LINE Correlation	X
S-LINE Parameter	
S- <u>L</u> INE Type	S-LINE 700
Cell <u>F</u> actor	S-LINE 700
Test Site	
Correction Factor	S-LINE OATS 10 m
Conversion Mode	
Conver <u>t</u> Measuremen	t Result
O Convert Limit Line Additional Points	10
Input File(s)	
V <u>x</u> :	S-LINE X Results
ν <u>ν</u> :	S-LINE Y Results
V <u>z</u> :	S-LINE Z Results
Output File	
E:	S-LINE E Results
Graphical Display	
Input File(s)	Knone>
<u>O</u> utput File	Knone>
Start	<u>Cancel</u>

b) Conversion of Limit Lines

In contrast to the first method, the fieldstrength limit line is first converted into a voltage limit line $V_{x,y,z} = (V_x^2 + V_y^2 + V_z^2)^{1/2}$. The advantage of this method is that the resulting interfering voltage from V_x, V_y and V_z can be directly compared with the calculated limit line.

Additional values determines the number of the additional sampling points for calculation of the limit line. Since the number of sampling points is usually very small and the conversion results in a more complex trace, it is advisable to use more sampling points - e.g. 100. The calculation is performed in two steps:

First of all, each point of the entered limit line (frequency / level) is converted.

In addition to the provided points, the entire frequency range is divided into the specified number of sampling points, linearly or logarithmically (according to the intermodulation mode of the limit line). Each of these sampling points (frequency / interpolated level) is then converted.

The output file corresponds to the respective voltage limit line of the entered fieldstrength limit line of the standard used.

Algorithm:

 $\begin{array}{l} U_{\text{Limit}} \text{ in } \left[dB\mu V \right], \text{ L in } \left[dB\mu V/m \right], \text{ f in } \left[MHz \right] \\ \text{C1: Cell Correction Factor} \\ \text{C2: OATS Correction Factor} \end{array}$

 $U_{Limit} = 14 - C1 - C2 + L - 20 \log (f)$

C LINE Constanting	Y
S-LINE Correlation	X
S-LINE Parameter	
S- <u>L</u> INE Type	S-LINE 700
Cell <u>F</u> actor	S-LINE 700
Test Site	
Correction Factor	S-LINE OATS 10 m
Conversion Mode	
O Conver <u>t</u> Measureme	nt Result
Convert Limit Line	
<u>A</u> dditional Points	10
Input File(s)	
<u>E</u> :	EN 55022 F QP
Output File	
<u>V</u> :	EN 55022 S-LINE QP
Graphical Display	
Input File(s)	<none></none>
Output File	<pre>knone></pre>
<u>o</u> acpact no	
Start	<u>C</u> ancel

The fields **S-LINE-Parameter** determine the S-LINE type and the appropriate cell factor (a system transducer).

The field **Test Site** enables to select the appropriate correction factor (a system transducer) for the site, depending on the distance between EuT and antenna.

The Start button checks the settings and the correlation is started.

3 Standard Scripts

The standard scripts are designed for a maximum flexibility thus enabling to perform the tests most effectively with all kinds of test equipment.

The design of the scripts helps to save time while still providing complete measurements as required for compliance testing. Through a wide range of parameters (accessible after starting a test) that can be stored and reloaded as "Script Parameters", it is possible to adapt and optimise the test proceedings to the needs of the operator:

- the preview test can be skipped and instead a former preview result can be defined as an input of the data reduction and the final test; alternatively, frequency lists or former final results can be used as an input of a final test
- in a kind of semi automatic mode the operator can skip certain parts of the test (preview test, final test, test report) or repeat the same test, then optionally leaving out other parts than during the first pass
- the total frequency range of the test can be split into subranges ("test ranges": linear or logarithmic, with respect to the ranges of the range table) that will be completely tested (preview test, data reduction, final test), therefore reducing the time elapsed between preview and final test, which is very useful with interference drifting over frequency; besides, this method reduces manual interaction, if more than one probe transducer has to be used for the test (e.g. two antennas for 30 1000 MHz in the field strength test: one single antenna change during the whole test)
- an ID string makes it easy to identify results and other files related to the test: the string will be used to build up default filenames (e.g. if test reports shall always include the same report header), but it is also possible to define fixed names
- since the variation of accessory devices (LISN, turntable and antenna mast, etc.) can be specified for
 preview and final test separately, it is possible to optimise the test (the kind of test also influences the
 optimum concept):
- preview test with spectrum analyzer mode (fast sweeps with limited frequency resolution):
 - preview test with sweeps on a number of accessory settings, storing the maximum levels and the corresponding settings
 - data reduction
 - final test on the accessory settings found in the preview test:
 - partial scans to compensate for the limited frequency resolution of the preview sweeps;
 - search for local maxima through fine tuning of the accessory (if possible)
 - measurements with final detector QP (+ AV);
- preview test with EMI test receiver mode (relatively slow scans with high frequency resolution):
 - preview test with one or two scans on accessory settings, where all interesting frequencies should be detectable (exact level information may be of less interest because of the complete final test)
 - data reduction, maybe with an increased acceptance offset to compensate for the few preview settings
 - optional partial scans to detect drifting interference
 - measurements on all (predefined) accessory settings, storing the maximum levels and the corresponding settings
 - measurements with final detector QP (+ AV) on the "worst case" accessory settings
- besides the normal test results (frequency, level, etc.), **frequency lists derived from the preview or final results** will implicitly be generated, labelled with the same name as the corresponding source results; such a frequency list might be used to perform a scan on these frequencies
- the data reduction has a very flexible design: the scan or sweep results are analysed on the one hand with the peak reduction (a level threshold of 0 dB means no reduction; a value of 10 dB means that only obvious pikes in the spectrum will come through; a value of e.g. 100 dB should block all data), on the other hand with the subrange maxima reduction (number of subranges is identical to

the maximum number of results to be kept from each test range in the script): a smaller level threshold means fewer subrange maxima will remain in the end; the remaining points will be merged (only one list entry if frequencies are identical) and further filtered with an acceptance analysis (cut off all points below an imaginary acceptance line; an acceptance offset of e.g. -100 dB wouldn't filter any points); for certain tests where the measurements come close to the sensitivity limitations of the instruments, the acceptance analysis can alternatively work with an arbitrarily defined acceptance line (which means no offset in reference to a limit line) so that the acceptance line goes above the noise floor; from the remaining points only those many will be kept (the margin will be evaluated) as defined by the operator; if more broadband signals shall be kept then the level threshold for the peak reduction (which finds narrowband interference) should be set to a higher value



To run a "Standard Test" the following components will be used:

- the scripts needed for testing plus the referring subscripts
- the limit lines for the required specifications
- the **probe and system transducers** that are used for the tests (the files hold typical values and if available should be replaced with the exact values for the transducers in use)
- for calibration tests the frequency lists if needed (for open area measurements the lists should be adapted to the ambient interference of the test site)
- the required scan and / or sweep range tables; they are already adapted to the ESI and to the test specifications, but they normally need some modification concerning the specified transducers (depending on the test equipment)

When a script has been started, a window will come up that enables the operator to modify the so called script parameters to control the proceedings of the test. Pressing **<ENTER>** or clicking the **OK** button (modified parameters will be stored) or the **Cancel** button (modified parameters will be ignored) will close this window and the test will run, using the stored settings of the script parameters; **Stop** aborts the test immediately.

To select other (default) settings for the script parameters (e.g. to run the test with another specification), the selection box on top of the script parameter window has to be used: a list with script parameters matching those of the current test will come up; any of the given script parameter files can be chosen to replace the current parameter settings; with **Save As** new parameter sets can be created.

A running test may be aborted at any time with the **Stop** button (an active sweep or scan might have to be aborted before), but the measurements stored so far may be of only limited use. Afterwards the test can't be continued but restarted from the beginning.

Although the scripts provide automatic printing at the end of a test, sometimes it may be useful to skip the report, redefine some elements in the graphics configuration (e.g. line styles, colours, etc.), in the report header or in the report configuration, and then start the report with the selection of **Print...** in the **File** menu.

On the following pages there are some flowcharts that show in principle the steps of the tests:



Standard Test Procedure





Data Reduction

3.1 Voltage Mains Test

3.1.1 Description

This test provides automatic measurement of electromagnetic interference on supply lines, optionally with automatic control of an artificial mains network (LISN; can be controlled via the TTL lines of the user port at the rear side of the ESI, using an appropriate adapter cable).

Depending on the kind of LISN, the parameters have to be set:

- with a **single line LISN** measurements are normally done on a number of (AC or DC) supply lines; switching between lines has to be done manually
- with a **2-line LISN** like the ESH3-Z5 switching can be done automatically between lines N and L1, protective earth between grounded floating (4 states in all)
- with a **4-line LISN** like the ESH2-Z5 switching can be done automatically between lines N, L1, L2 and L3, protective earth between grounded floating (8 states in all)

With test receivers the preview test (for finding the critical frequencies) is normally done on a single setting of the LISN (e.g. phase L1 with the protective earth floating).

3.1.2 Parameter Sets

Currently the following specifications are supported by the ESI-K1 Standard Data:

0.15 - 30 MHz

VDE 0875 Part 2 , CISPR 15

Fluorescent Lamps and Luminaries

QP and AV

EN 55011

Frequency Range:	0.15 - 30 MHz
Detectors:	QP and AV
Related Standards:	VDE 0875 Part 11 , CISPR 11
Test Samples:	ISM: Class B; Group 1

EN 55014

0.15 - 30 MHz
QP and AV
VDE 0875 Part 14 , CISPR 14
Household Equipment

EN 55015

Frequency Range: Detectors: Related Standards: Test Samples:

EN 55022

Frequency Range:	0.15 - 30 MHz
Detectors:	QP and AV
Related Standards:	VDE 0878 Part 3 , CISPR 22
Test Samples:	ITE: Class B

3.1.3 List of the Script Parameters

Topic Test

Parameter: Default value:	01: ID max. 12 chars to be included in filenames "vol_0001"
Function:	a short string that will be used for building up various default strings (see below); this string enables easy identification of files that belong to the same test
Parameter: Default value:	02: global start frequency [MHz] for the test 0.15
Function:	no measurements will be done below this frequency
Parameter: Default value:	03: global stop frequency [MHz] for the test 30
Function:	no measurements will be done above this frequency
Parameter: Default value:	04: suppress queries as far as possible not checked
Function:	if not checked then additional queries will come up that help to avoid overwriting of files or to skip certain parts of the test
Parameter: Default value:	05: split frequency range into test ranges checked
Function:	the total frequency range of the test can optionally be split into test ranges (linear or logarithmic, with respect to the ranges of the scan/sweep range table) that are calculated by the script and will be completely tested (preview test, data reduction, final test), therefore reducing the time elapsed between preview and final test, which is very useful with interference drifting over frequency; besides, this method reduces manual interaction, if more than one probe transducer has to be used for the test (e.g. two antennas for 30 - 1000 MHz in a field strength test); the value given with parameter <i>Test 07</i> has to be interpreted as a minimum value; if the value is set to (typically) 1 then nevertheless for each subrange of the scan/sweep table which used for the preview test, a test range will be calculated (e.g. a field strength test with two antennas or scan/sweep ranges will lead to one test range each); if splitting is not used then the whole frequency range of the scan/sweep table will be tested as one single test range (but maybe with a number of messageboxes requiring to change the antenna !)
Parameter: Default value: Function:	06: if splitting of frequency range: do with log. scale checked if checked then the splitting of the frequency range (if activated) will lead to test ranges of equal width in the logarithmic scale, else in the linear scale
Parameter: Default value:	07: no. of test ranges for splitting of frequency range
Function:	defines the number of test ranges that shall be calculated for the splitting of the frequency range
Parameter:	08: test configuration, <none>: ID</none>
Default value: Function:	" <none>" optional filename of the test configuration (lists all files belonging to the test, for easy transfers through Export/Import/Move) to be created by the test; if no filename is specified then a default name will be used</none>

Topic **Preview**

Parameter: Default value: Function:	01: preview result file, <none>: ID + '_pre PK' "<none>" optional filename for the PEAK results from the preview test; if no filename is specified then a default name will be used</none></none>
Parameter: Default value: Function:	02: 2nd preview result file, <none>: ID + '_pre AV' "<none>" optional filename for the AVERAGE results from the preview test; if no filename is specified then a default name will be used</none></none>
Parameter: Default value: Function:	03: scan table for preview " <none>" filename of the scan range table to be used for the preview test</none>
Parameter: Default value: Function:	04: sweep table for preview " <none>" filename of the sweep range table to be used for the preview test</none>
Topic DataReduct	tion
Parameter: Default value: Function:	01: QP limit line " <none>" a filename that corresponds to the required limit line for the QUASIPEAK detector</none>
Parameter: Default value: Function:	02: AV limit line " <none>" a filename that corresponds to the required limit line for the AVERAGE detector</none>
Parameter:	03: max. no. of results kept per test range
Function:	the maximum number of results that will be kept from each test range through data reduction
Parameter:	04: decision threshold [dB] for peak reduction
Function:	determines the decision level when data reduction is done with the "Peak Reduction"; a higher (stricter) value means that less peaks will be detected in the spectrum so that more results from the subrange maxima reduction will come through
Parameter: Default value: Function:	05: level offset [dB] for acceptance analysis -10.0 determines the level offset when data reduction is done with the "Acceptance Analysis"

Parameter: Default value: Function:	06: max. no. of results kept from partial scans 2 when a partial scan is performed then after data reduction there might still be more than one significant frequency linked to interference; this parameter limits the number of results from a partial scan (after data reduction)
Parameter: Default value: Function:	07: partial scan width: no. of IF-BWs (0=use ratio) 0 determines the frequency range for partial scans expressed in multiples of the IF bandwidth used in the referring scan/sweep table; if the value is set to 0 then the calculation of the partial scan width is based on the following parameter
Parameter: Default value: Function:	08: partial scan width: ref. frequ. ratio 0.01 determines the frequency range for partial scans (e.g. 0.01 means ± 0.5 %) in reference to the given mid frequency; the parameter is effective only if the previous parameter is set to 0
Topic Final	
Parameter: Default value: Function:	01: final result file, <none>: ID + '_fin QP' "<none>" optional filename for the QUASIPEAK results from the final test; if no filename is specified then a default name will be used</none></none>
Parameter: Default value: Function:	02: 2nd final result file, <none>: ID + '_fin AV' "<none>" optional filename for the AVERAGE results from the final test; if no filename is specified then a default name will be used</none></none>
Parameter: Default value: Function:	03: scan table for partial scans + single meas. " <none>" filename of the corresponding scan range table to be used for the final test, for partial scans as well as for single measurements: for single measurements with the final detector (QP/AV) the scan range table settings will be programmed and then modified if necessary (detector and measurement time); therefore the scan range table should be defined with the PEAK (and AVERAGE) detector in combination with a short measurement time, while the other settings have to be suitable also for QUASIPEAK measurements</none>
Parameter: Default value: Function:	04: perform partial scans not checked if checked then additional partial scans will be performed around the frequencies to be analysed; in this case the final measurements will be done on those frequencies that have been found (through data reduction) with these partial scans (recommended when preview was done with sweeps or when drifting interference is to be expected)
Parameter: Default value: Function:	05: complete search checked determines the search mode for the preview test: complete search means that measurements will be done on all LISN(/AUX) settings as specified with LISN(/AUX) parameters for the final test (recommended for final tests, when the preview test has not been performed as "complete search"; normally with EMI test receivers); use LISN(/AUX) data means that measurements will be done on those LISN(/AUX)

	settings that were determined through a "complete search" in the preview test (normally with EMI analysers)
Parameter: Default value: Function:	06: time [sec] for final measurements1.0a time that will be used for the measurements with the final detector(s); the device under test may require a minimum "duty cycle time" for full compliance testing
Parameter: Default value: Function:	07: optional input: preview result file " <none>" if the test shall be performed without a preview test then an existing preview result file can be specified as an input for the final test, one (for QP+AV) or optionally two (1st for QP, 2nd for AV) input files</none>
Parameter: Default value: Function:	08: optional input: preview result file (2nd det.) " <none>" see previous parameter</none>
Parameter: Default value: Function:	09: optional input: frequency list " <none>" if the test shall be performed without a preview test then an existing frequency list can be specified as an input for the final test, one (for QP+AV) or optionally two (1st for QP, 2nd for AV) input files</none>
Parameter: Default value: Function:	10: optional input: frequency list (2nd det.) " <none>" see previous parameter</none>
Parameter: Default value: Function:	 11: optional input: final result file "<none>"</none> if the test shall be performed without a preview test then an existing final result file can be specified as an input for the final test, one (for QP+AV) or optionally two (1st for QP, 2nd for AV) input files
Parameter: Default value: Function:	12: optional input: final result file (2nd det.) " <none>" see previous parameter</none>
Topic Graphics	
Parameter: Default value: Function:	01: graphics configuration, <none>: ID "<none>" optional filename for the graphics configuration to be used in the test; if no filename is specified then a default name will be used</none></none>
Parameter: Default value: Function: Parameter: Default value: Function:	02: optional graphics template (new graph only) " <none>" optional file name of a predefined graphics configuration, from which the graphics configuration to be used in the test shall be derived (line type and color settings) 03: split result display not checked if checked then the results will be displayed with two graphics: the first shows the PEAK and QUASIPEAK results and the QUASIPEAK limit line; the second shows the AVERAGE results and the AVERAGE limit line; the name of the second diagram is based on the first one's plus "_2" appended to it</none>

Topic Report

Parameter: Default value: Function:	01: generate printer hardcopy checked if checked then a report configuration for printing will be generated and a hardcopy will be sent to the device which is defined as the printer for the software
Parameter: Default value: Function:	02: report config. for printing, <none>: ID + '_prnt' "<none>" optional filename for the report configuration for printing, if printer output is selected; if no filename is specified then a default name will be used</none></none>
Parameter: Default value: Function:	03: footnote, empty field: ID "" optional text as a footnote on the pages of the test report; if an empty string is used then the ID string of the test will be used
Topic ReportHead	der
Parameter: Default value: Function:	01: test report header, <none>: ID "<none>" optional filename for the report header to be used in the test; if no filename is specified then a default name will be used</none></none>
Parameter: Default value: Function:	02: optional test report header template, <none>: ID "<none>" optional filename of a report header which shall be taken as a template for the one to be used in the test; if no filename is specified then a default name will be used</none></none>
Parameter: Default value: Function:	03: 1st header line "TEST" a string that will be taken as the first header line; if no string is given then the referring entry of the report header won't be changed
Parameter: Default value: Function:	04: 2nd header line "Voltage Mains Test" a string that will be taken as the second header line; if no string is given then the referring entry of the report header won't be changed
Parameter: Default value: Function:	05: E.u.T. name "E.u.T." a string that will be taken as the description of the equipment under test; if no string is given then the referring entry of the report header won't be changed
Parameter: Default value: Function:	06: manufacturer
	a string that will be taken as the name of the manufacturer (of the E.u.T.); if no string is given then the referring entry of the report header won't be changed
Parameter: Default value: Function:	07: operating conditions
	a string that will be taken as the description of the conditions of the test; if no string is given then the referring entry of the report header won't be changed

Standard Scripts

Parameter: Default value: Function:	08: test site
	a string that will be taken as the description of the test site; if no string is given then the referring entry of the report header won't be changed
Parameter: Default value: Function:	09: operator
	a string that will be taken as the description of the operator; if no string is given then the referring entry of the report header won't be changed
Parameter: Default value:	10: test specification
Function:	a string that will be taken as the description of the test specification; if no string is given then the referring entry of the report header won't be changed
Parameter:	11: comment line
Function:	a string that will be taken as a comment line ; if no string is given then the referring entry of the report header won't be changed
Parameter:	12: 2nd comment line (empty field: start time)
Function:	a string that will be taken as a comment line ; if no string is given then the start time of the test will be entered
Topic LISN	
Parameter: Default value: Function:	01: use manual switching only checked if checked then manual control of the artificial mains network (LISN) through dialogue boxes will be used
Parameter:	02: use a two line LISN (manual or 'ESH3-Z5')
Default value: Function:	not checked if checked then an artificial mains network (LISN) with two lines (N, L1) will be used
Parameter:	03: use a four line LISN (manual or 'ESH2-Z5')
Function:	if checked then an artificial mains network (LISN) with four lines (N, L1, L2, L3) will be used
Parameter:	04: 2/4: preview measurements with PE floating
Function:	if checked then the preview measurements will (also) be done with the protective earth floating
Parameter: Default value: Function:	05: 2/4: preview measurements with PE grounded
	if checked then the preview measurements will (also) be done with the protective earth grounded
Parameter:	06: 2/4: preview measurements on line N
Function:	if checked then the preview measurements will (also) be done on the neutral line N

Parameter: Default value:	07: 2/4: preview measurements on line L1 checked
Function:	if checked then the preview measurements will (also) be done on the line L1
Parameter: Default value:	08: 4: preview measurements on line L2 checked
Function:	if checked then the preview measurements will (also) be done on the line L2
Parameter: Default value:	09: 4: preview measurements on line L3 checked
Function:	if checked then the preview measurements will (also) be done on the line L3
Parameter: Default value:	10: 2/4: final measurements with PE floating checked
Function:	if checked then the final measurements will (also) be done with the protective earth floating
Parameter: Default value:	11: 2/4: final measurements with PE grounded checked
Function:	if checked then the final measurements will (also) be done with the protective earth grounded
Parameter:	12: 2/4: final measurements on line N
Function:	if checked then the final measurements will (also) be done on the neutral line N
Parameter: Default value:	13: 2/4: final measurements on line L1 checked
Function:	if checked then the final measurements will (also) be done on the line L1
Parameter: Default value:	14: 4: final measurements on line L2 checked
Function:	if checked then the final measurements will (also) be done on the line L2
Parameter: Default value:	15: 4: final measurements on line L3 checked
Function: Parameter: Default value: Function:	if checked then the final measurements will (also) be done on the line L3 16: single line LISN (manual)
	if checked then a single-line-LISN for measurements on a number of supply lines is assumed
Parameter: Default value: Function:	17: sgl.: no. of lines to be measured for preview
	specifies the number of lines to be analysed in the preview test, if a single-line-LISN is used
Parameter:	18: sgl.: no. of lines to be measured for finals
Function:	specifies the number of lines to be analysed in the final test, if a single-line-LISN is used

3.2 Power Test

3.2.1 Description

This test provides automatic measurement of electromagnetic interference (power) using a power absorbing clamp moved along the mains cable.

The exact positions for the clamp settings will be calculated from the actual start and stop frequencies of the active test range through a simple but very effective algorithm (position step size depends on highest frequency, maximum position depends on lowest frequency).

With test receivers the preview test (for finding the relevant frequencies) is normally done with the absorbing clamp in the zero position, which means very close to the equipment under test (E.u.T.); with that position all critical frequencies should show up, but not necessarily with the maximum level that might be detected at an other position.

If the test chamber is not shielded properly then ambient signals might find their way into the long mains cable. The software can help: An optional frequency list with ambients can be used to cut out for each frequency a range one IF bandwidth wide that won't be further analysed; of course this method has its problems if one or more frequencies of ambient interference are identical to those critical ones of the E.u.T.

3.2.2 Parameter Sets

Currently the following specifications are supported by the ESI-K1 Standard Data:

EN 55013

Frequency Range:	30 - 300 MHz
Detectors:	QP and AV
Related Standards:	VDE 0872 Part 13 , CISPR 13
Test Samples:	Television Sets

EN 55014

Frequency Range:	30 - 300 MHz
Detectors:	QP and AV
Related Standards:	VDE 0875 Part 14 , CISPR 14
Test Samples:	Household Equipment
3.2.3 List of the Script Parameters

Parameter: Default value: Function:	01: ID max. 12 chars to be included in filenames"pow_0001"a short string that will be used for building up various default strings (see below); this
	string enables easy identification of files that belong to the same test
Parameter:	02: global start frequency [MHz] for the test
Function:	no measurements will be done below this frequency
Parameter:	03: global stop frequency [MHz] for the test
Function:	no measurements will be done above this frequency
Parameter:	04: suppress queries as far as possible
Function:	if not checked then additional queries will come up that help to avoid overwriting of files or to skip certain parts of the test
Parameter:	05: split frequency range into test ranges
Function:	the total frequency range of the test can optionally be split into test ranges (linear or logarithmic, with respect to the ranges of the scan/sweep range table) that are calculated by the script and will be completely tested (preview test, data reduction, final test), therefore reducing the time elapsed between preview and final test, which is very useful with interference drifting over frequency; besides, this method reduces manual interaction, if more than one probe transducer has to be used for the test (e.g. two antennas for 30 - 1000 MHz in a field strength test); the value given with parameter <i>Test 07</i> has to be interpreted as a minimum value; if the value is set to (typically) 1 then nevertheless for each subrange of the scan/sweep table which used for the preview test, a test range will be calculated (e.g. a field strength test with two antennas or scan/sweep ranges will lead to one test range each); if splitting is not used then the whole frequency range of the scan/sweep table will be tested as one single test range (but maybe with a number of messageboxes requiring to change the antenna !)
Parameter: Default value: Function:	06: if splitting of frequency range: do with log. scale checked if checked then the splitting of the frequency range (if activated) will lead to test ranges of equal width in the logarithmic scale, else in the linear scale
Parameter:	07: no. of test ranges for splitting of frequency range
Default value: Function:	1 defines the number of test ranges that shall be calculated for the splitting of the frequency range
Parameter:	08: test configuration, <none>: ID</none>
Function:	optional filename of the test configuration (lists all files belonging to the test, for easy transfers through Export/Import/Move) to be created by the test; if no filename is specified then a default name will be used

Topic **Preview**

Parameter: Default value: Function:	01: preview result file, <none>: ID + '_pre PK' "<none>" optional filename for the PEAK results from the preview test; if no filename is specified then a default name will be used</none></none>
Parameter: Default value: Function:	02: 2nd preview result file, <none>: ID + '_pre AV' "<none>" optional filename for the AVERAGE results from the preview test; if no filename is specified then a default name will be used</none></none>
Parameter: Default value: Function:	03: scan table for preview " <none>" filename of the scan range table to be used for the preview test</none>
Parameter: Default value: Function:	04: sweep table for preview " <none>" filename of the sweep range table to be used for the preview test</none>
Parameter: Default value: Function:	05: complete search (all accessory settings) not checked if checked sweeps/scans will be done on all clamp settings as specified with clamp parameters for the preview test (recommended for preview tests with sweeps, e.g. with an EMI analyser); else only one sweep/scans will be done with <u>one</u> fixed setting as specified with clamp parameters for the preview test (recommended for preview tests with scans, e.g. with an EMI test receiver)
Topic DataReduct	ion
Topic DataReduct Parameter: Default value: Function:	tion 01: QP limit line " <none>" a filename that corresponds to the required limit line for the QUASIPEAK detector</none>
Topic DataReduct Parameter: Default value: Function: Parameter: Default value: Function:	tion 01: QP limit line " <none>" a filename that corresponds to the required limit line for the QUASIPEAK detector 02: AV limit line "<none>" a filename that corresponds to the required limit line for the AVERAGE detector</none></none>
Topic DataReduct Parameter: Default value: Function: Parameter: Default value: Function: Parameter: Default value: Function:	o1: QP limit line " <none>" a filename that corresponds to the required limit line for the QUASIPEAK detector 02: AV limit line "<none>" a filename that corresponds to the required limit line for the AVERAGE detector 03: max. no. of results kept per test range 10 the maximum number of results that will be kept from each test range through data reduction</none></none>
Topic DataReduct Parameter: Default value: Function: Parameter: Default value: Function: Parameter: Default value: Function: Parameter: Default value: Function:	 O1: QP limit line "<none>" a filename that corresponds to the required limit line for the QUASIPEAK detector</none> O2: AV limit line "<none>" a filename that corresponds to the required limit line for the AVERAGE detector</none> O3: max. no. of results kept per test range 10 the maximum number of results that will be kept from each test range through data reduction O4: decision threshold [dB] for peak reduction 20 determines the decision level when data reduction is done with the "Peak Reduction"; a higher (stricter) value means that less peaks will be detected in the spectrum so that more results from the subrange maxima reduction will come

Parameter: Default value: Function:	06: max. no. of results kept from partial scans 2 when a partial scan is performed then after data reduction there might still be more than one significant frequency linked to interference; this parameter limits the number of results from a partial scan (after data reduction).
Parameter:	07: partial scan width: no. of IF-BWs (0=use ratio)
Function:	determines the frequency range for partial scans expressed in multiples of the IF bandwidth used in the referring scan/sweep table; if the value is set to 0 then the calculation of the partial scan width is based on the following parameter
Parameter: Default value:	08: partial scan width: ref. frequ. ratio 0.01
Function:	determines the frequency range for partial scans (e.g. 0.01 means ± 0.5 %) in reference to the given mid frequency; the parameter is effective only if the previous parameter is set to 0
Topic Final	
Parameter:	01: final result file, <none>: ID + '_fin QP'</none>
Function:	optional filename for the QUASIPEAK results from the final test; if no filename is specified then a default name will be used
Parameter: Default value:	02: 2nd final result file, <none>: ID + '_fin AV' "<none>"</none></none>
Function:	optional filename for the AVERAGE results from the final test; if no filename is specified then a default name will be used
Parameter:	03: scan table for partial scans + single meas.
Function:	filename of the corresponding scan range table to be used for the final test, for partial scans as well as for single measurements: for single measurements with the final detector (QP/AV) the scan range table settings will be programmed and then modified if necessary (detector and measurement time); therefore the scan range table should be defined with the PEAK (and AVERAGE) detector in combination with a short measurement time, while the other settings have to be suitable also for QUASIPEAK measurements
Parameter: Default value:	04: perform partial scans
Function:	if checked then additional partial scans will be performed around the frequencies to be analysed; in this case the final measurements will be done on those frequencies that have been found (through data reduction) with these partial scans (recommended when preview was done with sweeps or when drifting interference is to be expected)
Parameter: Default value:	05: complete search checked
Function:	determines the search mode for the preview test: complete search means that measurements will be done on all clamp settings as specified with clamp parameters for the final test (recommended when the preview test has been performed with a fixed setting of the clamp); else: measurements will be done on those clamp settings that were determined through a "complete search" in the preview test

Parameter: Default value: Function:	06: time [sec] for final measurements1.0a time that will be used for the measurements with the final detector(s); the device
	under test may require a minimum "duty cycle time" for full compliance testing
Parameter: Default value:	07: perform accessory adjustment checked
Function:	if checked then an additional search (in a small range) for the (local) maximum level will be performed with the absorbing clamp; this is recommended, if the preview test was performed with only one or a small number of clamp settings
Parameter:	08: accessory adjustment full range
Function:	if an additional search for the maximum level will be performed then not a small range will be analysed but the full positioning range of the absorbing clamp
Parameter:	09: optional input: preview result file
Function:	if the test shall be performed without a preview test then an existing preview result file can be specified as an input for the final test, one (for QP+AV) or optionally two (1st for QP, 2nd for AV) input files
Parameter: Default value:	10: optional input: preview result file (2nd det.) " <none>"</none>
Function:	see previous parameter
Parameter: Default value:	11: optional input: frequency list " <none>"</none>
Function:	if the test shall be performed without a preview test then an existing frequency list can be specified as an input for the final test, one (for QP+AV) or optionally two (1st for QP, 2nd for AV) input files
Parameter: Default value:	12: optional input: frequency list (2nd det.) " <none>"</none>
Function:	see previous parameter
Parameter: Default value:	13: optional input: final result file " <none>"</none>
Function:	if the test shall be performed without a preview test then an existing final result file can be specified as an input for the final test, one (for QP+AV) or optionally two (1st for QP, 2nd for AV) input files
Parameter: Default value: Function:	14: optional input: final result file (2nd det.) " <none>" see previous parameter</none>

Topic Graphics		
Parameter: Default value: Function:	01: graphics configuration, <none>: ID "<none>" optional filename for the graphics configuration to be used in the test; if no filename is specified then a default name will be used</none></none>	
Parameter: Default value: Function:	02: optional graphics template (new graph only) " <none>" optional file name of a predefined graphics configuration, from which the graphics configuration to be used in the test shall be derived (line type and color settings)</none>	
Parameter: Default value: Function:	03: split result display not checked if checked then the results will be displayed with two graphics: the first shows the PEAK and QUASIPEAK results and the QUASIPEAK limit line; the second shows the AVERAGE results and the AVERAGE limit line; the name of the second diagram is based on the first one's plus "_2" appended to it	
Topic Report		
Parameter: Default value: Function:	01: generate printer hardcopy checked if checked then a report configuration for printing will be generated and a hardcopy will be sent to the device which is defined as the printer for the software	
Parameter: Default value: Function:	02: report config. for printing, <none>: ID + '_prnt' "<none>" optional filename for the report configuration for printing, if printer output is selected; if no filename is specified then a default name will be used</none></none>	
Parameter: Default value: Function:	03: footnote, empty field: ID "" optional text as a footnote on the pages of the test report; if an empty string is used then the ID string of the test will be used	
Topic ReportHeader		
Parameter: Default value: Function:	01: test report header, <none>: ID "<none>" optional filename for the report header to be used in the test; if no filename is specified then a default name will be used</none></none>	
Parameter: Default value: Function:	02: optional test report header template, <none>: ID "<none>" optional filename of a report header which shall be taken as a template for the one to be used in the test; if no filename is specified then a default name will be used</none></none>	
Parameter: Default value: Function:	03: 1st header line "TEST" a string that will be taken as the first header line; if no string is given then the referring entry of the report header won't be changed	
Parameter: Default value:	04: 2nd header line "Power Test"	

ESI-K1

Parameter: 05: E.u.T. name Function: a string that will be taken as the description of the equipment under test; if no string is given then the referring entry of the report header won't be changed Parameter: 06: manufacturer Tunction: a string that will be taken as the name of the manufacturer (of the E.u.T.); if no string is given then the referring entry of the report header won't be changed Parameter: 07: operating conditions Pefault value: "" Function: a string that will be taken as the description of the conditions of the test; if no string is given then the referring entry of the report header won't be changed Parameter: 06: test site Parameter: 08: test site Parameter: 09: operator Parameter: 09: operator Parameter: 10: test specification "" "" Function: a string that will be taken as the description of the test specification; if no string is given then the referring entry of the report header won't be changed Parameter: 10: test specification "" "" Function: a string that will be taken as a comment line; if no string is given then the referring entry of the report header won't be changed Parameter: 11: comment line	Function:	a string that will be taken as the second header line; if no string is given then the referring entry of the report header won't be changed
Function: a string that will be taken as the description of the equipment under test; if no string is given then the referring entry of the report header won't be changed Parameter: 06: manufacturer "" a string that will be taken as the name of the manufacturer (of the E.u.T.); if no string is given then the referring entry of the report header won't be changed Parameter: 07: operating conditions "" a string that will be taken as the description of the conditions of the test; if no string is given then the referring entry of the report header won't be changed Parameter: 08: test site "" a string that will be taken as the description of the test site; if no string is given then the referring entry of the report header won't be changed Parameter: 08: test site "" a string that will be taken as the description of the test site; if no string is given then the referring entry of the report header won't be changed Parameter: 09: operator "" "" Parameter: 01: test specification "" a string that will be taken as the description of the test specification; if no string is given then the referring entry of the report header won't be changed Parameter: 10: test specification "" a string that will be taken as a comment line ; if no string is given then the referring entry of the report header won't be chan	Parameter: Default value:	05: E.u.T. name "E.u.T."
Parameter: 06: manufacturer Default value: ** Function: a string that will be taken as the name of the manufacturer (of the E.u.T.); if no string is given then the referring entry of the report header won't be changed Parameter: 07: operating conditions Befault value: ** ** a string that will be taken as the description of the conditions of the test; if no string is given then the referring entry of the report header won't be changed Parameter: 08: test site Default value: ** ** a string that will be taken as the description of the test site; if no string is given then the referring entry of the report header won't be changed Parameter: 08: operator ** ** Function: a string that will be taken as the description of the operator; if no string is given then the referring entry of the report header won't be changed Parameter: 09: operator ** ** Function: a string that will be taken as the description of the test specification; if no string is given then the referring entry of the report header won't be changed Parameter: 10: test specification ** ** Function: a string that will be taken as a comment line ; if no string is given then the referring entry	Function:	a string that will be taken as the description of the equipment under test; if no string is given then the referring entry of the report header won't be changed
Function: a string that will be taken as the name of the manufacturer (of the E.u.T.); if no string is given then the referring entry of the report header won't be changed Parameter: 07: operating conditions "" a string that will be taken as the description of the conditions of the test; if no string is given then the referring entry of the report header won't be changed Parameter: 08: test site Default value: "" " a string that will be taken as the description of the test site; if no string is given then the referring entry of the report header won't be changed Parameter: 08: test site Default value: "" " a string that will be taken as the description of the test site; if no string is given then the referring entry of the report header won't be changed Parameter: 09: operator "" a string that will be taken as the description of the operator; if no string is given then the referring entry of the report header won't be changed Parameter: 10: test specification "Punction: a string that will be taken as the description of the test specification; if no string is given then the referring entry of the report header won't be changed Parameter: 10: test specification "Function: a string that will be taken as a comment line ; if no string is given then the referring entry of the report header won't be	Parameter:	06: manufacturer
Parameter: 07: operating conditions Default value: *** Function: a string that will be taken as the description of the conditions of the test; if no string is given then the referring entry of the report header won't be changed Parameter: 08: test site Default value: *** Function: a string that will be taken as the description of the test site; if no string is given then the referring entry of the report header won't be changed Parameter: 09: operator Default value: *** Function: a string that will be taken as the description of the operator; if no string is given then the referring entry of the report header won't be changed Parameter: 10: test specification Default value: *** *** a string that will be taken as the description of the test specification; if no string is given then the referring entry of the report header won't be changed Parameter: 10: test specification Default value: *** *** *** Function: a string that will be taken as a comment line ; if no string is given then the referring entry of the report header won't be changed Parameter: 12: 2nd comment line (empty field: start time) *** *** Function: <td>Function:</td> <td>a string that will be taken as the name of the manufacturer (of the E.u.T.); if no string is given then the referring entry of the report header won't be changed</td>	Function:	a string that will be taken as the name of the manufacturer (of the E.u.T.); if no string is given then the referring entry of the report header won't be changed
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Parameter: Default value:O9: operatorFunction:a string that will be taken as the description of the operator; if no string is given then the referring entry of the report header won't be changedParameter: Default value:10: test specification 	Function:	a string that will be taken as the description of the test site; if no string is given then the referring entry of the report header won't be changed
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Parameter: Default value:10:test specificationFunction:"a string that will be taken as the description of the test specification; if no string is given then the referring entry of the report header won't be changedParameter: Default value:11:comment line 	Function:	a string that will be taken as the description of the operator; if no string is given then the referring entry of the report header won't be changed
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Parameter: Default value:11: comment line "" a string that will be taken as a comment line ; if no string is given then the referring 	Function:	a string that will be taken as the description of the test specification; if no string is given then the referring entry of the report header won't be changed
Function:a string that will be taken as a comment line ; if no string is given then the referring entry of the report header won't be changedParameter:12: 2nd comment line (empty field: start time) "" a string that will be taken as a comment line ; if no string is given then the start time of the test will be enteredTopic ClampParameter:Parameter:01: use clamp positioning checked Function:Default value:checked if checked then manual control of the absorbing clamp through dialogue boxes will be usedParameter:02: fixed/max. length [cm] to be measured (preview) 500 Function:Default value:500 repending on the mode of the preview test: complete preview search: depending only:Position to be used for measurements initial setting only:position to be used for measurements (normally 0 cm)	Parameter: Default value:	11: comment line
Parameter: Default value:12: 2nd comment line (empty field: start time) "" a string that will be taken as a comment line ; if no string is given then the start time 	Function:	a string that will be taken as a comment line ; if no string is given then the referring entry of the report header won't be changed
Function: a string that will be taken as a comment line ; if no string is given then the start time of the test will be entered Topic Clamp Parameter: 01: use clamp positioning Default value: checked Function: if checked then manual control of the absorbing clamp through dialogue boxes will be used Parameter: 02: fixed/max. length [cm] to be measured (preview) Default value: 500 Function: depending on the mode of the preview test: complete preview search: determines the maximum length to be used for measurements initial setting only:	Parameter: Default value:	12: 2nd comment line (empty field: start time)
Topic ClampParameter: Default value: Function:01: use clamp positioning checked 	Function:	a string that will be taken as a comment line ; if no string is given then the start time of the test will be entered
Parameter: Default value: Function:01: use clamp positioning checked if checked then manual control of the absorbing clamp through dialogue boxes will be usedParameter: Default value: Function:02: fixed/max. length [cm] to be measured (preview) 500 depending on the mode of the preview test: complete preview search: determines the maximum length to be used for measurements initial setting only:	Topic Clamp	
Parameter:02: fixed/max. length [cm] to be measured (preview)Default value:500Function:depending on the mode of the preview test: complete preview search:determines the maximum length to be used for measurements position to be used for measurements (normally 0 cm)	Parameter: Default value: Function:	01: use clamp positioning checked if checked then manual control of the absorbing clamp through dialogue boxes will be used
Function: depending on the mode of the preview test: complete preview search: determines the maximum length to be used for measurements initial setting only: position to be used for measurements (normally 0 cm)	Parameter: Default value: Function:	02: fixed/max. length [cm] to be measured (preview)
initial setting only: measurements position to be used for measurements (normally 0 cm)		depending on the mode of the preview test: complete preview search: determines the maximum length to be used for
		initial setting only: position to be used for measurements (normally 0 cm)

Parameter: Default value:	03: no. of steps per shortest half wave length (preview) 3
Function:	 determines the number of steps that shall be measured within the first half wave of the highest frequency (of the current test range), with steadily increasing stepsize for greater distances, e.g.: a test 60 - 200 MHz, 3 steps per shortest half wave length: => 3 steps within 75 cm (half wave length at 200 MHz) => ever increasing steps (factor is 1 + 1/3) up to 250 cm (= half wave length at 60 MHz) => positions: 0/25/50/75/100/133/177/237/250 cm
Parameter: Default value: Function:	04: max. length [cm] to be measured (finals) 500 depending on the mode of the final test: complete final search: determines the maximum distance of the absorbing clamp to be used for measurements in the final test else: preview data will be used
Parameter: Default value: Function:	05: no. of steps per shortest half wave length (finals) 3 determines the number of steps that shall be measured within the first half wave of the highest frequency (of the current test range), with steadily increasing stepsize for greater distances, see example above (parameter <i>Clamp 07</i>)
Parameter: Default value: Function:	06: no. of steps as adjustment range (finals) 1 final test with "adjustment": determines the number of steps that shall be taken as a position range for the adjustment of the clamp

3.3 Field Strength Test

3.3.1 Description

This test provides automatic measurement of electric field strength with antennas.

For a complete test the critical frequencies have to be measured with all settings of the three "dimensions" antenna height, antenna polarisation and turntable azimuth.

Depending on the defined stepsizes the test may become time consuming but smaller steps do not necessarily lead to significantly higher levels; normally it is better to compensate for this uncertainty through an appropriate acceptance margin (e.g. 6 dB) during the analysis.

Alternatively to the field strength preview test, a frequency list from a power test (30 - 1000 MHz, PEAK-Detektor, advantage: no expensive test chamber required, see 3.2) could be used as an input to the field strength final test; this method however is not considered as very reliable with larger E.u.T.s.

For the preview test it is important to find all disturbances from the E.u.T. (the corresponding frequencies) but because of the superimposition of emitted and reflected signals (on a metallic ground) the antenna might be positioned in a minimum for certain frequency bands; measurements should generally be done with both horizontal and vertical polarisation; the antenna should be directed both to the front and to the back of the E.u.T.; the appropriate antenna height depends on the kind of test chamber:

In a **screened chamber** (only partially applied with absorbers; not suitable for final tests but almost no ambient interference) a single mid position (ca. 2 m) seems to be sufficient but because of the many reflections some minor disturbances might be "pushed up" whereas some stronger ones may come up with a decreased level; therefore the data reduction of the preview should be done with a larger acceptance offset and more frequencies have to be kept for the final test (e.g. in the open area). In an **anechoic chamber with metallic ground** it seems to be sufficient to measure at two positions (1 m and 2.5 m), if the distance between antenna and E.u.T. is 3 m; for greater distances (e.g. 10 m) more positions (e.g. a step size of 1 m) on the full height range (1 m up to 4 m or more) have to be analysed. In an **anechoic chamber with ground absorbers** the reflections on the ground can be disregarded (requires a limit line lowered by 6 dB !) so that a single mid position (ca. 2 m) should be sufficient for the preview test.

An **open area test site** (OATS) is normally not suitable for automatic preview tests because of the many ambient disturbances. Also, when final measurements only are done, problems can occur if one or more frequencies of ambient interference are identical to those critical ones of the E.u.T.; in this case the operator has to find out (e.g. through switching the E.u.T. off and on if possible or by looking at the signal with a smaller IF bandwidth) whether the field strength generated by the E.u.T. is above the limit, but sometimes this can be impossible, when the ambient disturbance exceeds the limit.

The **delivered script parameters** are designed for compliance testing with measurement receivers; measurements with spectrum analysers the preview test using (fast) sweeps could be done on more settings of the mast and turntable and the final test then could run without a complete search but with partial scans and "adjustment" of antenna height and turntable azimuth.

Annotation: There are antennas now available that are suitable for the whole frequency range from 30 MHz up to 3 GHz; this way any changing of antennas can be made totally superfluous within that range.

3.3.2 Parameter Sets

Currently the following specifications are supported by the ESI-K1 Standard Data:

EN 55011

Frequency Range: Detector:	30 - 1000 MHz QP
Related Standards: Test Samples: Distance:	VDE 0875 Part 11 , CISPR 11 ISM: Class B; Group 1 10m
EN 55022	
Frequency Range:	30 - 1000 MHz
Detector:	QP
Related Standards:	VDE 0878 Part 3 , CISPR 22
Test Samples:	ITE: Class B
Distance:	10m

FCC Part 15 Class A

FCC Part 15 Class B

3.3.3 List of the Script Parameters

Parameter: Default value: Function:	 01: ID max. 12 chars to be included in filenames "field_0001" a short string that will be used for building up various default strings (see below); this string enables easy identification of files that belong to the same test
Parameter: Default value: Function:	02: global start frequency [MHz] for the test 30 no measurements will be done below this frequency
Parameter: Default value: Function:	03: global stop frequency [MHz] for the test 1000 no measurements will be done above this frequency
Parameter: Default value: Function:	04: suppress queries as far as possible not checked if not checked then additional queries will come up that help to avoid overwriting of files or to skip certain parts of the test
Parameter: Default value: Function:	05: split frequency range into test ranges checked the total frequency range of the test can optionally be split into test ranges (linear or logarithmic, with respect to the ranges of the scan/sweep range table) that are calculated by the script and will be completely tested (preview test, data reduction, final test), therefore reducing the time elapsed between preview and final test, which is very useful with interference drifting over frequency; besides, this method reduces manual interaction, if more than one probe transducer has to be used for the test (e.g. two antennas for 30 - 1000 MHz in a field strength test); the value given with parameter <i>Test 07</i> has to be interpreted as a minimum value; if the value is set to (typically) 1 then nevertheless for each subrange of the scan/sweep table which used for the preview test, a test range will be calculated (e.g. a field strength test with two antennas or scan/sweep ranges will lead to one test range each); if splitting is not used then the whole frequency range of the scan/sweep table will be tested as one single test range (but maybe with a number of messageboxes requiring to change the antenna !)
Parameter: Default value: Function:	06: if splitting of frequency range: do with log. scale checked if checked then the splitting of the frequency range (if activated) will lead to test ranges of equal width in the logarithmic scale, else in the linear scale
Parameter: Default value: Function:	07: no. of test ranges for splitting of frequency range 1 defines the number of test ranges that shall be calculated for the splitting of the frequency range
Parameter: Default value: Function:	08: test configuration, <none>: ID "<none>" optional filename of the test configuration (lists all files belonging to the test, for easy transfers through Export/Import/Move) to be created by the test; if no filename is specified then a default name will be used</none></none>

01: preview result file, <none>: ID + '_pre PK' "<none>" optional filename for the PEAK results from the preview test; if no filename is specified then a default name will be used</none></none>
02: optional 2nd preview result file, <none>: ID + '_pre AV' "<none>" optional filename for the AVERAGE results from the preview test; if no filename is specified then a default name will be used</none></none>
03: scan table for preview " <none>" filename of the scan range table to be used for the preview test</none>
04: optional 2nd scan table for preview (vertical) " <none>" filename of a second scan range table for the preview test which to be used only when measurements are done with vertical polarisation; if used then the first scan range table will be used with horizontal polarisation only</none>
05: sweep table for preview " <none>" filename of the sweep range table to be used for the preview test</none>
06: optional 2nd sweep table for preview (vertical) " <none>" filename of a second sweep range table for the preview test which will be used only when measurements are done with vertical polarisation; if used then the first sweep range table will be used with horizontal polarisation only</none>
07: complete search (all accessory settings) not checked if checked sweeps/scans will be done on all accessory settings as specified with the mast/turntable/polarisation parameters for the preview test (recommended for preview tests with sweeps, e.g. with an EMI analyser); else only one sweep/scans will be done with <u>one</u> fixed setting as specified with clamp parameters for the preview test (recommended for preview tests with scans, e.g. with an EMI test receiver)

Topic DataReduction

Parameter:	01: QP limit line
Default value:	" <none>"</none>
Function:	a filename that corresponds to the required limit line for the $\ensuremath{QUASIPEAK}$ detector

Parameter: Default value:	02: optional QP acceptance line (no offset) " <none>"</none>
Function:	a filename of an optional limit line which will be directly used as a quasi arbitrarily defined acceptance line for the acceptance analysis during data reduction of PEAK results; if used then the given value for the acceptance offset will be ignored
Parameter:	03: optional AV limit line " <none>"</none>
Function:	a filename that corresponds to the required limit line for the AVERAGE detector
Parameter:	04: optional AV acceptance line (no offset)
Function:	a filename of an optional limit line which will be directly used as a quasi arbitrarily defined acceptance line for the acceptance analysis during data reduction of AVERAGE results; if used then the given value for the acceptance offset will be ignored
Parameter:	05: final measurements according to FCC standard
Function:	if checked then the final measurements in the frequency range >1 GHz will be done with the AV detector instead of the QP detector (as required in the FCC regulations part 15) and the referring results will be stored in an extra result file
Parameter:	06: max. no. of results kept per test range
Function:	the maximum number of results that will be kept from each test range through data reduction
Parameter:	07: decision threshold [dB] for peak reduction
Function:	determines the decision level when data reduction is done with the "Peak Reduction"; a higher (stricter) value means that less peaks will be detected in the spectrum so that more results from the subrange maxima reduction will come through
Parameter:	08: level offset [dB] for acceptance analysis
Function:	determines the level offset when data reduction is done with the "Acceptance Analysis"
Parameter:	09: max. no. of results kept from partial scans
Function:	when a partial scan is performed then after data reduction there might still be more than one significant frequency linked to interference; this parameter limits the number of results from a partial scan (after data reduction)
Parameter:	10: partial scan width: no. of IF-BWs (0=use ratio)
Function:	determines the frequency range for partial scans expressed in multiples of the IF bandwidth used in the referring scan/sweep table; if the value is set to 0 then the calculation of the partial scan width is based on the following parameter

Parameter: Default value:	11: partial scan width: ref. frequ. ratio 0.01 Image: scale
Function:	determines the frequency range for partial scans (e.g. 0.01 means ± 0.5 %) in reference to the given mid frequency; the parameter is effective only if the previous parameter is set to 0
Topic Final	
Parameter:	01: final result file, <none>: ID + '_fin QP' "<none>"</none></none>
Function:	optional filename for the QUASIPEAK results from the final test; if no filename is specified then a default name will be used
Parameter: Default value:	02: 2nd final result file, <none>: ID + '_fin AV' "<none>"</none></none>
Function:	optional filename for the AVERAGE results from the final test; if no filename is specified then a default name will be used
Parameter:	03: scan table for partial scans + single meas.
Function:	filename of the corresponding scan range table to be used for the final test, for partial scans as well as for single measurements: for single measurements with the final detector (QP/AV) the scan range table settings will be programmed and then modified if necessary (detector and measurement time); therefore the scan range table should be defined with the PEAK (and optional AVERAGE) detector in combination with a short measurement time, while the other settings have to be suitable also for QUASIPEAK measurements
Parameter:	04: optional 2nd scan table (vertical)
Function:	filename of a second scan range table for the final test (partial scans and single measurements) which will be used only when measurements are done with vertical polarisation; if used then the first scan range table will be used with horizontal polarisation only
Parameter:	05: perform partial scans
Function:	if checked then additional partial scans will be performed around the frequencies to be analysed; in this case the final measurements will be done on those frequencies that have been found (through data reduction) with these partial scans (recommended when preview was done with sweeps or when drifting interference is to be expected)
Parameter: Default value:	06: complete search checked
Function:	determines the search mode for the preview test: complete search means that measurements will be done on all mast/turntable/polarisation settings as specified with the corresponding parameters for the final test (recommended when the preview test has been performed with a fixed setting); else: measurements will be done on those mast/turntable/polarisation settings that were determined through a "complete search" in the preview test
Parameter:	07: time [sec] for final measurements
Function:	a time that will be used for the measurements with the final detector(s); the device under test may require a minimum "duty cycle time" for full compliance testing

Parameter: Default value: Function:	08: perform accessory adjustment checked if checked then an additional search (in a small range) for the (local) maximum level will be performed (mast height and turntable azimuth); this is recommended, if the preview test was performed with only one or a small number of settings (mast and turntable)
Parameter: Default value:	09: accessory adjustment full range not checked
Function:	if an additional search for the maximum level will be performed then not a small range will be analysed but the full positioning range (mast and turntable)
Parameter: Default value:	10: optional input: preview result file " <none>"</none>
Function:	if the test shall be performed without a preview test then an existing preview result file can be specified as an input for the final test, one (for QP+AV) or optionally two (1st for QP, 2nd for AV) input files
Parameter:	11: optional input: preview result file (2nd det.)
Function:	see previous parameter
Parameter: Default value:	12: optional input: frequency list " <none>"</none>
Function:	if the test shall be performed without a preview test then an existing frequency list can be specified as an input for the final test, one (for QP+AV) or optionally two (1st for QP, 2nd for AV) input files
Parameter:	13: optional input: frequency list (2nd det.)
Function:	see previous parameter
Parameter:	14: optional input: final result file
Function:	if the test shall be performed without a preview test then an existing final result file can be specified as an input for the final test, one (for QP+AV) or optionally two (1st for QP, 2nd for AV) input files
Parameter:	15: optional input: final result file (2nd det.)
Function:	see previous parameter
Topic Graphics	
Parameter:	01: graphics configuration, <none>: ID "<none>"</none></none>
Function:	optional filename for the graphics configuration to be used in the test; if no filename is specified then a default name will be used
Parameter: Default value:	02: optional graphics template (new graph only) " <none>"</none>
Function:	optional file name of a predefined graphics configuration, from which the graphics configuration to be used in the test shall be derived (line type and color settings)

Topic Report

Parameter: Default value: Function:	01: generate printer hardcopy checked if checked then a report configuration for printing will be generated and a hardcopy will be sent to the device which is defined as the printer for the software
Parameter: Default value: Function:	02: report config. for printing, <none>: ID + '_prnt' "<none>" optional filename for the report configuration for printing, if printer output is selected; if no filename is specified then a default name will be used</none></none>
Parameter: Default value: Function:	03: footnote, empty field: ID "" optional text as a footnote on the pages of the test report; if an empty string is used then the ID string of the test will be used
Topic ReportHea	der
Parameter: Default value: Function:	01: test report header, <none>: ID "<none>" optional filename for the report header to be used in the test; if no filename is specified then a default name will be used</none></none>
Parameter: Default value: Function:	02: optional test report header template, <none>: ID "<none>" optional filename of a report header which shall be taken as a template for the one to be used in the test; if no filename is specified then a default name will be used</none></none>
Parameter: Default value: Function:	03: 1st header line "TEST" a string that will be taken as the first header line; if no string is given then the referring entry of the report header won't be changed
Parameter: Default value: Function:	04: 2nd header line "Field Strength Test" a string that will be taken as the second header line; if no string is given then the referring entry of the report header won't be changed
Parameter: Default value: Function:	05: E.u.T. name "E.u.T." a string that will be taken as the description of the equipment under test; if no string is given then the referring entry of the report header won't be changed
Parameter: Default value: Function:	06: manufacturer
	a string that will be taken as the name of the manufacturer (of the E.u.T.); if no string is given then the referring entry of the report header won't be changed
Parameter:	07: operating conditions
Function:	a string that will be taken as the description of the conditions of the test; if no string is given then the referring entry of the report header won't be changed

Standard Scripts

Parameter: Default value: Function:	08: test site		
	a string that will be taken as the referring entry of the rep	the description of the test site; if no string is given then ort header won't be changed	
Parameter: Default value: Function:	09: operator		
	a string that will be taken as the referring entry of the repo	the description of the operator; if no string is given then ort header won't be changed	
Parameter:	10: test specification		
Function:	a string that will be taken a given then the referring entry	s the description of the test specification; if no string is / of the report header won't be changed	
Parameter:	11: comment line		
Function:	a string that will be taken as entry of the report header wo	a comment line ; if no string is given then the referring on't be changed	
Parameter:	12: 2nd comment line (emp	ty field: start time)	
Function:	a string that will be taken as of the test will be entered	a comment line ; if no string is given then the start time	
Topic Mast			
Parameter: Default value: Function:	01: use mast positioning checked if checked then manual con used	trol of the antenna mast through dialogue boxes will be	
Parameter:	07: control priority level (1=	highest)	
Default value: Function:	defines the priority level of the controlling of the antenna height (in combination with turntable azimuth and antenna polarisation): a value of 1 means highest priority, 3 means lowest priority		
Parameter:	08: min. height [cm] to be n	neasured for preview	
Function:	depending on the mode of th complete preview search: else:	ne preview test: minimum height to be used for measurements value will be ignored	
Parameter: 09: fixed/max. height [cm] to be measured for pr		o be measured for preview	
Function:	depending on the mode of the complete preview search:	ne preview test: determines the maximum height to be used for measurements	
	else:	fixed height to be used for measurements	

Parameter: Default value: Function:	10: height stepsize [cm] for 200 stepsize for height variation is sufficient (for finding all s search; this stepsize will be "adjustment", if the final test	preview in the preview test; normally two or three positions in all uspect frequencies), if the final test includes a complete used in the final test as the height range for an optional is done without complete search
Parameter: Default value: Function:	11: min. height [cm] to be m100depending on the mode of thcomplete final search:else:	neasured for finals ne final test: determines the minimum height of the mast to be used for measurements in the final test preview data will be used
Parameter: Default value: Function:	12: max. height [cm] to be r 400 depending on the mode of th complete final search: else:	measured for finals ne final test: determines the maximum height of the mast to be used for measurements in the final test preview data will be used
Parameter: Default value: Function:	13: height stepsize [cm] for 50 stepsize for height variation height range for an optional search	finals in the final test; this stepsize will also be used as the I "adjustment", if the final test is done with a complete
Topic Turntable		
Parameter: Default value: Function:	01: use turntable positioning checked if checked then manual cont	g rol of the turntable through dialogue boxes will be used
Parameter: Default value: Function:	02: control priority level (1= 2 defines the priority level of with antenna height and ante means lowest priority	highest) the controlling of the turntable azimuth (in combination enna polarisation): a value of 1 means highest priority, 3
Parameter: Default value: Function:	03: min. azimuth [deg] to be 90 depending on the mode of th complete preview search: else:	e measured for preview ne preview test: minimum azimuth to be used for measurements value will be ignored
Parameter: Default value: Function:	04: fixed/max. azimuth [deg 270 depending on the mode of th complete preview search: else:	g] to be measured for preview ne preview test: determines the maximum azimuth to be used for measurements fixed azimuth to be used for measurements
Parameter: Default value: Function:	05: azimuth stepsize [deg] 1 180 stepsize for azimuth variati sufficient (for finding all sus	for preview on in the preview test; normally two positions in all is spect frequencies), if the final test includes a complete

	"adjustment", if the final tes	st is done without complete search	
Parameter: Default value:	06: min. azimuth [deg] to be measured for finals		
Function:	depending on the mode of complete final search:	the final test: determines the minimum azimuth of the turntable to be used for measurements in the final test	
	else:	preview data will be used	
Parameter: Default value: Function:	07: max. azimuth [deg] to 360 depending on the mode of complete final search:	be measured for finals the final test: determines the azimuth of the turntable to be	
	else:	used for measurements in the final test preview data will be used	
Parameter: Default value:	08: azimuth stepsize [deg 45] for finals	
Function:	stepsize for azimuth variat azimuth range for an optic search	ion in the final test; this stepsize will also be used as the anal "adjustment", if the final test is done with a complete	
Topic Polarisatio	n		
Parameter: Default value: Function:	01: use manual switching checked if checked then manual co will be used	only ontrol of the antenna polarisation through dialogue boxes	
Parameter: Default value:	02: control priority level (1 3	=highest)	
Function:	defines the priority level of with antenna height and to means lowest priority	the controlling of the antenna polarisation (in combination urntable azimuth): a value of 1 means highest priority, 3	
Parameter:	03: preview measurement	ts with horizontal polaris.	
Default value: Function:	not checked if checked then the prev polarisation	riew measurements will (also) be done with horizontal	
Parameter: Default value:	04: preview measurement not checked	ts with vertical polaris.	
Function:	if checked then the pre polarisation	view measurements will (also) be done with vertical	
Parameter: Default value:	05: final measurements w not checked	ith horizontal polaris.	
Function:	if checked then the fina polarisation	al measurements will (also) be done with horizontal	
Parameter:	06: final measurements w	ith vertical polaris.	
Function:	if checked then the final me	easurements will (also) be done with vertical polarisation	

search; this stepsize will be used in the final test as the azimuth range for an optional

3.4 Magnetic Field Strength Test

3.4.1 Description

This test provides automatic measurement of magnetic interference, optionally with manual control of a triple loop antenna like the R&S HM020.

Besides, it is possible to integrate a manually controlled turntable to turn the EuT.

An **open area test site** (OATS) is normally not suitable for automatic preview tests because of the many ambient disturbances.

3.4.2 Parameter Sets

Currently the following specifications are supported by the ESI-K1 Standard Data:

VDE0875/211

Frequency Range:	0.009 - 30 MHz
Detector:	QP
Related Standards:	CISPR 11
Test Samples:	ISM

3.4.3 List of the Script Parameters

Parameter: Default value: Function:	01: ID max. 12 chars to be included in filenames "mfield_0001" a short string that will be used for building up various default strings (see below); this
Parameter: Default value:	other start frequency [MHz] for the test0.09
Function:	no measurements will be done below this frequency
Parameter: Default value: Function:	 03: global stop frequency [MHz] for the test 30 no measurements will be done above this frequency
Parameter:	04: suppress queries as far as possible
Default value: Function:	not checked if not checked then additional queries will come up that help to avoid overwriting of files or to skip certain parts of the test
Parameter: Default value:	05: split frequency range into test ranges checked
Function:	the total frequency range of the test can optionally be split into test ranges (linear or logarithmic, with respect to the ranges of the scan/sweep range table) that are calculated by the script and will be completely tested (preview test, data reduction, final test), therefore reducing the time elapsed between preview and final test, which is very useful with interference drifting over frequency; besides, this method reduces manual interaction, if more than one probe transducer has to be used for the test (e.g. two antennas for 30 - 1000 MHz in a field strength test); the value given with parameter <i>Test 07</i> has to be interpreted as a minimum value; if the value is set to (typically) 1 then nevertheless for each subrange of the scan/sweep table which used for the preview test, a test range will be calculated (e.g. a field strength test with two antennas or scan/sweep ranges will lead to one test range each); if splitting is not used then the whole frequency range of the scan/sweep table will be tested as one single test range (but maybe with a number of messageboxes requiring to change the antenna !)
Parameter: Default value: Function:	06: if splitting of frequency range: do with log. scale checked if checked then the splitting of the frequency range (if activated) will lead to test ranges of equal width in the logarithmic scale, else in the linear scale
Parameter: Default value: Function:	07: no. of test ranges for splitting of frequency range 1 defines the number of test ranges that shall be calculated for the splitting of the
	frequency range
Parameter: Default value: Function:	08: test configuration, <none>: ID "<none>" optional filename of the test configuration (lists all files belonging to the test, for easy transfers through Export/Import/Move) to be created by the test; if no filename is specified then a default name will be used</none></none>

Topic **Preview**

Parameter: Default value: Function:	01: preview result file, <none>: ID + '_pre PK' "<none>" optional filename for the PEAK results from the preview test; if no filename is specified then a default name will be used</none></none>
Parameter: Default value: Function:	02: 2nd preview result file, <none>: ID + '_pre AV' "<none>" optional filename for the AVERAGE results from the preview test; if no filename is specified then a default name will be used</none></none>
Parameter: Default value: Function:	03: scan table for preview " <none>" filename of the scan range table to be used for the preview test</none>
Parameter: Default value: Function:	04: sweep table for preview " <none>" filename of the sweep range table to be used for the preview test</none>
Topic DataReduct	lion
Parameter: Default value: Function:	01: QP limit line " <none>" a filename that corresponds to the required limit line for the QUASIPEAK detector</none>
Parameter: Default value: Function:	02: AV limit line " <none>" a filename that corresponds to the required limit line for the AVERAGE detector</none>
Parameter:	03: max. no. of results kept per test range
Function:	the maximum number of results that will be kept from each test range through data reduction
Parameter:	04: decision threshold [dB] for peak reduction
Function:	determines the decision level when data reduction is done with the "Peak Reduction"; a higher (stricter) value means that less peaks will be detected in the spectrum so that more results from the subrange maxima reduction will come through
Parameter: Default value:	05: level offset [dB] for acceptance analysis -10.0
Function:	determines the level offset when data reduction is done with the "Acceptance Analysis"

Parameter: Default value:	06: max. no. of results kept from partial scans 2
Function:	when a partial scan is performed then after data reduction there might still be more than one significant frequency linked to interference; this parameter limits the number of results from a partial scan (after data reduction)
Parameter: Default value: Function:	07: partial scan width: no. of IF-BWs (0=use ratio)
	determines the frequency range for partial scans expressed in multiples of the IF bandwidth used in the referring scan/sweep table; if the value is set to 0 then the calculation of the partial scan width is based on the following parameter
Parameter:	08: partial scan width: ref. frequ. ratio
Function:	determines the frequency range for partial scans (e.g. 0.01 means ± 0.5 %) in reference to the given mid frequency; the parameter is effective only if the previous parameter is set to 0
Topic Final	
Parameter:	01: final result file, <none>: ID + '_fin QP'</none>
Function:	optional filename for the QUASIPEAK results from the final test; if no filename is specified then a default name will be used
Parameter: Default value:	02: 2nd final result file, <none>: ID + '_fin AV' "<none>"</none></none>
Function:	optional filename for the AVERAGE results from the final test; if no filename is specified then a default name will be used
Parameter: Default value:	03: scan table for partial scans + single meas. " <none>"</none>
Function:	filename of the corresponding scan range table to be used for the final test, for partial scans as well as for single measurements: for single measurements with the final detector (QP/AV) the scan range table settings will be programmed and then modified if necessary (detector and measurement time); therefore the scan range table should be defined with the PEAK (and AVERAGE) detector in combination with a short measurement time, while the other settings have to be suitable also for QUASIPEAK measurements
Parameter:	04: perform partial scans
Function:	if checked then additional partial scans will be performed around the frequencies to be analysed; in this case the final measurements will be done on those frequencies that have been found (through data reduction) with these partial scans (recommended when preview was done with sweeps or when drifting interference is to be expected)
Parameter:	05: complete search
Function:	determines the search mode for the preview test: complete search means that measurements will be done on all loop antenna settings as specified with loop antenna parameters for the final test (recommended when the preview test has been performed with a fixed setting of the loop antenna); else: measurements will be done on those loop antenna settings that were determined through a "complete accord," in the preview test
	determined through a complete search in the preview test

Parameter: Default value: Function:	06: time [sec] for final measurements1.0a time that will be used for the measurements with the final detector(s); the device under test may require a minimum "duty cycle time" for full compliance testing
Parameter: Default value: Function:	07: optional input: preview result file " <none>" if the test shall be performed without a preview test then an existing preview result file can be specified as an input for the final test, one (for QP+AV) or optionally two (1st for QP, 2nd for AV) input files</none>
Parameter: Default value: Function:	08: optional input: preview result file (2nd det.) " <none>" see previous parameter</none>
Parameter: Default value: Function:	09: optional input: frequency list " <none>" if the test shall be performed without a preview test then an existing frequency list can be specified as an input for the final test, one (for QP+AV) or optionally two (1st for QP, 2nd for AV) input files</none>
Parameter: Default value: Function:	10: optional input: frequency list (2nd det.) " <none>" see previous parameter</none>
Parameter: Default value: Function:	11: optional input: final result file " <none>" if the test shall be performed without a preview test then an existing final result file can be specified as an input for the final test, one (for QP+AV) or optionally two (1st for QP, 2nd for AV) input files</none>
Parameter: Default value: Function:	12: optional input: final result file (2nd det.) " <none>" see previous parameter</none>
Topic Graphics	
Parameter: Default value: Function:	01: graphics configuration, <none>: ID "<none>" optional filename for the graphics configuration to be used in the test; if no filename is specified then a default name will be used</none></none>
Parameter: Default value: Function:	02: optional graphics template (new graph only) " <none>" optional file name of a predefined graphics configuration, from which the graphics configuration to be used in the test shall be derived (line type and color settings)</none>

Topic Report

Parameter: Default value: Function:	01: generate printer hardcopy checked if checked then a report configuration for printing will be generated and a hardcopy will be sent to the device which is defined as the printer for the software			
Parameter: Default value:	02: report config. for printing, <none>: ID + '_prnt' "<none>"</none></none>			
Function:	optional filename for the report configuration for printing, if printer output is selected; if no filename is specified then a default name will be used			
Parameter: Default value:	03: footnote, empty field: ID			
Function:	optional text as a footnote on the pages of the test report; if an empty string is used then the ID string of the test will be used			
Topic ReportHead	ler			
Parameter:	01: test report header, <none>: ID "<none>"</none></none>			
Function:	optional filename for the report header to be used in the test; if no filename is specified then a default name will be used			
Parameter: 02: optional test report header template, <none>: ID</none>				
Function:	optional filename of a report header which shall be taken as a template for the one to be used in the test; if no filename is specified then a default name will be used			
Parameter:	03: 1st header line			
Function:	a string that will be taken as the first header line; if no string is given then the referring entry of the report header won't be changed			
Parameter:	04: 2nd header line "Magn_Field Strength Test"			
Function: a string that will be taken as the second header line; if no string is give referring entry of the report header won't be changed				
Parameter:	05: E.u.T. name			
Function:	a string that will be taken as the description of the equipment under test; if no string is given then the referring entry of the report header won't be changed			
Parameter: Default value:	06: manufacturer			
Function:	a string that will be taken as the name of the manufacturer (of the E.u.T.); if no string is given then the referring entry of the report header won't be changed			
Parameter: Default value:	07: operating conditions			
Function:	a string that will be taken as the description of the conditions of the test; if no string is given then the referring entry of the report header won't be changed			
Parameter: Default value:	08: test site			

Function:	a string that will be taken as the description of the test site; if no string is given then the referring entry of the report header won't be changed	
Parameter: Default value: Function:	09: operator "" a string that will be taken as the description of the operator; if no string is given then the referring entry of the report header won't be changed	
Parameter: Default value: Function:	 10: test specification a string that will be taken as the description of the test specification; if no string is given then the referring entry of the report header won't be changed 	
Parameter: Default value: Function:	 11: comment line a string that will be taken as a comment line ; if no string is given then the referring entry of the report header won't be changed 	
Parameter: Default value: Function:	12: 2nd comment line (empty field: start time)a string that will be taken as a comment line ; if no string is given then the start time of the test will be entered	

Topic LoopAntenna

Parameter: Default value:	01: use loop antenna position switching checked
Function:	if checked then manual control of the loop antenna through dialogue boxes will be used
Parameter: Default value:	02: preview measurements on loop X checked
Function:	if checked then the preview measurements will (also) be done with the antenna loop "X" $% \left({{\left[{{{\rm{T}}_{\rm{T}}} \right]}_{\rm{T}}} \right)$
Parameter: Default value:	03: preview measurements on loop Y checked
Function:	if checked then the preview measurements will (also) be done with the antenna loop "Y"
Parameter:	04: preview measurements on loop Z
Function:	if checked then the preview measurements will (also) be done with the antenna loop "Z"
Parameter:	05: final measurements on loop X
Function:	if checked then the final measurements will (also) be done with the antenna loop "X"
Parameter:	06: final measurements on loop Y
Function:	if checked then the final measurements will (also) be done with the antenna loop "Y"
Parameter: Default value:	07: final measurements on loop Z checked
Function:	if checked then the final measurements will (also) be done with the antenna loop "Z"

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Parameter: Default value: Function:	01: use turntable positioning checked if checked then manual control of the turntable through dialogue boxes will be used		
Parameter: Default value:	02: min. azimuth [deg] to be measured for preview		
Function:	depending on the mode of the complete preview search: else:	ne preview test: minimum azimuth to be used for measurements value will be ignored	
Parameter: 03: fixed/max. azimuth [deg] to be measured for preview] to be measured for preview	
Function:	depending on the mode of the complete preview search:	the preview test: determines the maximum azimuth to be used for measurements fixed azimuth to be used for measurements	
		liked azimuti to be used for measurements	
Parameter: Default value: Function:	 04: azimuth stepsize [deg] for preview 180 stepsize for azimuth variation in the preview test; normally two positions in all is sufficient (for finding all suspect frequencies), if the final test includes a complete search; this stepsize will be used in the final test as the azimuth range for an optional "adjustment", if the final test is done without complete search 		
Parameter: 05: min. azimuth [deg] to be measured for finals		e measured for finals	
Function:	depending on the mode of th complete final search: else:	ne final test: determines the minimum azimuth of the turntable to be used for measurements in the final test preview data will be used	
Parameter: Default value:	06: max. azimuth [deg] to be measured for finals		
Function:	depending on the mode of the complete final search:	ne final test: determines the azimuth of the turntable to be used for measurements in the final test	
Parameter: Default value:	else: 07: azimuth stepsize [deg] 1 45	preview data will be used for finals	
Function:	stepsize for azimuth variation in the final test; this stepsize will also be used as the azimuth range for an optional "adjustment", if the final test is done with a complete search		

3.5 Overview Test

3.5.1 Description

This test consists of a preview test (scan or sweep) as well as an automatic and/or a manual data reduction (for finding critical frequencies).

The automatic data reduction works as with other standard scripts.

With the manual data reduction the user can select suspect frequencies with the marker from the spectrum of the preview test and add these to a list. In addition, either a partial scan or a partial sweep can be run around these frequencies, thus improving the accuracy of the frequencies.

It is a good idea to define the scan/sweep table such that a continuous repetition will occur. If a dialog for a LISN device has been opened in advance, then this device can be controlled all over the test, i.e. the user himself does the maximization through varying of the LISN lines.

3.5.2 List of the Script Parameters

Parameter: Default value: Function:	 01: ID max. 12 chars to be included in filenames "ovw_0001" a short string that will be used for building up various default strings (see below); this string enables easy identification of files that belong to the same test 		
Parameter: Default value: Function:	02: global start frequency [MHz] for the test 30 no measurements will be done below this frequency		
Parameter: Default value: Function:	03: global stop frequency [MHz] for the test 1000 no measurements will be done above this frequency		
Parameter: Default value: Function:	04: suppress queries as far as possible not checked if not checked then additional queries will come up that help to avoid overwriting of files or to skip certain parts of the test		
Parameter: Default value: Function:	05: split frequency range into test ranges checked the total frequency range of the test can optionally be split into test ranges (linear or logarithmic, with respect to the ranges of the scan/sweep range table) that are calculated by the script and will be completely tested (preview test, data reduction, final test), therefore reducing the time elapsed between preview and final test, which is very useful with interference drifting over frequency; besides, this method reduces manual interaction, if more than one probe transducer has to be used for the test (e.g. two antennas for 30 - 1000 MHz in a field strength test); the value given with parameter <i>Test 07</i> has to be interpreted as a minimum value; if the value is set to (typically) 1 then nevertheless for each subrange of the scan/sweep table which used for the preview test, a test range will be calculated (e.g. a field strength test with two antennas or scan/sweep ranges will lead to one test range each); if splitting is not used then the whole frequency range of the scan/sweep table will be tested as one single test range (but maybe with a number of messageboxes requiring to change the antenna !)		
Parameter: Default value: Function:	06: if splitting of frequency range: do with log. scale checked if checked then the splitting of the frequency range (if activated) will lead to test ranges of equal width in the logarithmic scale, else in the linear scale		
Parameter: Default value: Function:	07: no. of test ranges for splitting of frequency range 1 defines the number of test ranges that shall be calculated for the splitting of the frequency range		
Parameter: Default value: Function:	08: test configuration, <none>: ID "<none>" optional filename of the test configuration (lists all files belonging to the test, for easy transfers through Export/Import/Move) to be created by the test; if no filename is specified then a default name will be used</none></none>		
Topic Preview			

Parameter: Default value: Function:	01: preview result file, <none>: ID + '_pre PK' "<none>" optional filename for the PEAK results from the preview test; if no filename is specified then a default name will be used</none></none>		
Parameter: Default value: Function:	02: 2nd preview result file, <none>: ID + '_pre AV' "<none>" optional filename for the AVERAGE results from the preview test; if no filename is specified then a default name will be used</none></none>		
Parameter: Default value: Function:	03: scan table for preview " <none>" filename of the scan range table to be used for the preview test</none>		
Parameter: Default value: Function:	04: sweep table for preview " <none>" filename of the sweep range table to be used for the preview test</none>		
Parameter: Default value: Function:	05: optional input: preview result file " <none>" if the test shall be performed without a preview test then an existing preview result file can be specified as an input for the data reduction, one (for PK+AV results) or optionally two (1st for PK, 2nd for AV) input files</none>		
Parameter: Default value: Function:	06: optional input: preview result file (2nd det.) " <none>" see previous parameter</none>		
Topic DataReduct	ion		

Parameter: Default value: Function:	01: perform manual (interactive) data reduction not checked if checked then an automatic data reduction will be performed; if the next parameter is also activated then the manual data reduction will be done after the automatic one
Parameter: Default value: Function:	02: perform automatic data reduction not checked if checked then a manual data reduction will be performed; if the previous parameter is also activated then the manual data reduction will be done after the automatic one
Parameter: Default value: Function:	03: QP limit line " <none>" a filename that corresponds to the required limit line for the QUASIPEAK detector</none>
Parameter: Default value: Function:	04: optional QP acceptance line (no offset) " <none>" a filename of an optional limit line which will be directly used as a quasi arbitrarily defined acceptance line for the acceptance analysis during data reduction of PEAK results; if used then the given value for the acceptance offset will be ignored</none>
Parameter: Default value: Function:	05: optional AV limit line " <none>" a filename that corresponds to the required limit line for the AVERAGE detector</none>

Parameter: Default value: Function:	06: optional AV acceptance line (no offset) " <none>" a filename of an optional limit line which will be directly used as a quasi arbitrarily defined acceptance line for the acceptance analysis during data reduction of AVERAGE results; if used then the given value for the acceptance offset will be ignored</none>		
Parameter: Default value: Function:	 07: max. no. of results kept per test range 6 the maximum number of results that will be kept from each test range through data reduction 		
Parameter: Default value: Function:	08: decision threshold [dB] for peak reduction 6.0 determines the decision level when data reduction is done with the "Peak Reduction"; a higher (stricter) value means that less peaks will be detected in the spectrum so that more results from the subrange maxima reduction will come through		
Parameter: Default value: Function:	09: level offset [dB] for acceptance analysis -10.0 determines the level offset when data reduction is done with the "Acceptance Analysis"		
Topic Monitor			
Parameter: Default value: Default value: Function:	01: scan table for preview " <keine>" "<none>" filename of the scan table to be used for partial scans; this parameter cannot be used together with the next parameter</none></keine>		
Parameter: Default value: Function:	02: sweep table for preview " <keine>" filename of the sweep table to be used for partial sweeps: this parameter cannot be</keine>		
	used together with the previous para	meter	
Parameter: Default value:	03: partial scan/sweep width: 0	no. of IF-BWs (0=use ratio)	
Function:	determines the frequency range for partial scans/sweeps expressed in multiples of the IF bandwidth used in the referring scan/sweep table; if the value is set to 0 then the calculation of the partial scan width is based on the following parameter		
Parameter: Default value:	04: partial scan/sweep width:	ref. frequ. ratio	
Function:	determines the frequency range for partial scans/sweeps (e.g. 0.01 means ± 0.5 %) in reference to the given mid frequency; the parameter is effective only if the previous parameter is set to 0		

Topic Final			
Parameter: Default value: Function:	01: final result file, <none>: ID + '_fin PK' "<none>" optional filename for the PEAK results from the data reduction; if no filename is specified then a default name will be used</none></none>		
Parameter: Default value: Function:	02: 2nd final result file, <none>: ID + '_fin AV' "<none>" optional filename for the AVERAGE results from the data reduction; if no filename is specified then a default name will be used</none></none>		
Topic Graphics			
Parameter: Default value: Function:	01: graphics configuration, <none>: ID "<none>" optional filename for the graphics configuration to be used in the test; if no filename is specified then a default name will be used</none></none>		
Parameter: Default value: Function:	02: optional graphics template (new graph only) " <none>" optional file name of a predefined graphics configuration, from which the graphics configuration to be used in the test shall be derived (line type and color settings)</none>		
Topic Report			
Parameter: Default value: Function:	01: generate printer hardcopy checked if checked then a report configuration for printing will be generated and a hardcopy will be sent to the device which is defined as the printer for the software		
Parameter: Default value: Function:	02: report config. for printing, <none>: ID + '_prnt' "<none>" optional filename for the report configuration for printing, if printer output is selected; if no filename is specified then a default name will be used</none></none>		
Parameter: Default value: Function:	03: footnote, empty field: ID "" optional text as a footnote on the pages of the test report; if an empty string is used then the ID string of the test will be used		
Topic ReportHeader			
Parameter: Default value: Function:	01: test report header, <none>: ID "<none>" optional filename for the report header to be used in the test; if no filename is specified then a default name will be used</none></none>		
Parameter: Default value: Function:	02: optional test report header template, <none>: ID "<none>" optional filename of a report header which shall be taken as a template for the one to be used in the test; if no filename is specified then a default name will be used</none></none>		

Parameter: Default value: Function:	03: 1st header line "TEST" a string that will be taken as the first header line; if no string is given then the referring entry of the report header won't be changed
Parameter: Default value: Function:	04: 2nd header line "Overview" a string that will be taken as the second header line; if no string is given then the referring entry of the report header won't be changed
Parameter: Default value: Function:	05: E.u.T. name "E.u.T." a string that will be taken as the description of the equipment under test; if no string is given then the referring entry of the report header won't be changed
Parameter: Default value: Function:	06: manufacturer "" a string that will be taken as the name of the manufacturer (of the E.u.T.); if no string
Parameter: Default value: Function:	 O7: operating conditions a string that will be taken as the description of the conditions of the test; if no string is given then the referring entry of the report header won't be changed
Parameter: Default value: Function:	08: test site "" a string that will be taken as the description of the test site; if no string is given then the referring entry of the report header won't be changed
Parameter: Default value: Function: Parameter: Default value: Function:	 09: operator a string that will be taken as the description of the operator; if no string is given then the referring entry of the report header won't be changed 10: test specification a string that will be taken as the description of the test specification; if no string is given then the referring entry of the report header won't be changed
Parameter: Default value: Function:	11: comment line "" a string that will be taken as a comment line ; if no string is given then the referring entry of the report header won't be changed
Parameter: Default value: Function:	12: 2nd comment line (empty field: start time) "" a string that will be taken as a comment line ; if no string is given then the start time of the test will be entered

3.6 Semi Interactive Test

3.6.1 Description

An open area test site (OATS) is normally not suitable for automatic tests because of the many ambient disturbances. In this case the operator has to find out (e.g. through switching the E.u.T. off and on if possible or by looking at / listening to the signal) whether the field strength generated by the E.u.T. is above the limit, but sometimes this can be impossible, when the ambient disturbance exceeds the limit. This test provides interactive single measurements plus protocolling, controlled from a special dialog:

😑 Semi Intera	active Test
Frequency [MHz] 32 Down Up	Level Max Hold 49.4 54.7 dBμV/m
Pre <u>v</u> ious <u>N</u> ext <u>M</u> arker	Meas. Time [sec] 2
Partial S <u>w</u> eep Partial S <u>c</u> an	IF Bandwidth [kHz] 120
Range Width [kHz] 240	Comment -comment-
Measure <u>PK</u> Measure <u>Q</u> P	E.u.T. on E.u.T. off
Measure <u>R</u> MS Measure <u>A</u> V	<u>S</u> tore Qu <u>i</u> t

By clicking **Down** and **Up** the arbitrarily editable frequency will be decreased and increased by the step size defined in the scan table. If the test is based on a frequency list or on a measurement result list then with **Previous** and **Next** the dialogue will switch to the corresponding frequency. A click on the button **Marker** will copy the marker frequency of the currently active graphics diagram (if it has the marker activated).



The buttons **Partial Sweep** and **Partial Scan** start measurements to watch the spectrum around the current frequency if suitable range tables are selected with the script parameters. If those range tables are defined with continous repetitions then also variations in the spectrum can be observed (e.g. while moving the antenna). The resulting curve(s) will be shown in an extra window with the marker activated so that the maximum of the curve can easily be retrieved. The width of the partial scan or sweep can be defined in the field 'Range Width'.

Through activating one of the measurement detectors (**Measure Peak / Quasipeak / RMS / Average**) a single measurement will be started, using the given values for measurement time ('Meas.Time' in seconds) and for IF filter bandwidth ('IF Bandwidth' in kHz). The level will be displayed both digitally in the dialogue (current and maximum value) and as an analog bar. The analog bar display which can also be seen from a distance will adapt ist "operating range" to the current level value. As soon as the maximum has been found, the result (the maximum level) along with a short text ('Comment') can be saved by pressing **Store**. For each of the detectors there will be one measurement result file which also holds information about the limit and optionally about the settings of mast and turntable.

If the E.u.T. can be remotely switched then by pressing **E.u.T. on** and **E.u.T. off** the line 5 of the user port A of the ESI can be used as a TTL control signal; this feature enhances the identification of interference signals on an OATS.

3.6.2 List of the Script Parameters

Parameter: Default value: Function:	01: ID max. 12 chars to be included in filenames"semi_0001"a short string that will be used for building up various default strings (see below); this string enables easy identification of files that belong to the same test
Parameter: Default value: Function:	02: global start frequency [MHz] for the test 30 no measurements will be done below this frequency
Parameter: Default value: Function:	03: global stop frequency [MHz] for the test 1000 no measurements will be done above this frequency
Parameter: Default value: Function:	04: suppress queries as far as possible not checked if not checked then additional queries will come up that help to avoid overwriting of files or to skip certain parts of the test
Parameter: Default value: Function:	05: frequency list to be used (if next param is NONE) " <keine>" optional name of a frequency list with frequencies on which the test shall be based; the list might hold critical frequencies that have been entered manually or have been the output of a data reduction; this frequency list won't be used if a measurement result list is selected with the next parameter</keine>
Parameter: Default value: Function:	06: measurement result to be used " <keine>" optional name of a measurement result list with frequencies on which the test shall be based; the list might hold results that have been the output of a data reduction or of an automatic test; if this result list also holds information (columns) about mast and turntable settings, then parameter <i>Final 09</i> will make the script use these data for positioning mast and turntable accordingly</keine>
Parameter: Default value: Function:	07: test configuration, <none>: ID "<none>" optional filename of the test configuration (lists all files belonging to the test, for easy transfers through Export/Import/Move) to be created by the test; if no filename is specified then a default name will be used</none></none>

Topic Final	
Parameter: Default value: Function:	01: final result file, <none>: ID + '_fin PK' "<none>" optional filename for the PEAK results from the data reduction; if no filename is specified then a default name will be used</none></none>
Parameter: Default value: Function:	02: 2nd final result file, <none>: ID + '_fin QP' "<none>" optional filename for the QUASIPEAK results from the data reduction; if no filename is specified then a default name will be used</none></none>
Parameter: Default value: Function:	03: 3rd final result file, <none>: ID + '_fin AV' "<none>" optional filename for the AVERAGE results from the data reduction; if no filename is specified then a default name will be used</none></none>
Parameter: Default value: Function:	04: 4th final result file, <none>: ID + '_fin RMS' "<none>" optional filename for the RMS results from the data reduction; if no filename is specified then a default name will be used</none></none>
Parameter: Default value: Function:	05: scan table for single measurements " <keine>" filename of the scan range table to be used for single measurements; the settings will be loaded and then modified according to the settings of the dialogue (detector, IF bandwidth and measurement time)</keine>
Parameter: Default value: Function:	06: scan table for partial scans " <keine>" filename of the scan range table to be used for partial scans; to observe the spectrum more easily it is recommended to define a scan table with continuous repetitions</keine>
Parameter: Default value: Function:	07: sweep table for partial sweeps " <keine>" filename of the sweep range table to be used for partial sweeps; to observe the spectrum more easily it is recommended to define a sweep table with continuous repetitions</keine>
Parameter: Default value: Function:	08: use/store field mast/turntable data if available not checked if checked then any information about mast/turntable positions will be used (measurement result list as a basis for the test, see parameter <i>Test 06</i>); those positions will be directly set each time when a frequency is selected (previous or next); besides, the current positions will be stored in the result files of the test
Topic Limits	
Parameter: Default value: Function:	01: optional PK limit line " <none>" a filename that corresponds to an optional limit line for the PEAK detector; if selected then the result file that corresponds to the detector will also show the values of the limit and the margin</none>

Parameter: Default value: Function:	02: optional QP limit line " <none>" a filename that corresponds to an optional limit line for the QUASIPEAK detector; if selected then the result file that corresponds to the detector will also show the values of the limit and the margin</none>
Parameter: Default value: Function:	03: optional AV limit line " <none>" a filename that corresponds to an optional limit line for the AVERAGE detector; if selected then the result file that corresponds to the detector will also show the values of the limit and the margin</none>
Parameter: Default value: Function:	04: optional RMS limit line " <none>" a filename that corresponds to an optional limit line for the RMS detector; if selected then the result file that corresponds to the detector will also show the values of the limit and the margin</none>
Topic Graphics	
Parameter: Default value: Function:	01: graphics configuration, <none>: ID "<none>" optional filename for the graphics configuration to be used in the test; if no filename is specified then a default name will be used</none></none>
Parameter: Default value: Function:	02: optional graphics template (new graph only) " <none>" optional file name of a predefined graphics configuration, from which the graphics configuration to be used in the test shall be derived (line type and color settings)</none>
Parameter: Default value: Function:	 03: range of the analog level bar display [dBxx] 40 defines the display range of the analogue level display; as soon as the level comes closer than 5 dB to one end of the display range then the range will be shifted accordingly by 10 dB
Topic Report	
Parameter: Default value: Function:	01: generate printer hardcopy checked if checked then a report configuration for printing will be generated and a hardcopy will be sent to the device which is defined as the printer for the software
Parameter: Default value: Function:	02: report config. for printing, <none>: ID + '_prnt' "<none>" optional filename for the report configuration for printing, if printer output is selected; if no filename is specified then a default name will be used</none></none>
Parameter: Default value: Function:	03: footnote, empty field: ID "" optional text as a footnote on the pages of the test report; if an empty string is used then the ID string of the test will be used
Topic ReportHeader

Parameter: Default value: Function:	01: test report header, <none>: ID "<none>" optional filename for the report header to be used in the test; if no filename is specified then a default name will be used</none></none>
Parameter:	02: optional test report header template, <none>: ID</none>
Function:	optional filename of a report header which shall be taken as a template for the one to be used in the test; if no filename is specified then a default name will be used
Parameter:	03: 1st header line
Function:	a string that will be taken as the first header line; if no string is given then the referring entry of the report header won't be changed
Parameter:	04: 2nd header line "Somi Interactive Test"
Function:	a string that will be taken as the second header line; if no string is given then the referring entry of the report header won't be changed
Parameter:	05: E.u.T. name
Function:	a string that will be taken as the description of the equipment under test; if no string is given then the referring entry of the report header won't be changed
Parameter:	06: manufacturer
Function:	a string that will be taken as the name of the manufacturer (of the E.u.T.); if no string is given then the referring entry of the report header won't be changed
Parameter:	07: operating conditions
Function:	a string that will be taken as the description of the conditions of the test; if no string is given then the referring entry of the report header won't be changed
Parameter:	08: test site
Function:	a string that will be taken as the description of the test site; if no string is given then the referring entry of the report header won't be changed
Parameter:	09: operator
Function:	a string that will be taken as the description of the operator; if no string is given then the referring entry of the report header won't be changed
Parameter: Default value:	10: test specification
Function:	a string that will be taken as the description of the test specification; if no string is given then the referring entry of the report header won't be changed
Parameter: Default value: Function:	11: comment line
	a string that will be taken as a comment line ; if no string is given then the referring entry of the report header won't be changed

Parameter: Default value:	12: 2nd comment line (empty field: start time)
Function:	a string that will be taken as a comment line ; if no string is given then the start time of the test will be entered
Topic Mast	

Parameter:	01: use mast positioning
Default value:	checked
Function:	if checked then manual control of the antenna mast through dialogue boxes will be used

Topic Turntable

Parameter:	01: use turntable positioning
Default value:	checked
Function:	if checked then manual control of the turntable through dialogue boxes will be used

Topic Polarisation

Parameter:	01: use polarisation switching
Default value:	checked
Function:	if checked then manual control of the antenna polarisation through dialogue boxes will be used

3.7 Cable Calibration

3.7.1 Description

This test provides measuring cable transducers or any other system transducers (e.g. impedance converters, preamplifiers, attenuators, filters, etc.). The main result of the test is a system transducer table that can directly be used for level correction in the ESI-K1 (scan tables).

The test can be performed with a scan (plus data reduction), as well as on a given frequency list.

Since the test represents a two-gate measurement, a scan table has to be used that activates the tracking generator of the ESI; an "empty" (dummy) transducer (or simply "<none>") has to be declared as the probe transducer. For scan tables it is recommended to use the average detector in combination with a very small IF bandwidth.

3.7.2 List of the Script Parameters

Topic Test

Parameter: Default value: Function:	01: ID max. 12 chars to be included in filenames"cable_0001"a short string that will be used for building up various default strings (see below); this string enables easy identification of files that belong to the same test
Parameter: Default value: Function:	02: global start frequency [MHz] for the test0.1no measurements will be done below this frequency
Parameter: Default value: Function:	03: global stop frequency [MHz] for the test 1000 no measurements will be done above this frequency
Parameter: Default value: Function:	04: test configuration, <none>: ID "<none>" optional filename of the test configuration (lists all files belonging to the test, for easy transfers through Export/Import/Move) to be created by the test; if no filename is specified then a default name will be used</none></none>
Topic Calibration	
Parameter: Default value: Function:	01: result file (default: ID) " <none>" optional filename for the results from the test (filetype is system transducer); if no filename is specified then a default name will be used</none>
Parameter: Default value: Function:	02: name of correction factor from reference meas. "Cable Reference" filename of the reference correction, stored as a system transducer: if a reference measurement will be done, then first before the actual comparison test there will be measurements with the reference cable; these results will be stored as a system transducer so that any further tests can use these results - if the same reference cable is used - without another reference measurement (see next parameter)

Parameter: Default value:	03: create new reference factor (else: use given factor)
Function:	if checked then a reference measurement will be performed and stored as a system transducer with the given name (see previous parameter); else no reference measurements will be done but the selected system transducer will be taken as the corresponding reference measurement result
Parameter:	04: scan table for measurements
Function:	filename of the scan range table to be used for the test
Parameter:	05: optional frequency list for single measurements
Function:	filename of an optional frequency list to be used for single measurements; this frequency list can be used only in combination with a scan table
Parameter:	06: sweep table for measurements
Function:	filename of the sweep range table to be used for the test
Parameter:	07: no. of results kept from scan/sweep
Function:	the number of results that shall be kept from a scan or sweep through data reduction (if no single measurements according to a frequency list are done)
Topic Graphics	
Parameter:	01: graphics configuration, <none>: ID "<none>"</none></none>
Function:	optional filename for the graphics configuration to be used in the test; if no filename is specified then a default name will be used

Topic Report

Parameter: Default value: Function:	01: generate printer hardcopy checked if checked then a report configuration for printing will be generated and a hardcopy
	will be sent to the device which is defined as the printer for the software
Parameter: Default value: Function:	02: report config. for printing, <none>: ID + '_prnt' "<none>"</none></none>
	optional filename for the report configuration for printing, if printer output is selected; if no filename is specified then a default name will be used
Parameter: Default value:	03: footnote, empty field: ID
Function:	optional text as a footnote on the pages of the test report; if an empty string is used then the ID string of the test will be used
Topic ReportHead	der
Parameter:	01: test report header, <none>: ID "<none>"</none></none>
Function:	optional filename for the report header to be used in the test; if no filename is specified then a default name will be used
Parameter:	02: optional test report header template, <none>: ID</none>
Function:	optional filename of a report header which shall be taken as a template for the one to be used in the test; if no filename is specified then a default name will be used
Parameter:	03: 1st header line
Default value: Function:	a string that will be taken as the first header line; if no string is given then the referring entry of the report header won't be changed
Parameter: Default value: Function:	04: 2nd header line
	a string that will be taken as the second header line; if no string is given then the referring entry of the report header won't be changed
Parameter:	05: cable name
Function:	a string that will be taken as the description of the test object; if no string is given then the referring entry of the report header won't be changed
Parameter: Default value: Function:	06: manufacturer
	a string that will be taken as the name of the manufacturer (of the E.u.T.); if no string is given then the referring entry of the report header won't be changed
Parameter: Default value:	07: operating conditions
Function:	a string that will be taken as the description of the conditions of the test; if no string is given then the referring entry of the report header won't be changed

Standard Scripts

Parameter: Default value: Function:	08: test site
	a string that will be taken as the description of the test site; if no string is given then the referring entry of the report header won't be changed
Parameter: Default value:	09: operator
Function:	a string that will be taken as the description of the operator; if no string is given then the referring entry of the report header won't be changed
Parameter:	10: test specification
Function:	a string that will be taken as the description of the test specification; if no string is given then the referring entry of the report header won't be changed
Parameter: Default value: Function:	11: comment line
	a string that will be taken as a comment line ; if no string is given then the referring entry of the report header won't be changed
Parameter: Default value: Function:	12: 2nd comment line (empty field: start time)
	a string that will be taken as a comment line ; if no string is given then the start time of the test will be entered

3.8 S-LINE Test

3.8.1 Description

This test provides automatic measurement of radiated electromagnetic interference with an **S-LINE** measurement cell. The test starts with a preview test on three orientations of the EuT and does a data reduction. In the final test (again on three orientations) optionally partial scans can be performed; at all critical points simple single measurements - based on a scan table - will be done.

The measurement results will always be correlated to OATS results and be displayed in a separate diagram. If a field strength limit is selected, then the correlated final results will be evaluated against this limit, too.



3.8.2 Parameter Sets

Currently the following specifications are supported by the ESI-K1 Standard Data:

EN 55022

Frequency Range:	30 - 1000 MHz
Detector:	Pk
Related Standards:	CISPR
Test Samples:	

3.8.3 List of the Script Parameters

Topic Test

Parameter: Default value: Function:	01: ID max. 12 chars to be included in filenames"s-line_0001"a short string that will be used for building up various default strings (see below); this string enables easy identification of files that belong to the same test
Parameter: Default value: Function:	02: global start frequency [MHz] for the test 30 no measurements will be done below this frequency
Parameter: Default value: Function:	03: global stop frequency [MHz] for the test 1000 no measurements will be done above this frequency
Parameter: Default value: Function:	04: suppress queries as far as possible not checked if not checked then additional queries will come up that help to avoid overwriting of files or to skip certain parts of the test
Parameter: Default value: Function:	05: split frequency range into test ranges checked the total frequency range of the test can optionally be split into test ranges (linear or logarithmic, with respect to the ranges of the scan/sweep range table) that are calculated by the script and will be completely tested (preview test, data reduction, final test), therefore reducing the time elapsed between preview and final test, which is very useful with interference drifting over frequency; besides, this method reduces manual interaction, if more than one probe transducer has to be used for the test (e.g. two antennas for 30 - 1000 MHz in a field strength test); the value given with parameter <i>Test 07</i> has to be interpreted as a minimum value; if the value is set to (typically) 1 then nevertheless for each subrange of the scan/sweep table which used for the preview test, a test range will be calculated (e.g. a field strength test with two antennas or scan/sweep ranges will lead to one test range each); if splitting is not used then the whole frequency range of the scan/sweep table will be tested as one single test range (but maybe with a number of messageboxes requiring to change the antenna !)
Parameter: Default value: Function:	06: if splitting of frequency range: do with log. scale checked if checked then the splitting of the frequency range (if activated) will lead to test ranges of equal width in the logarithmic scale, else in the linear scale
Parameter: Default value: Function:	07: no. of test ranges for splitting of frequency range 1 defines the number of test ranges that shall be calculated for the splitting of the frequency range
Parameter: Default value: Function:	08: test configuration, <none>: ID "<none>" optional filename of the test configuration (lists all files belonging to the test, for easy transfers through Export/Import/Move) to be created by the test; if no filename is specified then a default name will be used</none></none>

Deverseter	
Parameter: Default value:	U1: S-LINE X preview result, <none>: ID +pre X "<none>"</none></none>
Function:	optional filename for the results from the preview test, gained with the EuT oriented to axis 'X'; if no filename is specified then a default name will be used
Parameter:	02: S-LINE Y preview result, <none>: ID + '_pre Y' "<none>"</none></none>
Function:	optional filename for the results from the preview test, gained with the EuT oriented to axis 'Y'; if no filename is specified then a default name will be used
Parameter:	03: S-LINE Z preview result, <none>: ID + '_pre Z'</none>
Function:	optional filename for the results from the preview test, gained with the EuT oriented to axis 'Z'; if no filename is specified then a default name will be used
Parameter:	04: OATS E preview result, <none>: ID + '_pre E'</none>
Function:	optional filename for the correlated fields trength results from the preview test; if no filename is specified then a default name will be used
Parameter:	05: scan table for preview
Function:	filename of the scan range table to be used for the preview test
Parameter: Default value:	06: sweep table for preview " <none>"</none>
Function:	filename of the sweep range table to be used for the preview test

Topic **Preview**

Topic DataReduction

Parameter:	01: limit line
Delault value.	<idhe></idhe>
Function:	a filename of the field strength limit line (for OATS) which shall be used for the evaluation of the correlated final measurements; if no limit line is selected, then no evaluation will be done
Parameter: Default value:	02: max. no. of results kept per test range 6
Function:	the maximum number of results that will be kept from each test range through data reduction

Parameter: Default value:	03: decision threshold [dB] for peak reduction 6.0				
Function:	determines the decision level when data reduction is done with the "Peak Reduction"; a higher (stricter) value means that less peaks will be detected in the spectrum so that more results from the subrange maxima reduction will come through				
Parameter: Default value:	04: max. no. of results kept from partial scans				
Function:	when a partial scan is performed then after data reduction there might still be more than one significant frequency linked to interference; this parameter limits the number of results from a partial scan (after data reduction)				
Parameter:	05: partial scan width: no. of IF-BWs (0=use ratio)				
Function:	determines the frequency range for partial scans expressed in multiples of the IF bandwidth used in the referring scan/sweep table; if the value is set to 0 then the calculation of the partial scan width is based on the following parameter				
Parameter:	06: partial scan width: ref. frequ. ratio				
Function:	determines the frequency range for partial scans (e.g. 0.01 means ± 0.5 %) in reference to the given mid frequency; the parameter is effective only if the previous parameter is set to 0				
Topic Final					
Parameter: Default value: Function:	01: S-LINE X final result, <none>: ID + '_fin X' "<none>" optional filename for the results from the final test, gained with the EuT oriented to</none></none>				
Deremeter	axis 'X'; if no filename is specified then a default name will be used				
Default value:	<pre>"<" style="text-align: center;" style="text-align: ce</pre>				
Function:	optional filename for the results from the final test, gained with the EuT oriented to axis 'Y'; if no filename is specified then a default name will be used				
Parameter:	03: S-LINE Z final result, <none>: ID + '_fin Z'</none>				
Function:	n: optional filename for the results from the final test, gained with the EuT oriented axis 'Z'; if no filename is specified then a default name will be used				
Parameter:	04: OATS E final result, <none>: ID + '_fin E'</none>				
Function:	optional filename for the correlated field strength results from the final test; if no filename is specified then a default name will be used				
Parameter:	05: perform partial scans				
Function:	if checked then additional partial scans will be performed around the frequencies to be analysed; in this case the final measurements will be done on those frequencies that have been found (through data reduction) with these partial scans (recommended when preview was done with sweeps or when drifting interference is to be expected)				

Parameter: Default value:	06: scan table for partial scans " <none>" fileneme of the corresponding coop range table to be used for partial scans</none>				
Function.	mename of the corresponding scan range table to be used for partial scans				
Parameter: Default value:	07: scan table for single measurements " <none>"</none>				
Function:	filename of the corresponding scan range table to be used for the single measurements				
Parameter: Default value:	08: optional input: frequency list " <none>"</none>				
Function:	if the test shall be performed without a preview test then an existing frequency list can be specified as an input for the final test				
Topic Graphics					
Parameter: Default value:	01: S-LINE graphics configuration, <none>: ID + '_CELL' "<none>"</none></none>				
Function:	optional filename for the graphics configuration to be used in the test to display the results from the S-LINE cell; if no filename is specified then a default name will be used				
Parameter: 02: OATS graphics configuration, <none>: ID + '_OATS'</none>					
Function:	optional filename for the graphics configuration to be used in the test to display the results correlated for the OATS; if no filename is specified then a default name will be used				
Parameter: Default value:	03: optional graphics template (new graph only) " <none>"</none>				
Function:	optional file name of a predefined graphics configuration, from which the graphics configuration to be used in the test shall be derived (line type and color settings)				
Topic Report					
Parameter: Default value:	01: generate printer hardcopy checked				
Function:	if checked then a report configuration for printing will be generated and a hardcopy will be sent to the device which is defined as the printer for the software				
Parameter: Default value:	02: report config. for printing, <none>: ID + '_prnt' "<none>"</none></none>				
Function:	optional filename for the report configuration for printing, if printer output is selected; if no filename is specified then a default name will be used				
Parameter: Default value:	03: footnote, empty field: ID				
Function:	optional text as a footnote on the pages of the test report; if an empty string is used then the ID string of the test will be used				
Topic ReportHead	ler				

Parameter:	01: test report header, <none>: ID</none>
Default value:	" <none>"</none>
Function:	optional filename for the report header to be used in the test; if no filename is specified then a default name will be used

Parameter: Default value:	02: optional test report header template, <none>: ID "<none>"</none></none>			
Function:	optional filename of a report header which shall be taken as a template for the one to be used in the test; if no filename is specified then a default name will be used			
Parameter:	03: 1st header line			
Function:	a string that will be taken as the first header line; if no string is given then the referring entry of the report header won't be changed			
Parameter:	04: 2nd header line			
Function:	a string that will be taken as the second header line; if no string is given then the referring entry of the report header won't be changed			
Parameter:	05: E.u.T. name			
Function:	a string that will be taken as the description of the equipment under test; if no string is given then the referring entry of the report header won't be changed			
Parameter:	06: manufacturer			
Function:	a string that will be taken as the name of the manufacturer (of the E.u.T.); if no string is given then the referring entry of the report header won't be changed			
Parameter:	07: operating conditions			
Function:	a string that will be taken as the description of the conditions of the test; if no string is given then the referring entry of the report header won't be changed			
Parameter:	08: test site			
Function:	a string that will be taken as the description of the test site; if no string is given then the referring entry of the report header won't be changed			
Parameter:	09: operator			
Function:	a string that will be taken as the description of the operator; if no string is given then the referring entry of the report header won't be changed			
Parameter:	10: test specification			
Function:	a string that will be taken as the description of the test specification; if no string is given then the referring entry of the report header won't be changed			
Parameter:	11: comment line			
Function:	a string that will be taken as a comment line ; if no string is given then the referring			
Parameter:	12: 2nd comment line (empty field: start time)			
Function:	a string that will be taken as a comment line ; if no string is given then the start time of the test will be entered			

Topic **SLINE**

Parameter:	01: S-LINE type is 700		
Default value:	checked		
Function:	if checked then a cell of the type S-LINE 700 will be assumed		
Parameter:	02: S-LINE type is 1000		
Default value:	not checked		
Function:	if checked then a cell of the type S-LINE 1000 will be assumed		
Parameter:	03: S-LINE type is 1500		
Default value:	not checked		
Function:	if checked then a cell of the type S-LINE 1500 will be assumed		
Parameter: Default value: Function:	04: S-LINE correction factor (C1) " <none>" selection of the appropriate correction table (a system transducer) which corresponds to the term 'C1' of the S-LINE correlation algorithm (for the S-LINE type)</none>		
Parameter: Default value: Function:	05: OATS correction factor (C2) " <none>" selection of the appropriate correction table (a system transducer) which corresponds to the term 'C2' of the S-LINE correlation algorithm (for the OATS setup like e.g. the measurement distance)</none>		

4 Device Driver ESI

4.1 Overview

The ESIx driver provides all functions to control the Rohde&Schwarz EMI analyzers ESI 7, ESI 26, ESI 40 as well as the spectrum analyzers FSEA, FSEB, FSEM.

The instrument can be controlled either interactively, in a system mode or through a script.

- Interactive mode: The settings will be done interactively from the device dialog.
- System Mode: The settings will be done via the menu selections 'Scan' / 'Sweep' / 'Single Measurement'.
- Script mode:

The settings will be done automatically, controlled by a running script.

4.2 Interactive Mode

With the selection of **Test - Set device...** a dialog comes up which can be toggled between the two modes "**Single Measurement**" and "**Sweep Mode**".

4.2.1 Single Measurement

ESIX	
Single Measurement Sweep Mode	
Level Detector 1 MaxPeak > '(≦'. ≦' ∃' dBµV Max Hold -50.0 150.0 72.63	Frequency <u>Up</u> <u>Down</u> Step Width <u>Step Width</u> <u>Step Step Step Step Step Step Step Step </u>
Audio Demodulation FM Volume 30 % Tracking Gen. Demodulation Measure Meas. Time 0.1 ms IF Bandwidth 120 kHz Tracking Gen.	Attenuation Auto Auto BF Attn. O dB Preamplifier RE Input AC © 2AC O 2DC O
Measure	<u>O</u> K <u>C</u> ancel

Through clicking **Measure** all settings will be checked for value range and dependencies. Then the level displays will be blanked and a new measurement starts.

For each of either one or two detectors, two levels are displayed. In the upper output field the current measurement level is shown, the field below shows the maximum level since the start of the measurement (maxhold function). The level unit and the level correction are set according to the most recently used transducer correction (e.g. with a scan). If a transducer correction is active, then the resulting correction value will also be shown.

Only the Up and Down buttons can be used while measurements are being done. In order to modify any other parameters, the measurements have to be interrupted with the Stop button.

4.2.2 Sweep Mode



The dialog combines analyzer sweeps and single measurements on the marker frequency inside the sweep curve.

With **Sweep** a continuously running analyzer sweep based on the dialog settings will be started. The sweep settings can also be retrieved from sweep range tables that are defined for the ESIx. If such a sweep range table consists of more than one range then by default the first range will be used. With a click on the **right mouse button** the ranges belonging to the selected sweep range table will be listed so that a certain range can be selected.

Optionally a **maxhold** curve can be added to the sweep display.

Chart opens a window below the sweep display. The window displays a single line for each sweep with the level being represented by a color or a gray scale (switching between color modes through clicking on the color scale to the right of the upper window). This kind of display shows changes of the spectrum over time. Pressing **Chart** again will close the window.

A mouse click inside the sweep display window will position the marker onto the referring frequency with the marker level display showing the corresponding measurement result.

Listen starts a continuous single measurement at the marker frequency, based on the corresponding settings.

The currently active measurement mode has to be halted by pressing **Stop** before changing to the other mode.

4.3 System Mode

Similar to the stand alone mode the test receiver can be addressed in the interactive mode as well as in the script mode. All Parameters of the stand alone mode are also available in the system mode.

In the system mode the available functions for the test receiver ESXI are **scan**, **sweep** and **single measurement**. Those measurements will be performed according to a given scan/sweep range table. A range table has to be created with the scan/sweep range editor.

4.3.1 Scan, Sweep and Single Measurement

Parameter: Function: Value range:	Auto Range switches Auto Range ON / OFF lin. / log. Scan: ON / OFF fast scan: OFF
Parameter:	Demodulation (not with sweeps)
Function:	determines the demodulation
Value range:	AM, FM, OFF
Parameter: Function: Value range:	Detector defines the Detector Scan: Max.Peak, Min.Peak, Quasipeak, Average, RMS, NONE Sweep: Max.Peak, Min.Peak, Average, RMS, NONE
Parameter:	Detector Mode
Function:	definition of the detector mode
Value range:	Clear Write, Max Hold
Parameter:	IF Attenuation (sweep only)
Function:	definition of the IF attenuation
Value range:	normal, low noise, low distortion
Parameter: Function: Value range:	IF Bandwidth definition of the IF bandwidth scan (6 dB bandwidths): 10 Hz, 100 Hz, 200 Hz, 1 kHz, 9 kHz, 10 kHz, 100 kHz, 120 kHz, 1 MHz sweep with option Analyzer (3 dB bandwidths): 1 Hz, 2 Hz, 3 Hz, 5 Hz, 10 Hz 10 MHz sweep with option Analyzer (6 dB bandwidths): 1.4 Hz, 2.8 Hz, 4.2 Hz, 7 Hz, 14 Hz 14 MHz
Parameter: Function: Value range:	Measurement Time / Sweep Time definition of the measurement time or sweep time scan: 100 μ s 1000 s, resolution 100 μ s sweep: coupled / 5 ms 16000 s, resolution 1 ms
Parameter:	Options
Function:	switches the available options
Value range:	sweep: Analyzer (3 dB bandwidths) / Analyzer (6 dB bandwidths)

Parameter:	Preamplifier			
Function:	definition of the preamplifier setting			
Value range:	20 dB, OFF			
Parameter:	Preselector			
Function:	definition of the preselector status			
Value range:	ON, OFF			
Parameter:	RF Attenuation			
Function:	definition of the RF attenuation			
Value range:	INPUT 1: 0 dB, 10 dB, 20 dB, 70 dB			
Parameter:	RF Input			
Function:	definition of the RF input			
Value range:	1, 2AC, 2DC			
Parameter:	Scan Mode			
Function:	definition of the scan mode			
Value range:	linear scan, logarithmic scan			
Parameter: Function:	Start/Stop/Step Frequency definition of the start/stop/step frequency of a scan/sweep range			
Value range:	INPUT 1: INPUT 1: INPUT 1: INPUT 1: INPUT 2: resolution: logarithmic scan:	FSEA: ESI 7, FSEB: ESI 26, FSEM: ESI 40, FSEK: ESIx: 1 Hz 0.01 % 100 %	20 Hz 3.5 GHz 20 Hz 7.0 GHz 20 Hz 26.5 GHz 20 Hz 40.0 GHz 20 Hz 1 GHz	
Parameter: Function: Value range:	Tracking Generator switches the tracking generator ON/OFF; regardless of the setting of the tracking generator (ON/OFF) always the absolute level will be measured ESIx/FSEx with option -B8/9/10/11: 0 dBm,20 dBm, OFF, resolution 0.1 dB ESIx/FSEx with option -B12: 0 dBm,90 dBm, OFF, resolution 0.1 dB			
Parameter: Function: Value range:	Video Bandwidth (sweep only) definition of the video bandwidth option 3 dB/6 dB Analyzer: coupled, 1 Hz, 2 Hz, 3 Hz, 5 Hz, 10 Hz 3 MHz			

4.3.2 Dependencies

The following dependencies have to be noted:

Measurement time

minimum measurement time in the Receiver Mode, depending on the detector

IF bandwidth	minimum measurement time QP	minimum measurement time AV, RMS	minimum measurement time PK
≤ 10 Hz	1 sec	1 sec	10 msec
100 Hz	100 msec	100 msec	1 msec
200 Hz	50 msec	50 msec	1 msec
1 kHz	10 msec	10 msec	0,1 msec
9 kHz	1 msec	1 msec	0,1 msec
≥ 100 kHz	1 msec	0,1 msec	0,1 msec

• <u>Measurement frequency</u> 'Receiver Mode':

 $f \ge 2 * [IF bandwidth]$

'Analyzer Mode': $f \ge 2 * [resolution bandwidth]$

input 2 (ESIx only): $f \le 1 \text{ GHz}$

• <u>IF bandwidth</u> with detector QP:

frequency	IF bandwidth	
< 150 kHz	200 Hz	
150 kHz - 30 MHz	9 kHz	
> 30 MHz	120 kHz	

• <u>Other dependencies</u> Preamplifier/Preselector "on" only if $f \le 7 \text{ GHz}$

5 Standard Device Drivers

5.1 V Networks ESH2-Z5 / ENV 4200 and ES-H3-Z5

The drivers provide all functions that are necessary for controlling the artificial mains networks ESH2-Z5 / ENV 4200 (four line V-network) and ESH3-Z5 (two line V-network) from Rohde&Schwarz.

5.1.1 Interactive Mode

With the selection of ESH2-Z5... or ES-H3-Z5... in the menu Test - Set device the corresponding dialogue comes up:

ESH2-Z5			
Line [1] [2 [3] [3] [1] [2] [2] [3] [3] [3] [3] [3] [1] [2] [2] [2] [2] [2] [2] [2] [2] [2] [2] [2] [2] [2] [2] [2] [2] [2] [2] [2] [2] [2] [2] [2] [2] [2] [2] [2] [2] [2] [2] [2] [2] [2] [2] [2] [2] [2] [2] [2] [2] [2] [2] [2] [2] [2] [2] [2] [2] [2] [2] [2] [2] [2] [2] [2] [2] [2] [2] [2] [2] [2] [2] [2] [2] [2] [2] [2] [2] [2] [2] [2] [2] [2] [2] [2] [2] [2] [2] [2] [2] [2] [2] [2] [2] [2] [2] [2] [2] [2] [2] [2] [2] [2] [2] [2] [2] [2] [2] [2] [2] [2] [2] [2] [2] [2] [2] [2] [2] [2] [2] [2] [2] [2] [2] [2] [2] [2] [2] [2] [2] [2] [2] [2] [2] [2] [2] [2] [2] [2] [2] [2] [2] [2] [2] [2] [2] [2] [2] [2] [2] [2] [2] [2] [2] [2] [2] [2] [2] [2] [2] [2] [2] [2] [2] [2] [2] [2] [2] [2] [2] [2] [2] [2] [2] [2] [2] [2] [2] [2] [2] [2] [2] [2] [2] [2] [2] [2] [2] [2] [2] [2] [2] [2] [2] [2] [2] [2] [2] [2] [2] [2] [2] [2] [2] [2] [2] [2] [2] [2] [2] [2] [2] [2] [2] [2] [2] [2] [2] [2] [2] [2] [2] [2] [2	PE O Ogen @ <u>G</u> rounded	ESH3-Z5 Line [] <u>N</u> <u>R</u> eset	PE O Ogen @ <u>G</u> rounded
<u> </u>	<u>C</u> ancel	<u>0</u> K	<u>C</u> ancel

One of the provided lines (live, neutral) can be chosen. In addition the protective earth can be set (no effect on ENV 4200) to be either open (floating) or grounded.

With the selection **Reset** the control lines of the user port will be set such that the LISN can again be unconditionally controlled from its front panel.