



ROHDE & SCHWARZ

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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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.

Symbols and safety labels

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

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 $\pm 10\%$ shall apply to the nominal voltage and of $\pm 5\%$ 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.

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4. If products/components are mechanically and/or thermally 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.
8. 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.
13. 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.
16. 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.

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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 heat-generating 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.
29. 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 estándares 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 estándares 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 industria 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 peritas 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.

Símbolos y definiciones de seguridad

Ver manual de instrucciones del uso	Informaciones para maquinaria con un 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 construcción con peligro de carga electrostática

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

Informaciones de seguridad

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 usuario. Punto de peligro que puede llevar hasta la muerte o graves heridas.
ADVERTENCIA	Indica un punto de peligro con un potencial 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 potencial 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 debiera 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 principalmente 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 $\pm 10\%$ sobre el voltaje nominal y de $\pm 5\%$ sobre la frecuencia nominal.
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 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 por partes originales. Despues de cada recambio de partes elementales para la seguridad deberá ser efectuado un control de

Informaciones de seguridad

- 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 produjeran 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 averiguar 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 referentes al tratamiento de materias 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, deberán 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.
 6. 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 áreas de trabajo en las que se corra un riesgo de exposición a radiaciones aumentadas de riesgo aumentado para evitar riesgos.
 7. 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.
 8. 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 producto.
 9. 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 construcciones o instalaciones, se deberá instalar el interruptor al nivel de la instalación.

Informaciones de seguridad

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.
15. 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 $U_{eff} > 30 \text{ V}$ 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.
18. 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.
19. 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 efectuadas 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.

Informaciones de seguridad

27. Baterías y acumuladores no deben de ser expuestos a temperaturas altas o al fuego. Guardar baterías y 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 fin. 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.
28. 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 V-networks.

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 WINDOWS™ 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); XGA (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):

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

All settings can be performed independent 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:

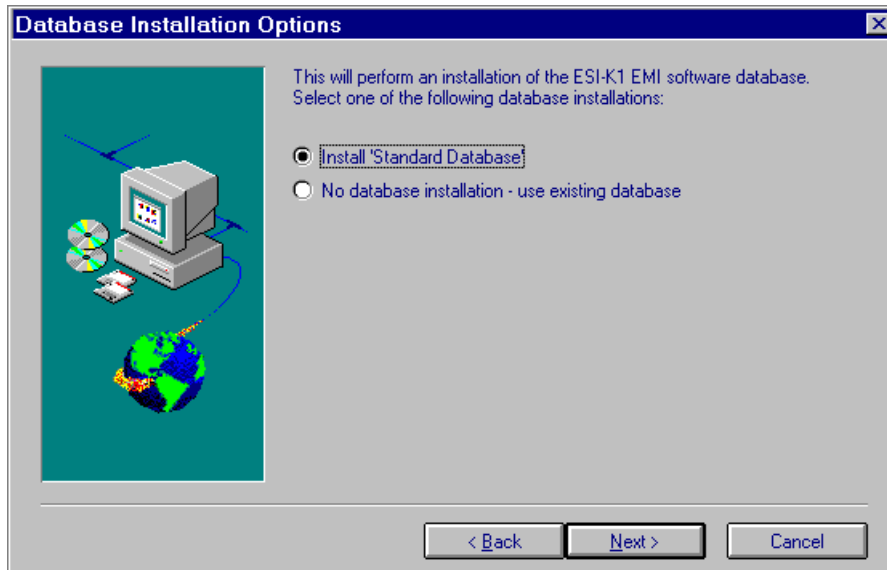
1. Open the **File** menu. When menu item **Execute...** is selected, a window is opened to start the setup program. All executable files are displayed in the selection window by clicking the **Search...** key and selecting the source drive (A: or the suitable drive letter).
2. Select the **setup.exe** 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**.

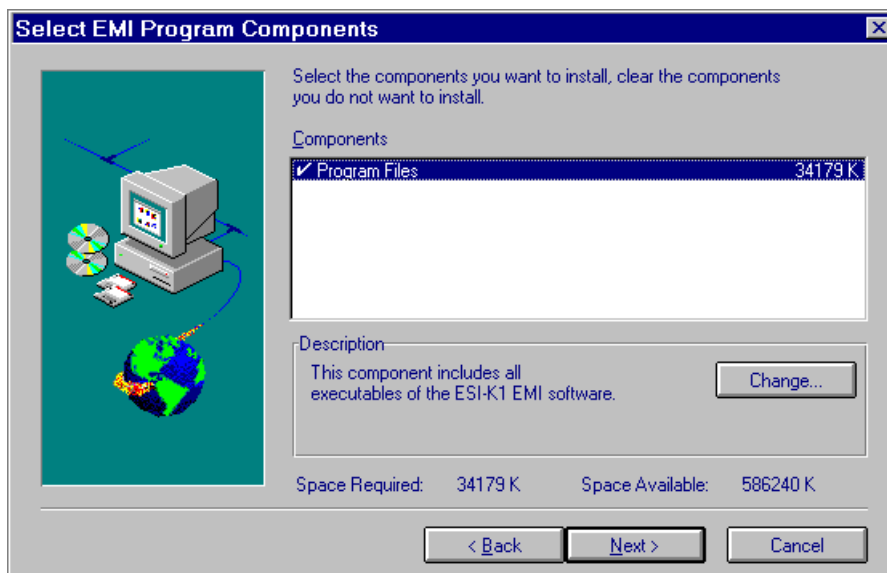
1.2.3.5 Installation Options

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



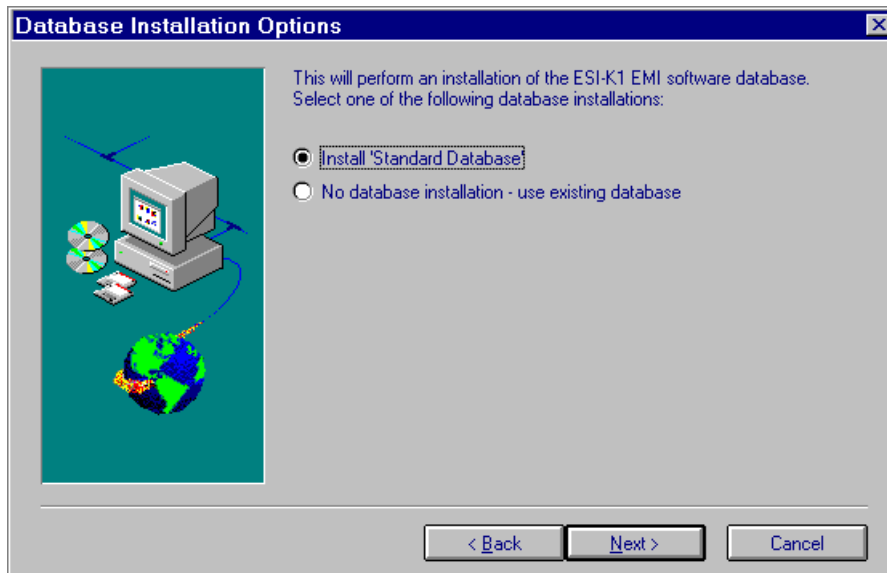
This dialog field selects the directory, in which EMI Software ESI-K1 is to be installed. Use the **Browse..** key to change the directory or to enter a new directory.

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

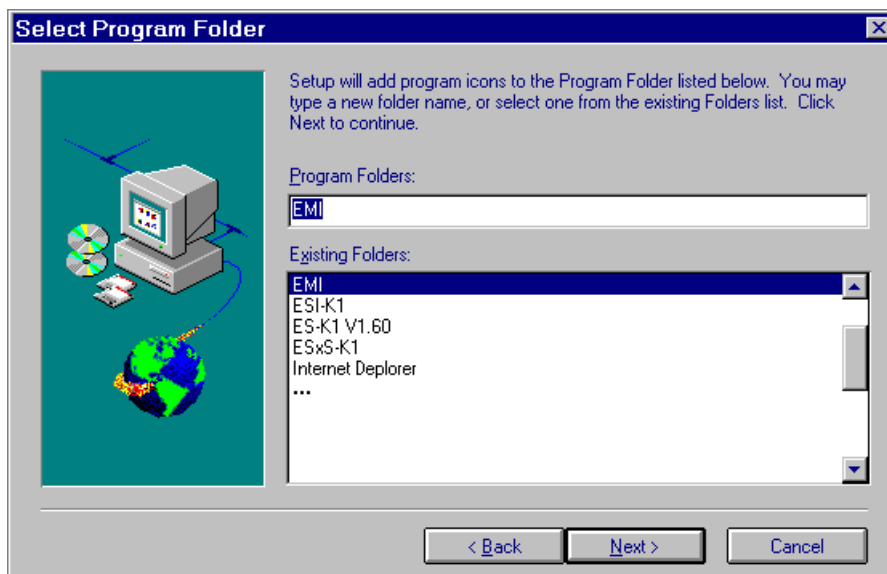


After selecting the corresponding components and clicking the **Change...** key, another dialog field allows the specific selection of options by a click:

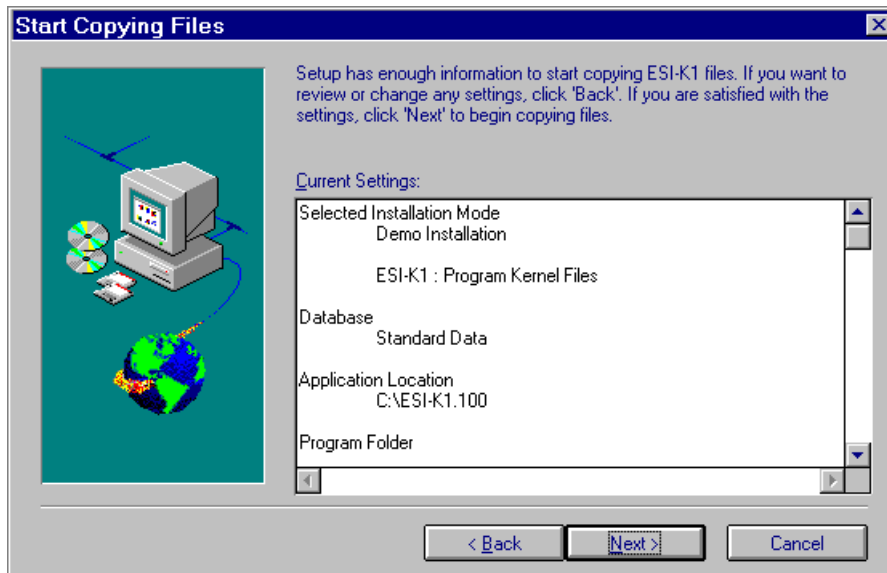
If an existing ESI-K1 database (from an earlier installation) is detected, either the existing database is saved in a backup directory before creating the new database or this step is skipped by selecting the option **No Database Installation**.



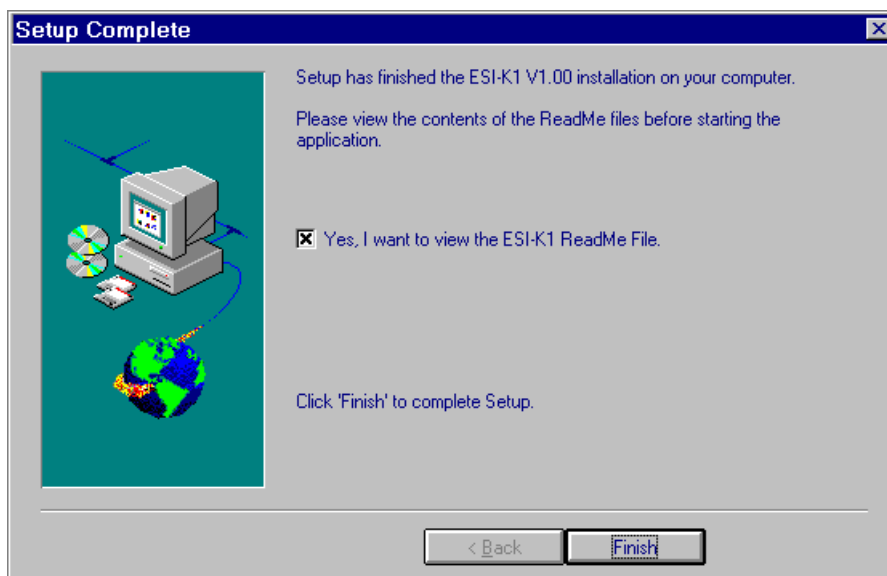
EMI Software ESI-K1, the associated Readme files of the installed components and options as well as the Help files are combined in a **program group**, which can be selected via the next dialog: Program group **EMI** is offered as a default setting:



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:



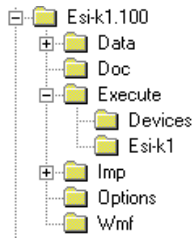
The current state of the file transfer to the harddisk is displayed during the subsequent installation through a progress bar.



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



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.

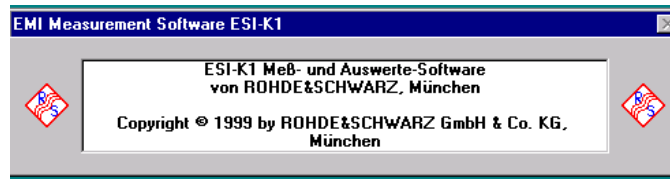
1.3.1 Starting Software ESI-K1 under Windows NT 4.0

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.

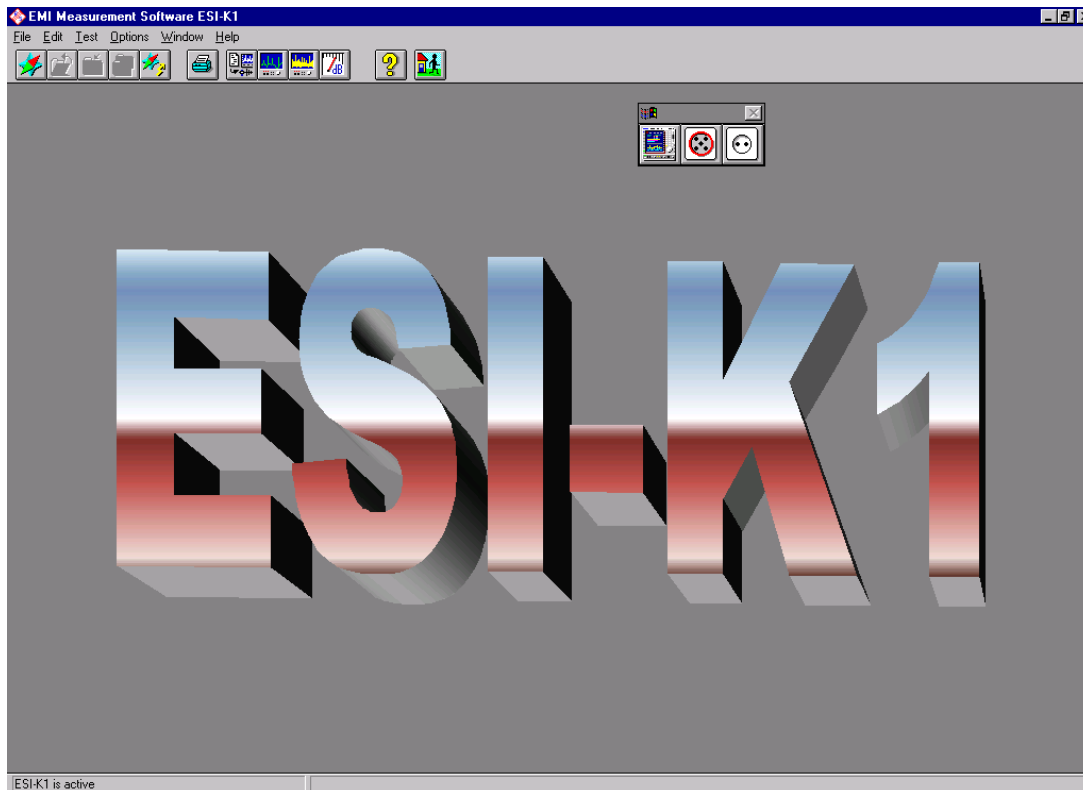


The program package ESI-K1 is then loaded and activated.

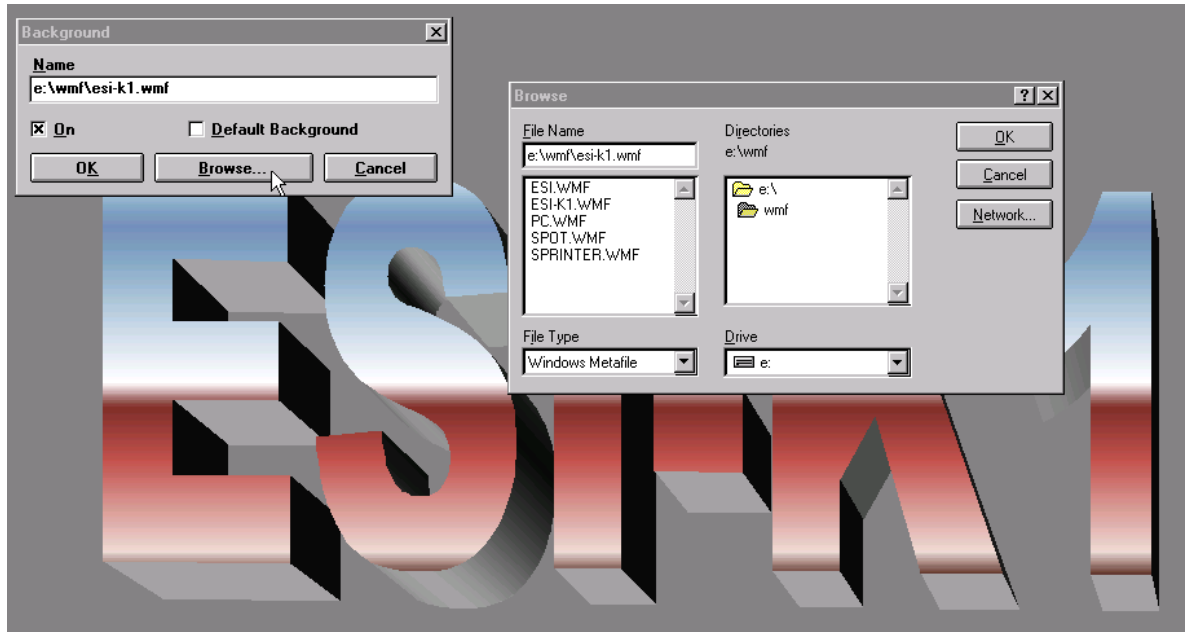
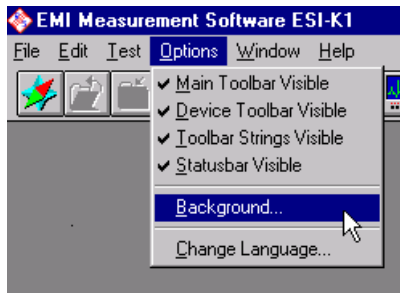


The devices connected in the automatically created device configuration are queried whether there is an IEC/IEEE-bus connection under the preset IEC/IEEE-bus address. In the basic version, these are Test Receiver ESI 7/26/40, Four-Line V-Network ESH2-Z5 and Two-Line V-Network ESH3-Z5.

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.



When the software is started without active IEC/IEEE-bus connection, error messages which can be acknowledged 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, i.e. 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:



Error message:
ESI Test Receiver driver cannot be driven.



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



Error message:

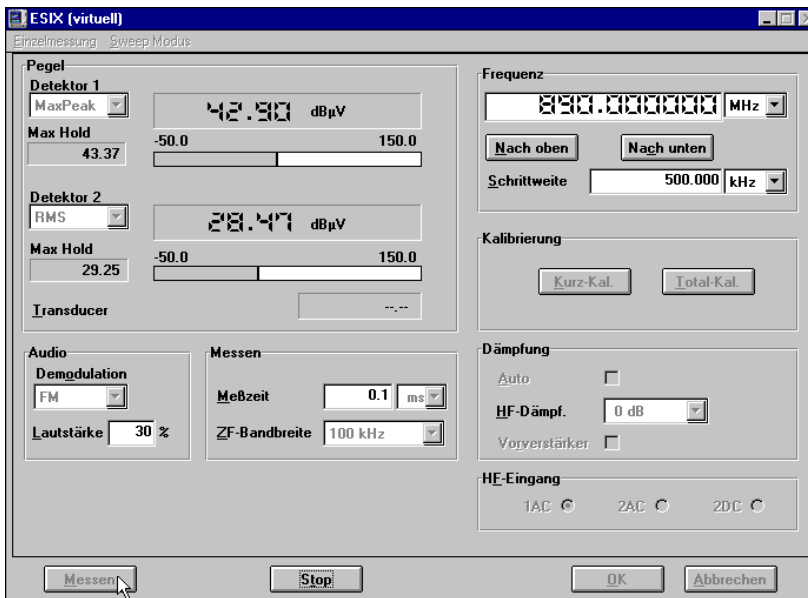
Two-line V-network cannot be driven.

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.

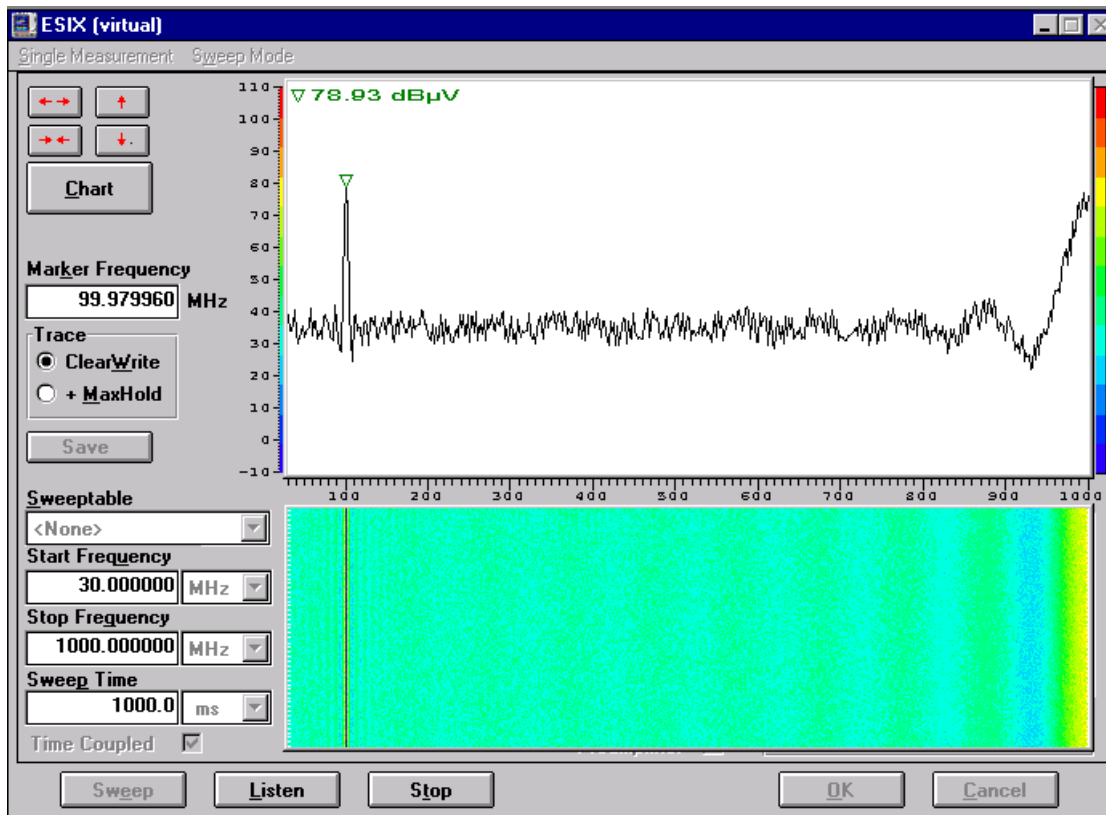


Basically, differentiation is made whether Test Receiver ESI is to make a single-frequency measurement or a sweep sequence. Parameters such as center frequency, bandwidth, measurement time, detector(s), etc. can be set individually. The parameters are adopted and activated by pressing **Measure**. Due to the preset measurement time, the updated detector level values appear on the display which permanently flashes. On pressing **Stop** the operation is stopped and other entries/parameter modifications can then be made.

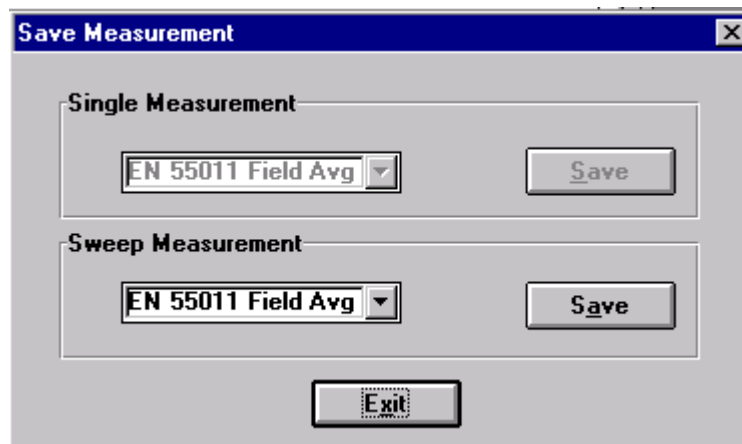


With SWEEP MODE selected in the upper menu line, a complete spectrum with preset parameters can be measured.

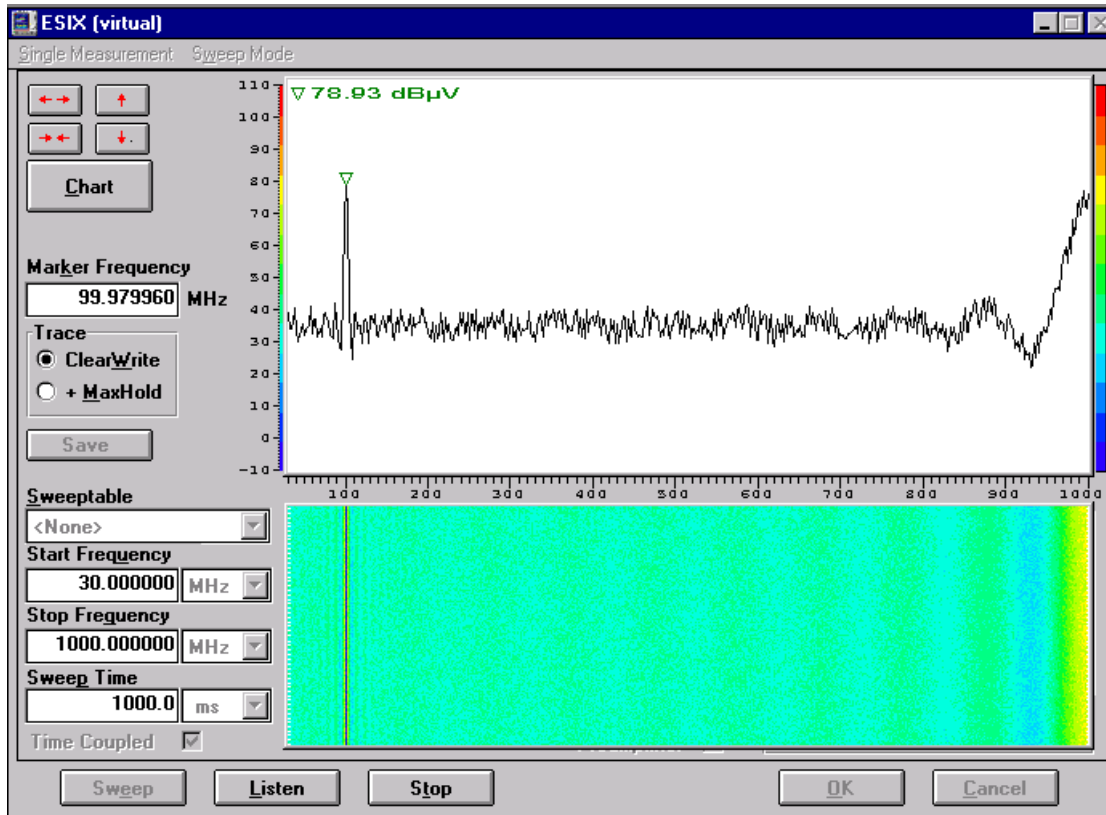
Caution: The instrument operates in the SWEEP MODE in the **spectrum analyzer mode**, ie for example bandwidth entries are 3 dB values and the resolution of the values measured during the sweep is limited.



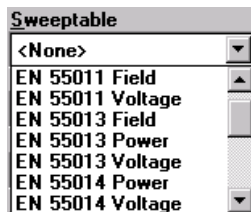
The internal demodulation path is switched on with **Listen** for aural monitoring. All values are adopted by clicking the **Sweep** key and the updated measured values are indicated on the upper graphic display. On pressing **Stop** the operation is stopped and all parameters can be modified. After 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.



A further way of quick recording in the SWEEP MODE is with the use of the button SCHREIBER. After the above procedure and selecting **Chart** the lower half of the diagram is used to record the level intensity (with different colours) and frequency band occupancy versus time. Signals occurring permanently or sporadically can thus be recorded.



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.



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.

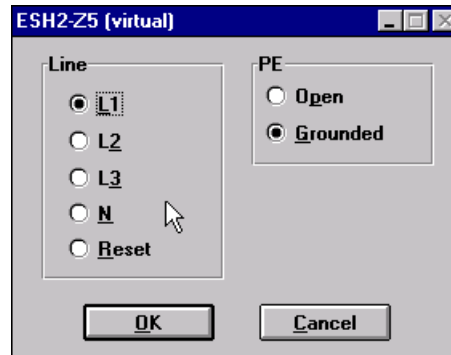
Test Receiver ESI and associated control cables:



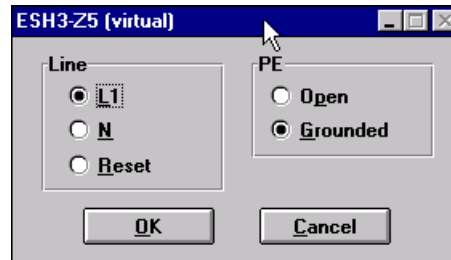
- EZ-4 Control cable (.03) 3 meter **to ESH3-Z5**
- EZ-5 Control cable (.03) 10 meter **to ESH2-Z5**
- EZ-6 Control cable (.03) 10 meter **to ESH3-Z5**



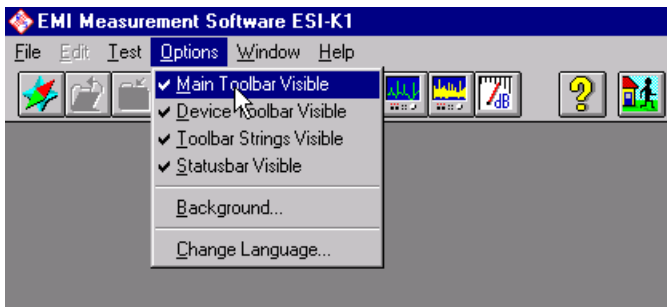
Setting of the four-line V-network



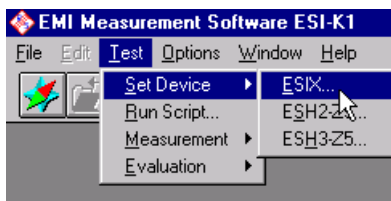
Setting of the two-line V-network



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



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

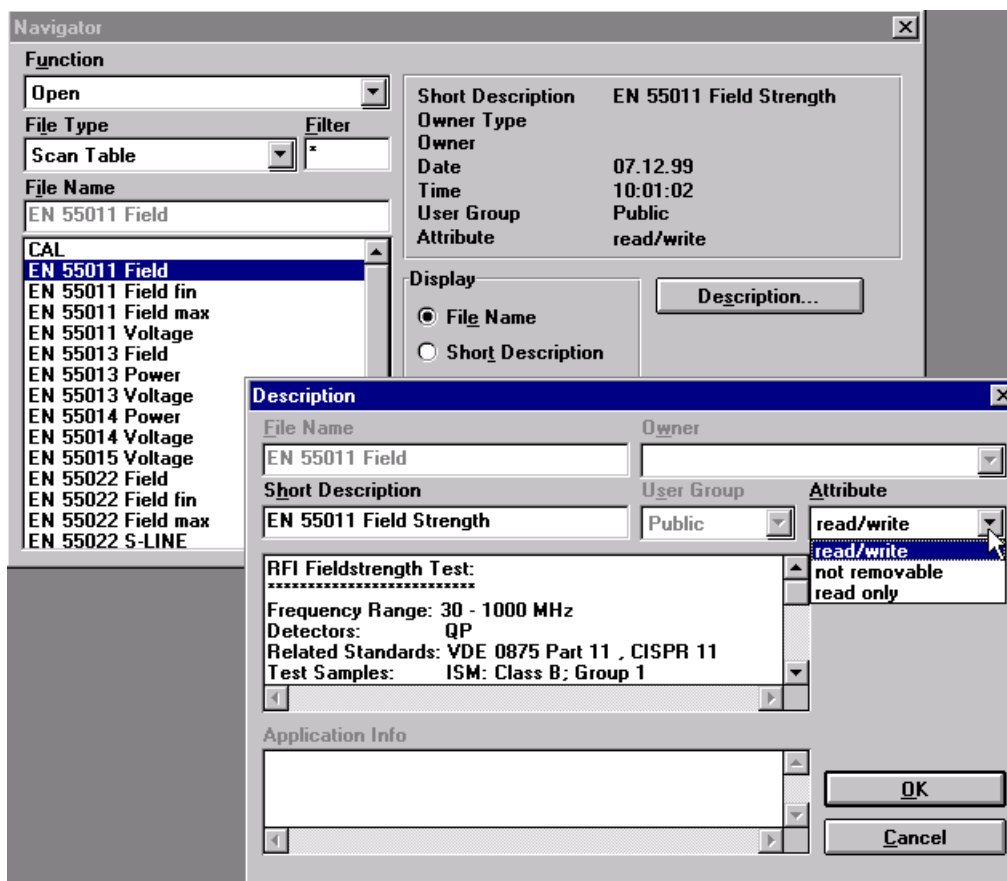


1.3.3 Familiarization with the Measurements

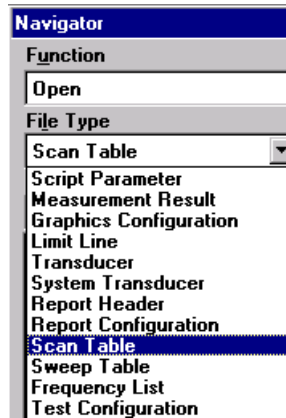
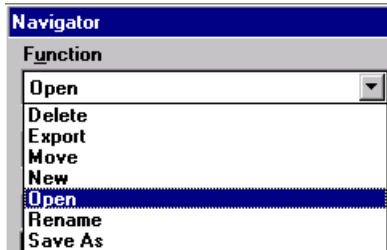
For standard-conforming measurements the simplest way is to use the information contained in the ESI-K1 database concerning frequency scan or sweep, transducer characteristics (eg of the artificial mains networks) and limit values of the different standards. The database of ESI-K1 is routed via a **Navigator**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



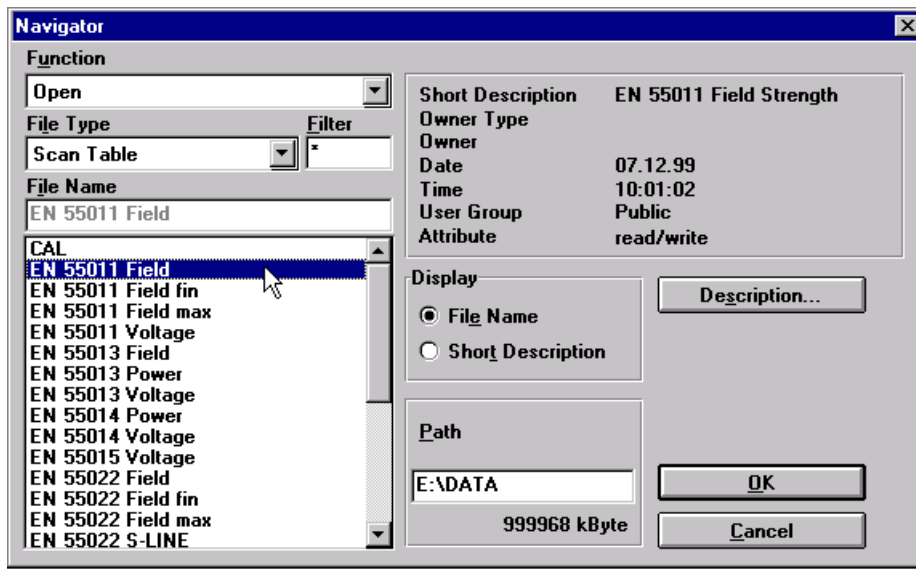
The configuration of software ESI-K1 allows the commenting/description of created or modified files. **Description...** gives the user short information including modification made by the user or the deviation from the **default setting**.



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 **OK**.



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.



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

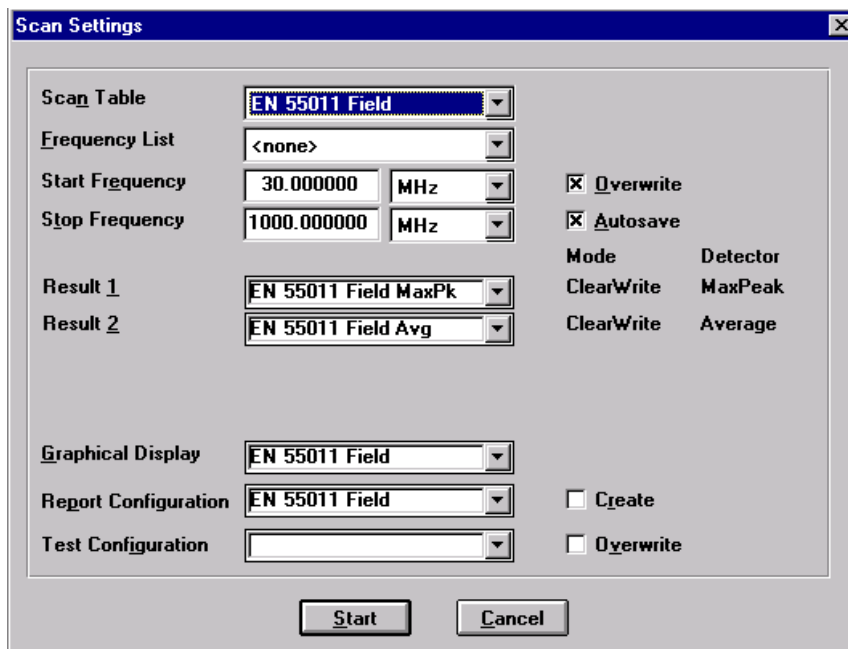
Since a scan table adapted or modified as to measurement bandwidth, step size, measurement time and detector selection is often used for the same DUT, it is recommended to start directly from the menu bar



or via



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.



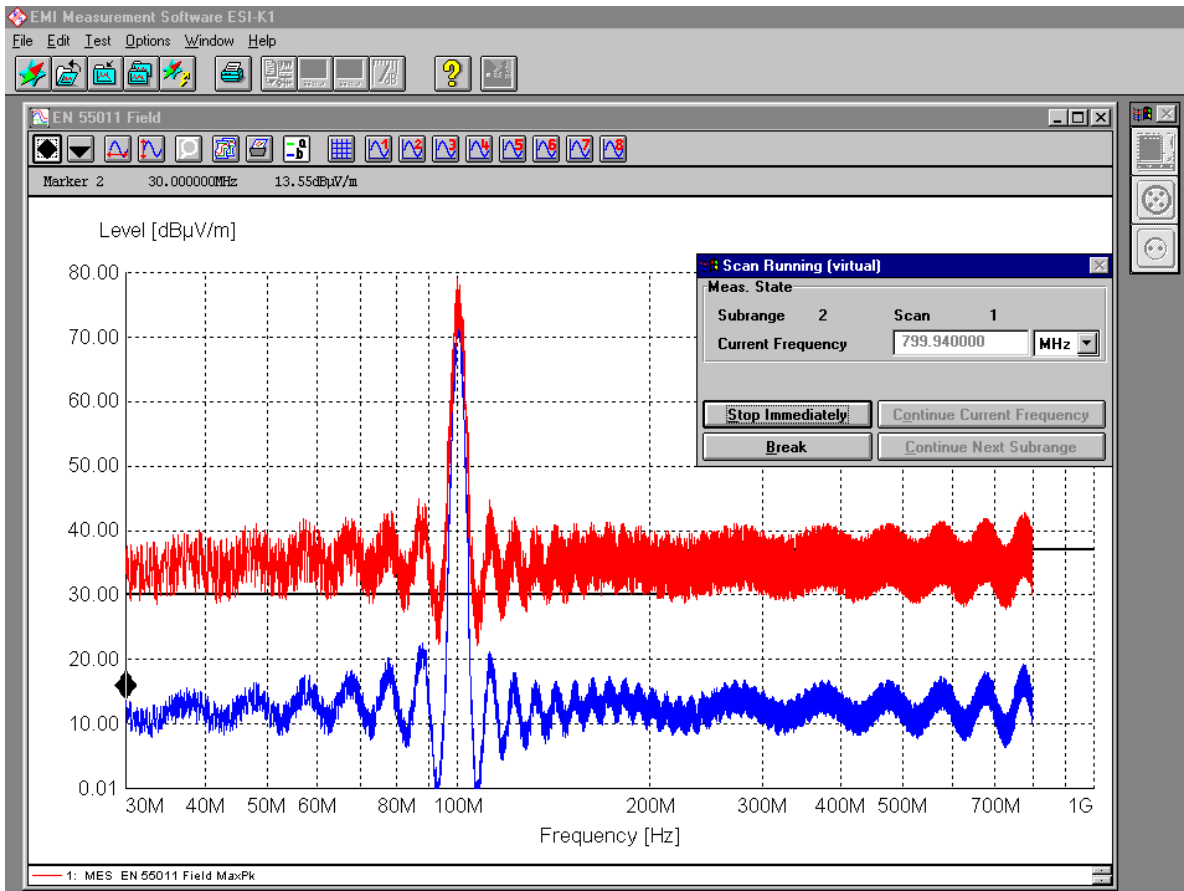
The same procedure applies to the use of prepared sweep tables for operating the spectrum analyzer mode of Test Receiver ESI.



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.*

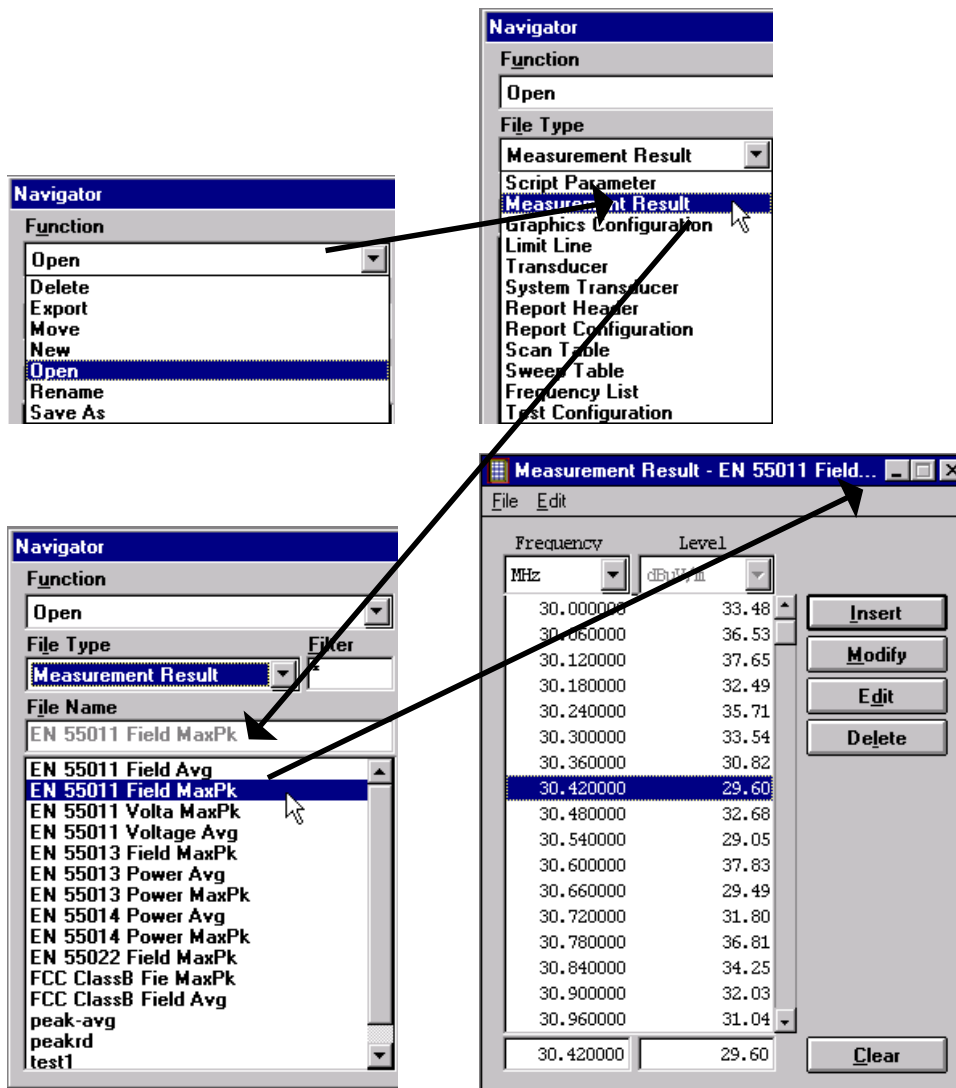
After entering a new/old graphic is opened and a scan is immediately started which writes the measurement data from the above case to the two result files FIELD MAX PK and FIELD AVG (the figure shown here contains virtually generated traces).



The scan can be stopped with 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 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.

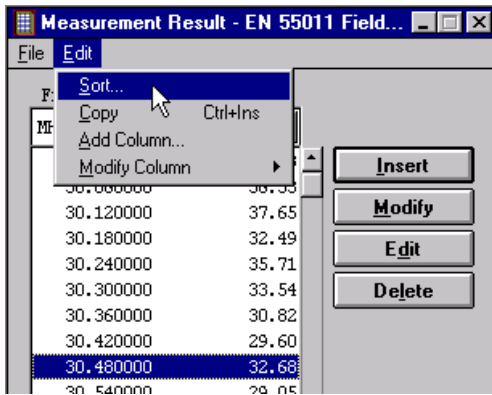
Assuming that a measurement was completely performed, the result files are available in tabulated form as well as graphical representation.

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.

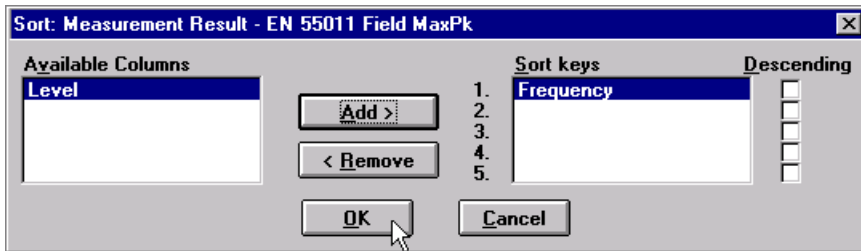


The test results can be printed in tabular form. Modification is performed by clicking the associated frequency and further processing DELETE / CHANGE. The display and sorting within the table can be preset as increasing/decreasing order depending on the type of columns. The standard two-column result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

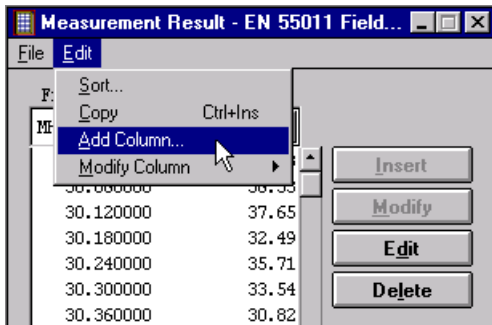
Selection of incremental/decremental sorting:



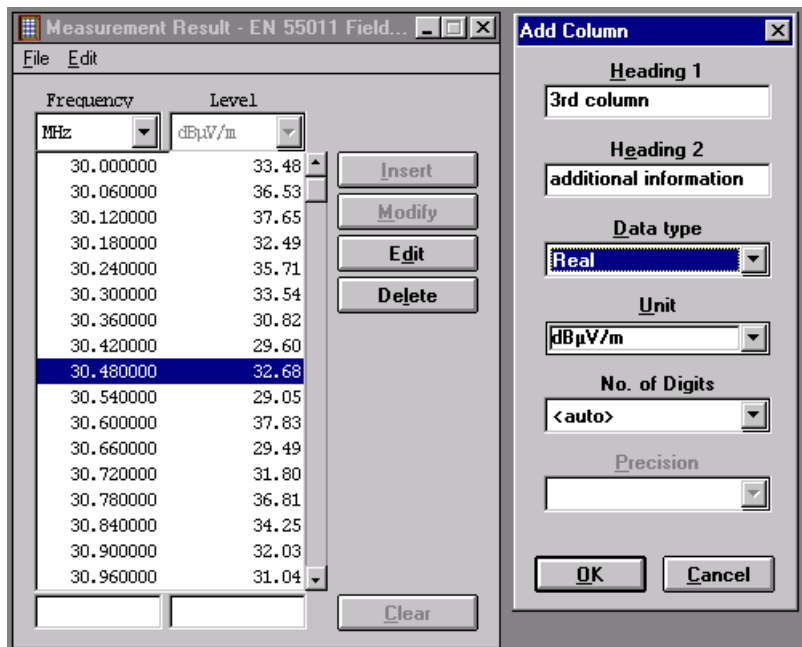
Parameter preset for sorting:



Creating an additional column:



Text/unit and display range of additional column:



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:



(see chapter .2x)

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(μ V/m) for electrical field strength) to a voltage level (measured in dB(μ V)) 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 analyzer 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.

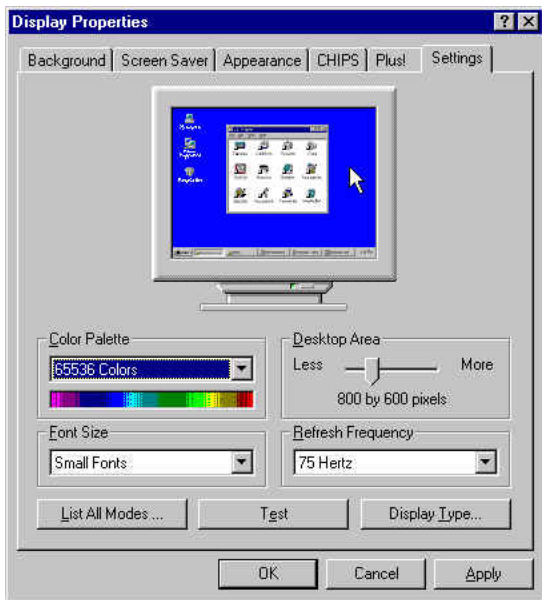
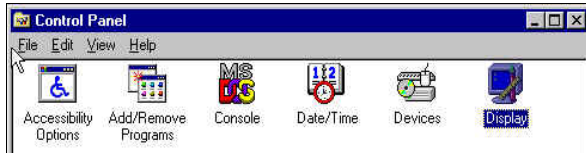
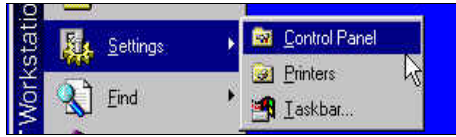
The maximum resolution of the ESI internal display is 640 x 480 pixels (VGA). Since the ESI-K1 software requires a minimum resolution of 800 x 600 pixels (SVGA) for full-screen display, it is recommended to connect a separate PC monitor to the rear-panel connector.



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



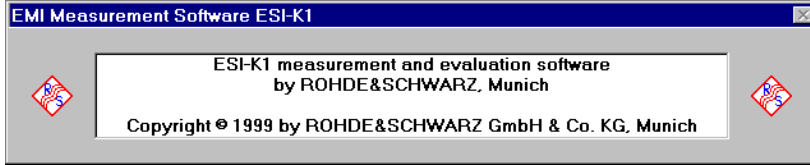
The screen can then be scrolled with the mouse cursor via the ESI-K1 user interface.

Starting ESI-K1 software

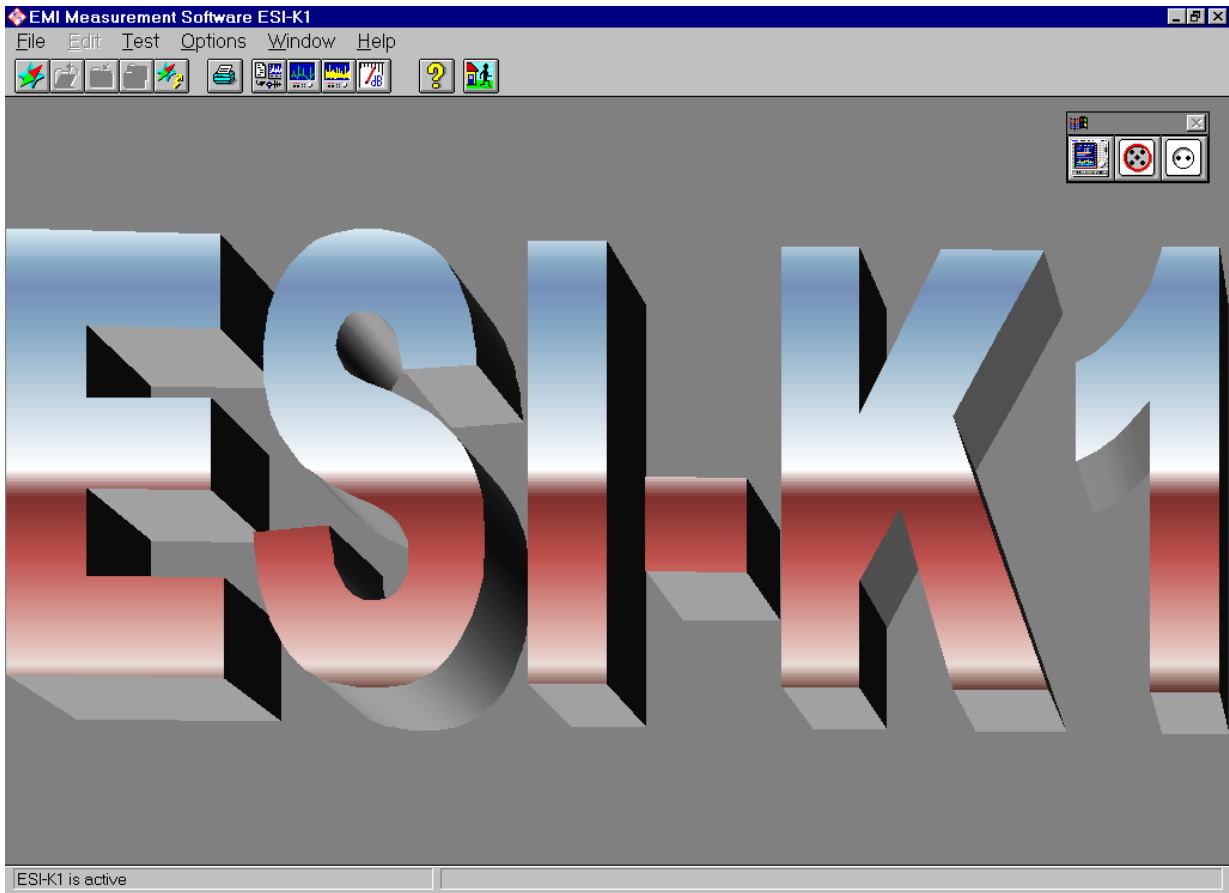
Double-clicking the icon



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 μ H//50 Ω ESH2-Z6 (max 150 A)
- Active probe, $R_{in} \geq$ 100 k Ω ESH2-Z2
- Passive probe, $R_{in} =$ 1.5 k Ω 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.

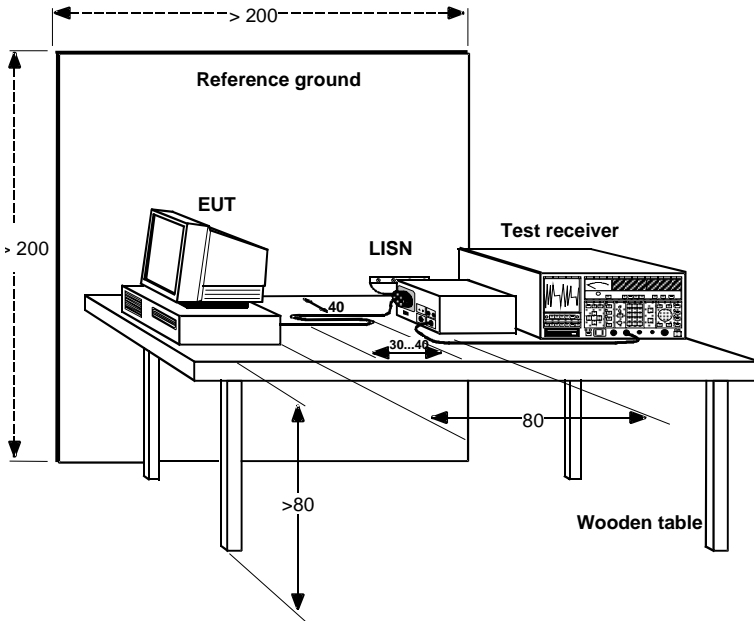
Generally, the frequency range for RFI voltage measurements is limited to the above frequency range of 9 kHz to 30 MHz in national and international standards. On vehicle accessories, RFI voltage measurements are performed up to 108 MHz.

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:



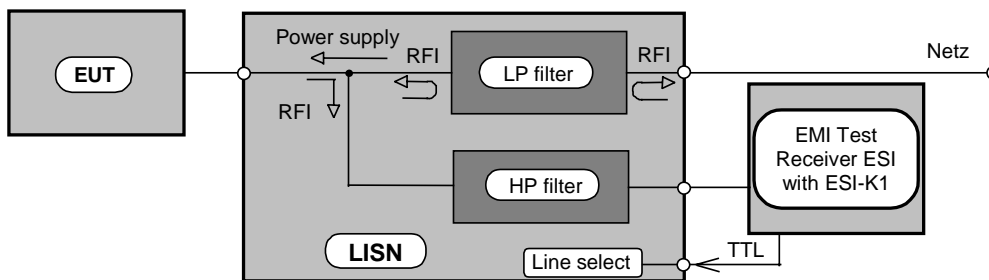
To avoid measurement errors caused by ambient interference, the DUT and measuring head (artificial mains network or probe) should be operated in a shielded cell whereas Test Receiver ESI with keyboard, mouse and printer remains outside.

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 incorporated or external module) should be used for protection.

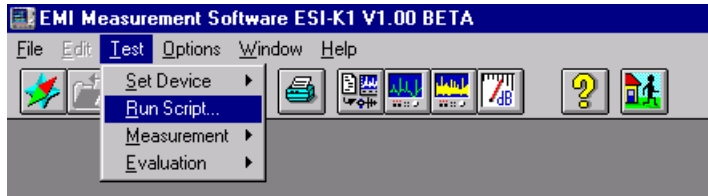
Block diagram of a RFI voltage measurement setup:



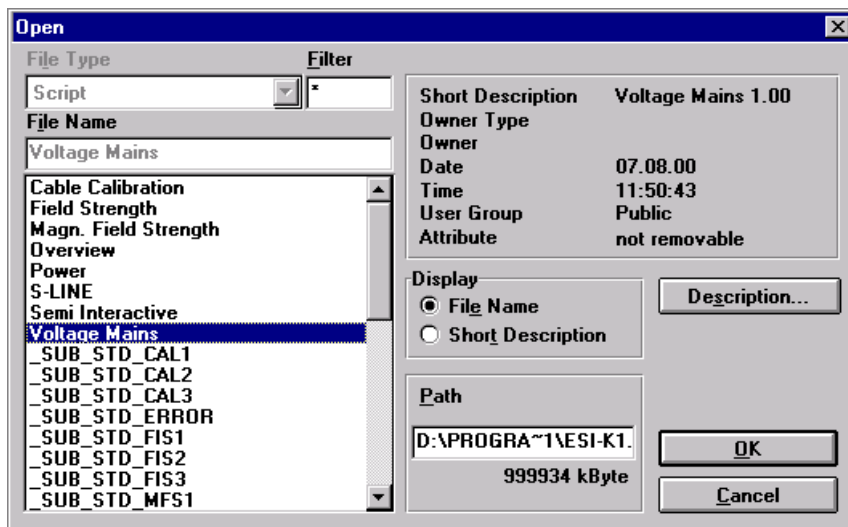
1.4.3.3 Programming the Measurement with Software ESI-K1

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

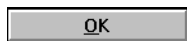
To do this, submenu Execute script... is to be clicked:



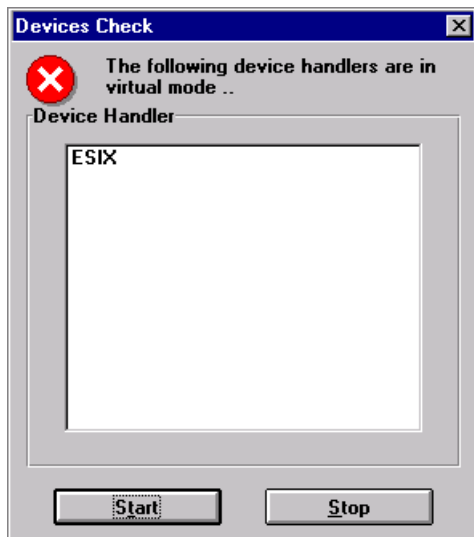
The corresponding script selection menu is opened in which the Voltage Mains script can be selected



and started by clicking



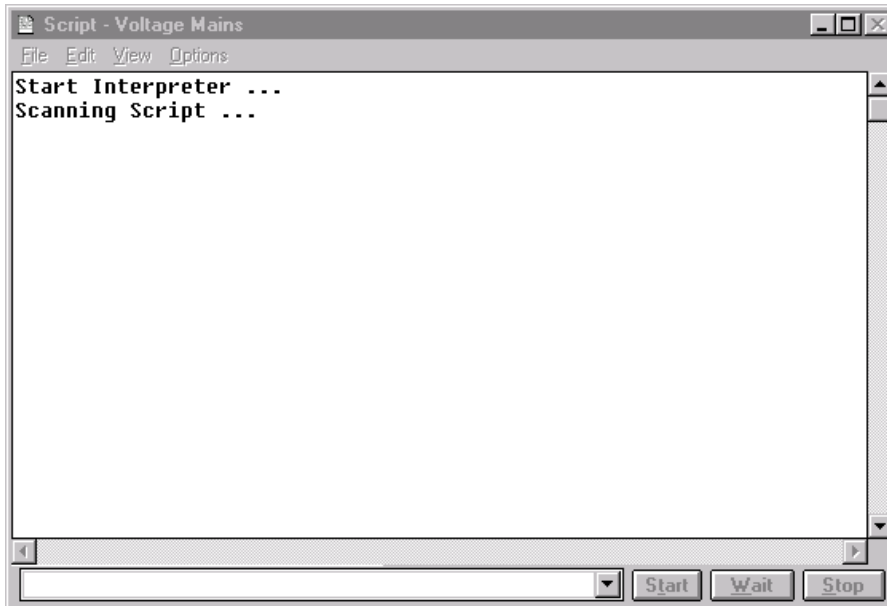
If the program is in the virtual mode (see introduction to this section), a message is displayed again:



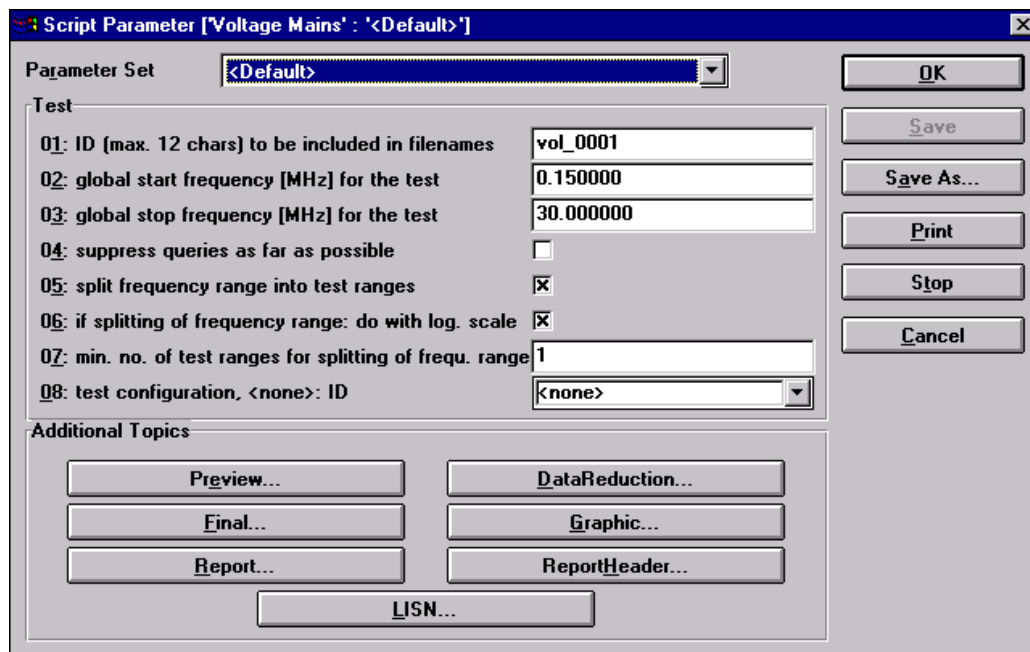
A mouse click on



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



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



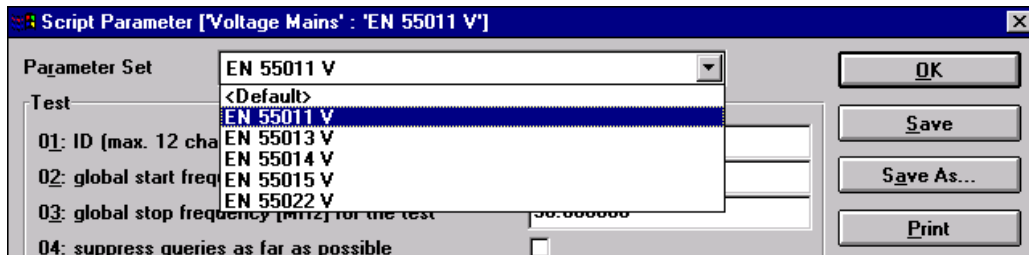
This menu comprises the selection window of the parameter set to be used for the measurement which can be defined beforehand,



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



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



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

EN 55011

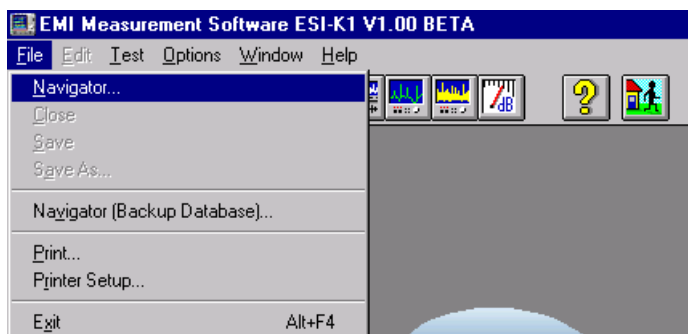
Frequency range: 0.15 to 30 MHz
 Detectors/limit values: QP and AV
 Standards used: VDE 0875 Part 11 , CISPR 11
 DUTs: ISM: Class B; Group 1

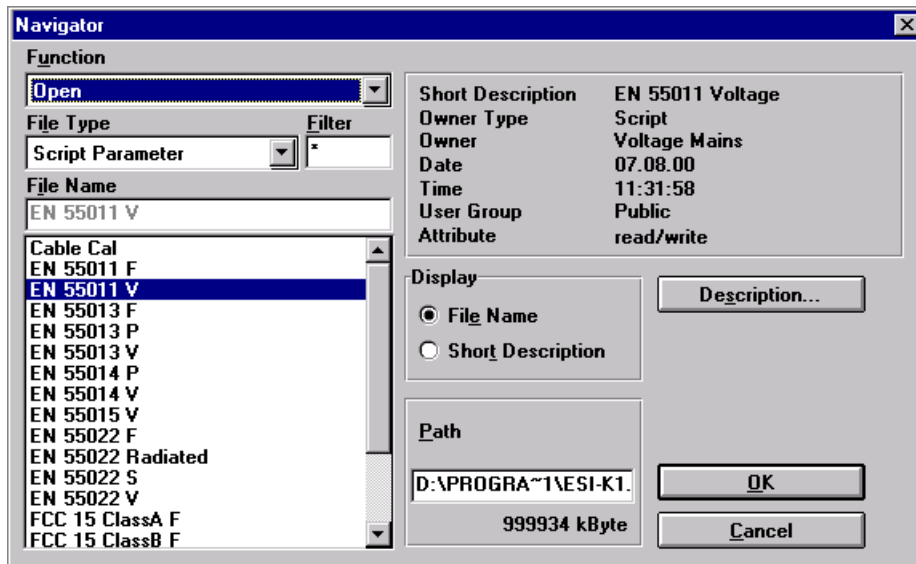
the associated frequency run (sweep/scan tables) and the corresponding limit lines (quasipeak, average) are automatically loaded to the relevant submenus.

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.

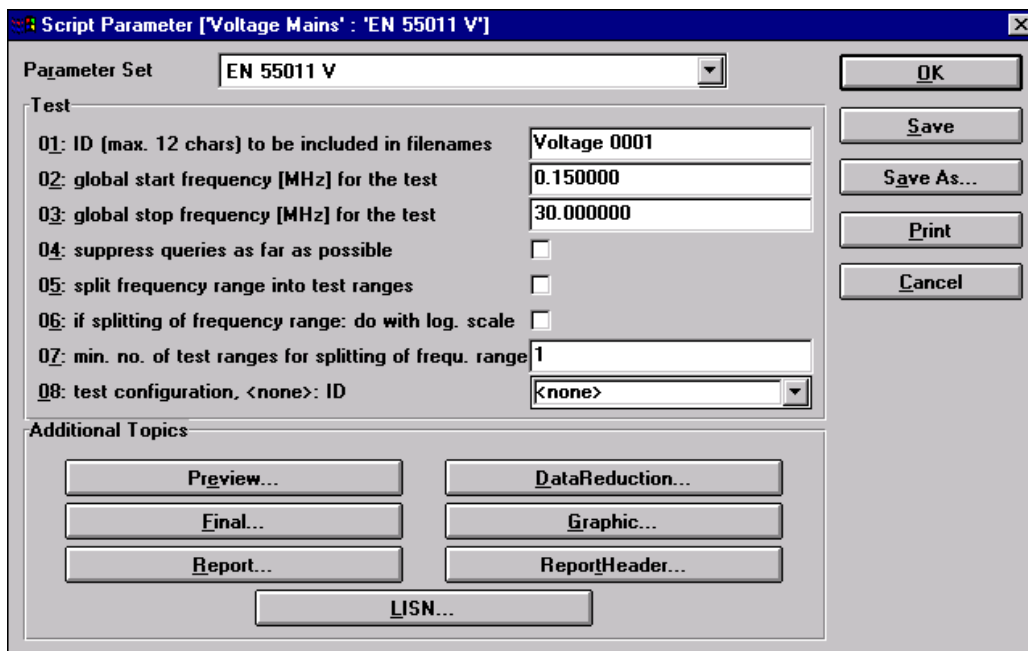
In addition, the ES-K1 database containing the different file types is directly called from the File menu via the file manager named by means of the navigator.





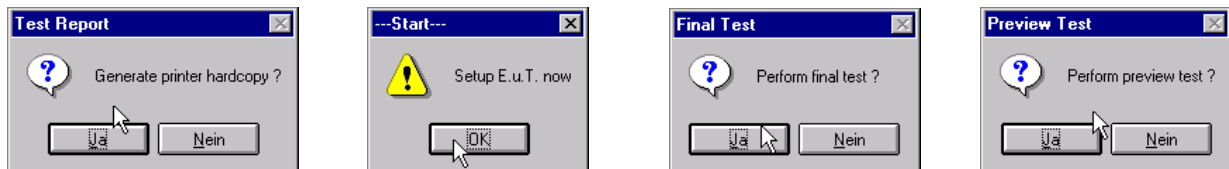
The selected parameter set for the RFI voltage measurement in the frequency range up to 30 MHz in line with product family standard EN 55011 offers the following settings for the script parameters (script parameters are described in detail in section xxx of this manual):

Topic 'Test'



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'

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'

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).

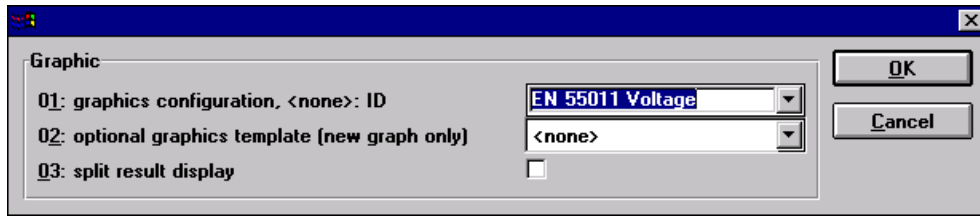
Topic 'Final'

Parameter	Description	Value
01	final result file, <none>: ID + '_fin QP'	<none>
02	2nd result file, <none>: ID + '_fin AV'	<none>
03	scan table for partial scans + single meas.	EN 55011 Voltage
04	perform partial scans	<input type="checkbox"/>
05	complete search (all accessory settings)	<input checked="" type="checkbox"/>
06	insert results into existing result file	<input type="checkbox"/>
07	time [sec] for final measurements	1.000000
08	optional input: preview result file	<none>
09	optional input: preview result file (2nd det.)	<none>
10	optional input: frequency list	<none>
11	optional input: frequency list (2nd det.)	<none>
12	optional input: final result file	<none>
13	optional input: final result file (2nd det.)	<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 measurement. The final 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'



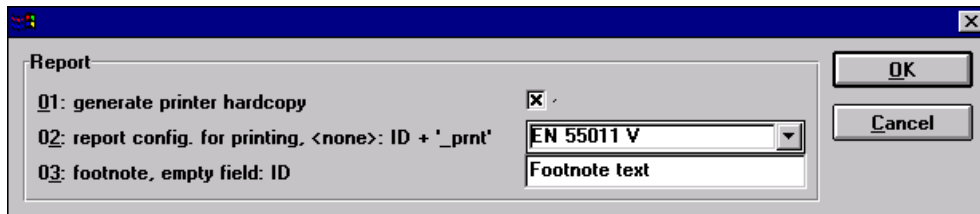
The graphics configuration describes the appearance of the graphic, ie the display of measured values (level) versus the frequency axis. In addition, the number and display form (eg colour) of traces, limit lines or transducers are defined in the graphics configuration. Markers, delta markers or legend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



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'

Parameter	Description	Value
01	resulting test report header, <none>: ID	EN 55011 Voltage
02	optional test report header template	<none>
03	1st header line	Conducted emission test to EN
04	2nd header line	
05	E.u.T. name	EUT
06	manufacturer	
07	operating conditions	
08	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 'LISN'

Parameter	Description	Value
01	use manual LISN switching	<input type="checkbox"/>
02	use a two line LISN (manual or 'ESH3-Z5')	<input checked="" type="checkbox"/>
03	use a four line LISN (manual or 'ESH2-Z5')	<input type="checkbox"/>
04	2/4: preview measurements with PE floating	<input type="checkbox"/>
05	2/4: preview measurements with PE grounded	<input checked="" type="checkbox"/>
06	2/4: preview measurements on line N	<input type="checkbox"/>
07	2/4: preview measurements on line L1	<input checked="" type="checkbox"/>
08	4: preview measurements on line L2	<input type="checkbox"/>
09	4: preview measurements on line L3	<input type="checkbox"/>
10	2/4: final measurements with PE floating	<input type="checkbox"/>
11	2/4: final measurements with PE grounded	<input checked="" type="checkbox"/>
12	2/4: final measurements on line N	<input checked="" type="checkbox"/>
13	2/4: final measurements on line L1	<input checked="" type="checkbox"/>
14	4: final measurements on line L2	<input type="checkbox"/>
15	4: final measurements on line L3	<input type="checkbox"/>
16	use single line LISN (manual only)	<input type="checkbox"/>
17	sgl.: no. of lines to be measured for preview	*
18	sgl.: no. of lines to be measured for finals	*

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 dB μ A. In this case too, automatic line selection is not necessary.

With 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.

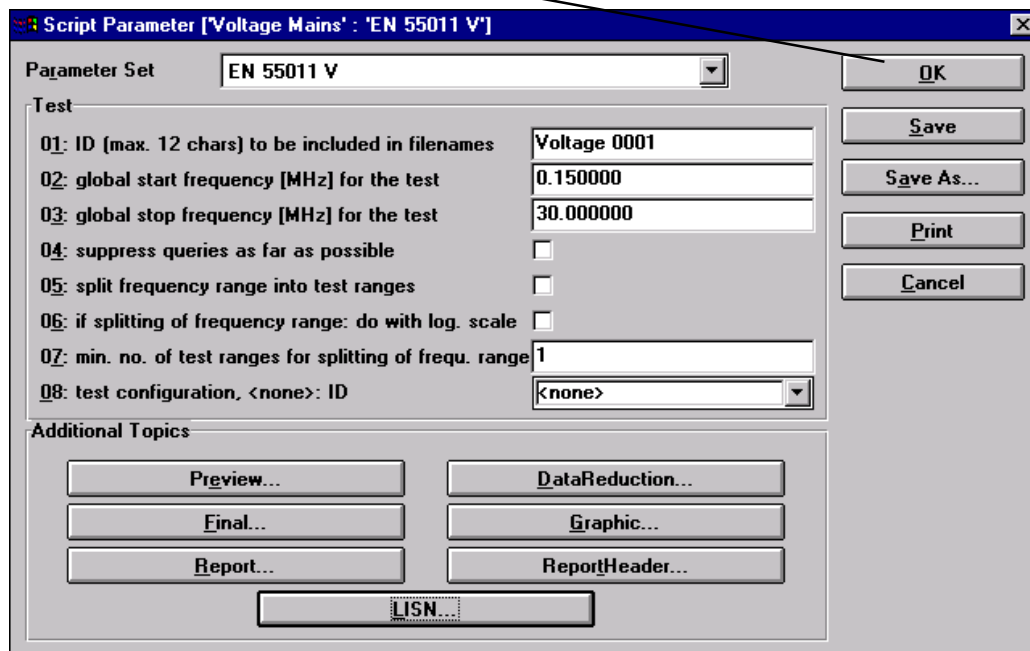
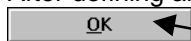
If parameter 04 is activated (PE floating), the protective earth choke is switched on. The PE grounded/floating control is not provided for Four-Line NNB ENV4200. Its protective earth is always connected to ground (PE grounded).

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.

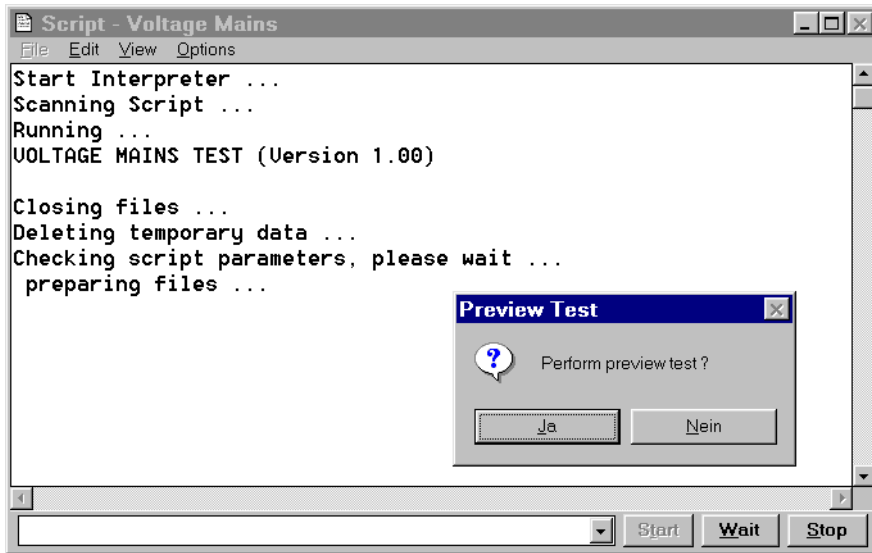
Transducer factors are normally not required in the case of artificial mains networks since they output the correct voltage levels.

Start of the measurement

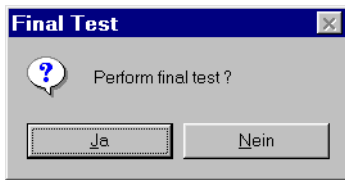
After defining all script parameters the measurement is started by clicking on



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.



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



Data combination



Acceptance analysis



Maxima reduction

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

```

Script - Voltage Mains
File Edit View Options
current frequency (11/15):      9.65 MHz
LISN line = N
measurement with final detector no.1 at      9.65 MHz
=> level:      49.111 dBµV

current frequency (12/15):      9.71 MHz
measurement with final detector no.1 at      9.71 MHz
=> level:      50.586 dBµV

current frequency (13/15):      9.98 MHz
measurement with final detector no.1 at      9.98 MHz
=> level:      71.211 dBµV

current frequency (14/15):      10.07 MHz
measurement with final detector no.1 at      10.07 MHz
=> level:      68.506 dBµV

current frequency (15/15):      10.265 MHz
measurement with final detector no.1 at      10.265 MHz
=> level:      50.96 dBµV
sorting for pe/line ...

current frequency (1/1):      10.03 MHz
LISN line = L1
measurement with final detector no.2 at      10.03 MHz
=> level:      71.233 dBµV
LISN line = N
sorting frequencies ...
merging results ...
sorting frequencies ...
merging results ...

Start Wait Stop

```

A script run can be halted by clicking



continued by clicking



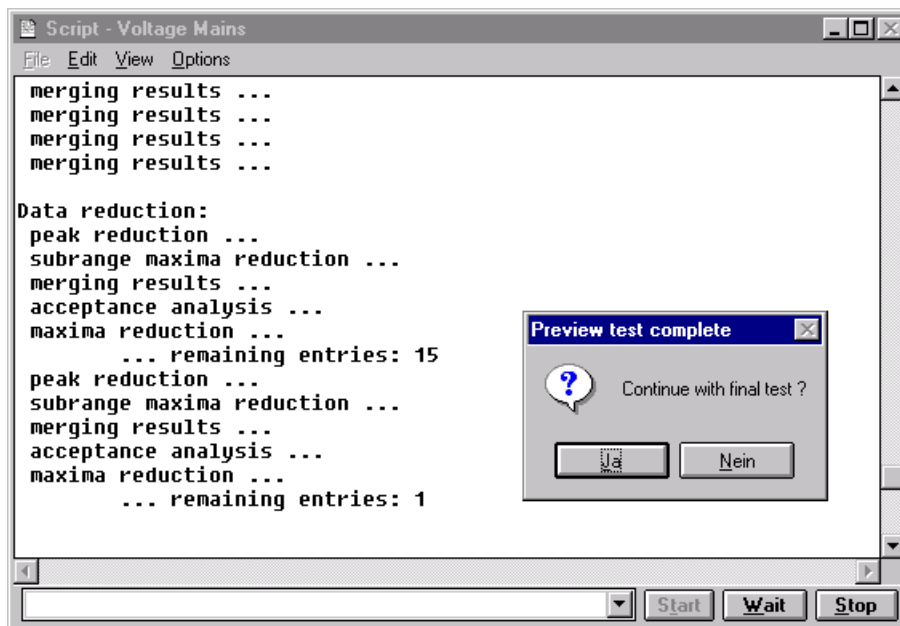
and aborted by clicking



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.



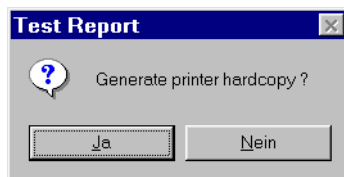
The final measurement takes place in the settings made in topic 'Final'.

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.

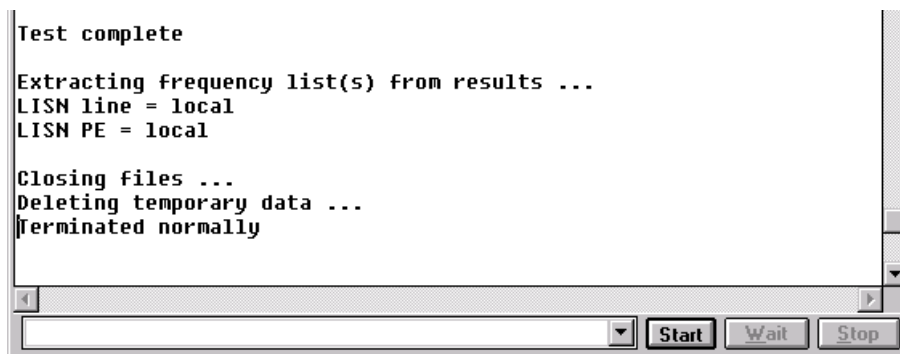
The following applies analogously:

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.

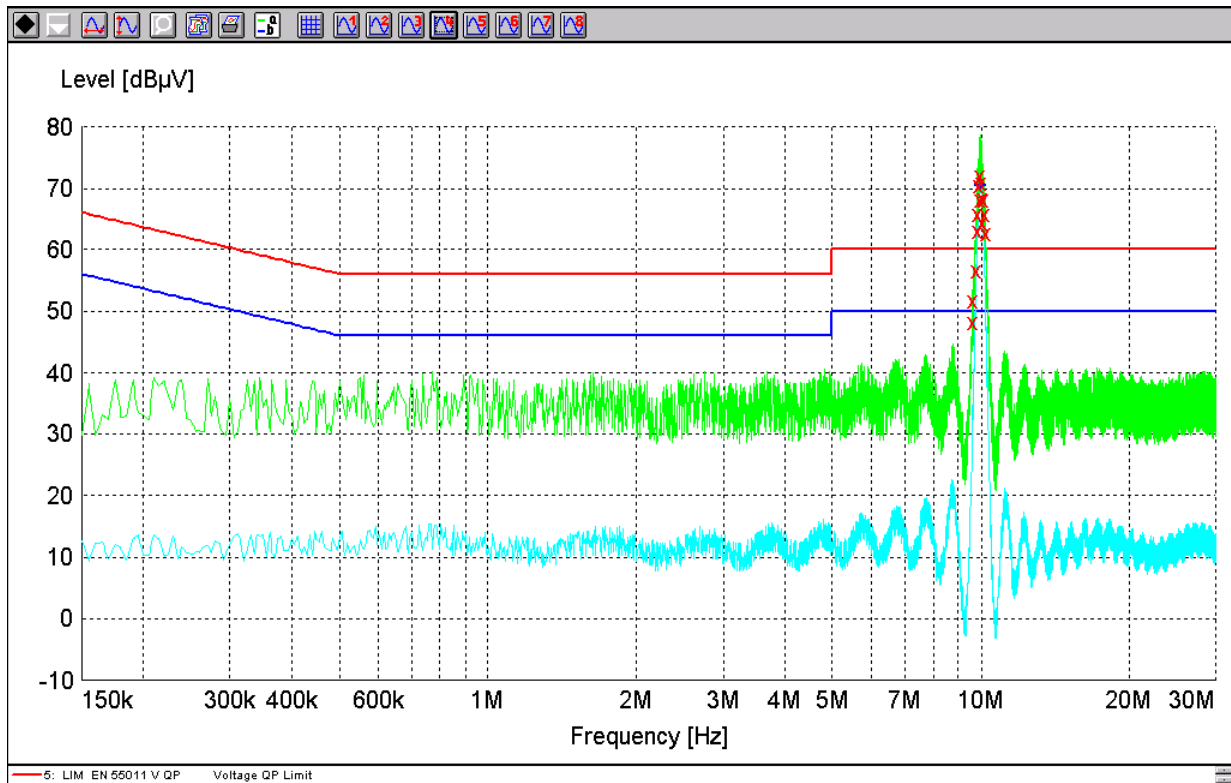
After completion of the final measurement, a graphical printout of results can be started.



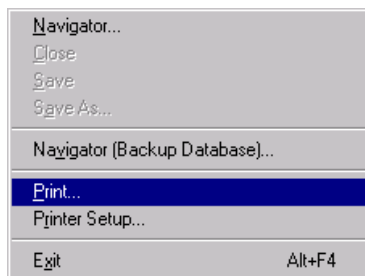
The script routine is thus terminated



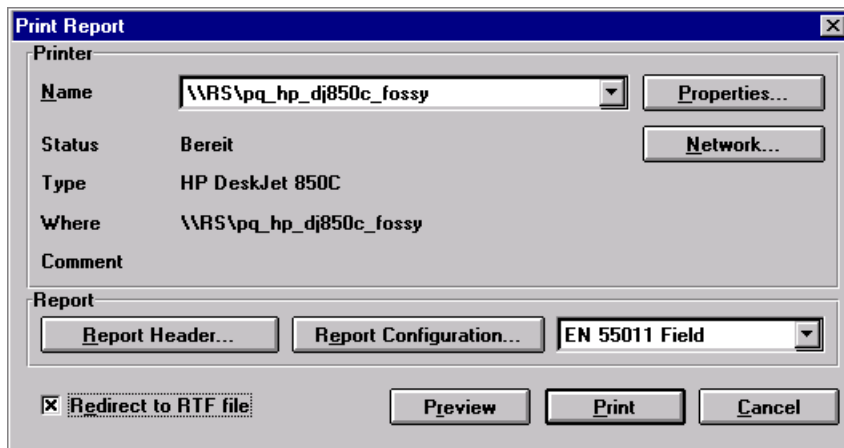
and the result is displayed graphically (in this example in the virtual mode with simulated test results):



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 File menu.



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



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.

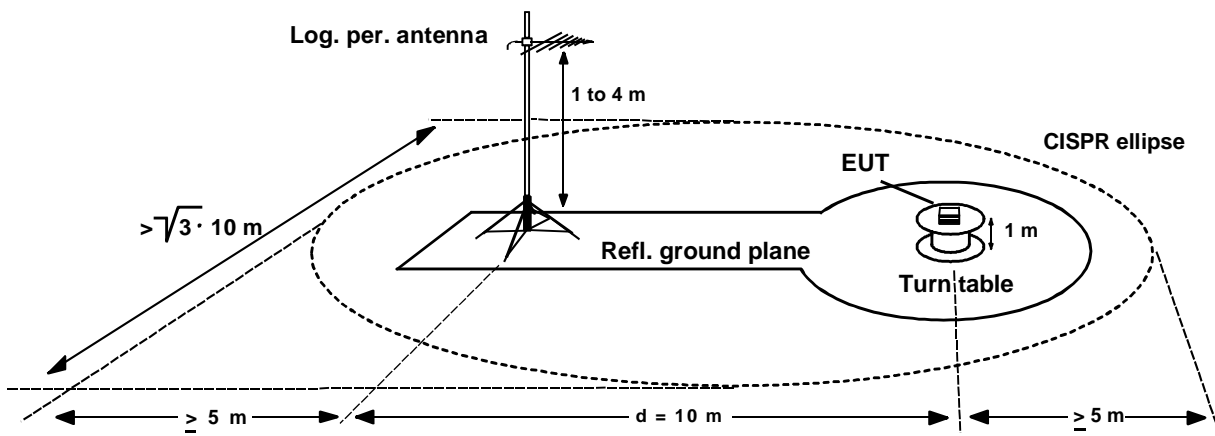
Rohde & Schwarz offers the following antennas for the RFI measurement:

- 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 plane, 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, measured in all possible modes.

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 clad 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

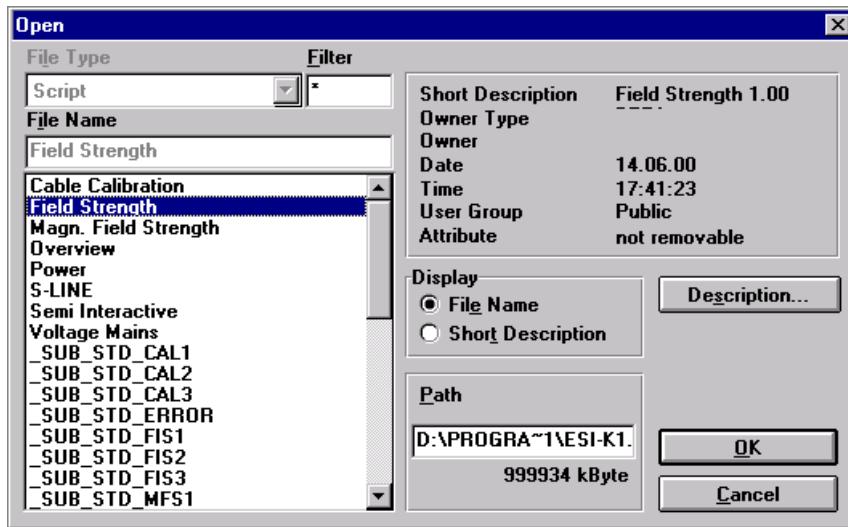
The following example describes the measurement of the electromagnetic RFI field strength using suitable antennas. The antenna mast and turntable control for setting the antenna height and polarization as well as for DUT positioning (azimuth) is not performed via the ESI-K1 software but separately (manually or via a separate 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 Programming the Measurement with Software ESI-K1

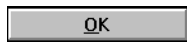
In this example, the measurement is performed in the automatic mode using the Field Strength script. To do this, submenu Execute script... in main menu Test is to be clicked:



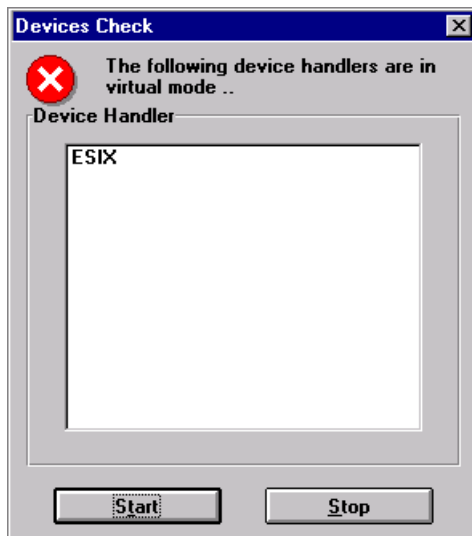
The script selection menu is opened in which the script can be selected



and started by clicking



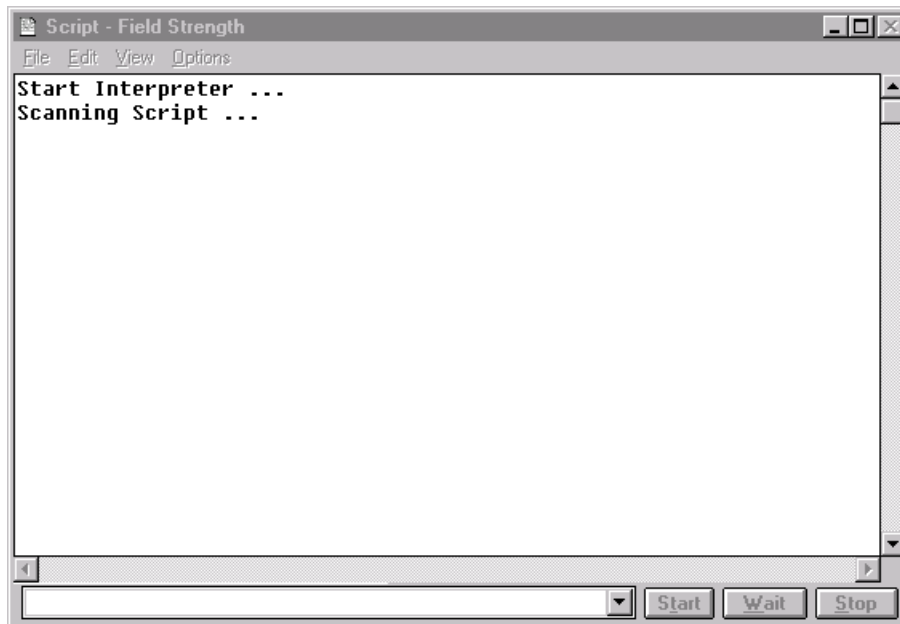
If the program is in the virtual mode (see introduction to this section), a message is displayed again:



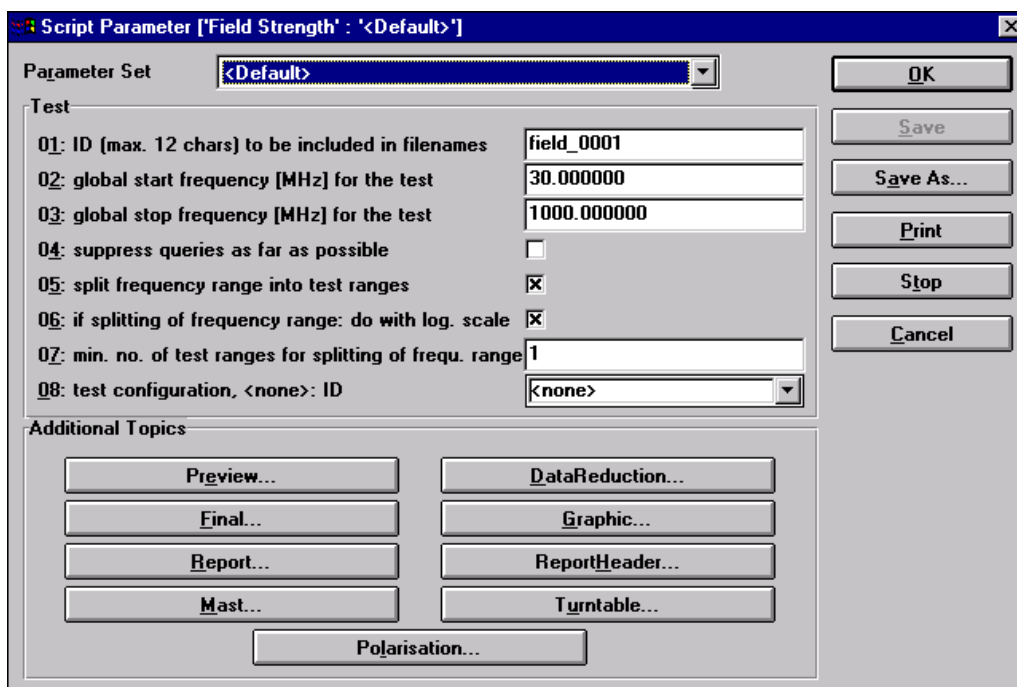
A mouse click on



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:

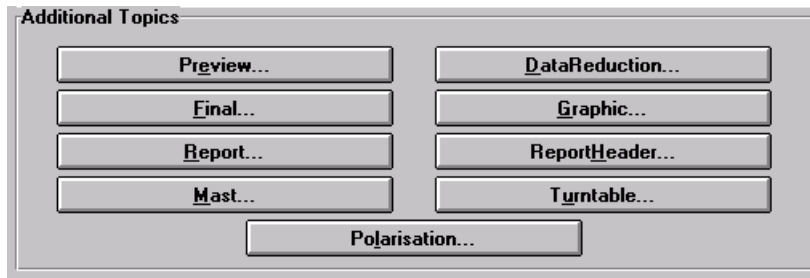


This menu comprises the selection window of the parameter set to be used for the measurement and which can be defined beforehand,

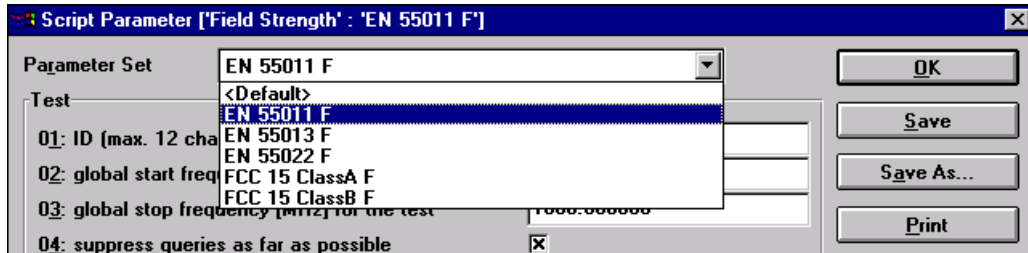


then submenu **Test**

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



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



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

EN 55011

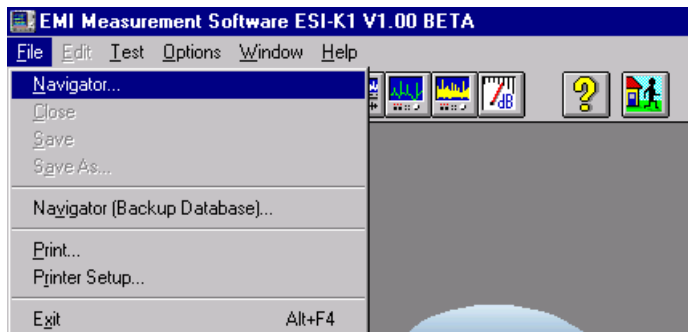
Frequency range: 30 to 1000 MHz
 Detectors/limit values: QP
 Standards used: VDE 0875 Part 11 , CISPR 11
 DUTs: ISM: Class B; Group 1
 Distance: 10 m

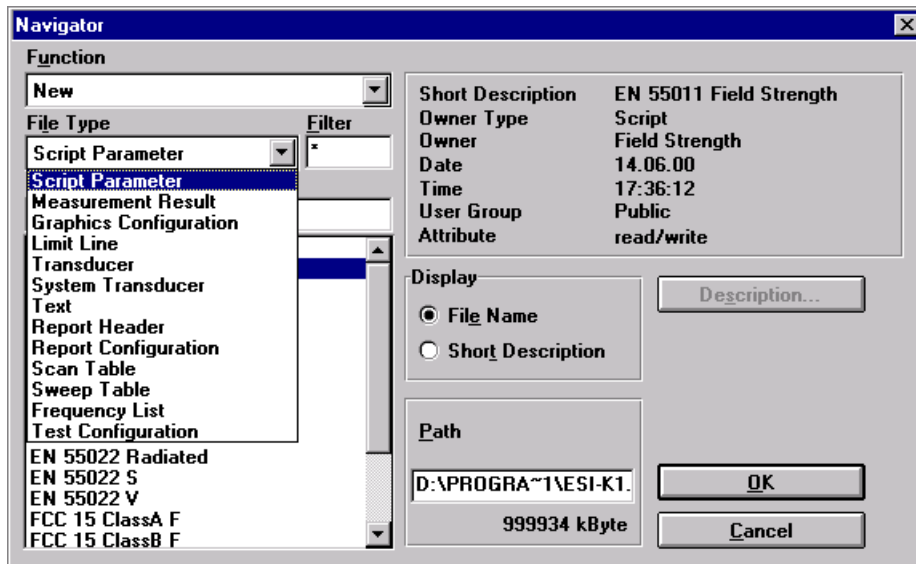
the associated frequency run (sweep/scan tables) and the corresponding limit lines (quasipeak, average) are automatically loaded to the relevant submenus.

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.

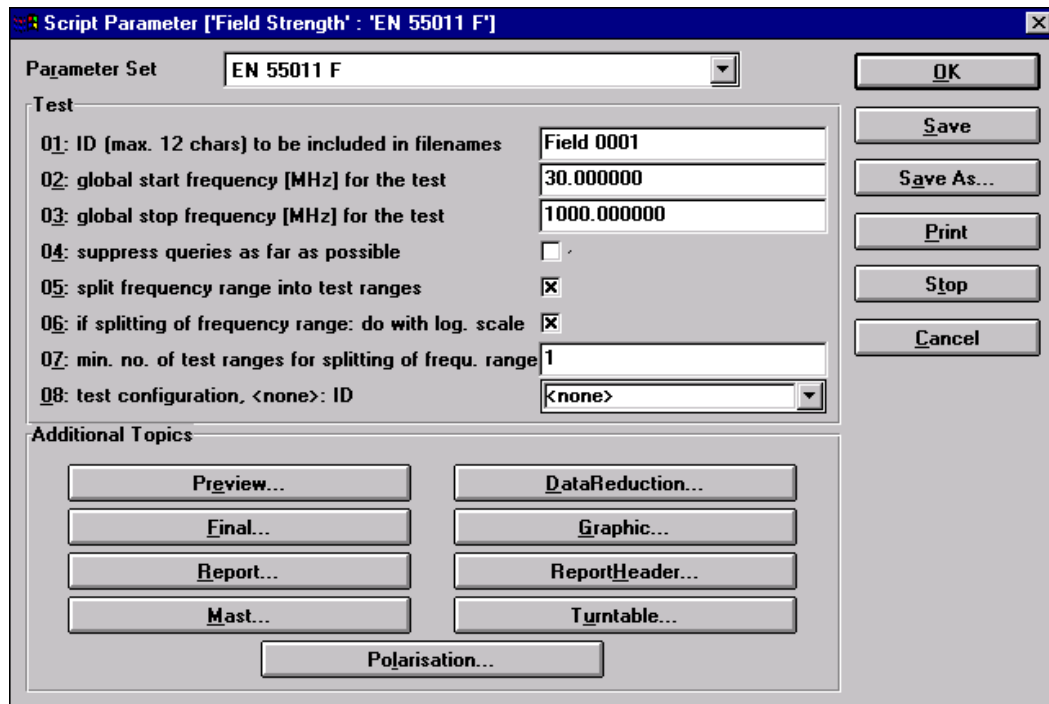
In this case, the ES-K1 database containing the different file types is directly called from the File menu via the file manager named by means of the navigator.





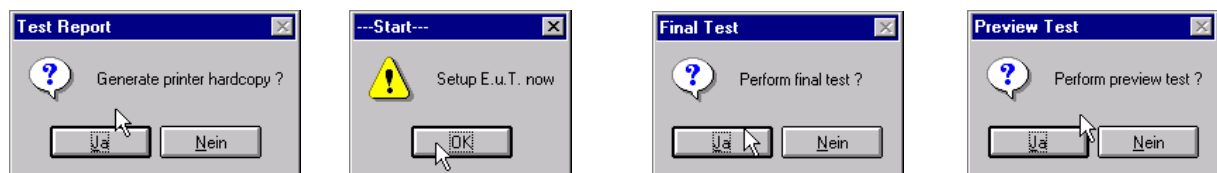
The selected parameter set for the RFI voltage measurement in the frequency range of 30 MHz to 1000 MHz in line with product family standard EN 55011 offers the following settings for the script parameters (script parameters are described in detail in section xxx of this manual):

Topic 'Test'



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 minimum value. If the value (as in this example) is set to 1, each **subrange** 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:



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



and the query for the final measurement results.

Topic 'Preview'

Parameter	Description	Value
01	preview result file, <none>: ID + '_pre PK'	<none>
02	optional 2nd result file, <none>: ID + '_pre AV'	<none>
03	scan table for preview	EN 55011 Field
04	optional 2nd scan table (vertical)	<none>
05	sweep table for preview	<none>
06	optional 2nd sweep table (vertical)	<none>
07	complete search (all accessory settings)	<input checked="" type="checkbox"/>
08	insert results into existing result file	<input type="checkbox"/>

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'

Parameter	Description	Value
01	QP limit line	EN 55011 F QP
02	optional QP acceptance line (no offset)	<none>
03	optional AV limit line	<none>
04	optional AV acceptance line (no offset)	<none>
05	final measurements according to FCC standard	<input type="checkbox"/>
06	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
09	max. no. of results kept from partial scans	1
10	partial scan width: no. of IF-BWs (0=use ratio)	0
11	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'

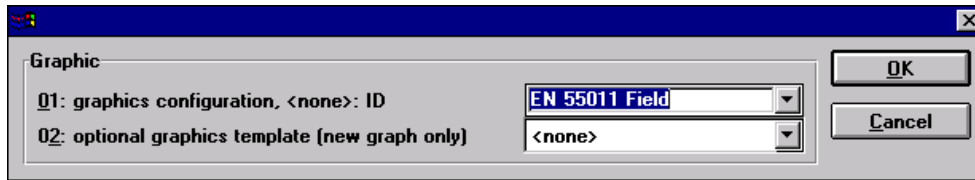
Parameter	Description	Value
01	final result file, <none>: ID + '_fin QP'	<none>
02	optional 2nd result file, <none>: ID + '_fin AV'	<none>
03	scan table for partial scans + maximizing	<none>
04	optional 2nd scan table (vertical)	<none>
05	scan table for final measurements	EN 55011 Field
06	optional 2nd scan table (vertical)	<none>
07	perform partial scans	<input checked="" type="checkbox"/>
08	complete search (all accessory settings)	<input checked="" type="checkbox"/>
09	insert results into existing result file	<input type="checkbox"/>
10	time [sec] for final measurements	1.000000
11	perform accessory adjustment	<input checked="" type="checkbox"/>
12	adjustment full range	<input type="checkbox"/>
13	optional input: preview result file	<none>
14	optional input: preview result file (2nd det.)	<none>
15	optional input: frequency list	<none>
16	optional input: frequency list (2nd det.)	<none>
17	optional input: final result file	<none>
18	optional input: final result file (2nd det.)	<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 (complete 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'

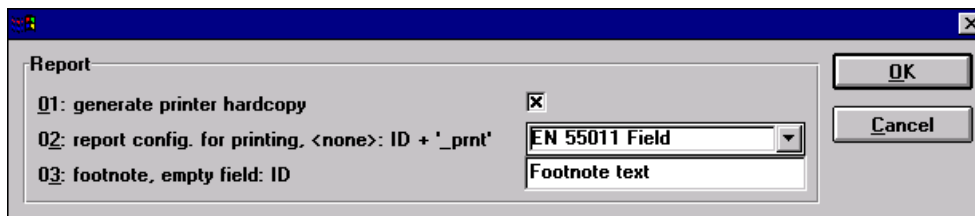


The graphics configuration describes the appearance of the graphic, ie the display of measured values (level) versus the frequency axis. In addition, the number and display form (eg colour) of traces, limit values lines or transducers are defined in the graphics configuration. Markers, delta markers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



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'

Field ID	Description	Value
01	resulting test report header, <none>: ID	EN 55011 Field
02	optional test report header template	<none>
03	1st header line	Radiated emission test to EN !
04	2nd header line	
05	E.u.T. name	EUT
06	manufacturer	
07	operating conditions	
08	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'

Field ID	Description	Value
01	use mast positioning	<input checked="" type="checkbox"/>
02	control priority level (1=highest)	1
03	min. height [cm] to be measured for preview	100
04	max. height [cm] to be measured for preview	300
05	height stepsize [cm] for preview	200
06	min. height [cm] to be measured for finals	100
07	max. height [cm] to be measured for finals	400
08	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'

Parameter	Value
01: use turntable positioning	<input checked="" type="checkbox"/>
02: control priority level (1=highest)	2
03: min. azimuth [deg] to be measured for preview	0
04: max. azimuth [deg] to be measured for preview	180
05: azimuth stepsize [deg] for preview	180
06: min. azimuth [deg] to be measured for finals	0
07: 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'

Parameter	Value
01: use polarisation switching	<input checked="" type="checkbox"/>
02: control priority level (1=highest)	3
03: preview measurements with horizontal polaris.	<input checked="" type="checkbox"/>
04: preview measurements with vertical polaris.	<input type="checkbox"/>
05: final measurements with horizontal polaris.	<input checked="" type="checkbox"/>
06: final measurements with vertical polaris.	<input checked="" type="checkbox"/>

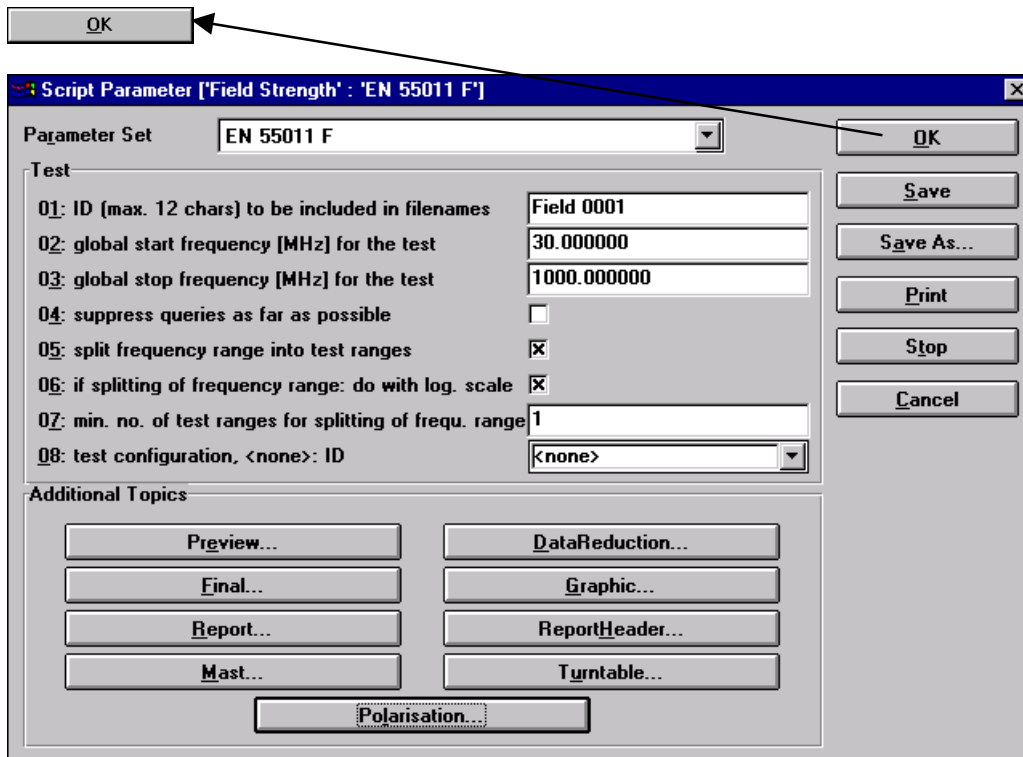
The script parameter set Polarization can be used to support the manual switchover of the antenna polarization by means of dialog windows (parameter 01).

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

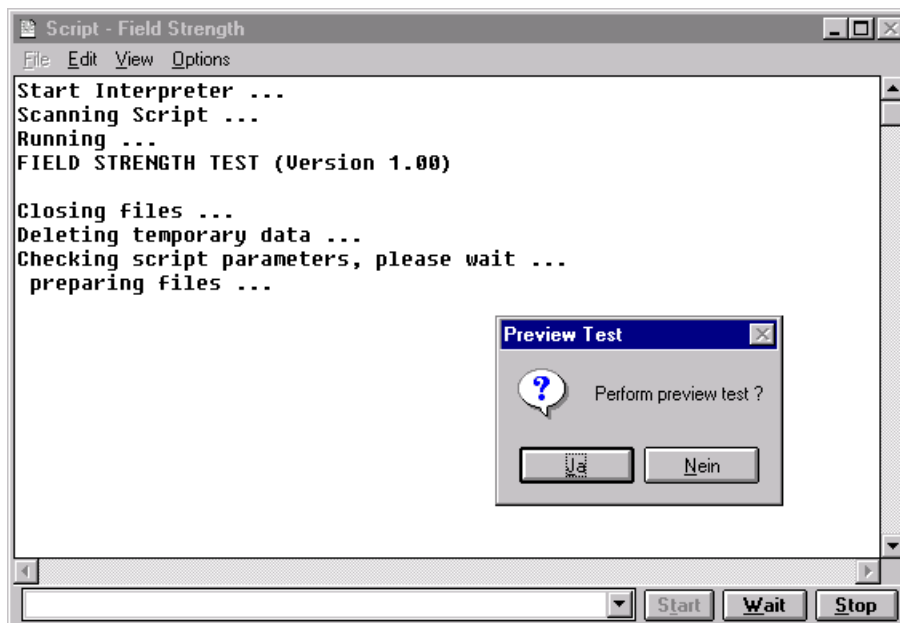
The priority of this polarization switchover can be preset with respect to the setting of antenna mast height and turntable angle using parameter 02. Again, value 1 means the highest priority, value 3 the lowest one.

Start of the measurement

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



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



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.

The screenshot shows the 'Scan Editor - EN 55011 Field' dialog box. The 'Subranges' table is as follows:

Subrange	Start Frequency	Stop Frequency	IF Bandwidth	Demodulation
30.0 MHz	200.0 MHz	120 kHz	ESIX	
200.0 MHz	1.0 GHz	120 kHz	ESIX	
<End of table>				

Subrange settings for the selected range (30.0 MHz to 200.0 MHz):

- Receiver: ESIX
- Transducer: HK116
- Start Frequency: 30.000000 MHz
- Stop Frequency: 200.000000 MHz
- Step Size: 60.000 kHz
- IF Bandwidth: 120 kHz
- Measure Time: 10.000 ms
- Demodulation: FM
- Volume [%]: 30
- Option: None

Control settings:

- Control: Curve 1, Curve 3
- Repetition: Single
- Stop Message: HK116

The screenshot shows the 'Scan Editor - EN 55011 Field' dialog box. The 'Subranges' table is as follows:

Subrange	Start Frequency	Stop Frequency	IF Bandwidth	Demodulation
30.0 MHz	200.0 MHz	120 kHz	ESIX	
200.0 MHz	1.0 GHz	120 kHz	ESIX	
<End of table>				

Subrange settings for the selected range (200.0 MHz to 1.0 GHz):

- Receiver: ESIX
- Transducer: HL223
- 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
- Volume [%]: 30
- Option: None

Control settings:

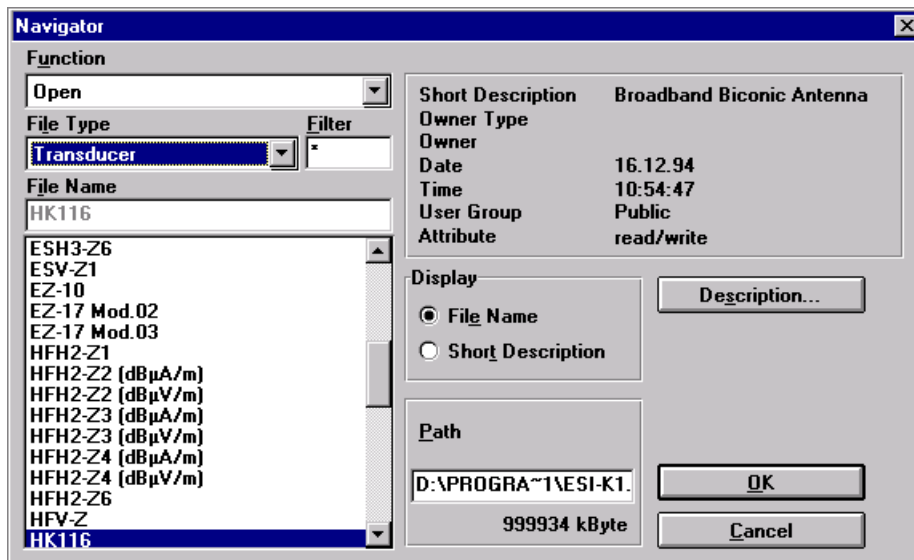
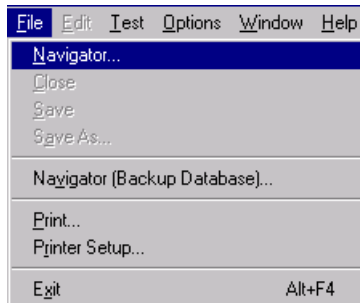
- Control: Curve 1, Curve 3
- Repetition: Single
- Stop Message: HL223

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.

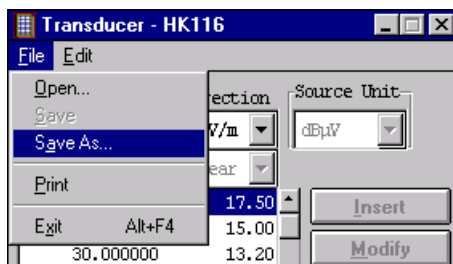
R&S antennas HK116 (30 to 200 MHz) and HL223 (200 to 1000 MHz) are preprogrammed for this measurement in the above scan table EN 55011 F. The change between the antennas at 200 MHz is

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:



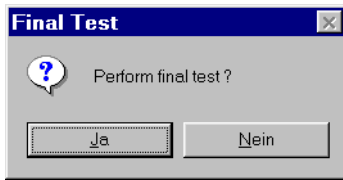
Using



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).

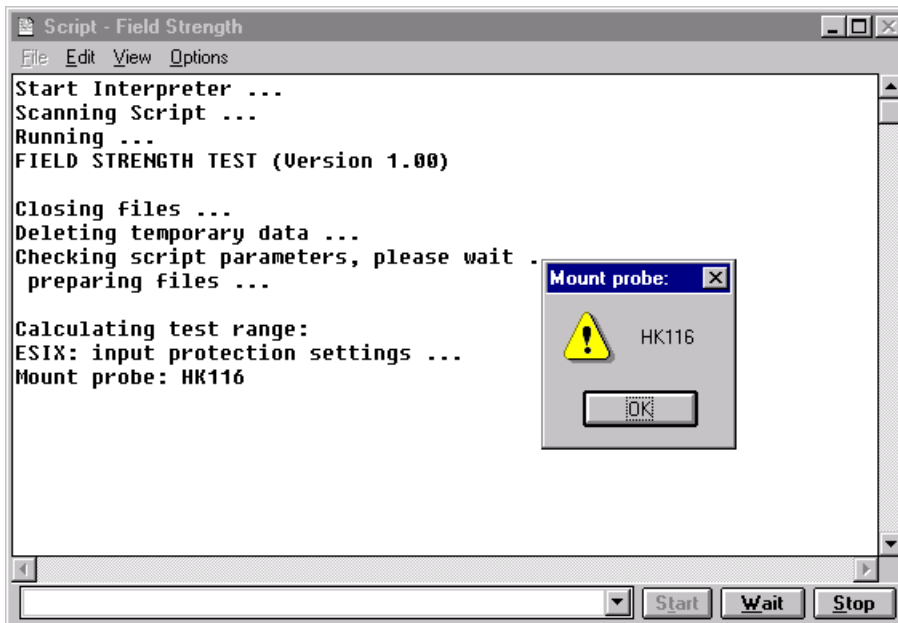
After the preview measurement, a final measurement can be performed with the selected detectors at the found critical frequencies.



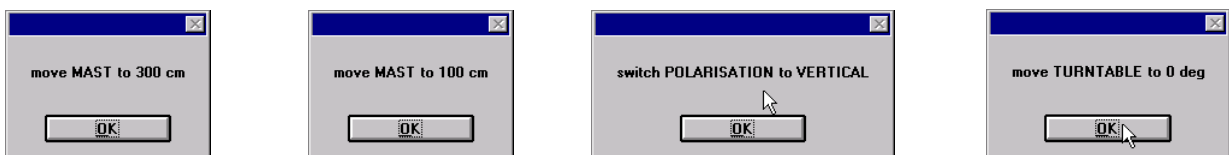
After confirming the final measurement, the user is asked to set the DUT to the required mode.



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:



etc.

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

```

Script - Field Strength
File Edit View Options
Start Interpreter ...
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
current test range:      30 -      200 MHz

Preview test:
preparing preview test ...
MAST height = 100 cm
TURNTABLE azimuth = 0 deg
POLARISATION = HORIZONTAL
scanning ...
merging results ...
MAST height = 300 cm
scanning ...
merging results ...
TURNTABLE azimuth = 180 deg
scanning ...
merging results ...
MAST height = 100 cm
scanning ...
merging results ...
TURNTABLE azimuth = 0 deg
merging results ...

Data reduction:
peak reduction ...
subrange maxima reduction ...
merging results ...
acceptance analysis ...
maxima reduction ...
... remaining entries: 10
  
```

The preview scans are performed at an antenna height of 1 m and 3 m at a turntable angle of 0° and 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

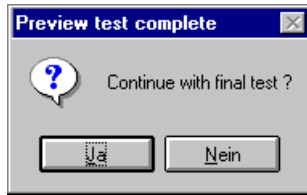
continued by clicking

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 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
File Edit View Options
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 ...


```

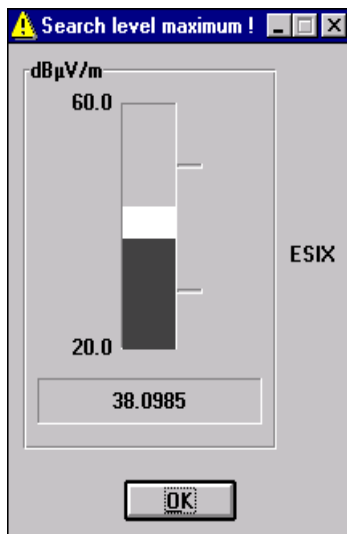
For these updated frequencies, the actual final measurement (complete search) is performed for all antenna heights between 1 m and 4 m at distances of 50 cm in all turntable positions between 0° and 315° (in 45° steps). This operation is first completely carried out for one polarization plane (vertical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


```

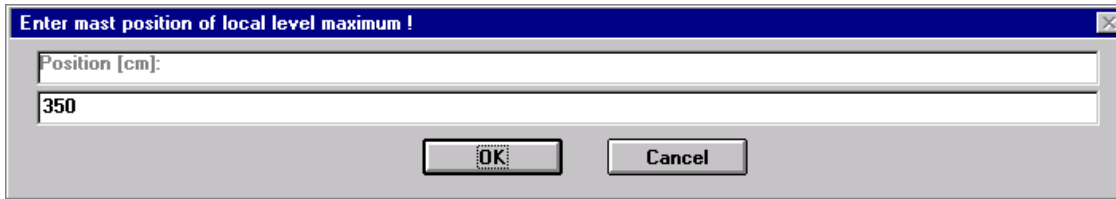
Script - Field Strength
File Edit View Options
Complete search:
MAST height = 100 cm
TURNTABLE azimuth = 0 deg
POLARISATION = VERTICAL
measuring complete set ...
MAST height = 150 cm
measuring complete set ...
MAST height = 200 cm
measuring complete set ...
MAST height = 250 cm
measuring complete set ...
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 quasi-analog bargraph display of the measured level value facilitates the search for maximum values. The measurement result is stored by clicking 

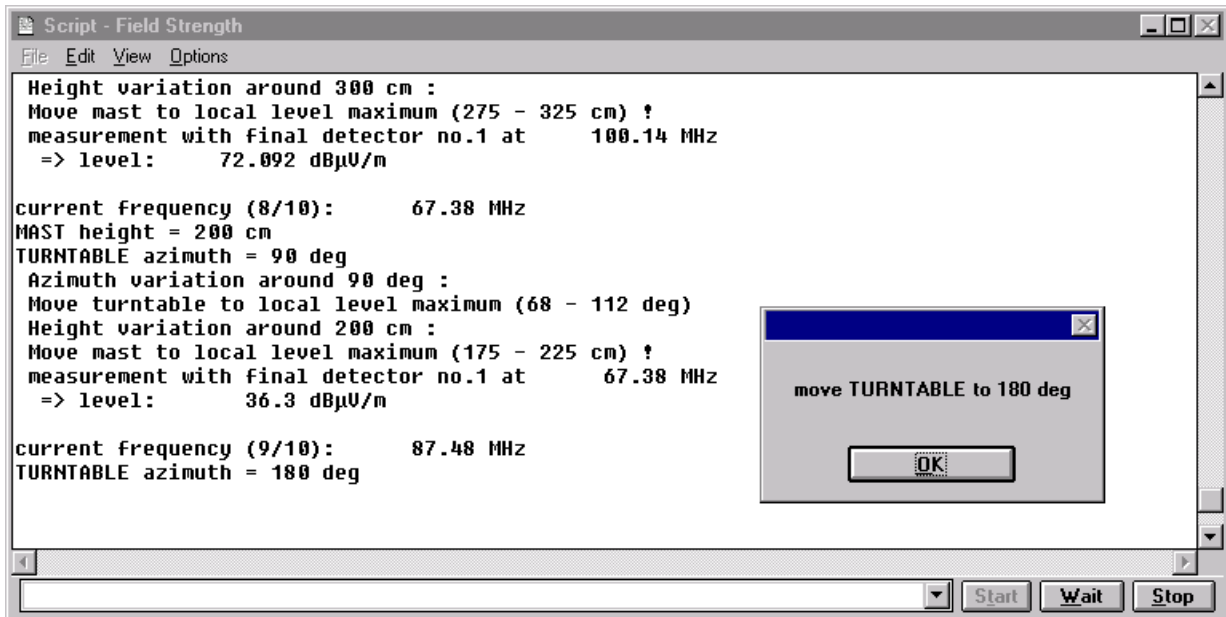


The numeric values for the turntable angle and the mast height are manually entered after each measurement.

The figure shows a dialog box titled "Enter turntable position of local level maximum!". It has a text input field labeled "Position [deg]:" containing the value "45". Below the input field, there are two buttons: "OK" and "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.



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
=> level:      36.717 dBµV/m

current frequency (10/10):      57 MHz
MAST height = 150 cm
TURNTABLE azimuth = 315 deg
Azimuth variation around 315 deg :
Move turntable to local level maximum (293 - 337 deg)
Height variation around 150 cm :
Move mast to local level maximum (125 - 175 cm) ?
measurement with final detector no.1 at      57 MHz
=> level:      33.937 dBµV/m
MAST height = 100 cm
TURNTABLE azimuth = 0 deg
POLARISATION = VERTICAL
sorting frequencies ...
merging results ...

Calculating test range:
ESIX: input protection settings ...
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.

```

current frequency (10/10):      999.62 MHz
MAST height = 350 cm
TURNTABLE azimuth = 315 deg
Azimuth variation around 315 deg :
Move turntable to local level maximum (293 - 337 deg)
Height variation around 350 cm :
Move mast to local level maximum (325 - 375 cm) ?
measurement with final detector no.1 at      999.62 MHz
=> level:      74.308 dBµV/m
MAST height = 100 cm
TURNTABLE azimuth = 0 deg
POLARISATION = VERTICAL
sorting frequencies ...
merging results ...

Test complete

Extracting frequency list(s) from results ...
ESIX: input protection settings ...

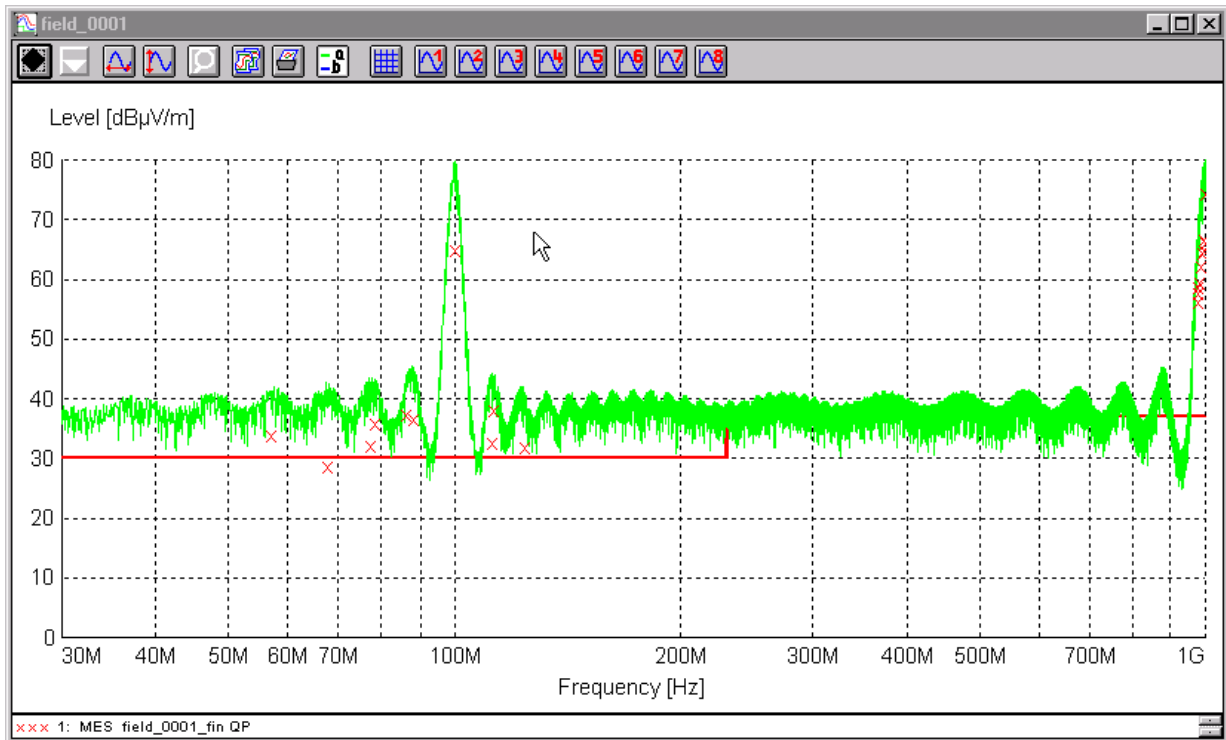
```



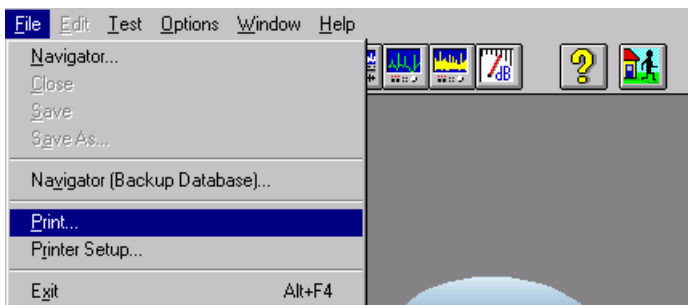
The script routine is then terminated

```
Closing files ...
Deleting temporary data ...
Terminated normally
```

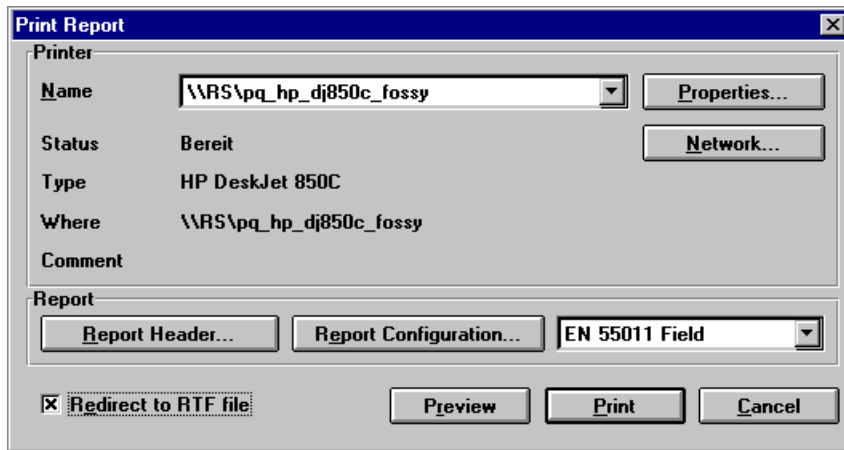
and the result is graphically displayed (in this example in the virtual mode with simulated test results):



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 File menu.



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

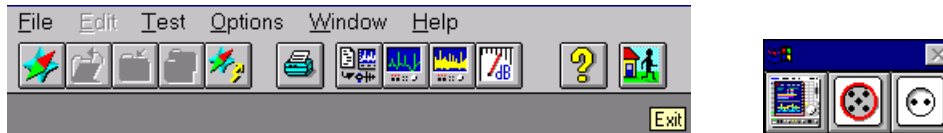


2 Graphical User Interface

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:



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 descriptive texts for each database element.

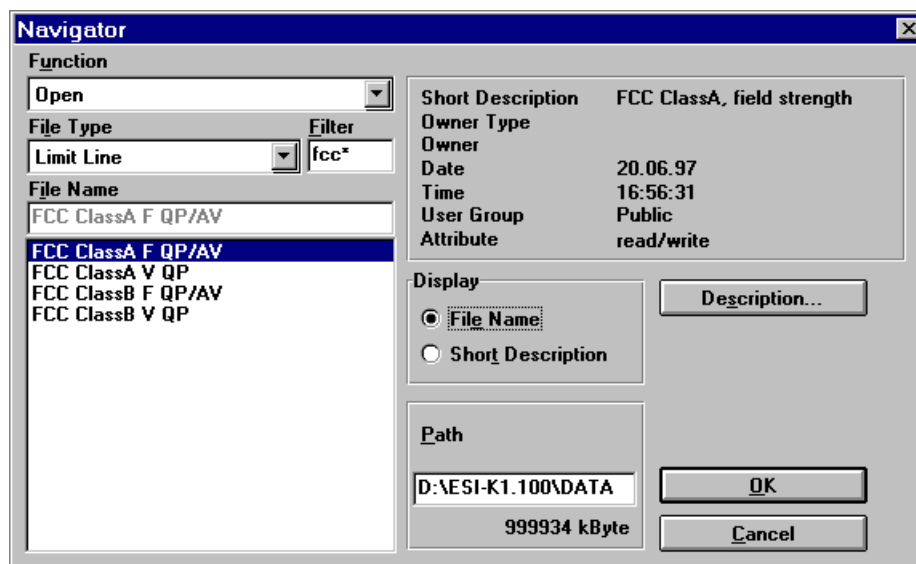
In the following, database elements are referred to as files, however, they are not to be understood in the sense of DOS files.

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:

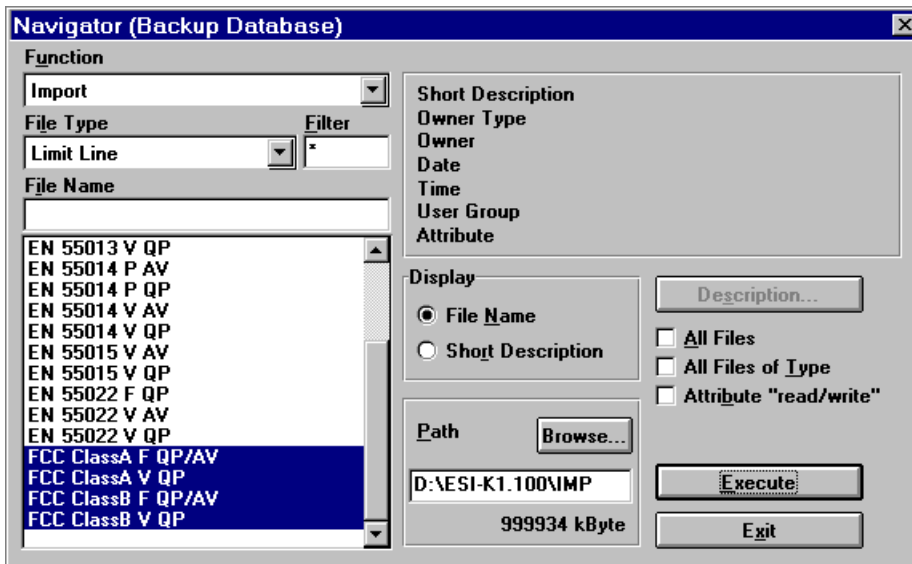
- **Delete**
- **Export**
- **Move**
- **New**
- **Open**
- **Rename**
- **Save As**



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.



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).

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

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 display of 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 (e.g. for cables, paths)	Table editor
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 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 initial, 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:

The screenshot shows a dialog box titled "Description". It has a standard window title bar with a close button. The dialog is divided into several sections:

- File Name:** A text input field containing "HK116".
- Owner:** A dropdown menu, currently empty.
- Short Description:** A text input field containing "Broadband Biconic Antenna".
- User Group:** A dropdown menu containing "Public".
- Attribute:** A dropdown menu containing "read/write".
- Description Area:** A large text area containing "Broadband Biconic Antenna" and "20 - 300 MHz". It has scrollbars on the right and bottom.
- Application Info:** A text area at the bottom, currently empty, with scrollbars on the right and bottom.
- Buttons:** "OK" and "Cancel" buttons are located at the bottom right of the dialog.

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 μ 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 open-area 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):

The screenshot shows a dialog box titled "Script Parameter ['Cable Calibration' : 'Cable Cal']". At the top, there is a "Parameter Set" dropdown menu currently set to "Cable Cal". Below this is a "Test" section with three rows of parameters:

Test	Value
01: ID (max. 12 chars) to be included in filenames	cable_0001
02: global start frequency for the test	100.000000
03: global stop frequency for the test	1000000000.000000

Below the "Test" section is an "Additional Topics" section containing four buttons: "Calibration...", "Graphics...", "Report...", and "ReportHeader...". On the right side of the dialog, there is a vertical stack of buttons: "OK", "Save", "Save As...", "Print", and "Cancel".

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.

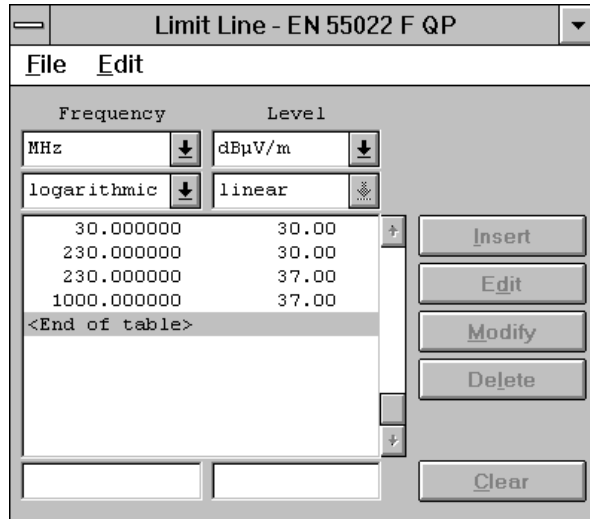
If parameters are deleted from a parameter set, the parameter set can still be used.

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.



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 dBµV (in the case of transducers), the correction level unit is always dB for system transducers.

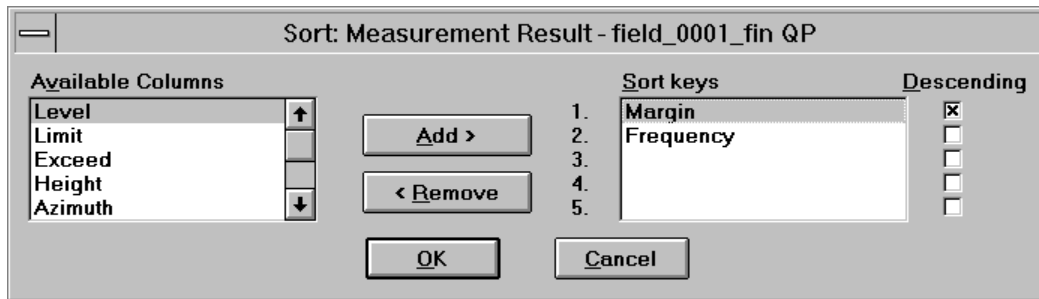
The lower input fields permit to enter new lines, which can be inserted into the list ahead of the active line using **Insert**. As an alternative, the active line in the list can be overwritten by means of **Modify**. **Edit** (or a double-click) permits to copy the contents of the active line into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

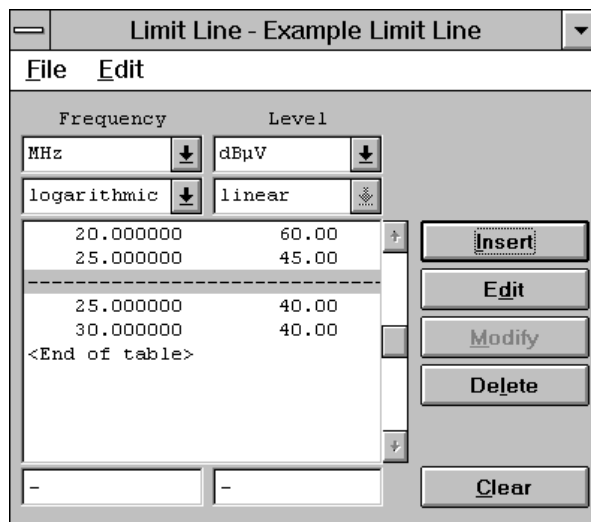


Up to five columns can be defined as **sorting keys** (decreasing priority) with optionally rising or falling values for the elements. Measurements which are not sorted with rising frequency, however, should not be displayed with line graphics display, since the sequence in the list is valid for the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

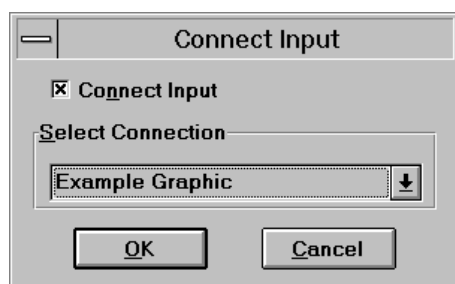
The columns described in the left field can be selected individually and entered or added as sorting criterion by means of **Add**. Likewise, they can be removed again by means of **Remove**, the subsequent entries being shifted accordingly.

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:



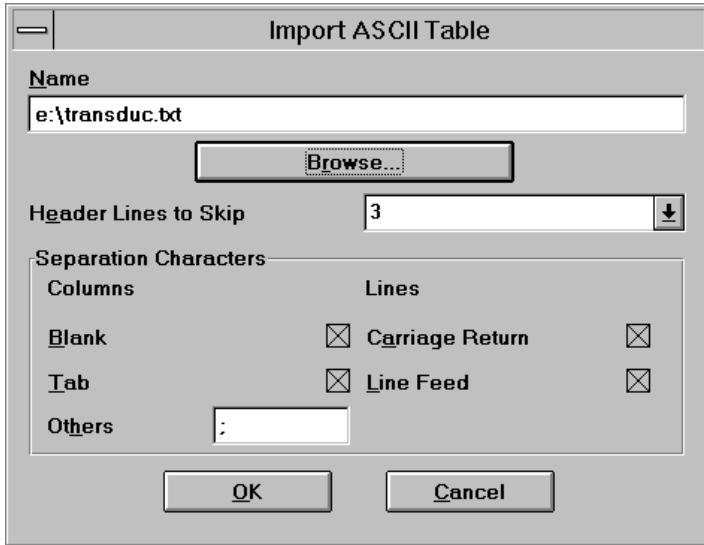
The file type **Frequency List** is provided with a special function which allows comfortable editing of a frequency list: **Connect Input...** determines from which of the opened graphics the marker frequency is to be transferred to the edit field:



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:



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.
```

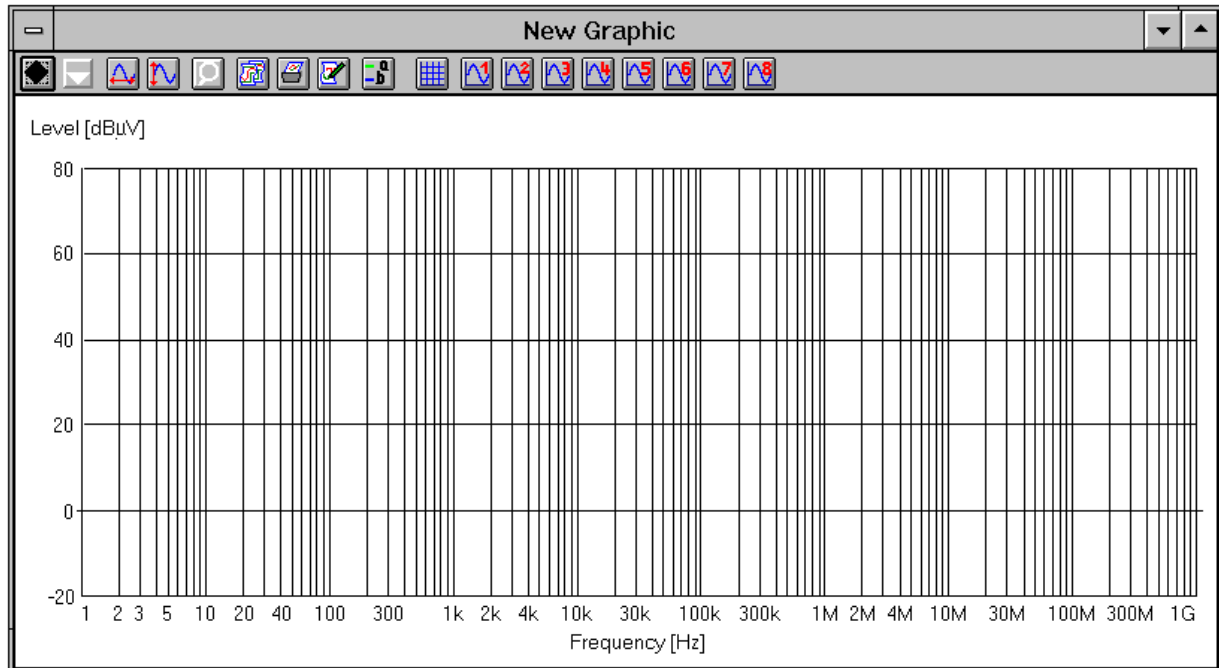
will be correctly be interpreted if there is an extra string column defined.

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.

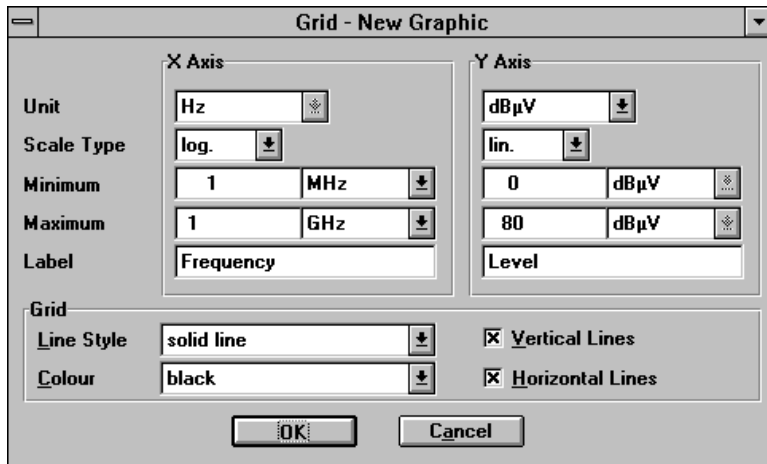
The dialog window is divided into two areas. The upper area contains the function bar for configuration of the graphics elements. Up to 8 trace elements can be edited independently of each other. The lower field displays the configured graphics. A complete graphics configuration comprises the elements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



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 always linear. In addition, the dialog permits to set the colour of the grid as well as to fade out the horizontal or vertical lines.

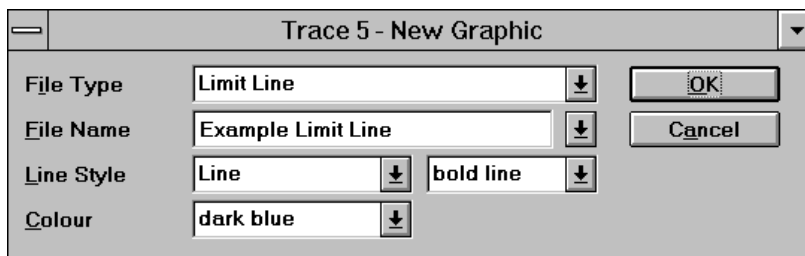
The frequencies of a diagram can easily be modified through shortcuts for the frequency units. A frequency of e.g. 300 MHz can be entered as *300M*.

The line style of the diagram grid can be selected. A dotted 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.

Trace ...

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:



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.*

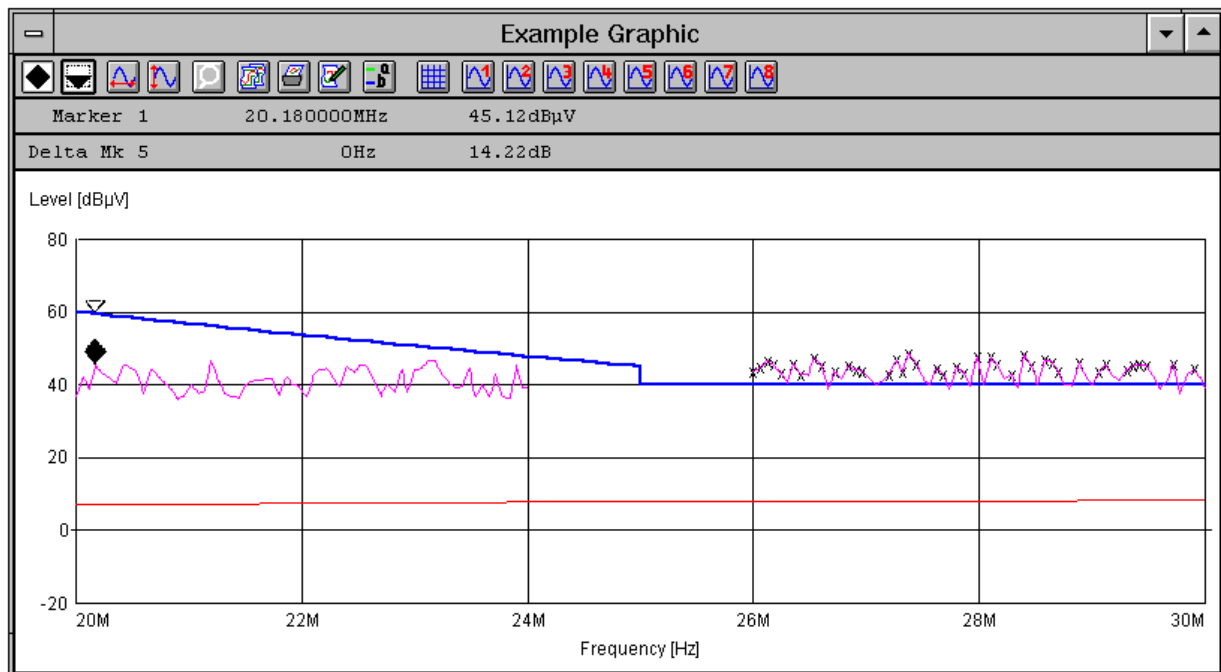
Autoscale X , **Autoscale Y** 

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.

Copy 

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
- MES Measurement 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	
File	
1. Heading	Example Report Header
2. Heading	
EUT	Dummy
Manufacturer	Rohde & Schwarz
Operating Condition	Normal
Test Site	Munich
Operator	Donald Duck
Test Specification	Virtual Mode
Comment	Simulation with Function Generator

OK Cancel

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

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.

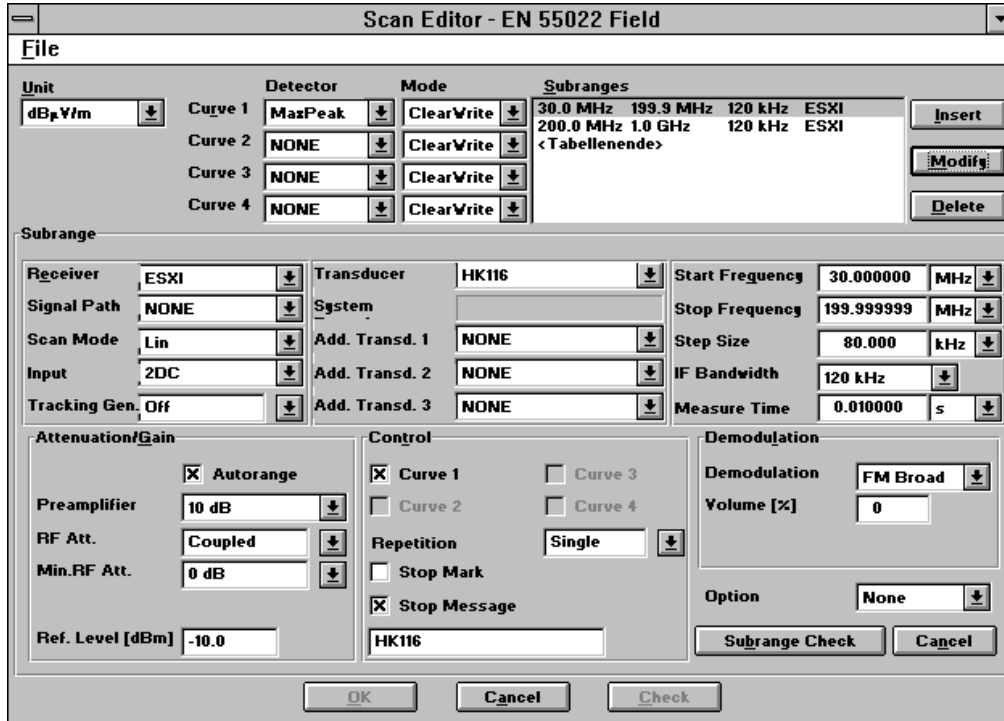
For each part of the test report (e.g. report header, graphics, result list) a number of lines can optionally be reserved. A value of '0' means no reservation, i.e., the number of printed lines simply depends on the content of the referring part. If a number of lines is given, then exactly this number 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 sweep 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.



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

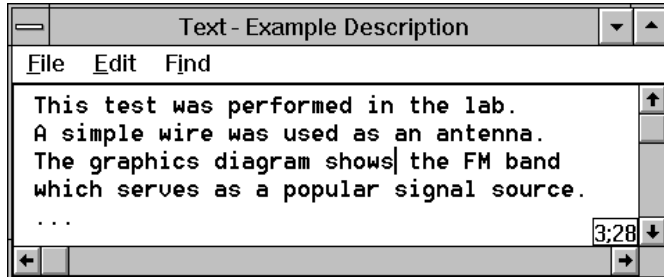
This editor can be used to generate or modify a test configuration (see 2.3).

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.

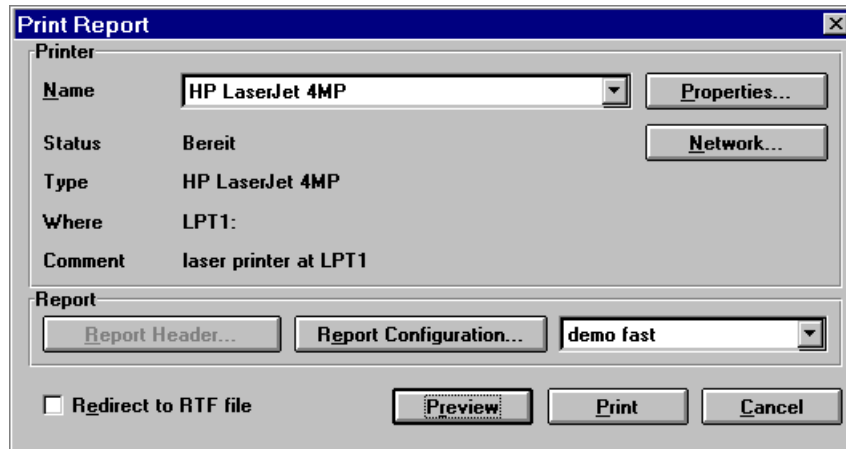


2.5 Report

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):



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 edit 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 obtained 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

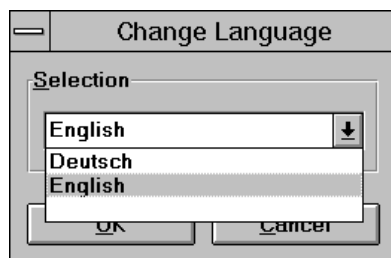
see 2.1 Overview

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.



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" (MAINSRIPT) 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.



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.

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.

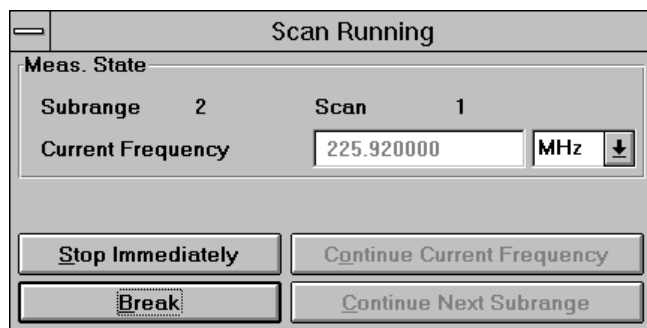
When starting a scan or a sweep, then besides the graphics configuration the software also can create a default **test configuration** or a default **report configuration**.

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.



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).

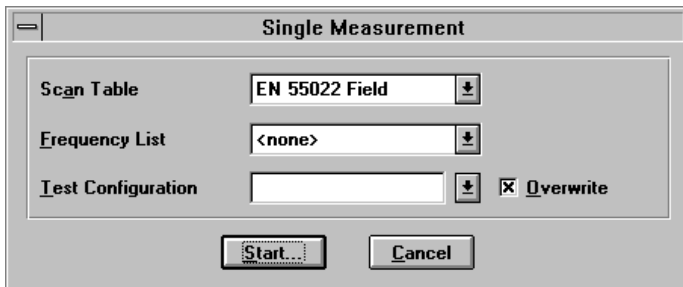
At the end of a scan or sweep, the frequency dependent transducer factor of the last range can optionally be programmed into the receiver - depending on the instrument's capabilities (if the number of correction values in the receiver is not sufficient then they will be interpolated). This way measurements 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

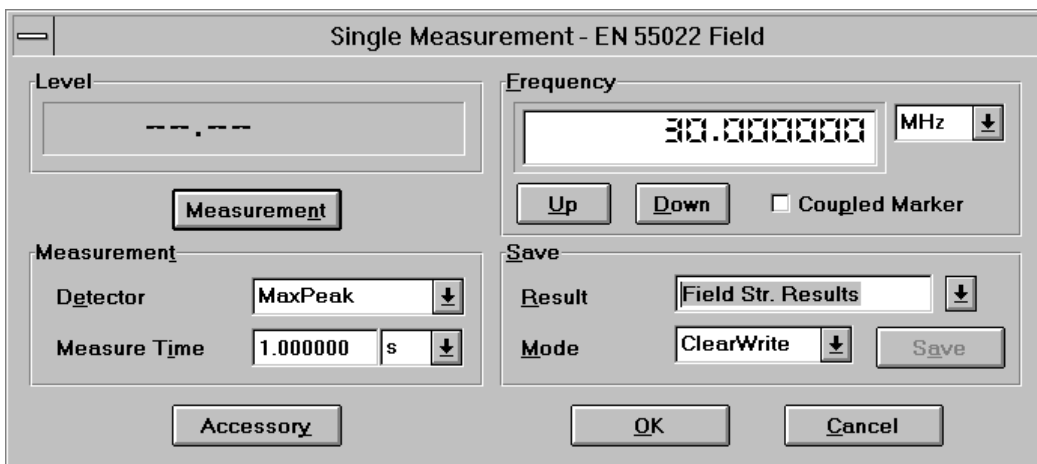
When a single measurement is started, the **Scan Table** to be used and an optional **Frequency List** are to be selected:



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:



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.

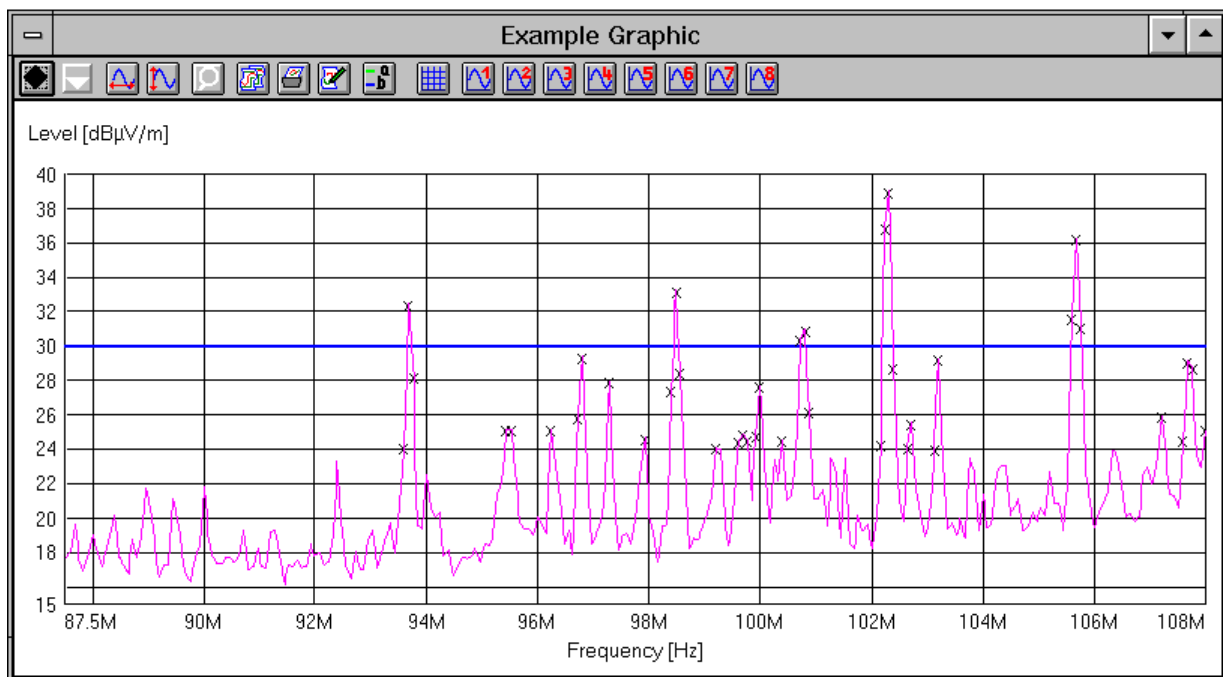
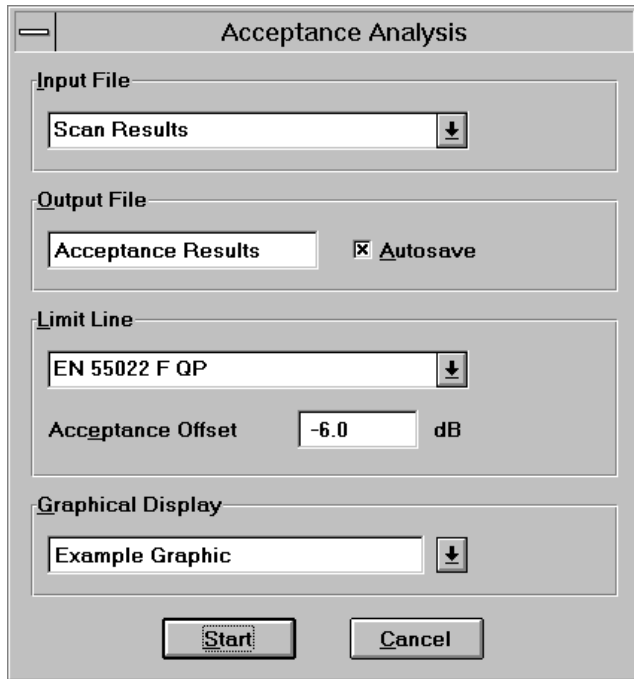
The duration of the evaluation functions is usually a few seconds; however, it may be longer if large input files are involved and if they are to be displayed graphically at the same time. The S-LINE Correlation requires very time-consuming calculations so that the size of the input file makes itself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

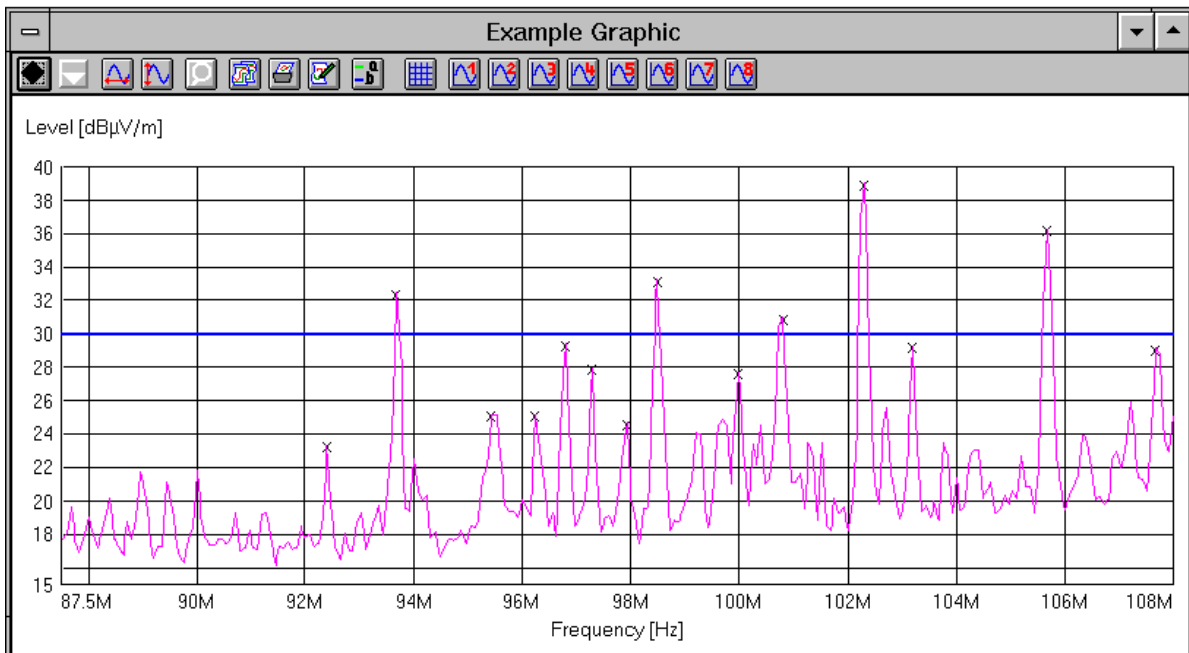
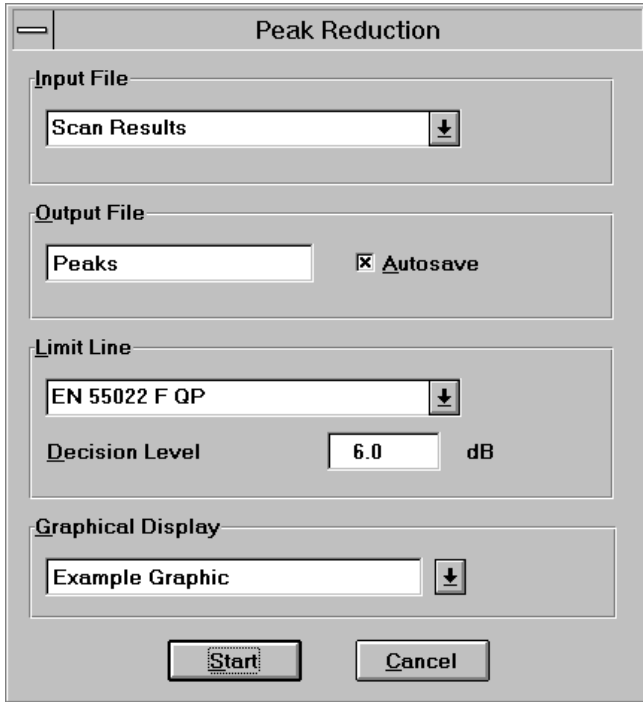


2.9.2 Peak Reduction

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.

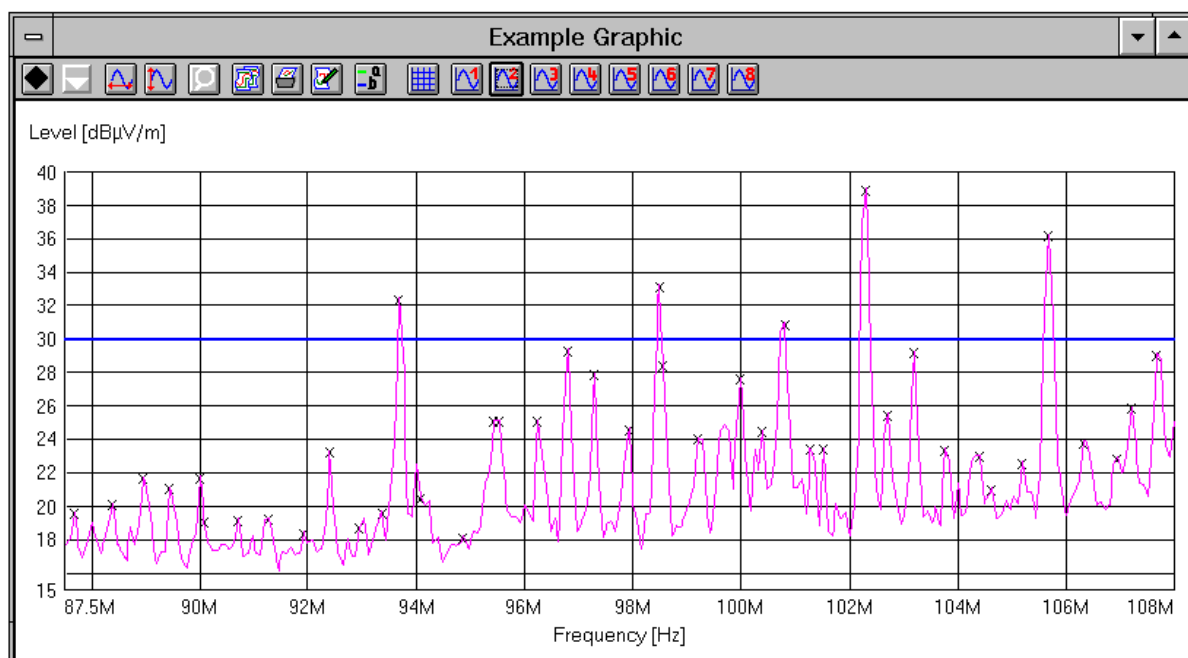
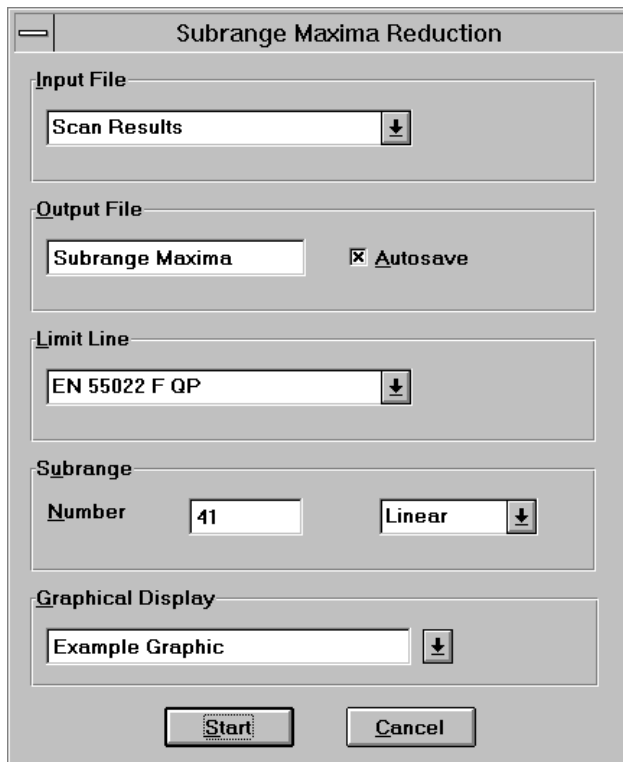
With a decision level of 0 dB, all local maxima are detected as "Peaks", whereas, with a value of e.g. 20 dB, only distinctive narrowband signals are detected.



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.



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 measured in the directions x, y and z in the S-LINE cell. The respective results are referred to as V_x , V_y 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 [V^2], U_{Meas} in [$dB\mu V$]

$$S = 10^{\frac{U_{Meas,x}-120}{10}} + 10^{\frac{U_{Meas,y}-120}{10}} + 10^{\frac{U_{Meas,z}-120}{10}}$$

L in [$dB\mu V/m$], f in [MHz], S in [V^2]

C1: Cell Correction Factor

C2: OATS Correction Factor

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

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:

U_{Limit} in [dB μ V] , L in [dB μ V/m] , f in [MHz]

C1: Cell Correction Factor

C2: OATS Correction Factor

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

S-LINE Correlation

S-LINE Parameter

S-LINE Type: S-LINE 700

Cell Factor: S-LINE 700

Test Site

Correction Factor: S-LINE OATS 10 m

Conversion Mode

Convert Measurement Result

Convert Limit Line

Additional Points: 10

Input File(s)

E: EN 55022 F QP

Output File

Y: EN 55022 S-LINE QP

Graphical Display

Input File(s): <none>

Output File: <none>

Start Cancel

The fields **S-LINE-Parameter** determine the 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.

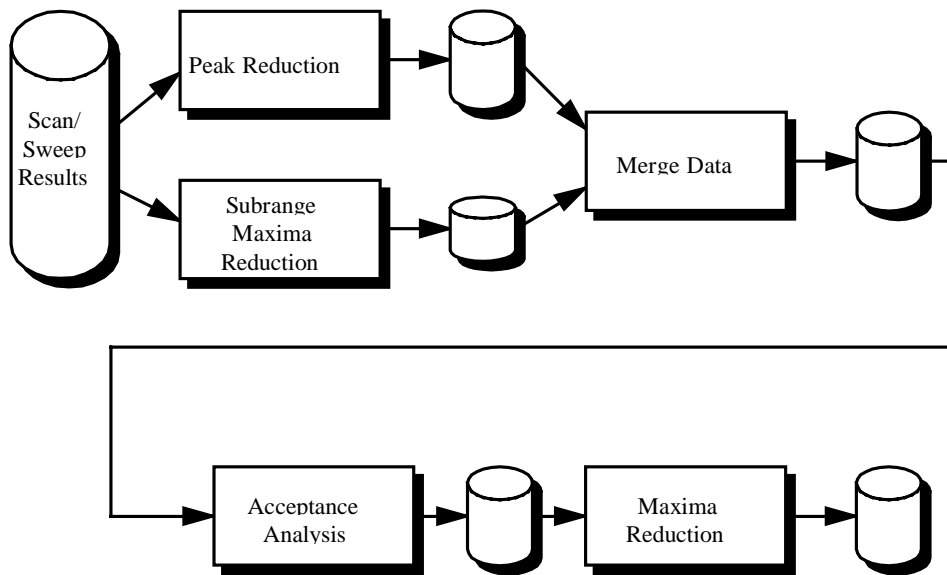
3 Standard Scripts

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.

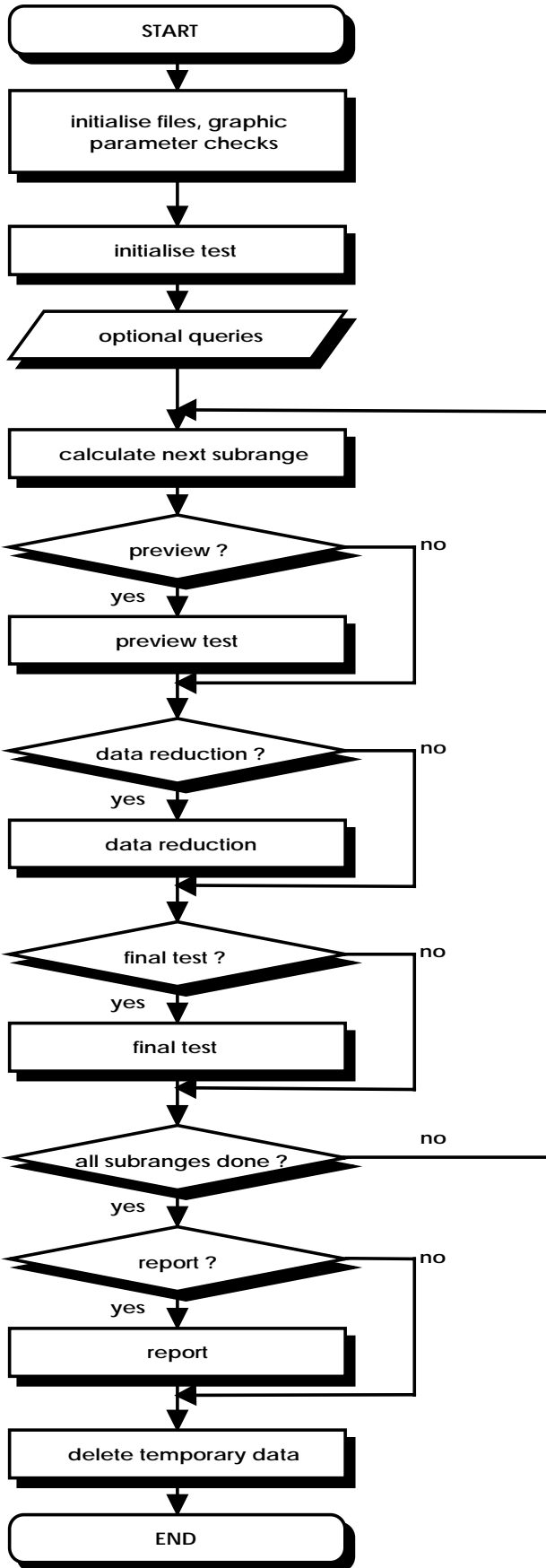
To select other (default) settings for the script parameters (e.g. to run the test with another specification), the selection box on top of the script parameter window has to be used: a list with script parameters matching those of the current test will come up; any of the given script parameter files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

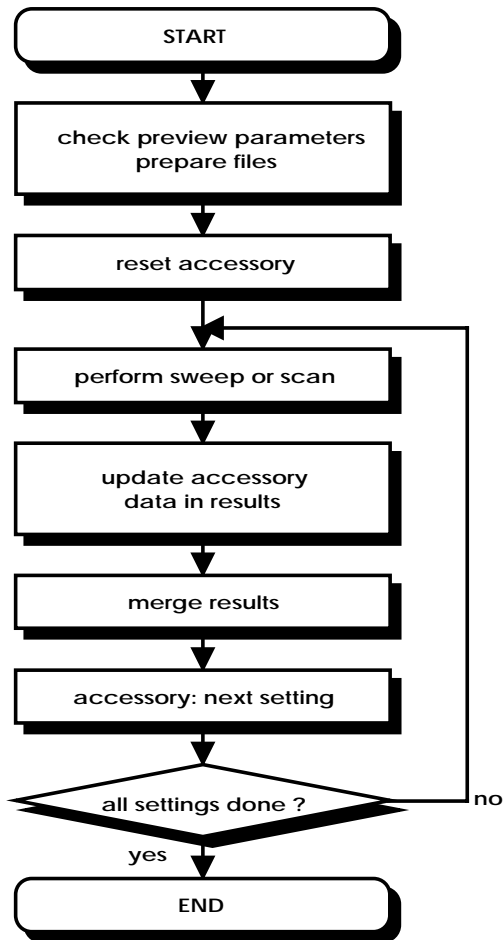
Although the scripts provide automatic printing at the end of a test, sometimes it may be useful to skip the report, redefine some elements in the graphics configuration (e.g. line styles, colours, etc.), in the report header or in the report configuration, and then start the report with the selection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

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

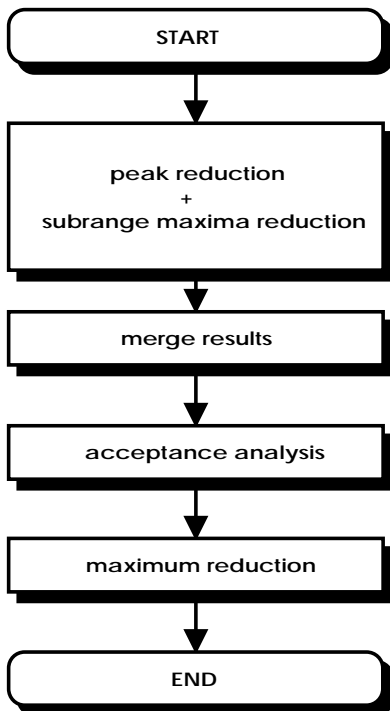
Standard Test Procedure



Preview 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:

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

Frequency Range: 0.15 - 30 MHz
Detectors: QP and AV
Related Standards: VDE 0875 Part 14 , CISPR 14
Test Samples: Household Equipment

EN 55015

Frequency Range: 0.15 - 30 MHz
Detectors: QP and AV
Related Standards: VDE 0875 Part 2 , CISPR 15
Test Samples: Fluorescent Lamps and Luminaries

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:	01: ID max. 12 chars to be included in filenames
Default value:	"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:	02: global start frequency [MHz] for the test
Default value:	0.15
Function:	no measurements will be done below this frequency
Parameter:	03: global stop frequency [MHz] for the test
Default value:	30
Function:	no measurements will be done above this frequency
Parameter:	04: suppress queries as far as possible
Default value:	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:	05: split frequency range into test ranges
Default value:	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:	06: if splitting of frequency range: do with log. scale
Default value:	checked
Function:	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:	1
Function:	defines the number of test ranges that shall be calculated for the splitting of the frequency range
Parameter:	08: test configuration, <none>: ID
Default value:	"<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: 01: preview result file, <none>: ID + '_pre PK'
Default value: "<none>"
Function: optional filename for the PEAK results from the preview test; if no filename is specified then a default name will be used

Parameter: 02: 2nd preview result file, <none>: ID + '_pre AV'
Default value: "<none>"
Function: optional filename for the AVERAGE results from the preview test; if no filename is specified then a default name will be used

Parameter: 03: scan table for preview
Default value: "<none>"
Function: filename of the scan range table to be used for the preview test

Parameter: 04: sweep table for preview
Default value: "<none>"
Function: filename of the sweep range table to be used for the preview test

Topic **DataReduction**

Parameter: 01: QP limit line
Default value: "<none>"
Function: a filename that corresponds to the required limit line for the QUASIPeAK detector

Parameter: 02: AV limit line
Default value: "<none>"
Function: a filename that corresponds to the required limit line for the AVERAGE detector

Parameter: 03: max. no. of results kept per test range
Default value: 6
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
Default value: 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: 05: level offset [dB] for acceptance analysis
Default value: -10.0
Function: determines the level offset when data reduction is done with the "Acceptance Analysis"

Parameter: 06: max. no. of results kept from partial scans
 Default value: 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: 07: partial scan width: no. of IF-BWs (0=use ratio)
 Default value: 0
 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: 08: partial scan width: ref. frequ. ratio
 Default value: 0.01
 Function: determines the frequency range for partial scans (e.g. 0.01 means $\pm 0.5\%$) 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'
 Default value: "<none>"
 Function: optional filename for the QUASPEAK results from the final test; if no filename is specified then a default name will be used

Parameter: 02: 2nd final result file, <none>: ID + '_fin AV'
 Default value: "<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.
 Default value: "<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 QUASPEAK measurements**

Parameter: 04: perform partial scans
 Default value: not checked
 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
 Default value: checked
 Function: 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: 06: time [sec] for final measurements
 Default value: 1.0
 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: 07: optional input: preview result file
 Default value: "<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: 08: optional input: preview result file (2nd det.)
 Default value: "<none>"
 Function: see previous parameter

Parameter: 09: optional input: frequency list
 Default value: "<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: 10: optional input: frequency list (2nd det.)
 Default value: "<none>"
 Function: see previous parameter

Parameter: 11: optional input: final result file
 Default value: "<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: 12: optional input: final result file (2nd det.)
 Default value: "<none>"
 Function: see previous parameter

Topic **Graphics**

Parameter: 01: graphics configuration, <none>: ID
 Default value: "<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: 02: optional graphics template (new graph only)
 Default value: "<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)

Parameter: 03: split result display
 Default value: not checked
 Function: if checked then the results will be displayed with two graphics: the first shows the PEAK and QUASPEAK results and the QUASPEAK 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: 01: generate printer hardcopy
 Default value: 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: 02: report config. for printing, <none>: ID + '_prnt'
 Default value: "<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: 03: footnote, empty field: ID
 Default value: ""
 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 ReportHeader

Parameter: 01: test report header, <none>: ID
 Default value: "<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
 Default value: "<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: "TEST"
 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
 Default value: "Voltage Mains 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
 Default value: "E.u.T."
 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
 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
 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: ""
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
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)
Default value: ""
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: 01: use manual switching only
Default value: checked
Function: 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: not checked
Function: 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')
Default value: checked
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
Default value: checked
Function: if checked then the preview measurements will (also) be done with the protective earth floating

Parameter: 05: 2/4: preview measurements with PE grounded
Default value: checked
Function: if checked then the preview measurements will (also) be done with the protective earth grounded

Parameter: 06: 2/4: preview measurements on line N
Default value: checked
Function: if checked then the preview measurements will (also) be done on the neutral line N

Parameter:	07: 2/4:	preview measurements on line L1
Default value:		checked
Function:		if checked then the preview measurements will (also) be done on the line L1
Parameter:	08: 4:	preview measurements on line L2
Default value:		checked
Function:		if checked then the preview measurements will (also) be done on the line L2
Parameter:	09: 4:	preview measurements on line L3
Default value:		checked
Function:		if checked then the preview measurements will (also) be done on the line L3
Parameter:	10: 2/4:	final measurements with PE floating
Default value:		checked
Function:		if checked then the final measurements will (also) be done with the protective earth floating
Parameter:	11: 2/4:	final measurements with PE grounded
Default value:		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
Default value:		checked
Function:		if checked then the final measurements will (also) be done on the neutral line N
Parameter:	13: 2/4:	final measurements on line L1
Default value:		checked
Function:		if checked then the final measurements will (also) be done on the line L1
Parameter:	14: 4:	final measurements on line L2
Default value:		checked
Function:		if checked then the final measurements will (also) be done on the line L2
Parameter:	15: 4:	final measurements on line L3
Default value:		checked
Function:		if checked then the final measurements will (also) be done on the line L3
Parameter:	16:	single line LISN (manual)
Default value:		not checked
Function:		if checked then a single-line-LISN for measurements on a number of supply lines is assumed
Parameter:	17: sgl.:	no. of lines to be measured for preview
Default value:		0
Function:		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
Default value:		0
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

Topic Test

Parameter:	01: ID max. 12 chars to be included in filenames
Default value:	"pow_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:	02: global start frequency [MHz] for the test
Default value:	30
Function:	no measurements will be done below this frequency
Parameter:	03: global stop frequency [MHz] for the test
Default value:	300
Function:	no measurements will be done above this frequency
Parameter:	04: suppress queries as far as possible
Default value:	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:	05: split frequency range into test ranges
Default value:	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:	06: if splitting of frequency range: do with log. scale
Default value:	checked
Function:	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:	1
Function:	defines the number of test ranges that shall be calculated for the splitting of the frequency range
Parameter:	08: test configuration, <none>: ID
Default value:	"<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: 01: preview result file, <none>: ID + '_pre PK'
Default value: "<none>"
Function: optional filename for the PEAK results from the preview test; if no filename is specified then a default name will be used

Parameter: 02: 2nd preview result file, <none>: ID + '_pre AV'
Default value: "<none>"
Function: optional filename for the AVERAGE results from the preview test; if no filename is specified then a default name will be used

Parameter: 03: scan table for preview
Default value: "<none>"
Function: filename of the scan range table to be used for the preview test

Parameter: 04: sweep table for preview
Default value: "<none>"
Function: filename of the sweep range table to be used for the preview test

Parameter: 05: complete search (all accessory settings)
Default value: not checked
Function: 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 one 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>"
Function: a filename that corresponds to the required limit line for the QUASPEAK detector

Parameter: 02: AV limit line
Default value: "<none>"
Function: a filename that corresponds to the required limit line for the AVERAGE detector

Parameter: 03: max. no. of results kept per test range
Default value: 10
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
Default value: 20
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: 05: level offset [dB] for acceptance analysis
Default value: -40.0
Function: determines the level offset when data reduction is done with the "Acceptance Analysis"

Parameter: 06: max. no. of results kept from partial scans
 Default value: 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: 07: partial scan width: no. of IF-BWs (0=use ratio)
 Default value: 0
 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: 08: partial scan width: ref. frequ. ratio
 Default value: 0.01
 Function: determines the frequency range for partial scans (e.g. 0.01 means $\pm 0.5\%$) 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'
 Default value: "<none>"
 Function: optional filename for the QUASPEAK results from the final test; if no filename is specified then a default name will be used

Parameter: 02: 2nd final result file, <none>: ID + '_fin AV'
 Default value: "<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.
 Default value: "<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 QUASPEAK measurements**

Parameter: 04: perform partial scans
 Default value: not checked
 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
 Default value: 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:	06: time [sec] for final measurements
Default value:	1.0
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:	07: perform accessory adjustment
Default value:	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
Default value:	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 of the absorbing clamp
Parameter:	09: optional input: preview result file
Default value:	"<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:	10: optional input: preview result file (2nd det.)
Default value:	"<none>"
Function:	see previous parameter
Parameter:	11: optional input: frequency list
Default value:	"<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:	12: optional input: frequency list (2nd det.)
Default value:	"<none>"
Function:	see previous parameter
Parameter:	13: optional input: final result file
Default value:	"<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:	14: optional input: final result file (2nd det.)
Default value:	"<none>"
Function:	see previous parameter

Topic Graphics

Parameter: 01: graphics configuration, <none>: ID
Default value: "<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: 02: optional graphics template (new graph only)
Default value: "<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)

Parameter: 03: split result display
Default value: not checked
Function: 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: 01: generate printer hardcopy
Default value: 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: 02: report config. for printing, <none>: ID + '_prnt'
Default value: "<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: 03: footnote, empty field: ID
Default value: ""
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 ReportHeader

Parameter: 01: test report header, <none>: ID
Default value: "<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
Default value: "<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: "TEST"
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
Default value: "Power 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

Default value: "E.u.T."

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

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

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: ""

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

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)

Default value: ""

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: position to be used for measurements (normally 0 cm)

- Parameter: 03: no. of steps per shortest half wave length (preview)
Default value: 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: 04: max. length [cm] to be measured (finals)
Default value: 500
Function: 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: 05: no. of steps per shortest half wave length (finals)
Default value: 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, see example above (parameter *Clamp 07*)
- Parameter: 06: no. of steps as adjustment range (finals)
Default value: 1
Function: 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: 30 - 1000 MHz
Detector: QP
Related Standards: VDE 0875 Part 11 , CISPR 11
Test Samples: ISM: Class B; Group 1
Distance: 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

Topic Test

- Parameter: 01: ID max. 12 chars to be included in filenames
Default value: "field_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: 02: global start frequency [MHz] for the test
Default value: 30
Function: no measurements will be done below this frequency
- Parameter: 03: global stop frequency [MHz] for the test
Default value: 1000
Function: no measurements will be done above this frequency
- Parameter: 04: suppress queries as far as possible
Default value: 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: 05: split frequency range into test ranges
Default value: 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 *Test 07* 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: 06: if splitting of frequency range: do with log. scale
Default value: checked
Function: 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: 1
Function: defines the number of test ranges that shall be calculated for the splitting of the frequency range
- Parameter: 08: test configuration, <none>: ID
Default value: "<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: 01: preview result file, <none>: ID + '_pre PK'
Default value: "<none>"
Function: optional filename for the PEAK results from the preview test; if no filename is specified then a default name will be used

Parameter: 02: optional 2nd preview result file, <none>: ID + '_pre AV'
Default value: "<none>"
Function: optional filename for the AVERAGE results from the preview test; if no filename is specified then a default name will be used

Parameter: 03: scan table for preview
Default value: "<none>"
Function: filename of the scan range table to be used for the preview test

Parameter: 04: optional 2nd scan table for preview (vertical)
Default value: "<none>"
Function: 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

Parameter: 05: sweep table for preview
Default value: "<none>"
Function: filename of the sweep range table to be used for the preview test

Parameter: 06: optional 2nd sweep table for preview (vertical)
Default value: "<none>"
Function: 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

Parameter: 07: complete search (all accessory settings)
Default value: not checked
Function: 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 one 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>"
Function: a filename that corresponds to the required limit line for the QUASPEAK detector

Parameter:	02: optional QP acceptance line (no offset)
Default value:	"<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
Default value:	"<none>"
Function:	a filename that corresponds to the required limit line for the AVERAGE detector
Parameter:	04: optional AV acceptance line (no offset)
Default value:	"<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 AVERAGE results; if used then the given value for the acceptance offset will be ignored
Parameter:	05: final measurements according to FCC standard
Default value:	not checked
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
Default value:	6
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
Default value:	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:	08: level offset [dB] for acceptance analysis
Default value:	-10.0
Function:	determines the level offset when data reduction is done with the "Acceptance Analysis"
Parameter:	09: max. no. of results kept from partial scans
Default value:	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:	10: partial scan width: no. of IF-BWs (0=use ratio)
Default value:	0
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: 11: partial scan width: ref. frequ. ratio
 Default value: 0.01
 Function: determines the frequency range for partial scans (e.g. 0.01 means $\pm 0.5\%$) 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'
 Default value: "<none>"
 Function: optional filename for the QUASPEAK results from the final test; if no filename is specified then a default name will be used

Parameter: 02: 2nd final result file, <none>: ID + '_fin AV'
 Default value: "<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.
 Default value: "<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 optional AVERAGE) detector in combination with a short measurement time, while the other settings **have to be suitable also for QUASPEAK measurements**

Parameter: 04: optional 2nd scan table (vertical)
 Default value: "<none>"
 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
 Default value: not checked
 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: 06: complete search
 Default value: checked
 Function: determines the search mode for the preview test: complete search means that measurements will be done on all mast/turtable/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/turtable/polarisation settings that were determined through a "complete search" in the preview test

Parameter: 07: time [sec] for final measurements
 Default value: 1.0
 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: 08: perform accessory adjustment
Default value: checked
Function: 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: 09: accessory adjustment full range
Default value: 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: 10: optional input: preview result file
Default value: "<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.)
Default value: "<none>"
Function: see previous parameter

Parameter: 12: optional input: frequency list
Default value: "<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.)
Default value: "<none>"
Function: see previous parameter

Parameter: 14: optional input: final result file
Default value: "<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: 15: optional input: final result file (2nd det.)
Default value: "<none>"
Function: see previous parameter

Topic **Graphics**

Parameter: 01: graphics configuration, <none>: ID
Default value: "<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: 02: optional graphics template (new graph only)
Default value: "<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: 01: generate printer hardcopy
 Default value: 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: 02: report config. for printing, <none>: ID + '_prnt'
 Default value: "<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: 03: footnote, empty field: ID
 Default value: ""
 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 ReportHeader

Parameter: 01: test report header, <none>: ID
 Default value: "<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
 Default value: "<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: "TEST"
 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
 Default value: "Field Strength 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
 Default value: "E.u.T."
 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
 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
 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:	""
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
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)
Default value:	""
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
Parameter:	07: control priority level (1=highest)
Default value:	1
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 measured for preview
Default value:	100
Function:	depending on the mode of the preview test: complete preview search: minimum height to be used for measurements else: value will be ignored
Parameter:	09: fixed/max. height [cm] to be measured for preview
Default value:	300
Function:	depending on the mode of the preview test: complete preview search: determines the maximum height to be used for measurements else: fixed height to be used for measurements

Parameter: 10: height stepsize [cm] for preview
 Default value: 200
 Function: stepsize for height variation in the preview test; normally two or three 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 height range for an optional "adjustment", if the final test is done without complete search

Parameter: 11: min. height [cm] to be measured for finals
 Default value: 100
 Function: depending on the mode of the final test:
 complete final search: determines the minimum height of the mast to be used for measurements in the final test
 else: preview data will be used

Parameter: 12: max. height [cm] to be measured for finals
 Default value: 400
 Function: depending on the mode of the final test:
 complete final search: determines the maximum height of the mast to be used for measurements in the final test
 else: preview data will be used

Parameter: 13: height stepsize [cm] for finals
 Default value: 50
 Function: stepsize for height variation in the final test; this stepsize will also be used as the height range for an optional "adjustment", if the final test is done with a complete search

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

Parameter: 02: control priority level (1=highest)
 Default value: 2
 Function: defines the priority level of the controlling of the turntable azimuth (in combination with antenna height and antenna polarisation): a value of 1 means highest priority, 3 means lowest priority

Parameter: 03: min. azimuth [deg] to be measured for preview
 Default value: 90
 Function: depending on the mode of the preview test:
 complete preview search: minimum azimuth to be used for measurements
 else: value will be ignored

Parameter: 04: fixed/max. azimuth [deg] to be measured for preview
 Default value: 270
 Function: depending on the mode of the preview test:
 complete preview search: determines the maximum azimuth to be used for measurements
 else: fixed azimuth to be used for measurements

Parameter: 05: azimuth stepsize [deg] for preview
 Default value: 180
 Function: 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: 06: min. azimuth [deg] to be measured for finals
 Default value: 0
 Function: depending on the mode of the final test:
 complete final search: determines the minimum azimuth of the turntable to be used for measurements in the final test
 else: preview data will be used

Parameter: 07: max. azimuth [deg] to be measured for finals
 Default value: 360
 Function: depending on the mode of the final test:
 complete final search: determines the azimuth of the turntable to be used for measurements in the final test
 else: preview data will be used

Parameter: 08: azimuth stepsize [deg] for finals
 Default value: 45
 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

Topic **Polarisation**

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

Parameter: 02: control priority level (1=highest)
 Default value: 3
 Function: defines the priority level of the controlling of the antenna polarisation (in combination with antenna height and turntable azimuth): a value of 1 means highest priority, 3 means lowest priority

Parameter: 03: preview measurements with horizontal polaris.
 Default value: not checked
 Function: if checked then the preview measurements will (also) be done with horizontal polarisation

Parameter: 04: preview measurements with vertical polaris.
 Default value: not checked
 Function: if checked then the preview measurements will (also) be done with vertical polarisation

Parameter: 05: final measurements with horizontal polaris.
 Default value: not checked
 Function: if checked then the final measurements will (also) be done with horizontal polarisation

Parameter: 06: final measurements with vertical polaris.
 Default value: not checked
 Function: if checked then the final measurements will (also) be done with vertical polarisation

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

Topic Test

Parameter:	01: ID max. 12 chars to be included in filenames
Default value:	"mfield_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:	02: global start frequency [MHz] for the test
Default value:	0.09
Function:	no measurements will be done below this frequency
Parameter:	03: global stop frequency [MHz] for the test
Default value:	30
Function:	no measurements will be done above this frequency
Parameter:	04: suppress queries as far as possible
Default value:	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:	05: split frequency range into test ranges
Default value:	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:	06: if splitting of frequency range: do with log. scale
Default value:	checked
Function:	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:	1
Function:	defines the number of test ranges that shall be calculated for the splitting of the frequency range
Parameter:	08: test configuration, <none>: ID
Default value:	"<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: 01: preview result file, <none>: ID + '_pre PK'
Default value: "<none>"
Function: optional filename for the PEAK results from the preview test; if no filename is specified then a default name will be used

Parameter: 02: 2nd preview result file, <none>: ID + '_pre AV'
Default value: "<none>"
Function: optional filename for the AVERAGE results from the preview test; if no filename is specified then a default name will be used

Parameter: 03: scan table for preview
Default value: "<none>"
Function: filename of the scan range table to be used for the preview test

Parameter: 04: sweep table for preview
Default value: "<none>"
Function: filename of the sweep range table to be used for the preview test

Topic **DataReduction**

Parameter: 01: QP limit line
Default value: "<none>"
Function: a filename that corresponds to the required limit line for the QUASIPeAK detector

Parameter: 02: AV limit line
Default value: "<none>"
Function: a filename that corresponds to the required limit line for the AVERAGE detector

Parameter: 03: max. no. of results kept per test range
Default value: 6
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
Default value: 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: 05: level offset [dB] for acceptance analysis
Default value: -10.0
Function: determines the level offset when data reduction is done with the "Acceptance Analysis"

Parameter: 06: max. no. of results kept from partial scans
 Default value: 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: 07: partial scan width: no. of IF-BWs (0=use ratio)
 Default value: 0
 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: 08: partial scan width: ref. frequ. ratio
 Default value: 0.01
 Function: determines the frequency range for partial scans (e.g. 0.01 means $\pm 0.5\%$) 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'
 Default value: "<none>"
 Function: optional filename for the QUASPEAK results from the final test; if no filename is specified then a default name will be used

Parameter: 02: 2nd final result file, <none>: ID + '_fin AV'
 Default value: "<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.
 Default value: "<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 QUASPEAK measurements**

Parameter: 04: perform partial scans
 Default value: not checked
 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
 Default value: checked
 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 search" in the preview test

Parameter: 06: time [sec] for final measurements
Default value: 1.0
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: 07: optional input: preview result file
Default value: "<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: 08: optional input: preview result file (2nd det.)
Default value: "<none>"
Function: see previous parameter

Parameter: 09: optional input: frequency list
Default value: "<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: 10: optional input: frequency list (2nd det.)
Default value: "<none>"
Function: see previous parameter

Parameter: 11: optional input: final result file
Default value: "<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: 12: optional input: final result file (2nd det.)
Default value: "<none>"
Function: see previous parameter

Topic **Graphics**

Parameter: 01: graphics configuration, <none>: ID
Default value: "<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: 02: optional graphics template (new graph only)
Default value: "<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: 01: generate printer hardcopy
Default value: 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: 02: report config. for printing, <none>: ID + '_prnt'
Default value: "<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: 03: footnote, empty field: ID
Default value: ""
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 ReportHeader

Parameter: 01: test report header, <none>: ID
Default value: "<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
Default value: "<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: "TEST"
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
Default value: "Magn. Field Strength 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
Default value: "E.u.T."
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
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
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:	""
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
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)
Default value:	""
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 **LoopAntenna**

Parameter:	01: use loop antenna position switching
Default value:	checked
Function:	if checked then manual control of the loop antenna through dialogue boxes will be used
Parameter:	02: preview measurements on loop X
Default value:	checked
Function:	if checked then the preview measurements will (also) be done with the antenna loop "X"
Parameter:	03: preview measurements on loop Y
Default value:	checked
Function:	if checked then the preview measurements will (also) be done with the antenna loop "Y"
Parameter:	04: preview measurements on loop Z
Default value:	checked
Function:	if checked then the preview measurements will (also) be done with the antenna loop "Z"
Parameter:	05: final measurements on loop X
Default value:	checked
Function:	if checked then the final measurements will (also) be done with the antenna loop "X"
Parameter:	06: final measurements on loop Y
Default value:	checked
Function:	if checked then the final measurements will (also) be done with the antenna loop "Y"
Parameter:	07: final measurements on loop Z
Default value:	checked
Function:	if checked then the final measurements will (also) be done with the antenna loop "Z"

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
Parameter:	02: min. azimuth [deg] to be measured for preview
Default value:	90
Function:	depending on the mode of the preview test: complete preview search: minimum azimuth to be used for measurements else: value will be ignored
Parameter:	03: fixed/max. azimuth [deg] to be measured for preview
Default value:	270
Function:	depending on the mode of the preview test: complete preview search: determines the maximum azimuth to be used for measurements else: fixed azimuth to be used for measurements
Parameter:	04: azimuth stepsize [deg] for preview
Default value:	180
Function:	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
Default value:	0
Function:	depending on the mode of the final test: complete final search: determines the minimum azimuth of the turntable to be used for measurements in the final test else: preview data will be used
Parameter:	06: max. azimuth [deg] to be measured for finals
Default value:	360
Function:	depending on the mode of the final test: complete final search: determines the azimuth of the turntable to be used for measurements in the final test else: preview data will be used
Parameter:	07: azimuth stepsize [deg] for finals
Default value:	45
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

Topic **Test**

Parameter:	01: ID max. 12 chars to be included in filenames
Default value:	"ovw_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:	02: global start frequency [MHz] for the test
Default value:	30
Function:	no measurements will be done below this frequency
Parameter:	03: global stop frequency [MHz] for the test
Default value:	1000
Function:	no measurements will be done above this frequency
Parameter:	04: suppress queries as far as possible
Default value:	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:	05: split frequency range into test ranges
Default value:	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:	06: if splitting of frequency range: do with log. scale
Default value:	checked
Function:	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:	1
Function:	defines the number of test ranges that shall be calculated for the splitting of the frequency range
Parameter:	08: test configuration, <none>: ID
Default value:	"<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:	01: preview result file, <none>: ID + '_pre PK'
Default value:	"<none>"
Function:	optional filename for the PEAK results from the preview test; if no filename is specified then a default name will be used
Parameter:	02: 2nd preview result file, <none>: ID + '_pre AV'
Default value:	"<none>"
Function:	optional filename for the AVERAGE results from the preview test; if no filename is specified then a default name will be used
Parameter:	03: scan table for preview
Default value:	"<none>"
Function:	filename of the scan range table to be used for the preview test
Parameter:	04: sweep table for preview
Default value:	"<none>"
Function:	filename of the sweep range table to be used for the preview test
Parameter:	05: optional input: preview result file
Default value:	"<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 data reduction, one (for PK+AV results) or optionally two (1st for PK, 2nd for AV) input files
Parameter:	06: optional input: preview result file (2nd det.)
Default value:	"<none>"
Function:	see previous parameter

Topic **DataReduction**

Parameter:	01: perform manual (interactive) data reduction
Default value:	not checked
Function:	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:	02: perform automatic data reduction
Default value:	not checked
Function:	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:	03: QP limit line
Default value:	"<none>"
Function:	a filename that corresponds to the required limit line for the QUASIPeAK detector
Parameter:	04: optional QP acceptance line (no offset)
Default value:	"<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:	05: optional AV limit line
Default value:	"<none>"
Function:	a filename that corresponds to the required limit line for the AVERAGE detector

Parameter:	06: optional AV acceptance line (no offset)
Default value:	"<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 AVERAGE results; if used then the given value for the acceptance offset will be ignored
Parameter:	07: max. no. of results kept per test range
Default value:	6
Function:	the maximum number of results that will be kept from each test range through data reduction
Parameter:	08: decision threshold [dB] for peak reduction
Default value:	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:	09: level offset [dB] for acceptance analysis
Default value:	-10.0
Function:	determines the level offset when data reduction is done with the "Acceptance Analysis"

Topic Monitor

Parameter:	01: scan table for preview
Default value:	"<keine>"
Default value:	"<none>"
Function:	filename of the scan table to be used for partial scans; this parameter cannot be used together with the next parameter
Parameter:	02: sweep table for preview
Default value:	"<keine>"
Function:	filename of the sweep table to be used for partial sweeps; this parameter cannot be used together with the previous parameter
Parameter:	03: partial scan/sweep width: no. of IF-BWs (0=use ratio)
Default value:	0
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:	04: partial scan/sweep width: ref. frequ. ratio
Default value:	0.01
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: 01: final result file, <none>: ID + '_fin PK'
Default value: "<none>"
Function: optional filename for the PEAK results from the data reduction; if no filename is specified then a default name will be used

Parameter: 02: 2nd final result file, <none>: ID + '_fin AV'
Default value: "<none>"
Function: optional filename for the AVERAGE results from the data reduction; if no filename is specified then a default name will be used

Topic Graphics

Parameter: 01: graphics configuration, <none>: ID
Default value: "<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: 02: optional graphics template (new graph only)
Default value: "<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: 01: generate printer hardcopy
Default value: 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: 02: report config. for printing, <none>: ID + '_prnt'
Default value: "<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: 03: footnote, empty field: ID
Default value: ""
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 ReportHeader

Parameter: 01: test report header, <none>: ID
Default value: "<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
Default value: "<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: "TEST"
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
Default value: "Overview"
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
Default value: "E.u.T."
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
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
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: ""
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

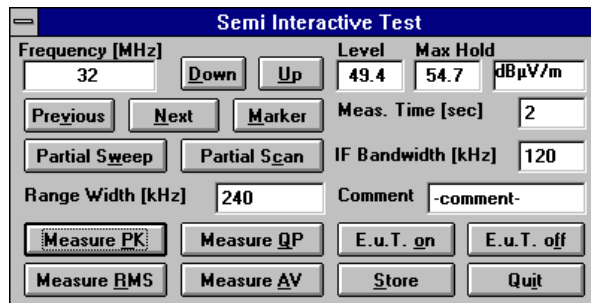
Parameter: 11: comment line
Default value: ""
Function: a string that will be taken as a comment line ; if no string is given then the referring entry of the report header won't be changed

Parameter: 12: 2nd comment line (empty field: start time)
Default value: ""
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

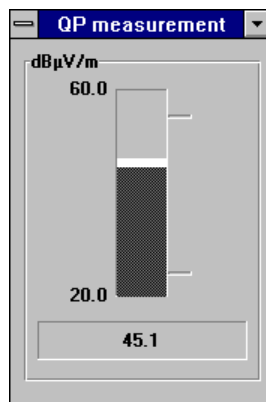
3.6 Semi Interactive Test

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:



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 continuous 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 its "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

Topic Test

Parameter:	01: ID max. 12 chars to be included in filenames
Default value:	"semi_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:	02: global start frequency [MHz] for the test
Default value:	30
Function:	no measurements will be done below this frequency
Parameter:	03: global stop frequency [MHz] for the test
Default value:	1000
Function:	no measurements will be done above this frequency
Parameter:	04: suppress queries as far as possible
Default value:	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:	05: frequency list to be used (if next param is NONE)
Default value:	"<keine>"
Function:	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
Parameter:	06: measurement result to be used
Default value:	"<keine>"
Function:	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
Parameter:	07: test configuration, <none>: ID
Default value:	"<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 **Final**

Parameter: 01: final result file, <none>: ID + '_fin PK'
Default value: "<none>"
Function: optional filename for the PEAK results from the data reduction; if no filename is specified then a default name will be used

Parameter: 02: 2nd final result file, <none>: ID + '_fin QP'
Default value: "<none>"
Function: optional filename for the QUASIPEAK results from the data reduction; if no filename is specified then a default name will be used

Parameter: 03: 3rd final result file, <none>: ID + '_fin AV'
Default value: "<none>"
Function: optional filename for the AVERAGE results from the data reduction; if no filename is specified then a default name will be used

Parameter: 04: 4th final result file, <none>: ID + '_fin RMS'
Default value: "<none>"
Function: optional filename for the RMS results from the data reduction; if no filename is specified then a default name will be used

Parameter: 05: scan table for single measurements
Default value: "<keine>"
Function: 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)

Parameter: 06: scan table for partial scans
Default value: "<keine>"
Function: 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

Parameter: 07: sweep table for partial sweeps
Default value: "<keine>"
Function: 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

Parameter: 08: use/store field mast/turtable data if available
Default value: not checked
Function: if checked then any information about mast/turtable positions will be used (measurement result list as a basis for the test, see parameter *Test 06*); 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: 01: optional PK limit line
Default value: "<none>"
Function: 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

Parameter: 02: optional QP limit line
Default value: "<none>"
Function: 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

Parameter: 03: optional AV limit line
Default value: "<none>"
Function: 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

Parameter: 04: optional RMS limit line
Default value: "<none>"
Function: 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

Topic **Graphics**

Parameter: 01: graphics configuration, <none>: ID
Default value: "<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: 02: optional graphics template (new graph only)
Default value: "<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)

Parameter: 03: range of the analog level bar display [dBxx]
Default value: 40
Function: 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: 01: generate printer hardcopy
Default value: 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: 02: report config. for printing, <none>: ID + '_prnt'
Default value: "<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: 03: footnote, empty field: ID
Default value: ""
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 **ReportHeader**

Parameter:	01: test report header, <none>: ID
Default value:	"<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
Default value:	"<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:	"TEST"
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
Default value:	"Semi 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
Default value:	"E.u.T."
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
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
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:	""
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
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)
Default value: ""
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: 01: ID max. 12 chars to be included in filenames
 Default value: "cable_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: 02: global start frequency [MHz] for the test
 Default value: 0.1
 Function: no measurements will be done below this frequency

Parameter: 03: global stop frequency [MHz] for the test
 Default value: 1000
 Function: no measurements will be done above this frequency

Parameter: 04: test configuration, <none>: ID
 Default value: "<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 Calibration

Parameter: 01: result file (default: ID)
 Default value: "<none>"
 Function: optional filename for the results from the test (filetype is system transducer); if no filename is specified then a default name will be used

Parameter: 02: name of correction factor from reference meas.
 Default value: "Cable Reference"
 Function: 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: 03: create new reference factor (else: use given factor)
Default value: checked
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
Default value: "CAL"
Function: filename of the scan range table to be used for the test

Parameter: 05: optional frequency list for single measurements
Default value: "CAL"
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
Default value: "<none>"
Function: filename of the sweep range table to be used for the test

Parameter: 07: no. of results kept from scan/sweep
Default value: 20
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
Default value: "<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: 01: generate printer hardcopy
Default value: 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: 02: report config. for printing, <none>: ID + '_prnt'
Default value: "<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: 03: footnote, empty field: ID
Default value: ""
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 ReportHeader

Parameter: 01: test report header, <none>: ID
Default value: "<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
Default value: "<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: "TEST"
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
Default value: "Cable Calibration"
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: cable name
Default value: "Cable"
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: 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
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: ""
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
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)
Default value: ""
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

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: 01: ID max. 12 chars to be included in filenames
Default value: "s-line_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: 02: global start frequency [MHz] for the test
Default value: 30
Function: no measurements will be done below this frequency
- Parameter: 03: global stop frequency [MHz] for the test
Default value: 1000
Function: no measurements will be done above this frequency
- Parameter: 04: suppress queries as far as possible
Default value: 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: 05: split frequency range into test ranges
Default value: 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 *Test 07* 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: 06: if splitting of frequency range: do with log. scale
Default value: checked
Function: 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: 1
Function: defines the number of test ranges that shall be calculated for the splitting of the frequency range
- Parameter: 08: test configuration, <none>: ID
Default value: "<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: 01: S-LINE X preview result, <none>: ID + '_pre X'
Default value: "<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'
Default value: "<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'
Default value: "<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'
Default value: "<none>"
Function: optional filename for the correlated fields strength results from the preview test; if no filename is specified then a default name will be used

Parameter: 05: scan table for preview
Default value: "<none>"
Function: filename of the scan range table to be used for the preview test

Parameter: 06: sweep table for preview
Default value: "<none>"
Function: filename of the sweep range table to be used for the preview test

Topic **DataReduction**

Parameter: 01: limit line
Default value: "<none>"
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: 02: max. no. of results kept per test range
Default value: 6
Function: the maximum number of results that will be kept from each test range through data reduction

Parameter:	03: decision threshold [dB] for peak reduction
Default value:	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:	04: max. no. of results kept from partial scans
Default value:	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:	05: partial scan width: no. of IF-BWs (0=use ratio)
Default value:	0
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
Default value:	0.01
Function:	determines the frequency range for partial scans (e.g. 0.01 means $\pm 0.5\%$) in reference to the given mid frequency; the parameter is effective only if the previous parameter is set to 0

Topic Final

Parameter:	01: S-LINE X final result, <none>: ID + '_fin X'
Default value:	"<none>"
Function:	optional filename for the results from the final 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 final result, <none>: ID + '_fin Y'
Default value:	"<none>"
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'
Default value:	"<none>"
Function:	optional filename for the results from the final 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 final result, <none>: ID + '_fin E'
Default value:	"<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
Default value:	not checked
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:	06: scan table for partial scans
Default value:	"<none>"
Function:	filename of the corresponding scan range table to be used for partial scans
Parameter:	07: scan table for single measurements
Default value:	"<none>"
Function:	filename of the corresponding scan range table to be used for the single measurements
Parameter:	08: optional input: frequency list
Default value:	"<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:	01: S-LINE graphics configuration, <none>: ID + '_CELL'
Default value:	"<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'
Default value:	"<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:	03: optional graphics template (new graph only)
Default value:	"<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:	01: generate printer hardcopy
Default value:	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:	02: report config. for printing, <none>: ID + '_prnt'
Default value:	"<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:	03: footnote, empty field: ID
Default value:	""
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 **ReportHeader**

Parameter:	01: test report header, <none>: ID
Default value:	"<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
Default value:	"<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:	"TEST"
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
Default value:	"S-LINE 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
Default value:	"E.u.T."
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
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
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:	""
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
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)
Default value:	""
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:	04: S-LINE correction factor (C1)
Default value:	"<none>"
Function:	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)
Parameter:	05: OATS correction factor (C2)
Default value:	"<none>"
Function:	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)

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.

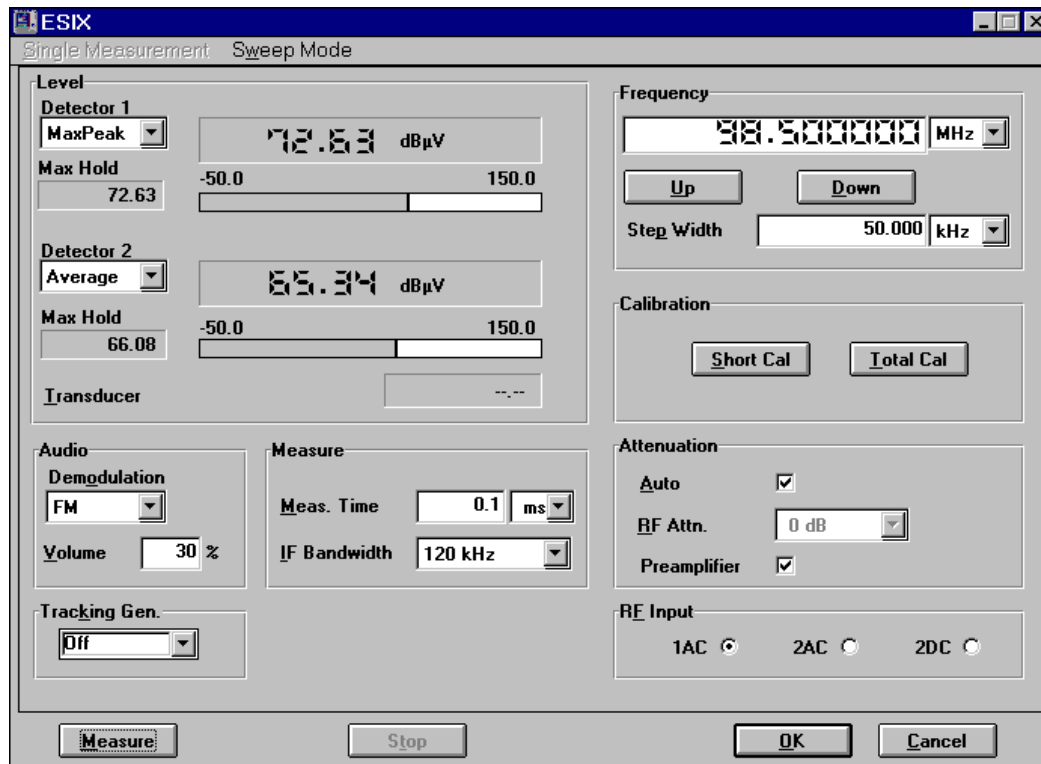
The instrument can be controlled either interactively, in a system mode or through a script.

- **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

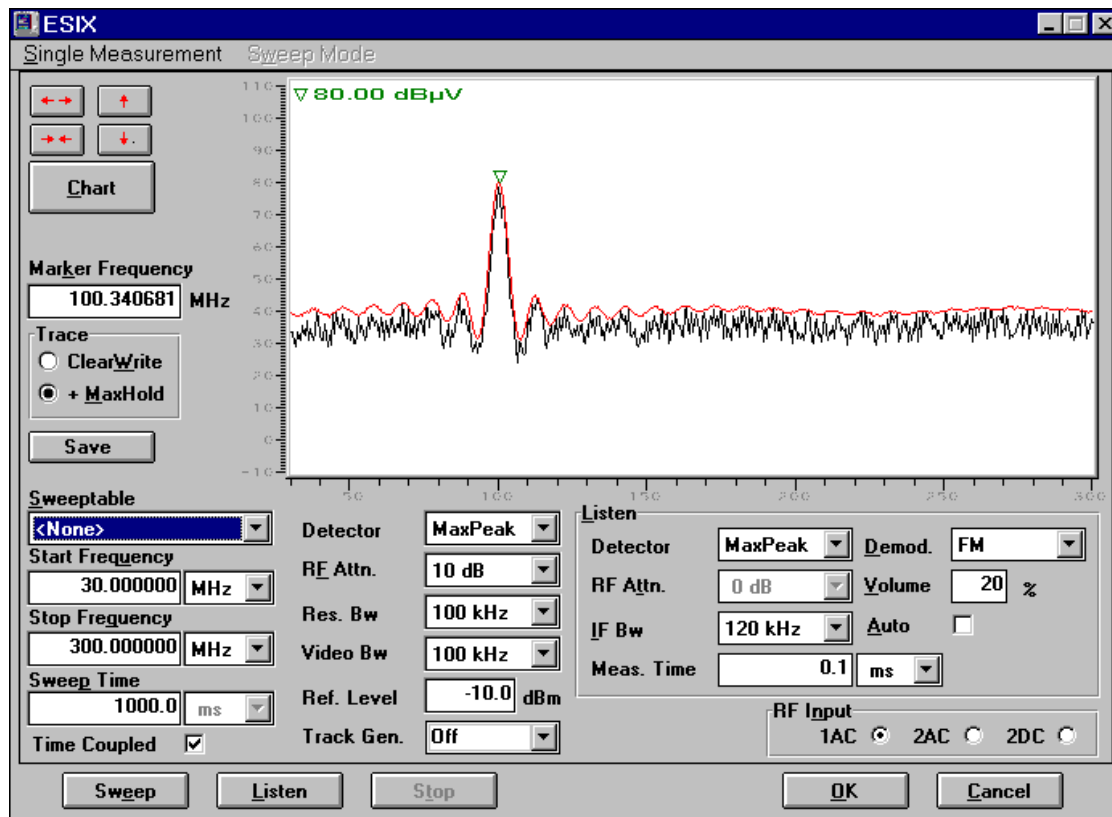


Through clicking **Measure** all settings will be checked for value range and dependencies. Then the level displays will be blanked and a new measurement starts.

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 ESI 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:	Auto Range
Function:	switches Auto Range ON / OFF
Value range:	lin. / log. Scan: ON / OFF fast scan: OFF
Parameter:	Demodulation (not with sweeps)
Function:	determines the demodulation
Value range:	AM, FM, OFF
Parameter:	Detector
Function:	defines the Detector
Value range:	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:	IF Bandwidth
Function:	definition of the IF bandwidth
Value range:	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:	Measurement Time / Sweep Time
Function:	definition of the measurement time or sweep time
Value range:	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:	Start/Stop/Step Frequency																					
Function:	definition of the start/stop/step frequency of a scan/sweep range																					
Value range:	<table border="0"> <tr> <td>INPUT 1:</td> <td>FSEA:</td> <td>20 Hz ... 3.5 GHz</td> </tr> <tr> <td>INPUT 1:</td> <td>ESI 7, FSEB:</td> <td>20 Hz ... 7.0 GHz</td> </tr> <tr> <td>INPUT 1:</td> <td>ESI 26, FSEM:</td> <td>20 Hz ... 26.5 GHz</td> </tr> <tr> <td>INPUT 1:</td> <td>ESI 40, FSEK:</td> <td>20 Hz ... 40.0 GHz</td> </tr> <tr> <td>INPUT 2:</td> <td>ESIx:</td> <td>20 Hz ... 1 GHz</td> </tr> <tr> <td>resolution:</td> <td>1 Hz</td> <td></td> </tr> <tr> <td>logarithmic scan:</td> <td>0.01 % ... 100 %, resolution 0.01 %</td> <td></td> </tr> </table>	INPUT 1:	FSEA:	20 Hz ... 3.5 GHz	INPUT 1:	ESI 7, FSEB:	20 Hz ... 7.0 GHz	INPUT 1:	ESI 26, FSEM:	20 Hz ... 26.5 GHz	INPUT 1:	ESI 40, FSEK:	20 Hz ... 40.0 GHz	INPUT 2:	ESIx:	20 Hz ... 1 GHz	resolution:	1 Hz		logarithmic scan:	0.01 % ... 100 %, resolution 0.01 %	
INPUT 1:	FSEA:	20 Hz ... 3.5 GHz																				
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INPUT 2:	ESIx:	20 Hz ... 1 GHz																				
resolution:	1 Hz																					
logarithmic scan:	0.01 % ... 100 %, resolution 0.01 %																					
Parameter:	Tracking Generator																					
Function:	switches the tracking generator ON/OFF; regardless of the setting of the tracking generator (ON/OFF) always the absolute level will be measured																					
Value range:	<table border="0"> <tr> <td>ESIx/FSEx with option -B8/9/10/11:</td> </tr> <tr> <td>0 dBm, ... -20 dBm, OFF, resolution 0.1 dB</td> </tr> <tr> <td>ESIx/FSEx with option -B12:</td> </tr> <tr> <td>0 dBm, ... -90 dBm, OFF, resolution 0.1 dB</td> </tr> </table>	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																	
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ESIx/FSEx with option -B12:																						
0 dBm, ... -90 dBm, OFF, resolution 0.1 dB																						
Parameter:	Video Bandwidth (sweep only)																					
Function:	definition of the video bandwidth																					
Value range:	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

- Measurement frequency
'Receiver Mode':
 $f \geq 2 * [\text{IF bandwidth}]$

'Analyzer Mode':
 $f \geq 2 * [\text{resolution bandwidth}]$

input 2 (ESIx only):
 $f \leq 1 \text{ GHz}$

- IF bandwidth
with detector QP:

frequency	IF bandwidth
< 150 kHz	200 Hz
150 kHz - 30 MHz	9 kHz
> 30 MHz	120 kHz

- Other dependencies
Preamplifier/Preselector "on" only if $f \leq 7 \text{ GHz}$

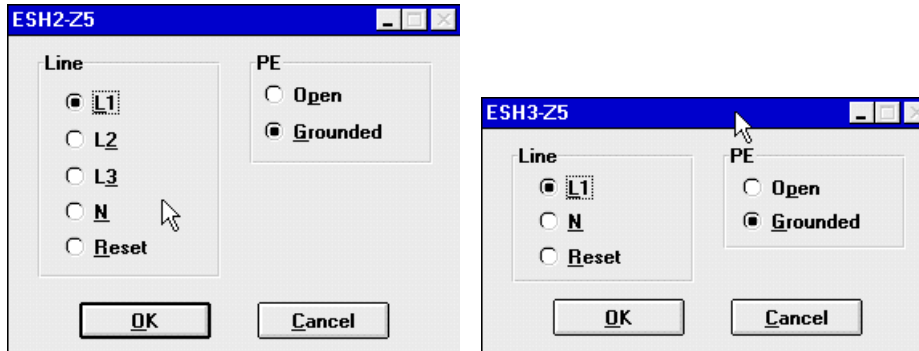
5 Standard Device Drivers

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:



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.