



**ROHDE&SCHWARZ**

**Test and Measurement  
Division**

**Manual**

**EMI Test Software for  
R&S EMI Receivers and Accessory**

**ES-K1**

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



## **S a f e t y I n s t r u c t i o n s**

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.

## Safety Instructions

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  $V_{\text{rms}} > 30 \text{ V}$ , 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.

## Safety Instructions

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 standards 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 standards 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 péritas o debidamente minuciosamente instruidas con los conocimientos citados. Si fuera necesaria indumentaria de seguridad para el uso de productos de R&S, encontrará la información debida en la documentación del producto en el capítulo correspondiente.

### 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 (povos 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.

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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.

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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.

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# 1 Introduction

## 1.1 Overview

### 1.1.1 Introduction to the Manual

The following chapters provide a complete description of the EMI Application Software ES-K1. Users working with the EMI Application Software ES-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 "Standard Device Drivers", describes the function of the Rohde & Schwarz V-networks, relay switching units, etc..

The Options ES-Kxx provide information about the use of the script language FSL (Flexible Script Language) and the device drivers.

**Option ES-K2**, "Script Development Kit", explains how a script is produced and includes a description of the general language elements of FSL and a list of all standard functions, system-specific and device-specific functions.

**Option ES-K1x**, "Device Driver", contains a list of all device drivers for test receivers and spectrum analyzers including their application, which are supported by the EMI Application Software ES-K1.

**Option ES-K3x**, "Device Driver", contains a list of all device drivers for accessories including their application, which are supported by the EMI Application Software ES-K1.

**Option ES-K50**, "Device Driver", contains the universal IEEE-bus device driver for simple ASCII communication with devices that can be controlled via IEEE bus.

**Option ES-K80**, "Device driver", contains the device driver for the R&S TTL card PS-B11.

### 1.1.2 Short Description

The Rohde&Schwarz EMI Software package ES-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 ES-K1:

- User-friendly software for Microsoft Windows™ 95 / 98 / 98SE / ME / NT 4.0 / 2000 / XP
- EMI measurements both to international **commercial standards** (CISPR, VDE, FCC, VCCI, ANSI, EN) and **military standards** (MIL, VG, DEF-STAN, GAM-EG13)
- 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 ES-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.

An option for the system software is the **Script Development Environment** (ES-K2). This environment permits the user to modify the supplied standard scripts in order to match them to the latest standards. It also allows him to develop scripts that cover completely new standards. Of course, this environment also contains debugging aids and test facilities, which simplify the generation and modification of the scripts.

### 1.1.2.3 Measuring and Analyzing Functions

The Software ES-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 and subrange minima reduction, maxima reduction and narrowband/broadband discrimination.

Further possible evaluations are used to combine measurement results, output MIL measurement results in a broadband-related display (/MHz) and eliminate known interference, e.g. ambients.

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

A similar correlation for S-LINE measurement cells is also available.

### 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.

### 1.1.3 Licence

The EMI Application Software ES-K1 is protected by a hardware adapter (hardlock), which is connected to the parallel interface of the computer. This does not impair the function of the interface, i.e. the adapter is transparent for the user.

#### **Note:**

The user must make sure that the hardlock is firmly connected!

## 1.2 Installation

### 1.2.1 System Requirements

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

- Microsoft Windows™ 95 / 98 / 98SE / ME / NT 4.0 / 2000 / XP
- CPU: 486; PENTIUM recommended
- 16 Mbyte RAM; 64 Mbytes recommended
- At least 60 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)

EMI Software ES-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 ES-K1 have to comply with DOS conventions, i.e. meet the rule <8 characters>.<3 extension> .*

### 1.2.2 Options Concept

Due to its **options concept** the software is easy to handle and future-safe. The drivers required for the units and additional software options are combined to form the software core.

EMI Software ES-K1 supports all EMI test receivers and spectrum analyzers from Rohde & Schwarz, ie the models of receiver family ESCS, ESHS, ESVS, ESVD, ESPC und ESS, the EMI test receivers based on spectrum analyzers ESPI, ESIB, ESAI, ESBI und ESMI and still the instruments ESH3, ESVP and EZM.

In addition to these receivers, a large number of remote-controllable accessories is used. These are amongst others artificial-mains networks and V-networks ESH2-Z5, ENV4200, ESH3-Z5 and ENV216, Absorbing Clamp Slideways for the measurement of conducting interference as well as remote-controllable Positioning Mast and Turntable for measuring RFI fieldstrength. Relay matrices are used for switching the antenna and transducers.

### 1.2.2.1 Basic Program

EMI Software **ES-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.)
- Drivers for R&S artificial-mains networks ESH2-Z5, ENV4200, ESH3-Z5 and ENV216 as well as for R&S relay switch units (PSU, RSU, PSN, TS-RSP).
- Internal database for data management (scripts, limit-value lines, transducers, graphics, scan tables, test results, etc.)

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

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

### 1.2.2.2 Options

The following options (receiver and accessories) can be used with ES-K1:

<b>ES-K2</b>	Script development environment
<b>ES-K10</b>	Driver for R&S EMI test receivers ESCS / ESPC / ESHS / ESVS / ESVD
<b>ES-K11</b>	Driver for R&S EMI test receivers ESS
<b>ES-K12</b>	Driver for R&S EMI test receivers ESAI / ESBI / ESMI
<b>ES-K13</b>	Driver for R&S EMI test receivers ESH3 / ESVP
<b>ES-K14</b>	Driver for R&S EMI test receivers ESH3-EZM / ESVP-EZM
<b>ES-K15</b>	Driver for R&S spectrum analyzers FSA / FSB / FSM
<b>ES-K16</b>	Driver for R&S EMI test receivers ESIB and spectrum analyzers FSE (FSIQ)
<b>ES-K17</b>	Driver for R&S tempest receivers FSET
<b>ES-K18</b>	Driver for R&S EMI test receivers ESPI
<b>ES-K19</b>	Driver for R&S spectrum analyzers FSP and FSU
<b>ES-K20</b>	Driver for R&S EMI test receivers ESCI
<b>ES-K30</b>	Driver for Schäfer Mast HCM (RSM) and Turntable HCT (RST)
<b>ES-K31</b>	Driver for Schäfer Absorbing Clamp Slidebar HCA (RSA)
<b>ES-K32</b>	Driver for EMCO Mast with Controller 1050 and EMCO Turntable with Controller 1060, as well as for combined Controllers 1090 and 2090
<b>ES-K33</b>	Driver for DEISEL Mast and Turntable with Controller HD50/100
<b>ES-K34</b>	Driver for DEISEL Absorbing Clamp Slidebar with Controller HD50/100
<b>ES-K37</b>	Driver for AKZO Mast and Turntable with Controller ASC-300
<b>ES-K40</b>	Driver for EMCO Mast and Turntable with Controller 2090, and for SUNOL Mast and Turntable with Controller SC9xV
<b>ES-K50</b>	Universal GPIB driver

### 1.2.2.3 Multiple-user Licences

**ES-K100** Licence for the use of EMI Application Software by several users. An additional hardlock will be supplied for each ES-K100 ordered.

### 1.2.3 Installation Instructions

Scope of supply of EMI Software ES-K1:

- CD-ROM for installing the software



- Hardlock key (dongle) for authentication (not with an update)
- Option disk with customer-specific authentication code (not with an update)
- Operating manual (not with an update)

The EMI Software ES-K1 is installed on the PC from the the CD-ROM.

If necessary then a set of installation disks can be generated from the CD-ROM through starting the batch file 'DISKS.BAT'. Eight 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 4.0) from the CD-ROM on your computer proceed as follows (drive D: refers to the CD-ROM drive):

Go to the "Start" button and select "Run".

Enter 'D:\AcroRd32\setup ' and follow the instructions of the installation program.

### 1.2.3.2 ES-K1 on the Controller Function of the EMI Analyzer ESIB

If the application ES-K1 shall be installed on the controller function (Windows NT) of the EMI analyzer ESIB 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 ESIB manual (chapter 1.7: Connecting an External Monitor).

For the installation of the application under Windows NT you need administrator access privileges because also the hardlock driver (a system driver) needs to be installed. You have to do a login with the 'administrator' identification. Further details can be found in the ESIB manual (chapter 1.4: Controller Function). Once the application has been successfully installed you can change back to the original login with 'instrument' identification.

If the application doesn't need to control any other GPIB devices besides the ESIB then a second GPIB interface is not necessary and can be replaced by the internal software interface "RSIB". Further details can be found in the ES-K16 manual (Operation with the RSIB Interface)

### 1.2.3.3 Authentication

When using ES-K1 software, the hardlock key (dongle) is required for authentication if a test receiver and/or accessories are to be controlled via the GPIB interface. If the software is operated without a suitable hardlock, it runs in the im **Demo mode**, i.e. the GPIB interface cannot be physically addressed, the units can only be operated virtually. The other functions can all be used without any restriction.

The hardlock is not required during installation but on starting the ES-K1.

### 1.2.3.4 Option Disk

This disk which is supplied in addition to the installation disk and queried by the software during installation contains the ID files (ID: identification) coded to the associated hardlock key according to the specific customer's requirements. The files allow the use of ES-K1 with the user's test receivers or options (accessories). The options are offered by the setup program for installation.

If no option disk is available then only an update can be done which in turn requires the existence of an earlier installation or version of the application.

If an installation of version 1.50 exists then an option disk can be generated from there through starting the batch file 'OPT-DISK.BAT' in the referring subdirectory '...\EXECUTE\'.

### 1.2.3.5 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>	<b>NONE</b> , driver setting and interface setting should match
<u>Base I/O Address:</u>	driver setting and interface setting should match
<u>Interrupt Line:</u>	driver setting and interface setting should match; may also be set to NONE
<u>Enable Auto Serial Polling:</u>	<b>NO</b>
<u>Assert REN when System Controller</u>	<b>YES</b>

All settings can be performed independent of the operating system using the associated configuration programs. The configuration can 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 ES-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.

### 1.2.3.6 Starting the Installation

The EMI Application Software ES-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 / 2000 / XP administrator access privileges are required for the installation!):

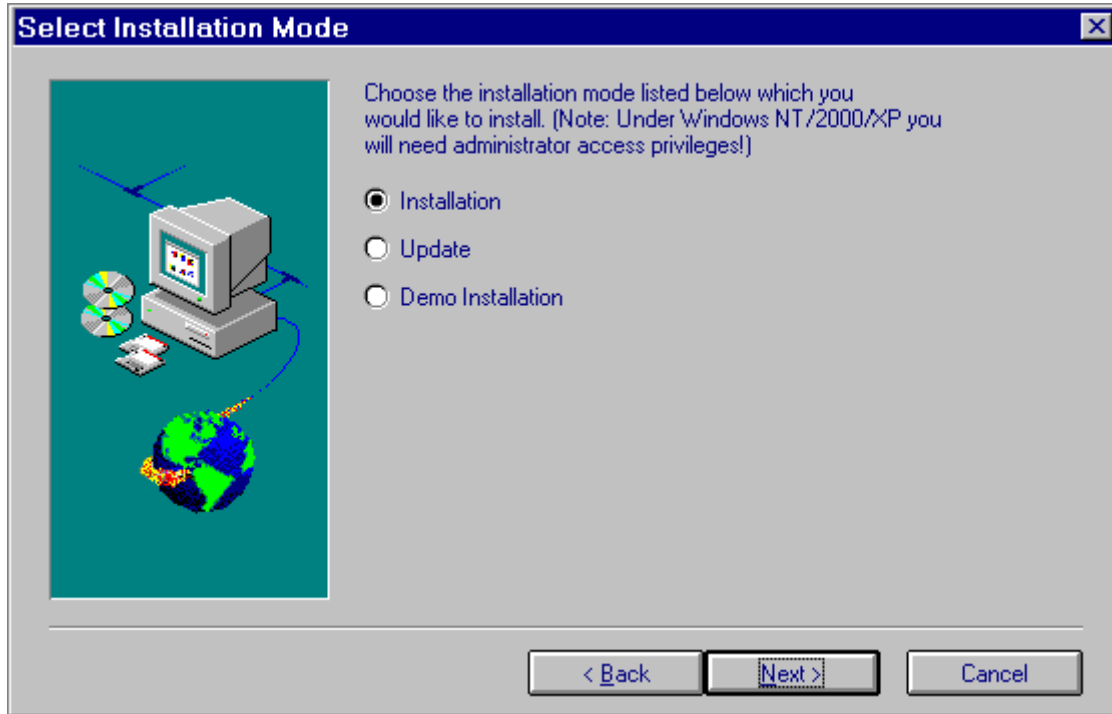
1. Open the **Start** menu. Select the menu item **settings** and **system control** to open the associated window.
2. The dialog is opened by clicking the icon **Software** and the **setup.exe** program is automatically selected from the disk by clicking the Installation key.

*Note: The installation language is in English. Prior to starting the setup program terminate all other Windows applications.*

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

### 1.2.3.7 Installation Options

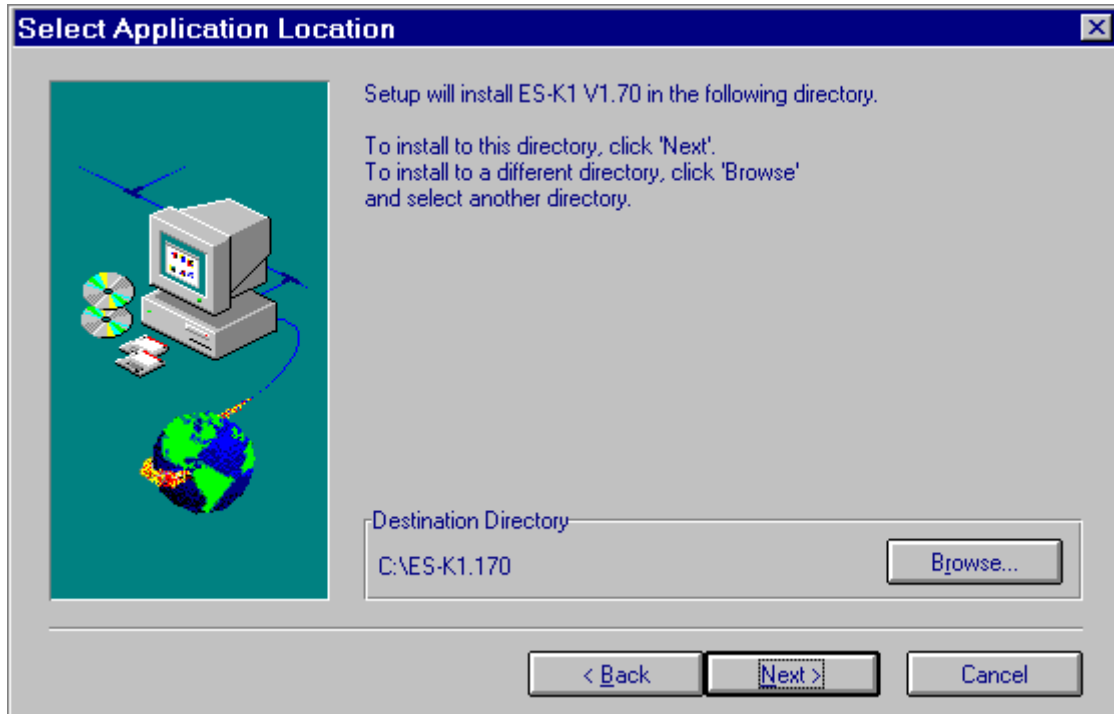
After starting the setup program the following is displayed on the screen:



The option **Update** is used for former versions of the EMI software, which is installed in the system. The option **Demo Installation** performs an installation of the ES-K1 specifically for demos.

### 1.2.3.7.1 Option Installation

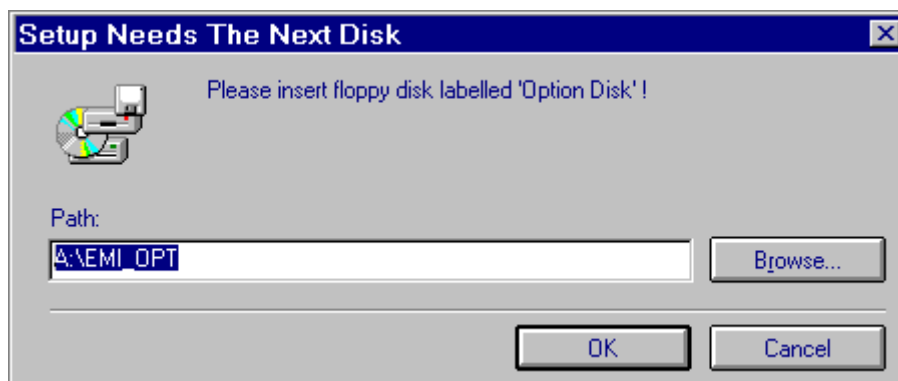
This option allows the installation of EMI Software ES-K1, the supplied drivers and options (by querying the option disk) and the pre-configured database.



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

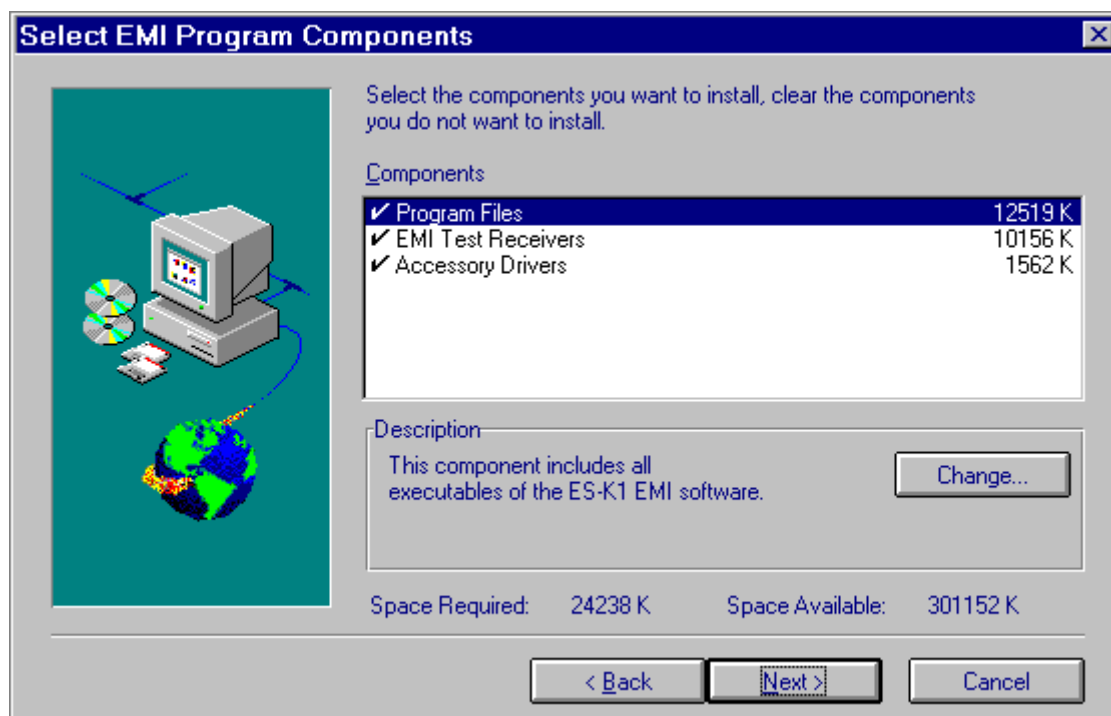
*Note: The path name under which the ES-K1 software is to be installed should not exceed a length of 30 characters.*

The setup program then queries the customer-specific option disk:

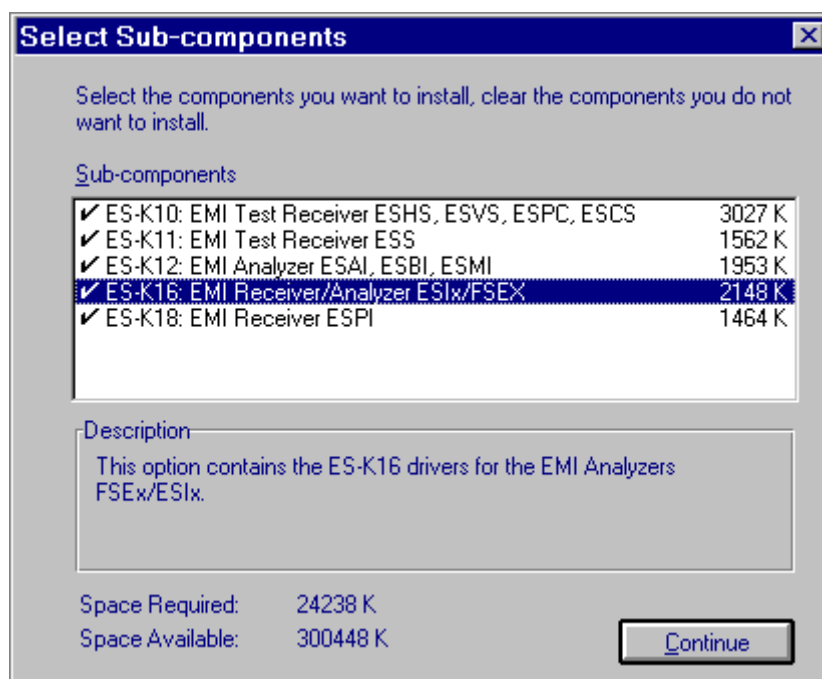


After inserting the option disk in the corresponding drive, the setup program offers the drivers and options for EMI Software ES-K1 via the supplied ID files. All supplied components are usually installed, confirmation with the **Next** key is sufficient.

If only specific options are to be installed, selection is via **Change..** key from selected components **Program Files**, **EMI Test Receivers** and **Accessory Drivers**:



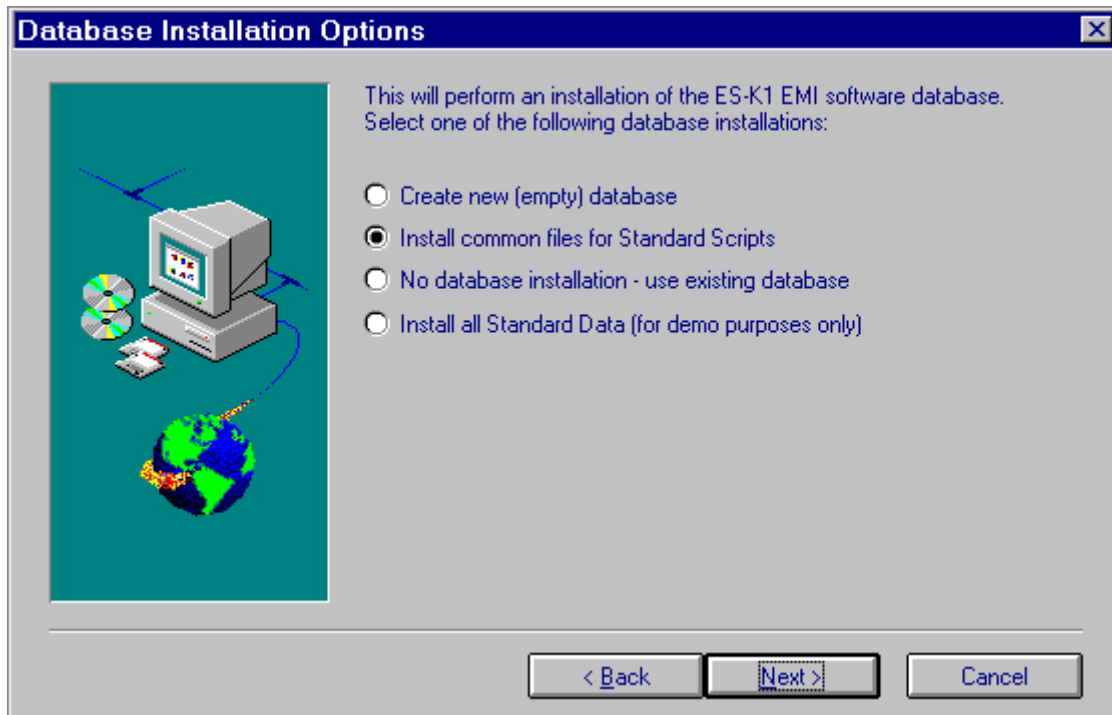
After selecting the corresponding components and clicking the **Change...** key, another dialog field allows the specific selection of options by a click:



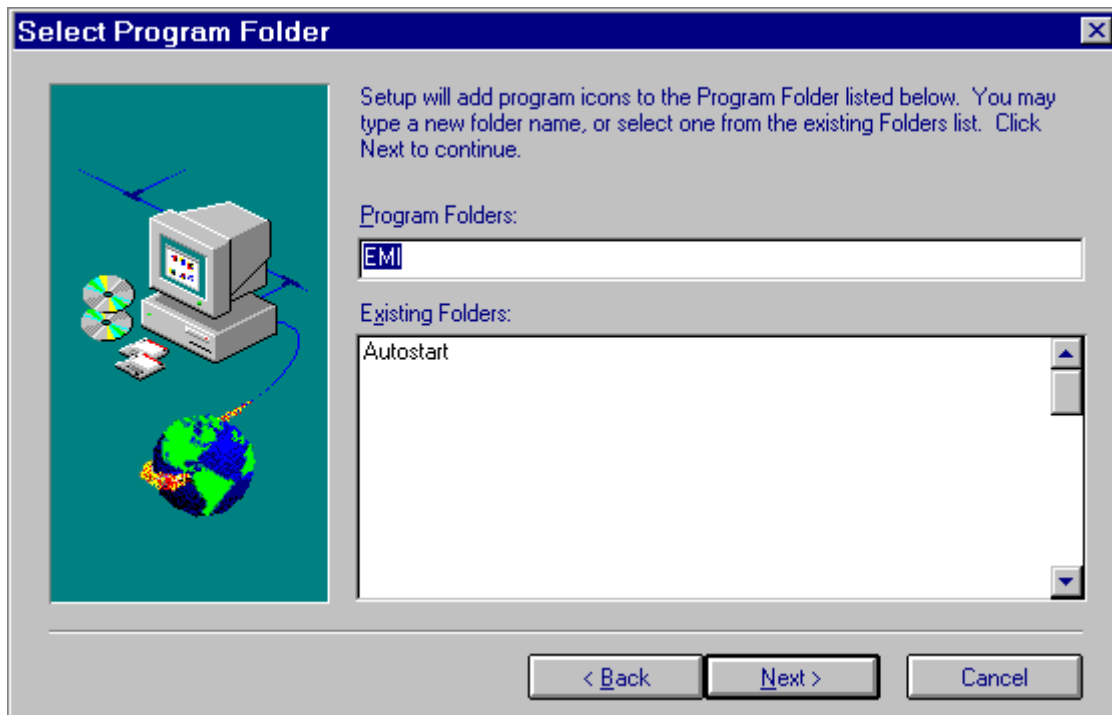
After selecting the components and options to be installed, the installation of the pre-configured database for EMI Software ES-K1 is offered.

The option **Install Standard Database** installs the pre-configured database with the standard data (scripts, limit-value lines, scan data, transducers, etc.). The option **Create New Database** is used when an existing external database is to be imported after the installation.

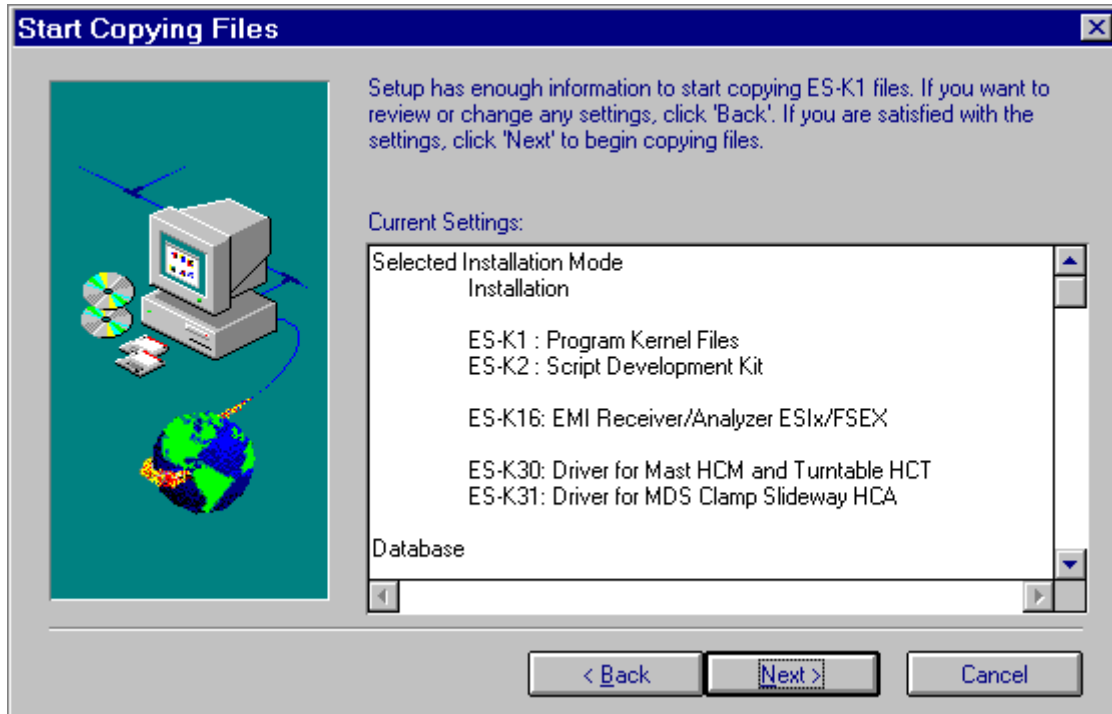
If an ES-K1 database is detected, either the existing database is saved in a backup directory before creating the new database or this step is skipped by selecting the option **No Database Installation**.



EMI Software ES-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:

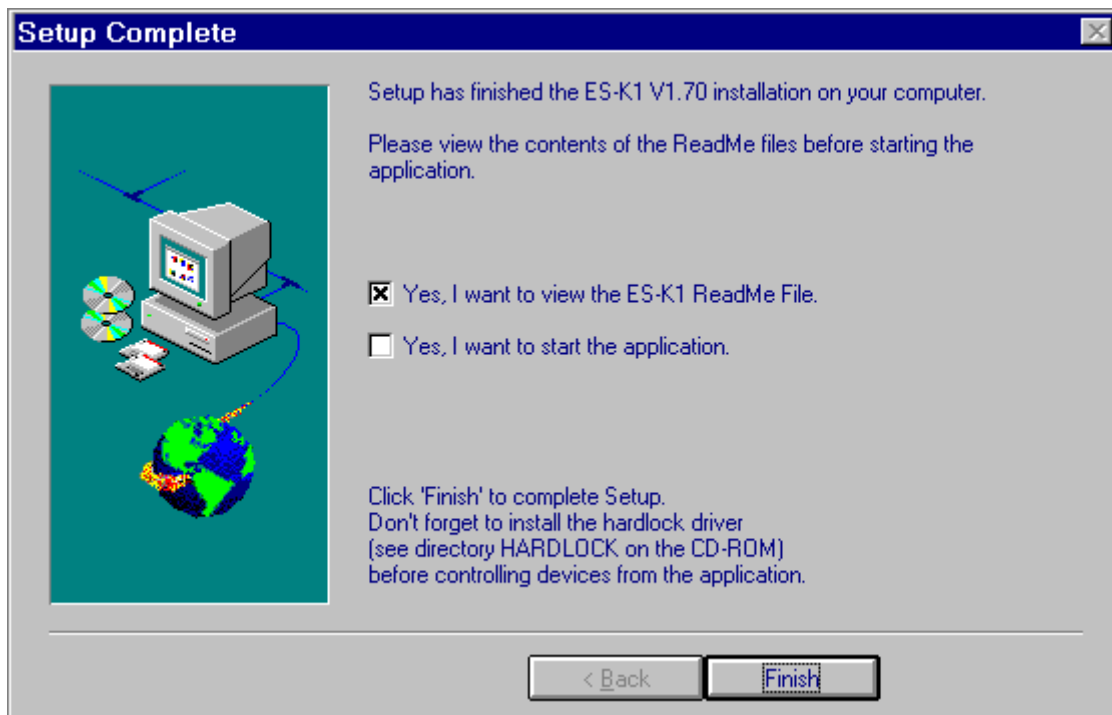


Before the installation is performed by transferring the files from the installation disks, the setup program again indicates the selected installation options, the selected components and options, the program path and the program group for verification:

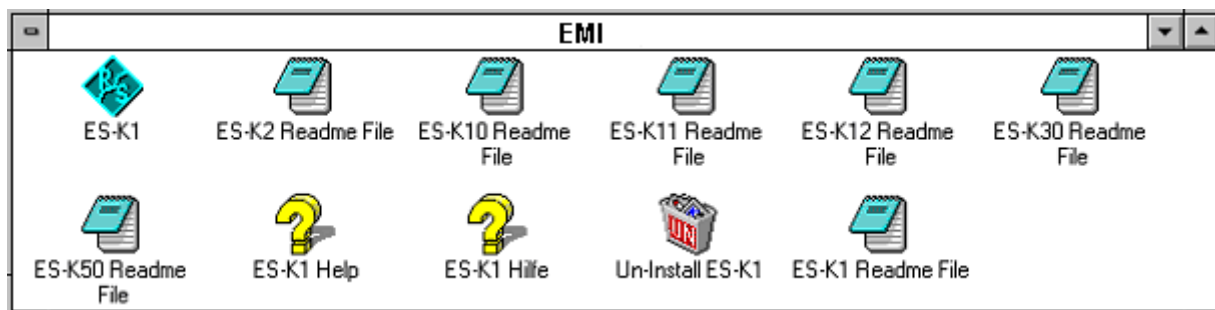


The current state of the file transfer to the harddisk is displayed during the subsequent installation through a progress bar.

At the end of the installation, a re-start of Windows or of the computer (depending on the operating system) is offered to activate the newly installed driver of the hardlock required to operate the ES-K1:



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



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

**Directory structure of EMI Software ES-K1:**

- [-] ES-K1.170
  - [+] DATA
  - [+] DATANULL
  - [+] DOC
  - [-] EXECUTE
    - [+] DEVICES
    - [+] ES-K1
  - [+] I02
  - [+] I10
  - [+] I11
  - [+] I12
  - [+] I13
  - [+] I14
  - [+] I15
  - [+] I16
  - [+] I17
  - [+] I18
  - [+] I19
  - [+] I20
  - [-] IMPSTD
    - [+] AUTO
    - [+] BASE
    - [+] CAL
    - [+] COND
    - [+] EXP
    - [+] GAM
    - [+] INT
    - [+] MIL
    - [+] NSA
    - [+] RAD
    - [+] TEM
    - [+] UTIL
  - [+] OPTIONS
  - [+] WMF

The database of EMI Software ES-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 directory 'DOC' contains README files for the installed options and more.

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

The supplied **databases** which are **pre-installed** by the setup program is available through a number of directories:

The directory 'I02' holds script examples from the manual for the "script development kit" ES-K2.

**The receiver-specific scan and sweep tables can be imported from subdirectories of 'lxx' (refers to receiver option ES-Kxx).**

**The 'Standard Data' (limit lines, standard scripts, etc.) are located in subdirectories of 'IMPSTD'.**

**The meaning of the subdirectories inside (topics) is explained in the Readme file.**

The '**OPTIONS**' directory contains the customer-specific authentication files for the hardlock.

The background pictures for the ES-K1 software are stored in the '**WMF**' directory.



### 1.2.3.7.2 Option Update

The installation of the option **Update** serves for the automatic transfer of customer-specific hardlock key files of an existing former EMI software installation. This option does not require a specific option disk since a check for the presence of an ES-K1 software is performed at the beginning of the installation. If such a version is detected, the drivers and options offered for the installation result from the existing ID files.

*Note: The installation of the new version of EMI Software ES-K1 should always be carried out in its own directory (without overwriting of an existing version).*

Existing data sets can be exported from the old version and imported into the new version of ES-K1.

### 1.2.3.7.3 Option „Demo Installation“

No customer-specific option disk is required for the installation of the demo mode, all drivers and options can be selected. This installation of EMI Software ES-K1 is provided for trying out the software in the demo mode (without active operation via the GPIB interface) or for full operation of ES-K1 with demo hardlock code 0001.

### 1.2.3.7.4 De-installation of ES-K1 Software

To de-install EMI Software ES-K1, double-click the **Un-Install ES-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 ES-K1.INI in the subdirectory ..\EXECUTE\. The above-mentioned files or the paths created after the installation are to be manually cleared, as required.

### 1.2.3.8 First Steps after Installation

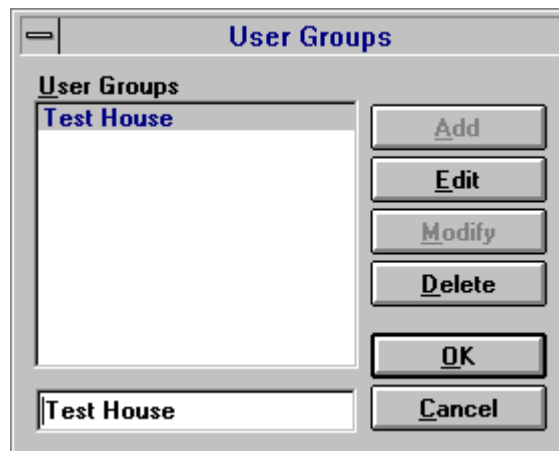
EMI Software ES-K1 has a **password protection** for each user, which offers the following advantages:

- The data are protected against unauthorized access
- The configuration of the system can be only changed by authorized persons

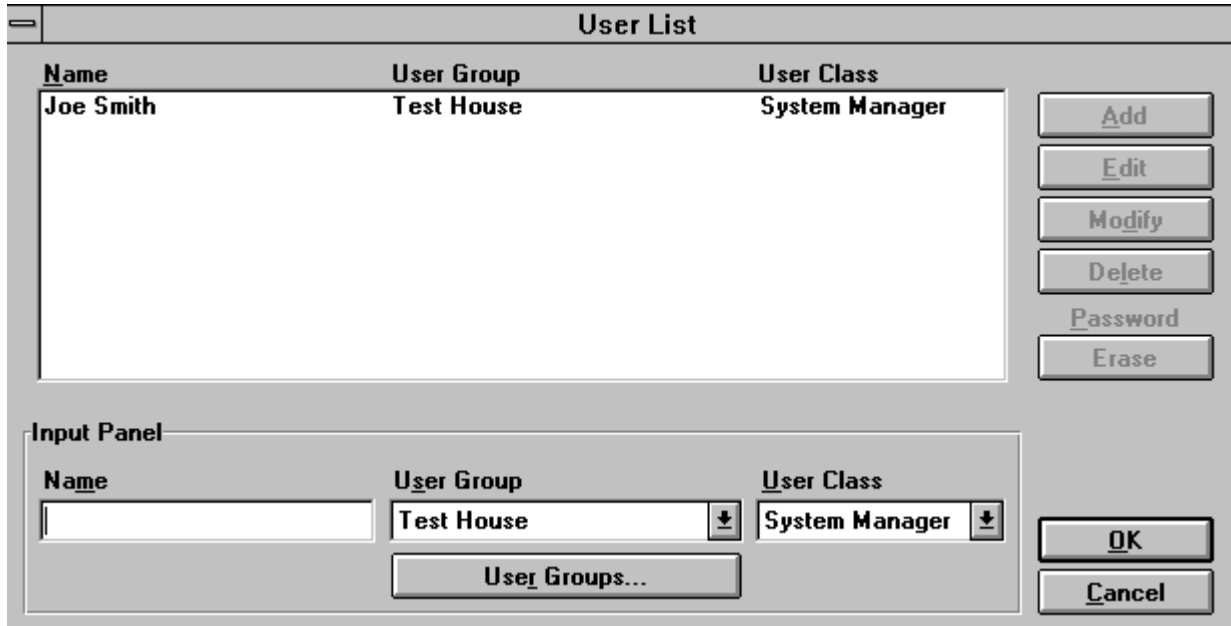
In addition, each user of ES-K1 is allocated to a **user group**. The user groups can be allocated to the three **user classes** with different **access rights**:

- System manager
- Extended
- Standard

User groups or user names are not provided on delivery of the software. Therefore, **log-in** dialog is not called when the ES-K1 software is started for the first time, but the **user group** dialog:



After setting up the user group with the ADD key, the list of users to belong to the defined group is entered in the subsequent dialog:



Note: At least one **system manager** should be defined since it is only the system manager who can enter further users in the list of users.

When a user logs in for the first time, the entry and confirmation of the password is required:



After these steps, the installation and the setup of EMI Software ES-K1 is terminated for the user. The next chapter gives an introduction on how to perform measurements.

Annotation:

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

In the example below, interactive control of the software is explained step by step to familiarize the user with the logical sequence of operations.

The example is based on a specific measurement task that can be performed immediately with the equipment shown. For practising, the measurement can also be performed without the said equipment in the virtual operating mode. This mode is automatically selected if there is no hardlock at the printer output of the computer. In this case, the "Test Setup" and "Block Diagram" sections are irrelevant, and the values entered into the test report are simulated values supplied by an internal random generator.

#### 1.3.1 Measurement Task (Example)

Measurement of EMI voltage on the power line of a **domestic appliance** with 200 W power consumption; continuous interference, pure broadband interference, ie without internal processor or the like.

Test setup to **CISPR 16-2, Figure 2.**

Limit values to **EN 55014**

##### 1.3.1.1 Test Setup

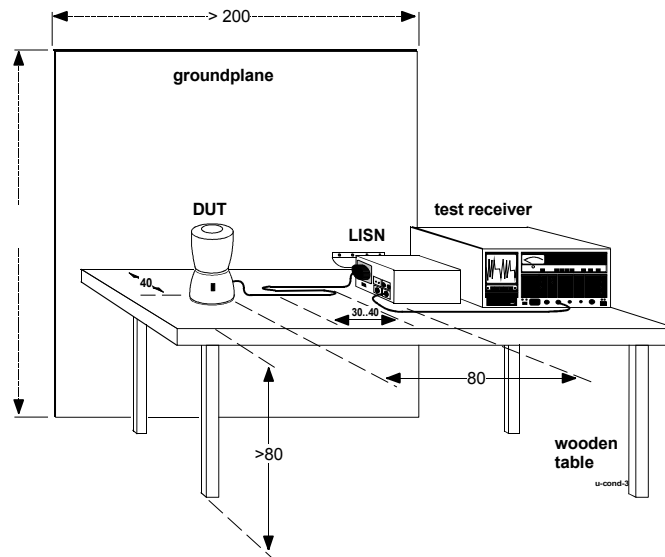


FIG 1: Test setup to CISPR 16-2

### 1.3.1.2 Block Diagram

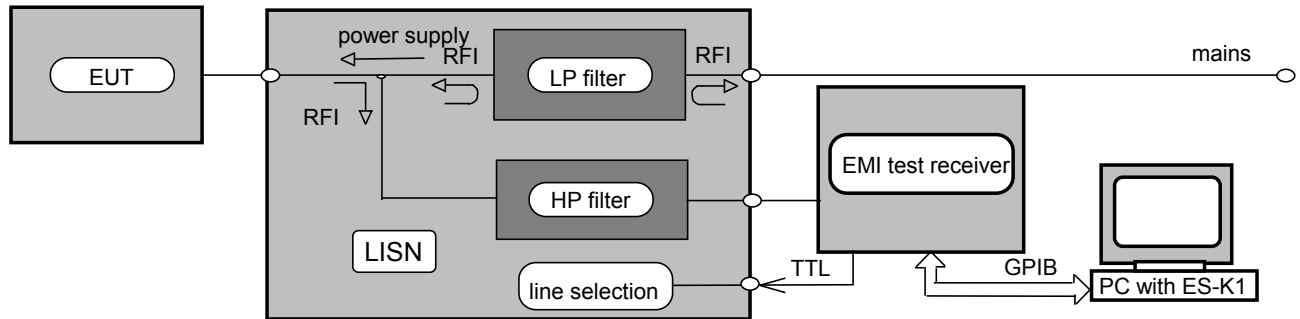


FIG 2: Block diagram of EMI test setup

### 1.3.1.3 Definition of Terms

Some terms necessary for understanding ES-K1 operation are explained below.

**Transducers** are four-terminal networks connected between the input of the test setup and the test receiver, for example a test antenna in EMI field strength measurements. The antenna converts in a defined manner the EMI field strength level (given in  $\text{dB}(\mu\text{V}/\text{m})$  for electrical field strength) into a voltage level (measured in  $\text{dB}(\mu\text{V})$ ), which is displayed by the test receiver. The difference between the two numerical values is referred to as transducer factor (unit:  $\text{dB}(1/\text{m})$ ), which is usually frequency-dependent. Stored transducer data, therefore, always include the transducer factor and the conversion into the correct unit so that the result displayed has the correct magnitude and unit.

**Standards**, which are listed in the ES-K1 database, contain information on emission limit values, the frequency range to which a given standard applies and on the setup of the test receiver. All of the standards in question cover product families. For example, the EN55014 standard applies to "Electrical equipment and systems" covering, among other equipment, all domestic appliances and electric tools.

**Scanning** is the tuning of the test receiver step by step across a given frequency range. For this, the step size (absolute or as percentage of the tuning frequency), the dwell time for each frequency, and the start and stop frequencies are to be defined. Synthesized test receivers (eg ESxS, ESS, ESPC) are typically tuned by scanning.

**Sweeping** is the continuous tuning of a test receiver across a given frequency range. In addition to start and stop frequencies, the time for the receiver to sweep the frequency range is to be defined. This tuning mode is typically employed by spectrum analyzers, although some analyzers can be tuned step by step as well (eg ESMI). Series ESxS and ESS test receivers have no sweep capability. No sweep tables are therefore supplied for these units.

### 1.3.2 Starting ES-K1 Software

Activate ES-K1 icon in Windows Program Manager field.



FIG 3: ES-K1 software icon

When program has been loaded, enter user name and password (log-in):



FIG 4: Log-in dialog window

**NOTE:** The user name and password must be entered in exactly the same notation (upper-case and lower-case letters) as in program installation. Even the slightest difference will result in abortion of the program. It is therefore advisable to note down the user name and password before entering them during program installation.

Confirm user name with TAB key (not with RETURN!), and password with OK or RETURN.

The response message depends on whether or not a hardlock is installed at the printer output. For practising, the program can be run without hardlock. In this case, the window (FIG 5) shown opposite will appear:



FIG 5

On confirmation with **OK**, the default background mask of ES-K1 Software (FIG 6) appears, from which operation of the program can be started.

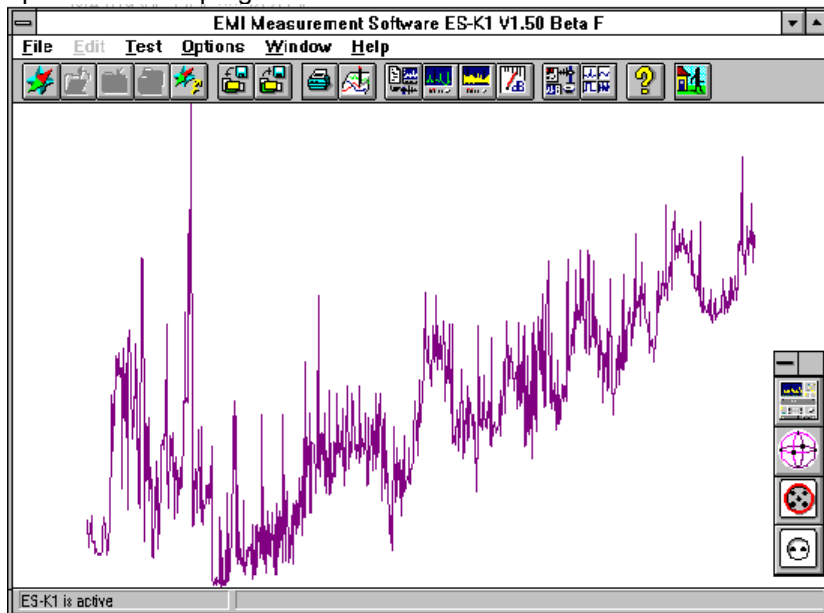


FIG 6: Background mask for Software ES-K1

### 1.3.3 Programming a Measurement with ES-K1 Software

As an initial step, configuration of the test equipment as shown in the test setup (FIG 2) is to be defined. For this, select **Device Configuration...** from the **Options** menu.

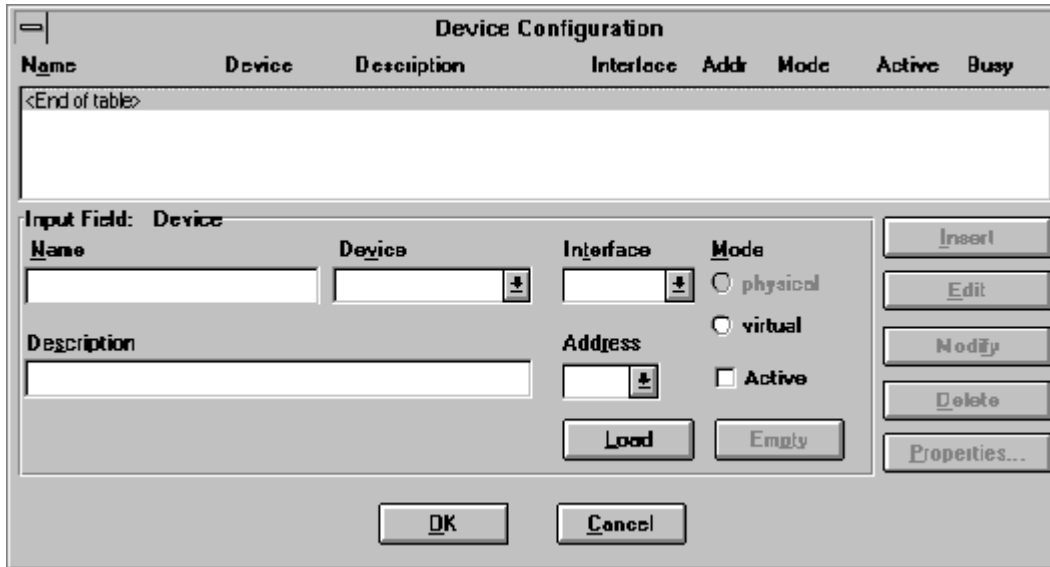


FIG 7 Device configuration dialog window

Instruments addressed by ES-K1 can be loaded into the **Device** field.

On clicking on **Load**, available devices appear after approx. 10 s in the **Device** field from where they can be selected by means of the scrollbar. In this example, Test Receiver ESHS is selected. Then the **Interface** (GBIB0), **Address** (17) and **Mode** are to be set. The **virtual** or **physical** mode is selected automatically depending on whether a hardlock is installed or the measurement is performed with real devices, see 1.3). Devices can be switched passive (**Active** not selected). This prevents measurement errors in the case of devices listed but not connected.

Entries in the **Name** field are optional. They describe a device more precisely if several devices of the same type are used. Entries in the **Description** field are optional, too.

On clicking on **Insert**, ESHS is transferred as the first device to position **<End of table>**, which thus moves one line down, ie **<End of table>** is always indicated at the end of the list.

Next, Two-Line V-Network ESH3-Z5 is to be selected in the **Device** field. ESH3-Z5 has no GPIB interface but is driven via the parallel TTL interface of the test receiver (see FIG 2), so the GPIB address of the test receiver is to be entered, ie the default address 20 is to be changed to 17. Then Two-Line V-Network ESH3-Z5 is to be transferred to the device table by clicking on **Insert**. FIG 8 shows the complete device configuration. Any entries made in the **Name** and **Description** fields are displayed in the corresponding columns of the device table.

Make sure to confirm the settings made in the **Device Configuration** window with **OK**, otherwise the settings will be lost. Note: if there is no response on clicking on **OK**, click on **Modify** even if no modifications were made, then **OK** will be active in any case.

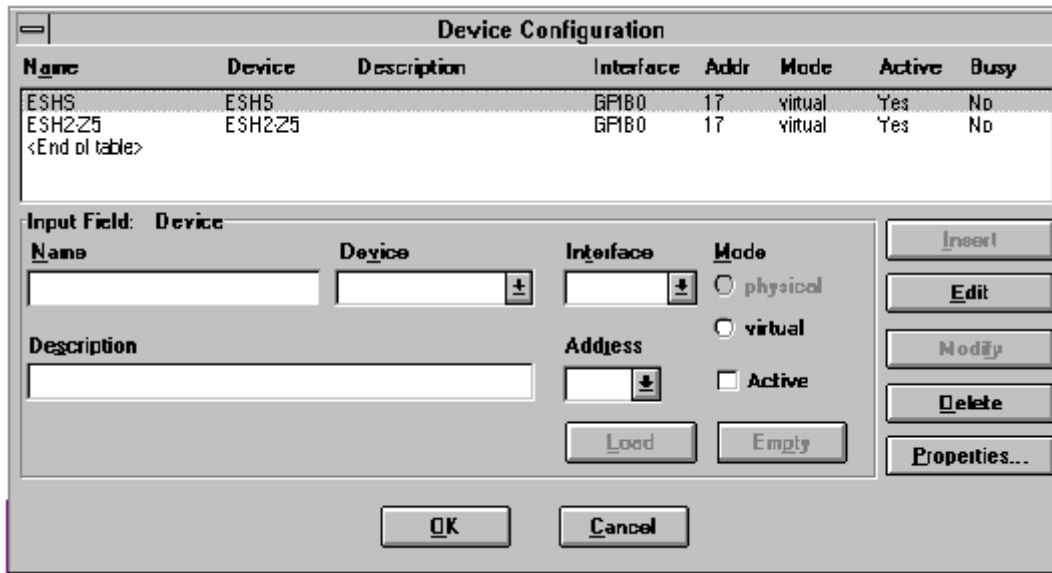


FIG 8: Completed device configuration. Return to main menu with .



### 1.3.4 Preparatory Operations for Measurement

The shortest way of parameterizing the devices used is by calling the data stored in the database of the software, ie tuning mode of test receiver (scan or sweep), transducer characteristics (eg of artificial mains networks) and limit values stipulated by standards. The ES-K1 database is managed by the **Navigator**, which is called from the **File** menu (FIG 10).

For initial use of the ES-K1 software, information first has to be loaded into the database and is then available for any subsequent measurements.

**Software handling is therefore different after initial installation and subsequent operations.**

After installation, the **Scan Table** for the receiver used must be loaded. To load the table, first call the **Navigator (Backup Database)** from the **File** menu.

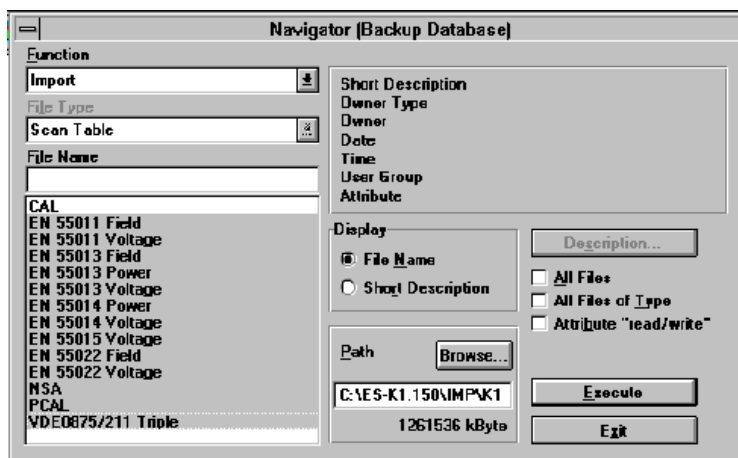


FIG 9

The **Browse** key (FIG 9) activates the **Path** dialog window with the import directory (see README files) from which a subdirectory with the scan tables for the receiver used is selected.

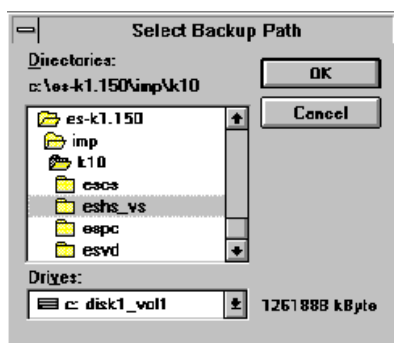


FIG 10: Subdirectory K10/EHS with scan tables for Receiver EHS

Then the required scan tables designated with the name of the standard are marked and transferred to the scan table under **Navigator...** by means of **Execute**.

The standard import database is stored in the same directory in which the ES-K1 Software was installed. The scan and sweep tables can be selected from the subdirectories for the receiver versions (K10, K11, etc).

### 1.3.4.1 Performing the Measurement

When preparatory operations as described under 1.3.4 are completed (required only after installation, not for recall of ES-K1 Software), the measurement task as defined in chapter 1.3.1 is performed through the following steps:

Call **Navigator** from the **File** menu. In the **Navigator** window (FIG 11), click on **Open** under **Function** and select **Scan Table** under **File Type**. Under **File Name**, select **EN55014 Voltage** and click on **OK**. The **Scan Editor** window (FIG 13) will appear.

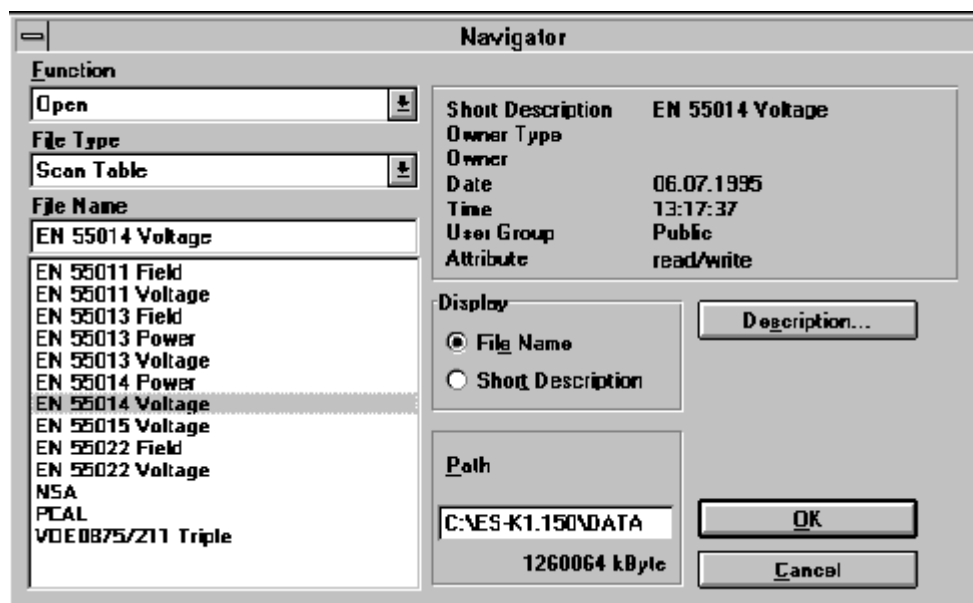


FIG 11: **Navigator** database manager selected from **File** menu. Selection of **Open** function and **Scan Table** file type. Calling of **EN55014 Voltage** file.

The **Scan Editor** window usually already contains data from previous settings. What the operator has to do is to edit the data to make the required settings for each subrange. The **Subranges** list box (upper right in FIG 16) is of primary importance. The list box will however be empty after installation of the software. In this case, proceed as described under 1.1.4.2.

It is important to note that for each subrange selected from the **Subranges** list box the settings in the **Subrange** window below are made separately, while the settings made under **Unit**, **Detector** and **Mode** above apply jointly to all subranges. It is therefore advisable to assign one of the four possible detectors (**MaxPeak**, **Average**, **QuasiPeak** and **RMS**, selectable under **Detector**) to each of the four curves (**Curve 1 to 4**). Desired detectors for the individual subranges can then be selected from the **Control** window below the **Subrange** window.

Select the desired subrange from the **Subranges** list box by means of a double click. The associated settings will be displayed in the **Subrange** window.

### 1.3.4.2 Editing Data in Scan Editor Window

#### 1.3.4.2.1 Adding a Receiver

By clicking on **Receiver** in the **Subrange** window, all receivers entered in the **Device Configuration** table can be called. The selected receiver is shown with the settings stored in previous measurements displayed in the various windows under **Subrange**. Make the required settings including **Attenuation/Gain, Transducer, Curve 1 to 4** and **Demodulation**. Conclude settings with **Subrange Check**. Click on **Insert** (upper right). In doing so, make sure that the blue selection line in the **Subranges** list box indicates a frequency range higher than the subrange to be added. Otherwise an error message will be output. Store setting with **OK**.

#### 1.3.4.2.2 Changing a Frequency Range

Select frequency range from **Subranges** list box with blue selection line. Double-click on frequency range to activate it. All associated settings will appear in the **Subrange** window. Change range as required and conclude setting with **Subrange Check**. If the new value does not match existing settings (eg artificial mains network above 30 MHz), the operator is prompted to make an appropriate correction. Click on **Modify** to confirm the change. Store with **OK**.

### 1.3.4.2.3 Deleting a Frequency Range

Select frequency range from **Subranges** list box with blue selection line. Activate range by means of single click. Then click on **Delete** and store with **OK**.

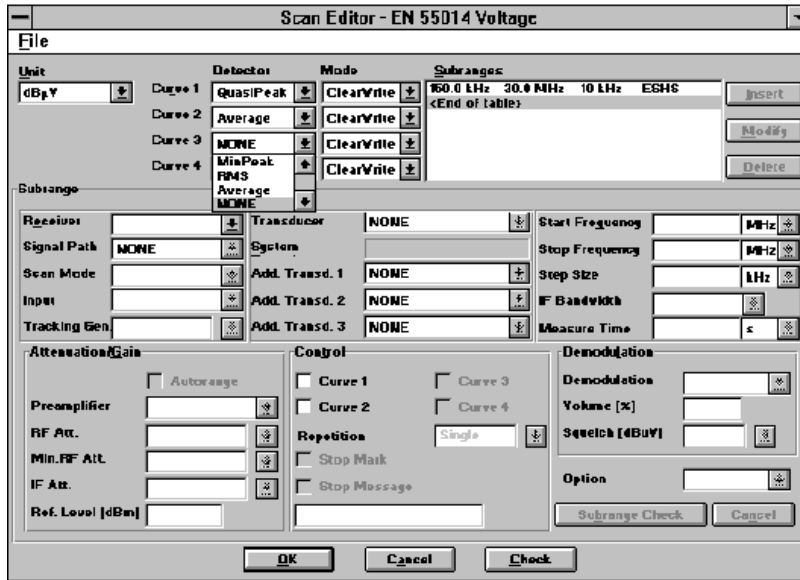


FIG 12: Scan Editor - EN55014 Voltage

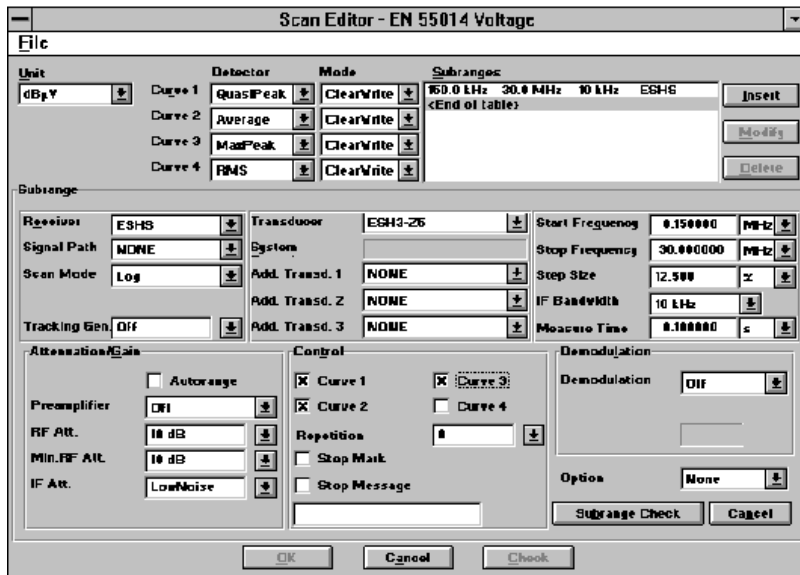


FIG 13: Scan Editor - EN55014 Voltage, after double-click on test receiver marked blue in **Subranges** list box and calling of transducer ESH3-Z5; confirmation with **Insert** in the upper right. Curve 4 (rms detector in this case) is not available for ESHS.

It should be noted that **MaxPeak** in conjunction with 10 ms measurement time will provide a coarse result for orientation only. For measurements in line with standards, the quasi-peak detector would have to be selected for curve 1, as well as a measurement time of 1 s. However, this would lead to uneconomical measurement times, so a time-saving approach (subrange analysis) is usually taken for this type of measurement.

The DUT in this measurement task is a pure broadband interferer. This means that it does not cause sinusoidal interference on just a single frequency. In this special case, it is not obligatory to measure at

each single frequency of the range but the range can be scanned in steps larger than the bandwidth of the test receiver. It is appropriate to select logarithmic steps. With a step size of 12.5%, total measurement time at each frequency will in this case be just about 1 min 40 s even for the standard-conforming measurement time of 1 s.

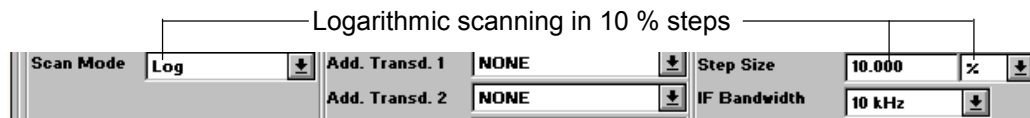


FIG 14: Selection of logarithmic scanning. It should be noted that the step size actually selectable depends on the receiver characteristics. Type ESxS and ESPC receivers allow for step sizes with a factor of  $100\%/2^n$  only, ie 100%, 50%, 25%, 12.5%, etc. The nearest possible step size is set and displayed in the **Step Size** window after clicking on **Insert**. In this case, this is 12.5%.

### 1.3.5 Measurement

#### 1.3.5.1 Example of Virtual Measurement

The measurement described in this section is based on the settings made in the previous sections 1.3.3 and 1.3.4. In this case, however, no hardlock is installed (virtual measurement). Results (FIG 18) are supplied by an internal function generator (simulated by the software). The measurement described is therefore suitable for demonstration.

Select **Test** from the menu line of the initial mask. From the **Test** menu, select **Measurement** and then **Scan** (FIG 19):

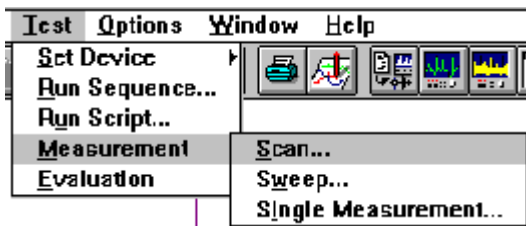


FIG 15 Calling **Measurement** and then **Scan** from the **Test** menu

Click on **Scan**. The scan settings made before are displayed (FIG 20).

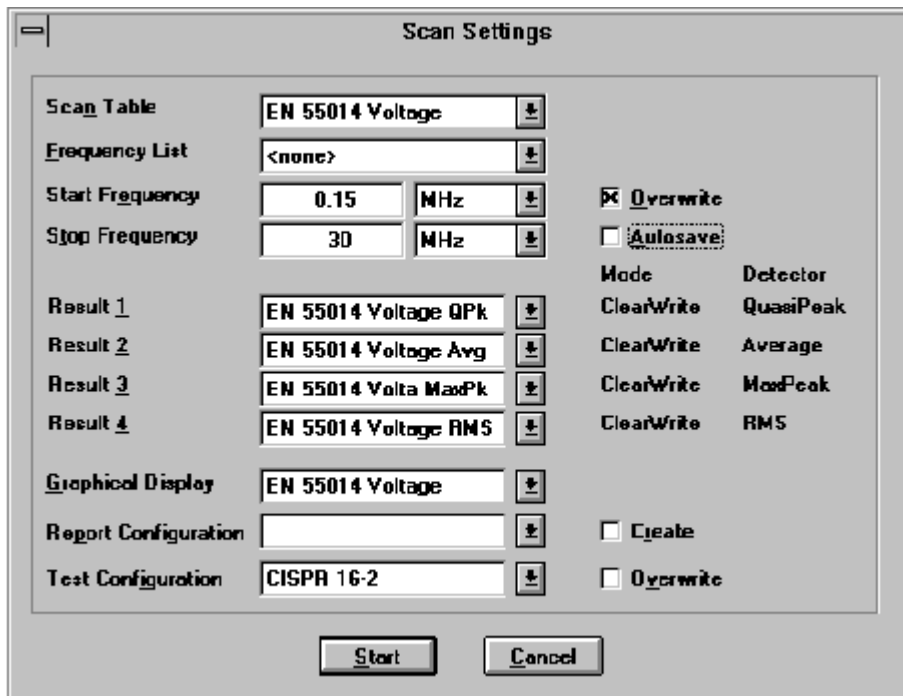


FIG 16 Scan settings. Note: No rms measurement will be performed because **Curve 4 (rms detector)** cannot be selected in the **Scan Editor** since Receiver ESHS contains no rms detector. Despite this, **Result 4 (rms value)** is included in the **Scan Settings** because it is possible that a subrange not used here is used by an ESS (with rms detector), and the scan table applies to all subranges.

The measurement is activated by clicking on **Start**.

The graphics shown in FIG 18 is displayed while the measurement is being performed. The icons numbered 1 to 8 for the various curve configurations can be assigned as required to the two test curves (QP (quasi-peak) and AV (average)) and to the limit lines from the database.

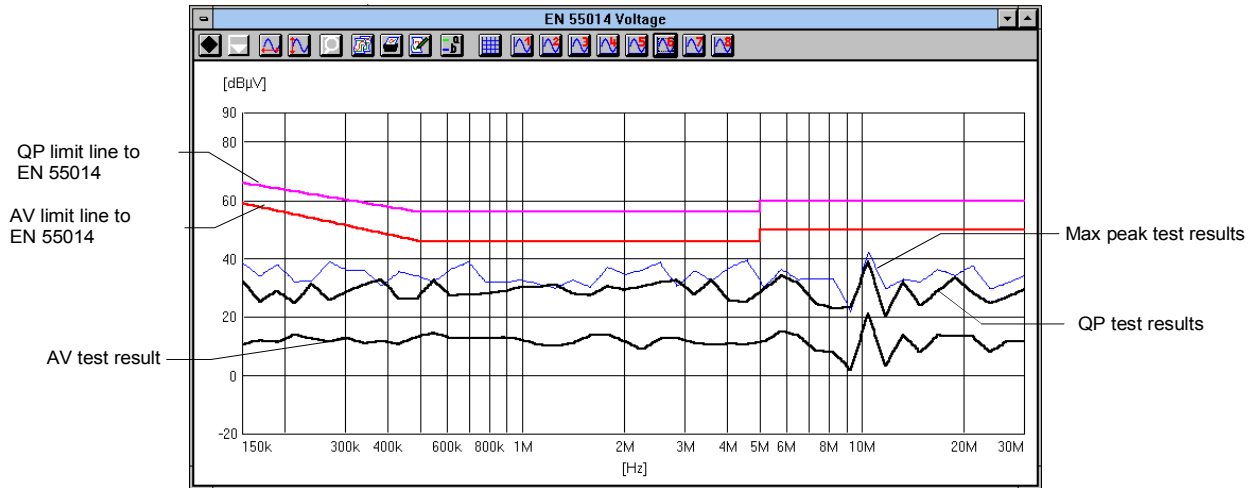


FIG 17: Display of results

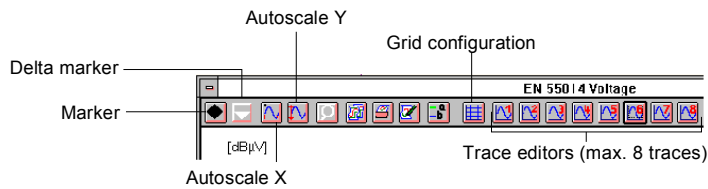


FIG 18: The line of icons above the chart is used for configuring the chart with the test curves as required. Particularly helpful is the zoom function, which is always active and operated with the lefthand mouse key. The icon is for returning to the unzoomed chart.

### 1.3.5.2 Practical Measurements

#### 1.3.5.2.1 Measurement of Broadband Interferer in Range 150 kHz to 30 MHz

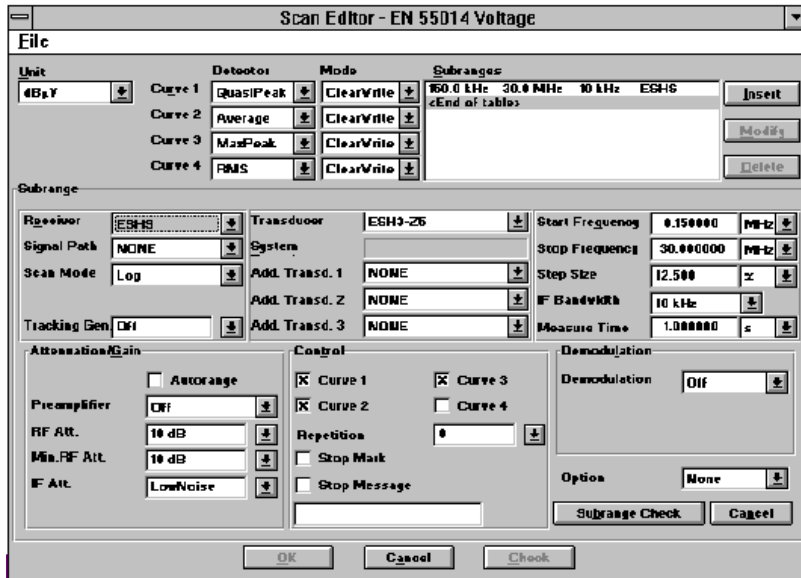


FIG 19: Scan Editor. Note that curve 4 is switched off in this case too because ESHS contains no rms detector.

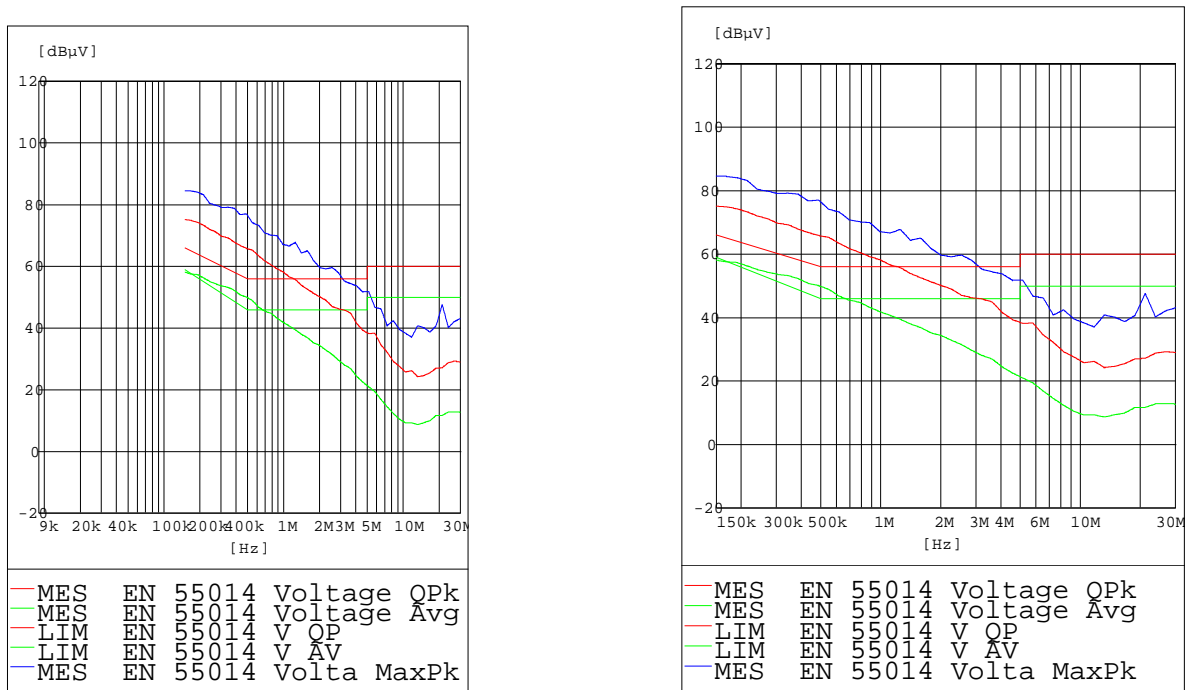



FIG 20: Display of results. Left: using graticule stored in previous measurement with frequency axis from 9 kHz to 30 MHz. Right: after clicking on "Autoscale X" icon . ESHS test sequence: QP and AV values determined in first run, MaxPeak in second run.



1.3.5.2.2 Measurement of Broadband Interferer in Range 9 kHz to 30 MHz

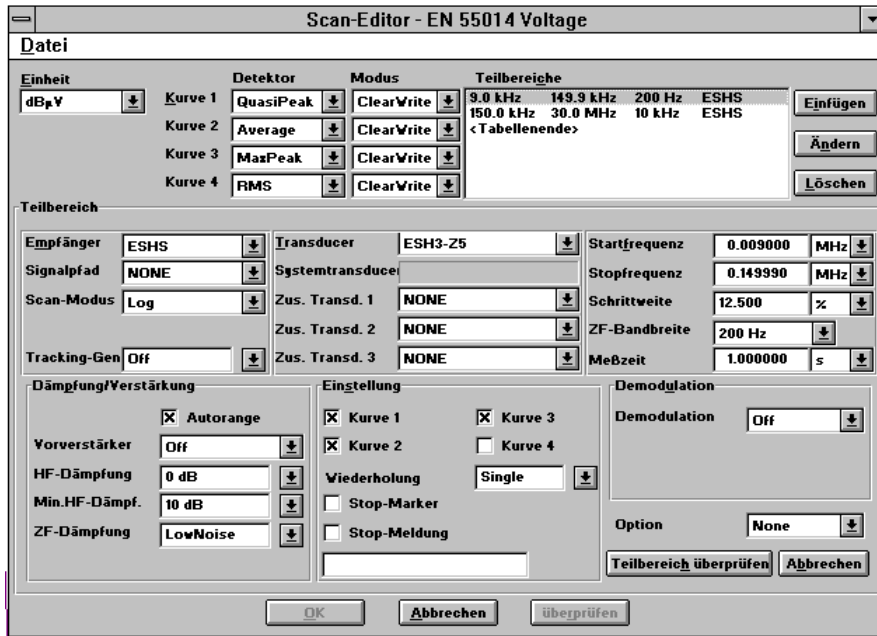


FIG 21: Note: 149 kHz is the highest frequency selectable for CISPR band A (9 kHz to 150 kHz) in conjunction with a bandwidth of 200 Hz and QP display. The program will not accept the value 150 kHz for CISPR band A with QP and 200 Hz bandwidth.

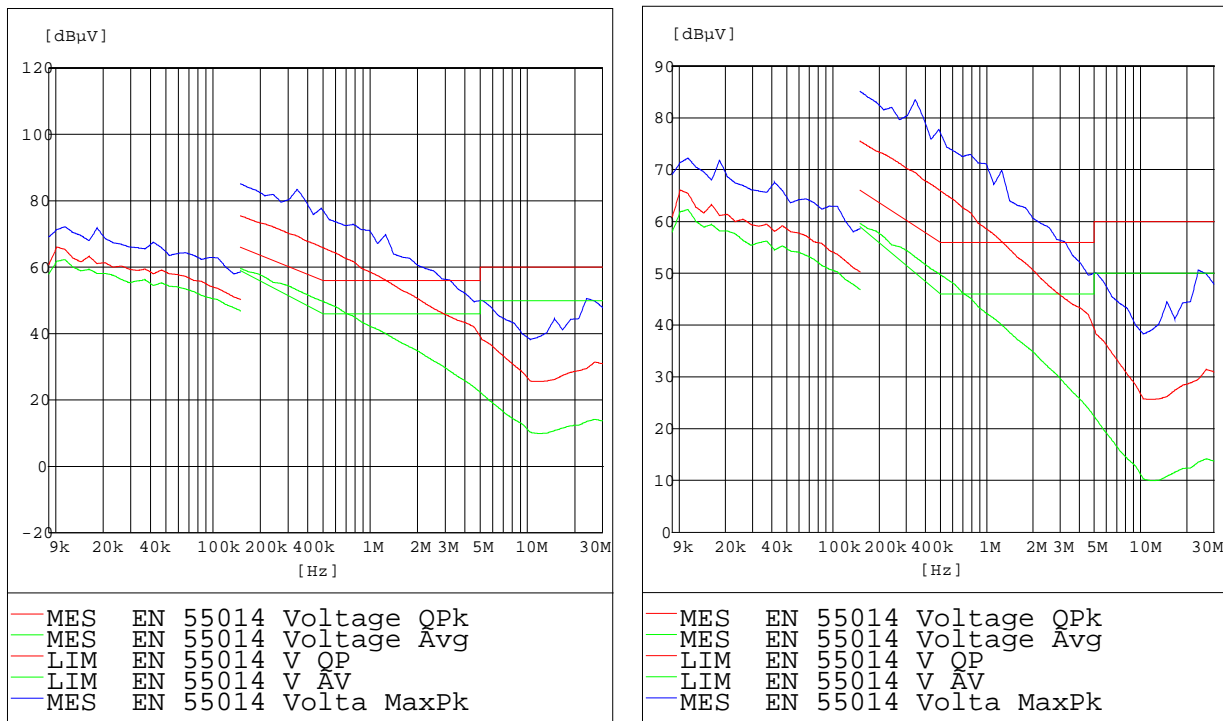



FIG 22: Display of results. Left: in default diagram. Right: in diagram with level range adjusted as required by clicking on Autoscale Y icon .

From the above figure it can be seen that the legend for the curves is printed completely on the hardcopy. On the screen, there is only one line displayed at a time; the lines for the other curves can be displayed by scrolling.

# **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.

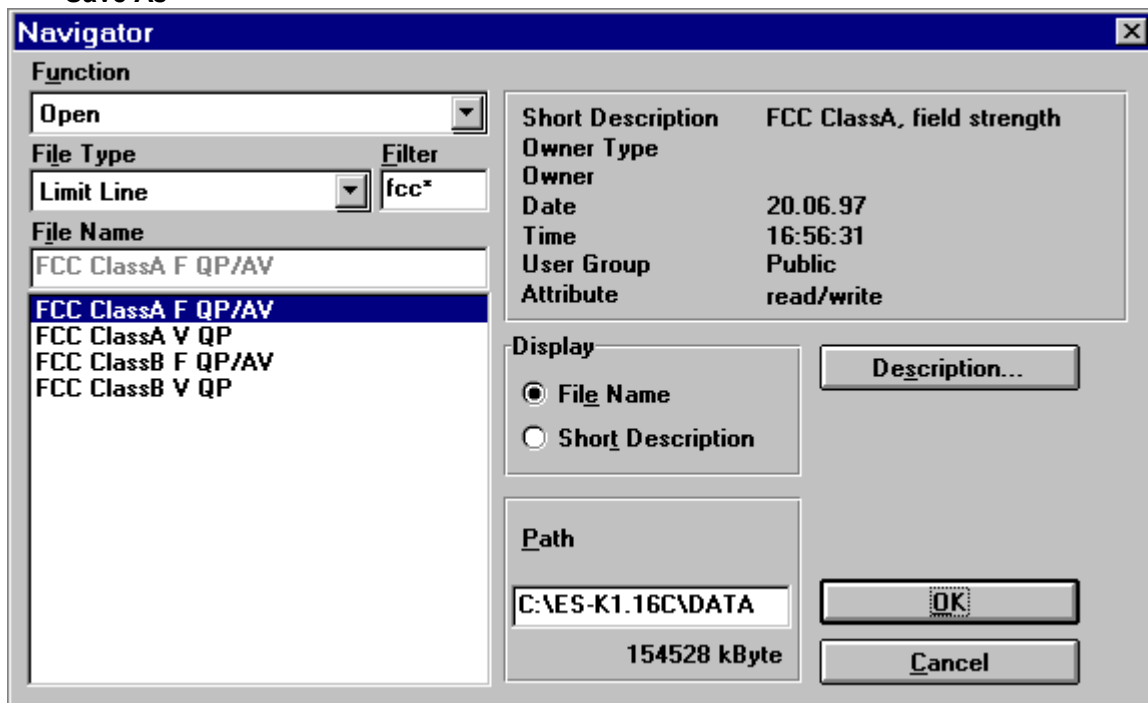
In the following, database elements are referred to as files, however, they are not to be understood in the sense of DOS files.

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

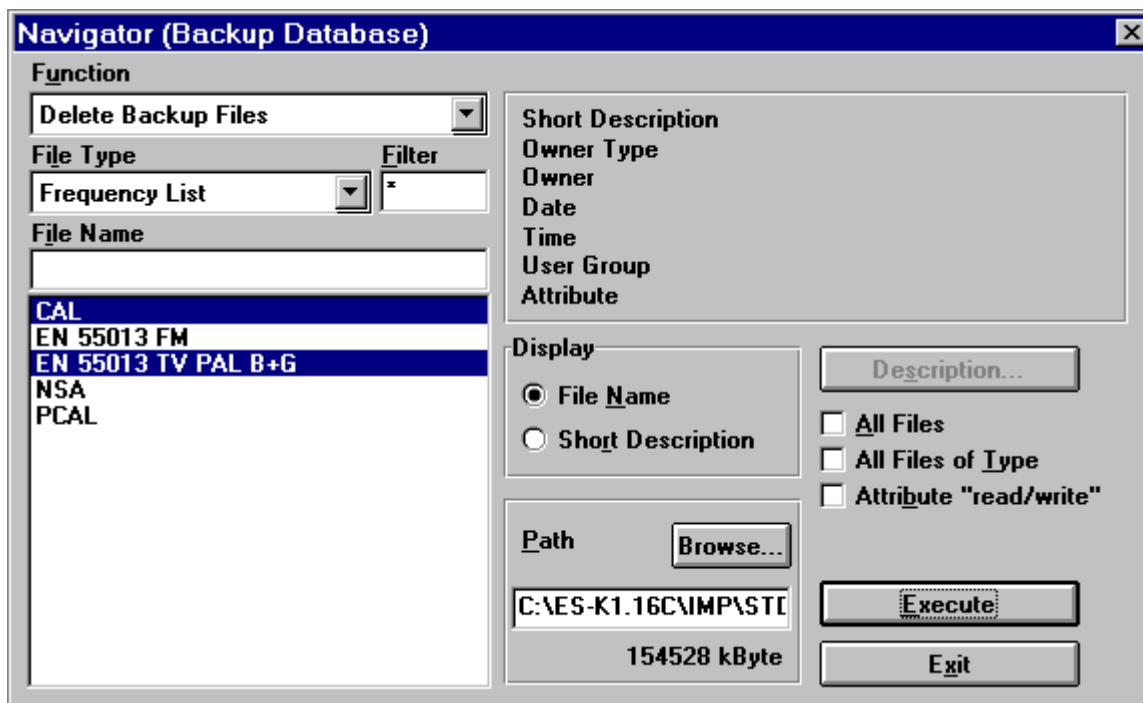


File functions on the **external** database:

- 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:

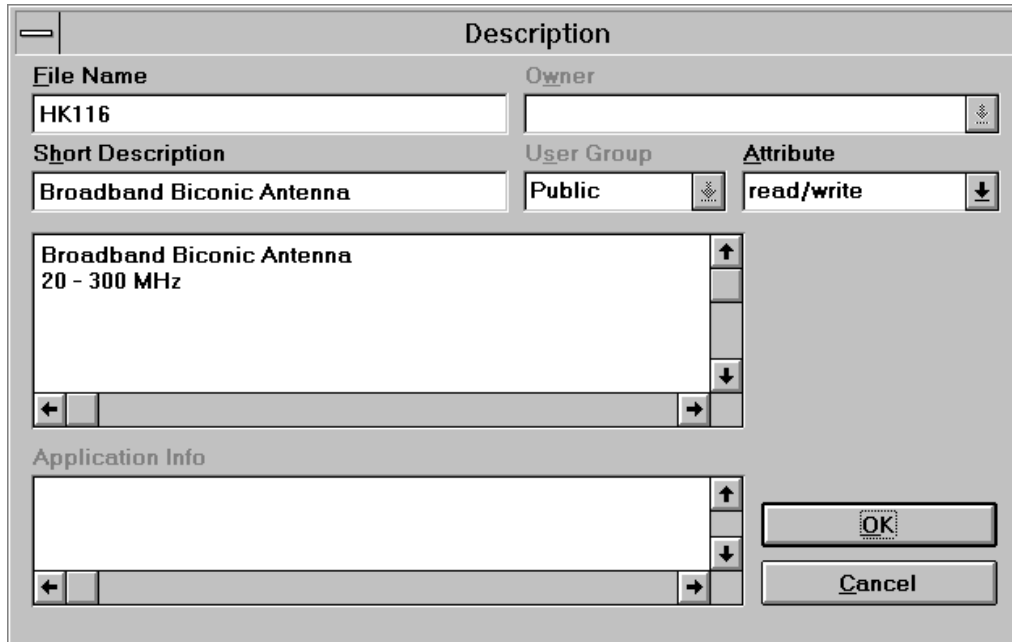
File type	Function	Editor
<b>Sequence</b>	A sequence of scripts	Sequence editor
<b>Script</b>	An automatic test procedure	Script editor (can only be operated with option ES-K2)
<b>Script Parameters</b>	Definition of script parameters	Script parameter editor
<b>Measurement result</b>	Display of measurement results	Table editor
<b>Graphics configuration</b>	Definition and display of graphics	Graphics configuration editor
<b>Limit line</b>	Definition of limit line	Table editor
<b>Transducer</b>	Definition of probe transducer (e.g. for antenna, absorbing clamp)	Table editor
<b>System transducer</b>	Definition of system transducer (e.g. for cables, paths)	Table editor
<b>Report header</b>	Definition of report header	Report header editor
<b>Report configuration</b>	Definition of report configuration	Report configuration editor
<b>Scan table</b>	Definition of scan table	Scan editor
<b>Sweep table</b>	Definition of sweep table	Sweep editor
<b>Frequency list</b>	Definition of frequency list	Table editor
<b>Test configuration</b>	Definition of files belonging to a test	Test configuration editor
<b>Text file</b>	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 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.

Generation or modification of a script is performed by the script editor of the script development environment (Option ES-K2); it also permits to execute scripts in single steps and inspect variables (debugger).

### 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 Sequence

A sequence describes a sequence of automatic program runs or scripts. If the individual scripts are executed without user interaction, very complex measurement tasks can thus be handled fully automatically.

### 2.3.4 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.

### 2.3.5 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.

### 2.3.6 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 $\mu$ V, dB $\mu$ A, dB $\mu$ V/m, etc.) having to be specified for the transducer.

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

Note:

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



### 2.3.7 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.

### 2.3.8 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.

### 2.3.9 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.

### 2.3.10 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.

### 2.3.11 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.

### **2.3.12 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.

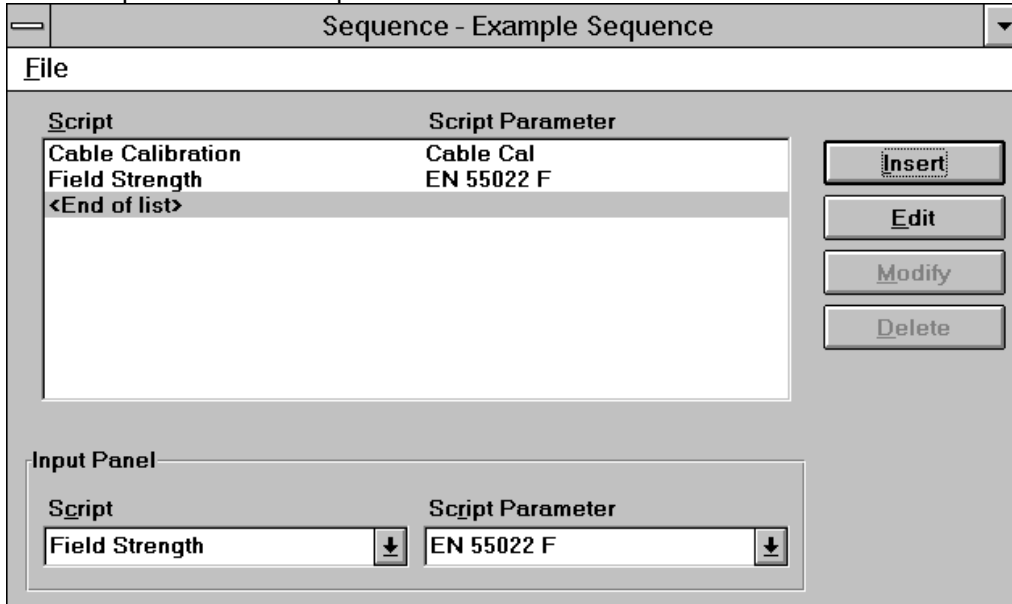
### **2.3.13 Text File**

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

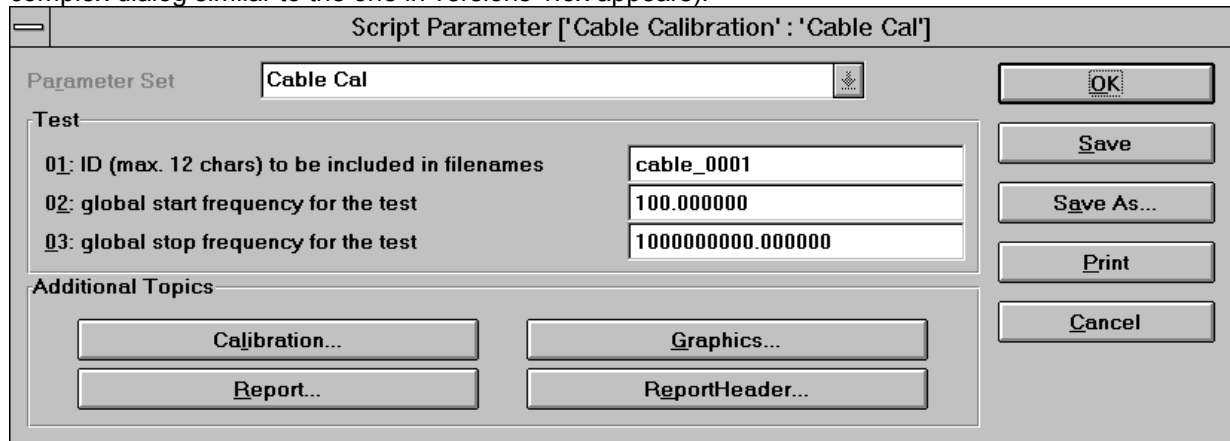
### 2.4.1 Sequence Editor

The sequence editor is used to define a sequence for execution of the scripts. A sequence of scripts with a defined parameter set each can be entered in a list.



### 2.4.2 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 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.

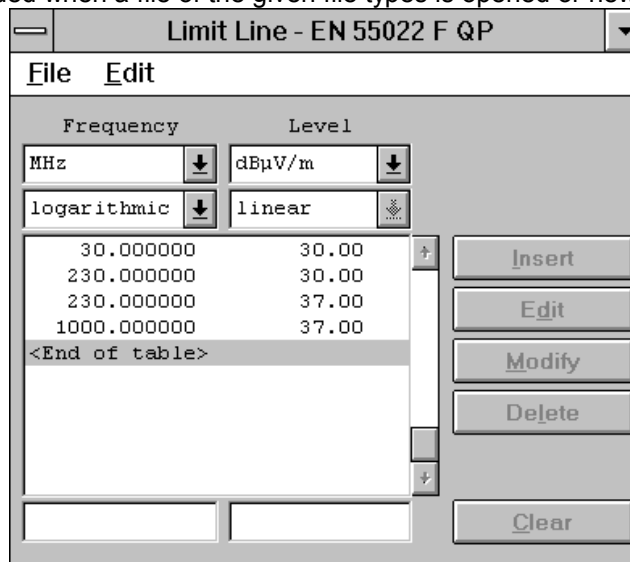
If parameters are deleted from a parameter set, the parameter set can still be used.

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

**2.4.3 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.

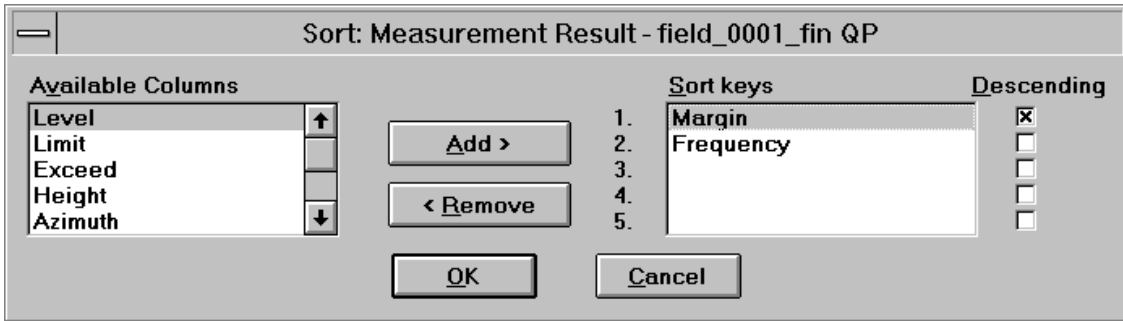
The lower input fields permit to enter new lines, which can be inserted into the list ahead of the active line using **Insert**. As an alternative, the active line in the list can be overwritten by means of **Modify**. **Edit** (or a double-click) permits to copy the contents of the active line into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

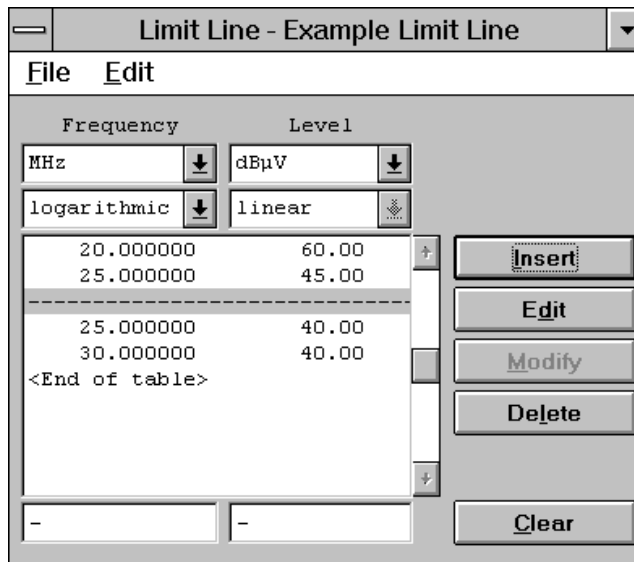


Up to five columns can be defined as **sorting keys** (decreasing priority) with optionally rising or falling values for the elements. Measurements which are not sorted with rising frequency, however, should not be displayed with line graphics display, since the sequence in the list is valid for the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

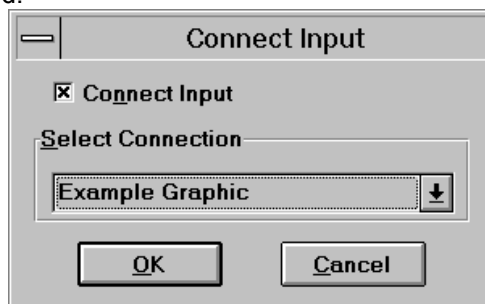
The columns described in the left field can be selected individually and entered or added as sorting criterion by means of **Add**. Likewise, they can be removed again by means of **Remove**, the subsequent entries being shifted accordingly.

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:



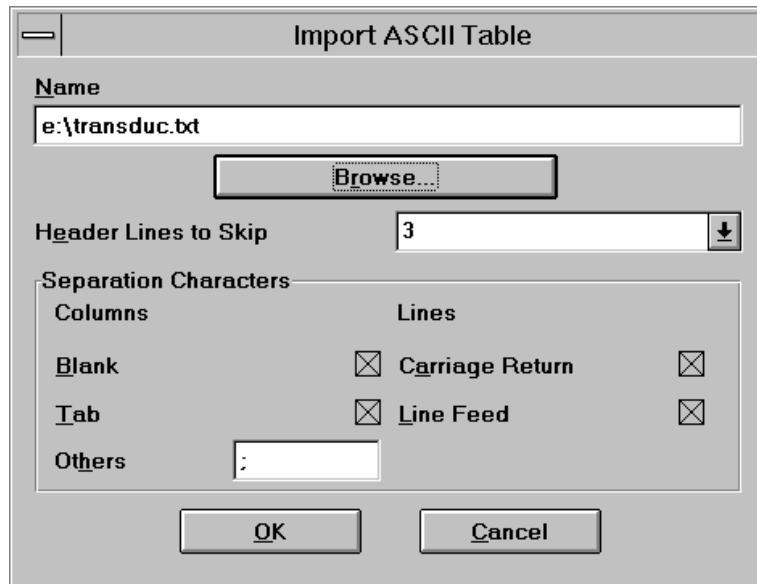
The file type **Frequency List** is provided with a special function which allows comfortable editing of a frequency list: **Connect Input...** determines from which of the opened graphics the marker frequency is to be transferred to the edit field:



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 ES-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.
```

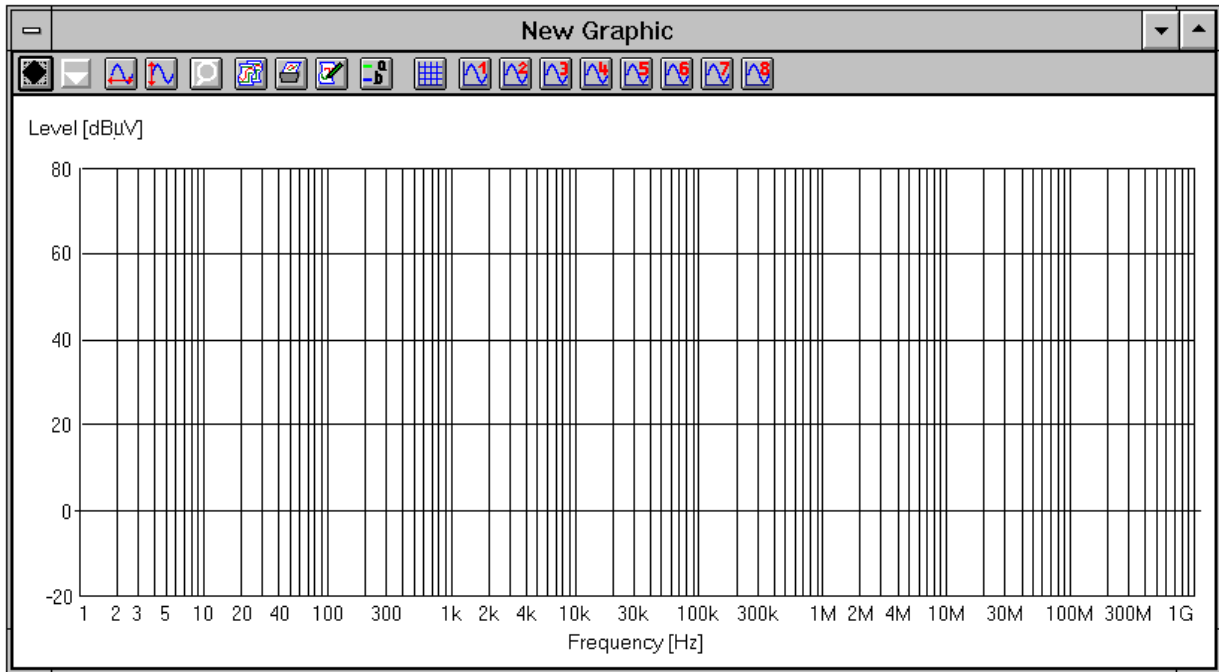
will be correctly be interpreted if there is an extra string column defined.

If a column within a line cannot be filled then this will be indicated with an asterisk.

#### 2.4.4 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.

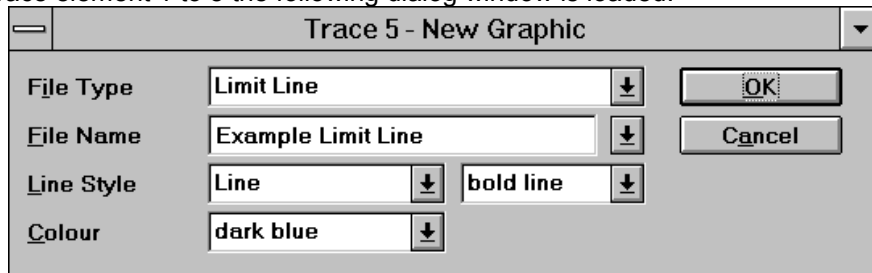
The frequencies of a diagram can easily be modified through shortcuts for the frequency units. A frequency of e.g. 300 MHz can be entered as *300M*.

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** 

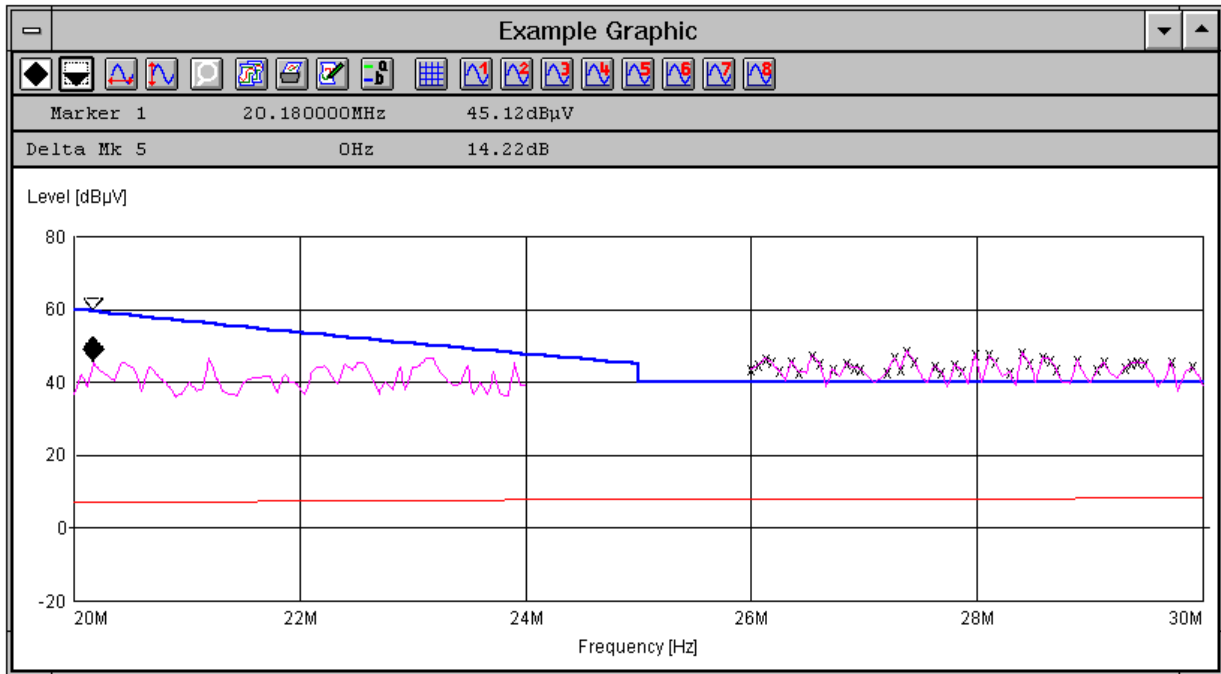
Automatic scaling of the graphic - for the two axes separately - leads to a complete display of all displayed traces. The associated value range of the grid is changed accordingly.

**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.

### 2.4.5 Report Header Editor

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

Field	Value
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

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.

### 2.4.6 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.

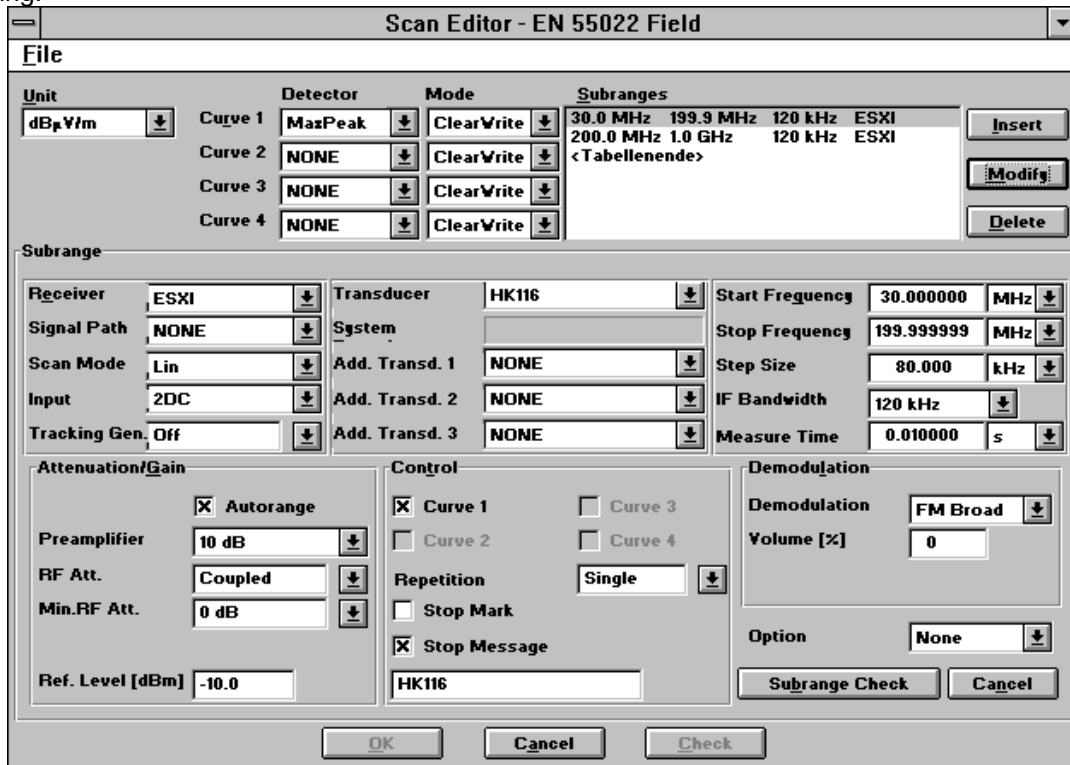
For each part of the test report (e.g. report header, graphics, result list) a number of lines can optionally be reserved. A value of '0' means no reservation, i.e., the number of printed lines simply depends on the content of the referring part. If a number of lines is given, then exactly this number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

### 2.4.7 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.

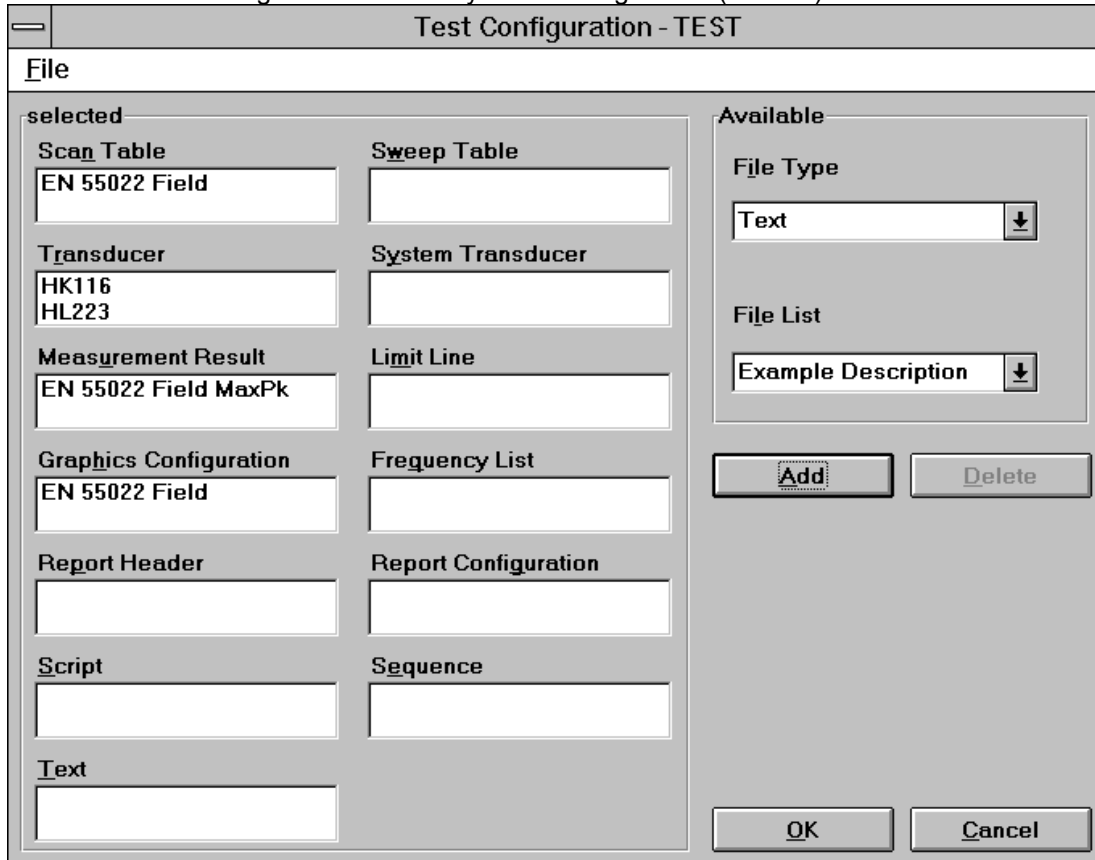
If the procedure is to be aborted when changing from one subrange to the next, e.g. in order to be able to mount another antenna, the **stop mark** must be activated. Thus, the procedure is stopped before this subrange is executed and must be continued by the user (or, as an alternative, be aborted for 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.

## 2.4.8 Test Configuration Editor

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

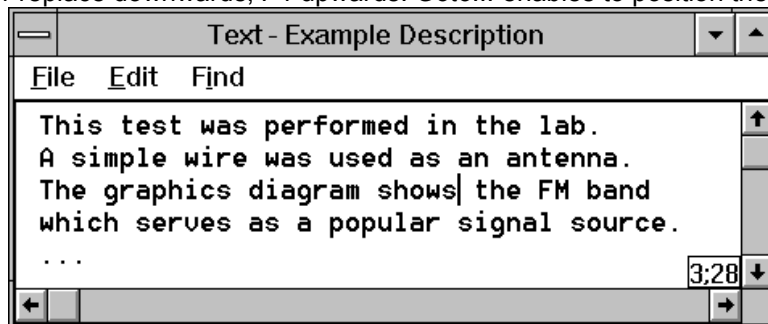


The actual configuration is indicated in the "Selection" field, whereas the individual elements can be selected in the „Available“ field.

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.

### 2.4.9 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.

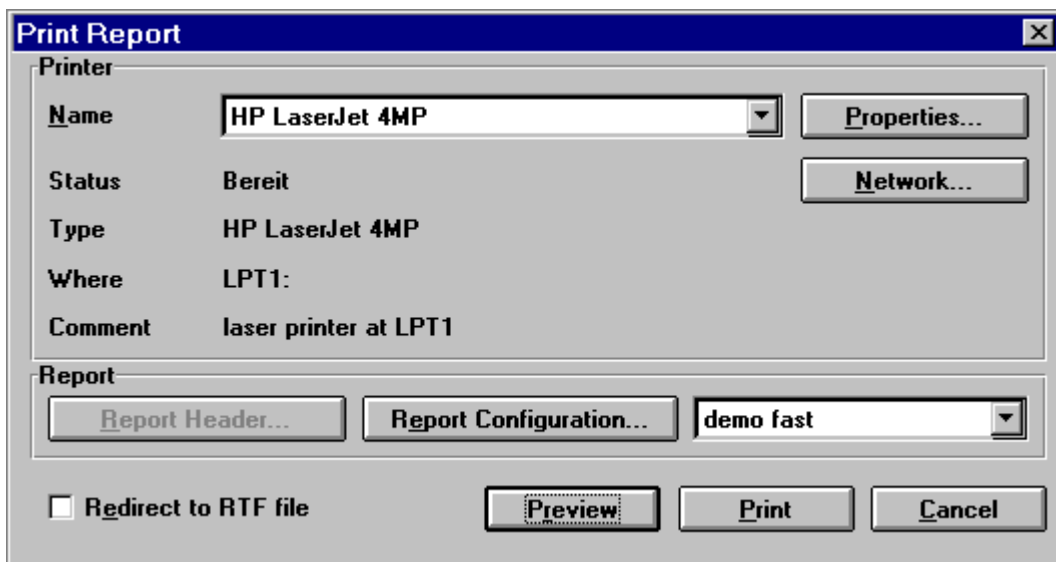


## 2.5 Report

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.

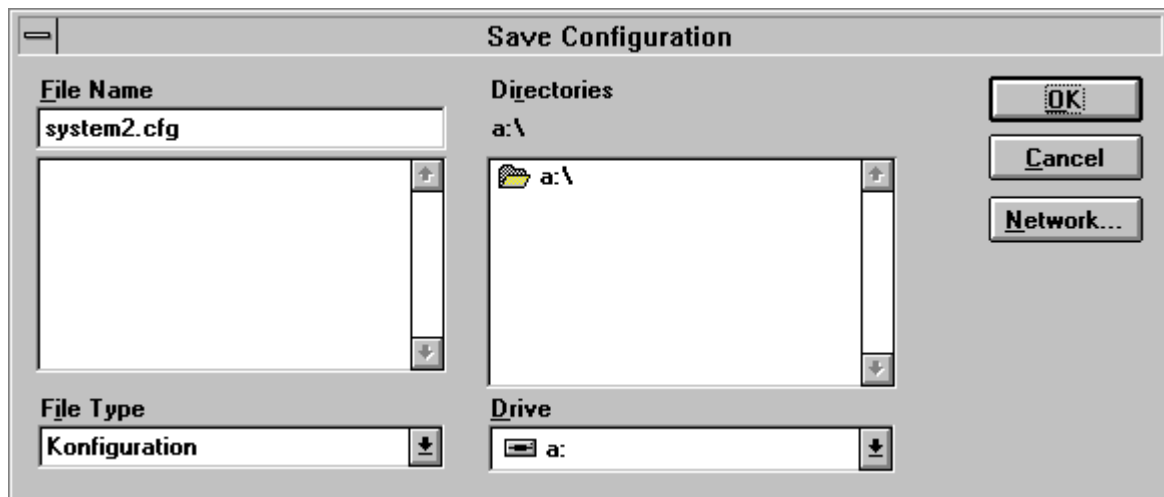
A report can be output into a file in ASCII format. For this purpose, the device driver **Generic/Text only** must be provided together with the interface **FILE:**, installed as continuous printer without formfeeds. During the output, an additional window for entering a DOS file name is opened. This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

## 2.6 Special Functions

### 2.6.1 Configuration

The function **Save Configuration...** enables the user to save all files of the application that include configuration data (\*.INI) in a given directory on floppy disk or hard disk (as copy).

Vice versa, **Load Configuration...** permits a software configuration to be restored. Thus, the configuration can also be used for another installation of the software.  
After this step the application must be closed and restarted!



### 2.6.2 Quit (Alt-F4)

Terminates the program ES-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. device configuration and dialog language.

The menu consists of the following functions:

- Device Configuration
- Selftest
- Simulator
- Login
- User List
- Change Password
- Edit Accessory
- Configure Accessory
- 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 Device Configuration

The function Device Configuration enables the user to incorporate new devices in the software or modify the configuration for the provided devices.

The loaded device drivers are displayed in the upper selection window. They can be selected by double-clicking on the device name. Then the specific device settings can be performed.

Name	Device	Description	Interface	Addr	Mode	Active	Busy
ESXI	ESMI		GPIB0	20	virtual	Yes	No
MAST	HCM		GPIB0	15	virtual	Yes	No
TURNTABLE	HCT		GPIB0	15	virtual	Yes	No
ESH2-Z5	ESH2-Z5		GPIB0	18	virtual	Yes	No
ESH3-Z5	ESH3-Z5		GPIB0	20	virtual	Yes	No

**Input Field: Device**

<b>Name</b>	<b>Device</b>	<b>Interface</b>	<b>Mode</b>
ESXI	ESMI	GPIB0	<input type="radio"/> physical <input checked="" type="radio"/> virtual
<b>Description</b>	<b>Address</b>	<input checked="" type="checkbox"/> Active	
	20		

Buttons: Insert, Edit, Modify, Delete, Properties..., Load, Empty, OK, Cancel

All device functions can be executed in two different operating modes:

**a) physical mode**

The parameters are set on the device.

**b) virtual mode**

The settings are simulated by the software. The device is not addressed.

A (newly) installed device driver can be inserted by means of **Load**. After actuating the key, the respective device can be selected for editing in the selection window **Device**.

The device to be incorporated (designation of the device driver) is selected by means of **Device**; the function **Load** must already have been executed.

The **Name** is used to establish a reference to the software.

A short **description** - e.g. "Analyzer" - can be assigned to each device.

When the software is started, the communication via the specified **interface** is checked. The software settings must comply with the implemented hardware. The interface "GPIB0" (IEEE bus) is used as standard.

The **IEEE address** is important for the connected devices. For proper communication, the IEEE addresses in the device configuration must comply with the hardware settings on the device.

The **operating mode** determines whether the device is to be operated in **physical** or **virtual** mode.

All devices that are to be addressed or simulated via the software must be set to **active**. Before a device can be set to active, the respective device driver must be installed. The software recognizes an existing device driver, and **Yes** is displayed in the column *Active*. If the instrument is just being used, **Yes** is also entered in the column *Busy*.

**Modify** is used to transfer the modified settings to the device configuration.

**Insert** transfers the settings to the device configuration (above the currently selected device) as a new device.

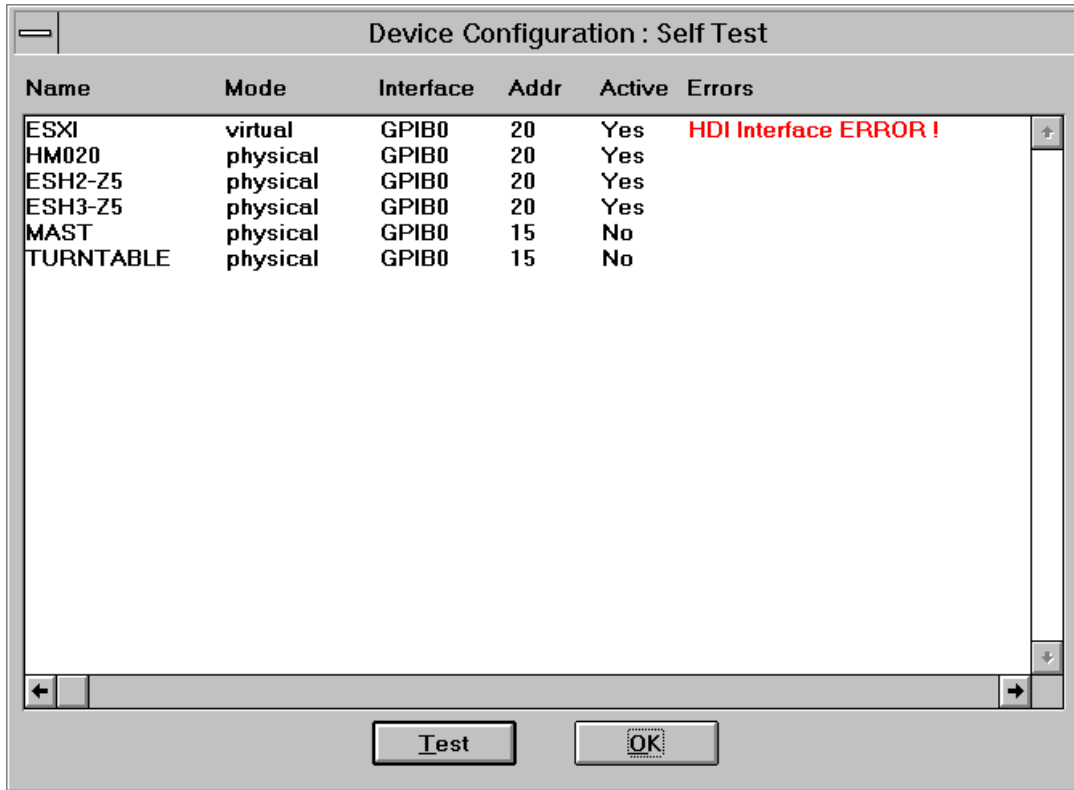
**Delete** is used to remove the selected device from the device configuration.

The definition of the device-specific **Properties** (see description of the respective device driver) must comply with the hardware of the device.

## 2.7.2 Selftest

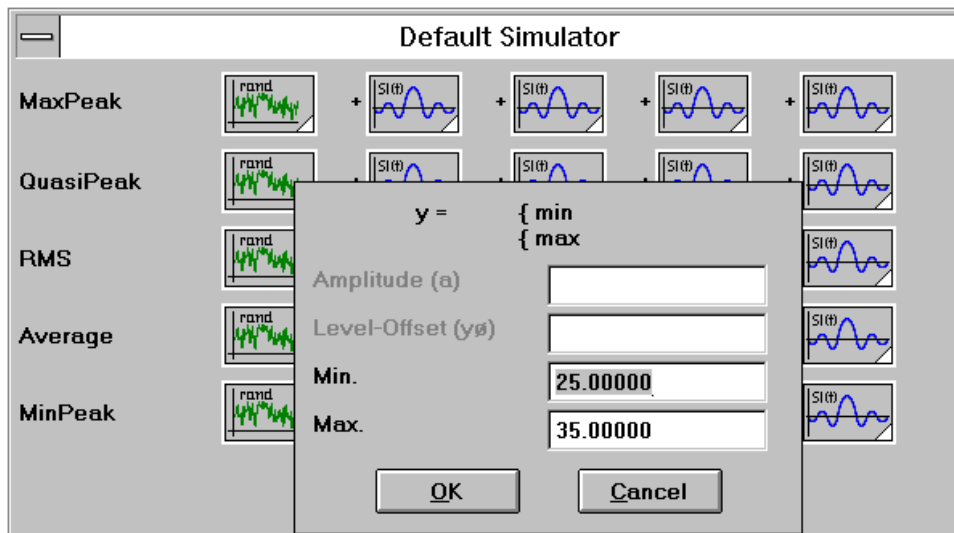
The menu item **Selftest** repeats checking of the device list (according to the device configuration) as in the case of the software start. This is particularly useful if one or several devices were not yet in operation by mistake when the software was started: In this case, the software does not have to be restarted, and correction of the device configuration (for subsequently changing the devices not found from the virtual to the physical operating mode) is not necessary.

Note: The abbreviation "HDI" means "handler device interface" and refers to the interface, normally to the GPIB system. If an error message tells about an "HDI" problem, then make sure that the devices to be controlled are ready for operation (maybe switching off and on again helps) and that all bus cables are working properly.



### 2.7.3 Simulator

The function generator permits to simulate a scan or sweep with devices operated in virtual mode. A dialog window is opened for defining the settings (see below). A total of up to 5 basic functions can be superimposed (see below). The basic function is selected by clicking on the white triangle in the function symbol.



#### Sine function

$$y(f) = y_0 + a * \sin(2\pi * (f - f_0) / F)$$

Amplitude (a), level offset ( $y_0$ ), period (F) and freq. offset ( $f_0$ ) can be specified in a dialog window by clicking on the function symbol. The sine function can be used for simulation of broadband interference.

**Si-Function (  $\sin(x)/x$  )**

$$y(f) = y_0 + a * \sin(2\pi * (f - f_0) / F) / (2\pi * (f - f_0) / F)$$

Amplitude (a), level offset ( $y_0$ ), period (F) and freq. offset ( $f_0$ ) can be specified in a dialog window by clicking on the function symbol. The Si-function can be used for simulation of narrowband interference.

**Square function**

$$y(f) = y_0 \text{ with } f < s \text{ and } f > e$$

$$y(f) = a + y_0 \text{ with } s \leq f \leq e$$

Amplitude (a), y-offset ( $y_0$ ), start frequency (s) and stop frequency (e) can be specified in a dialog window by clicking on the function symbol. The square function can be used for simulation of broadband interference.

**Random function**

$$y(f) = [\text{min} ; \text{max}]$$

Minimum value (min) and maximum value (max) can be specified in a dialog window by clicking on the function symbol. The random function can be used for simulation of background noise.

**2.7.4 Login, User List and Change Password**

The Software ES-K1 is provided with password protection. This is of great importance for two reasons:

1. the data are protected against unauthorized access
2. the system configuration is only changed by authorized people

The program includes three user classes with different rights of access:

1. System manager
2. Extended
3. Standard

Besides, every user is assigned to a user group.

The rights of access are distributed as follows:

Ÿ The **system manager** has access to all components and data of the software.

Ÿ The **user with extended access rights** is assigned the same access rights as a system manager, with the following exceptions:

Ÿ Processing of the device configuration

Ÿ Processing of the path configuration

Ÿ Processing of the user groups

Ÿ Processing of the user list

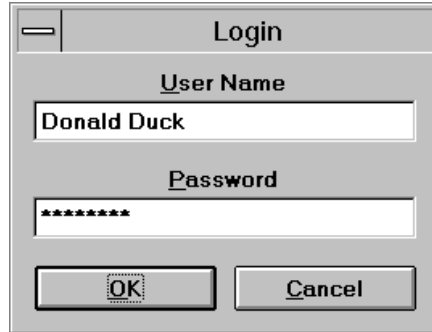
Ÿ Processing of the files outside his group (exception: files with the attribute **Public** may be processed)

Ÿ The **user with standard access rights** has the same access rights as a user with extended access rights, with the following exceptions:

Ÿ Processing of the file type script

Ÿ Reading of the files outside his group (exception: files with the attribute **Public** can be read)

When the software is started, the following dialog window appears:



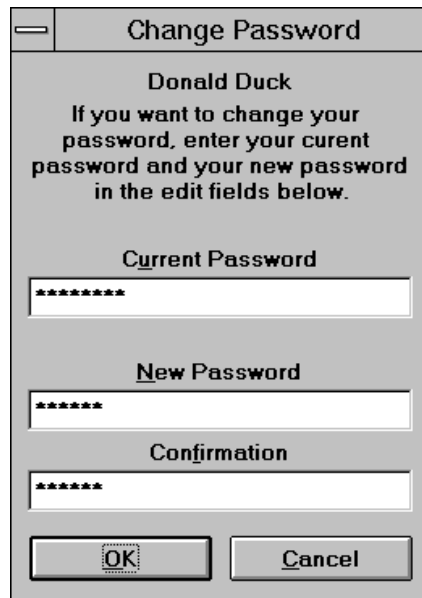
The user must enter his user name and password in this window. On pressing the **OK** key, the settings are checked and, in the case of a correct login, the main menu is entered. The **Cancel** key is used to abort the start of the software and open Windows.

**Option Login**

This function is used to reregister a user in the software. The currently registered user is thus logged out automatically. Besides, the same is true as for login on starting of the software.

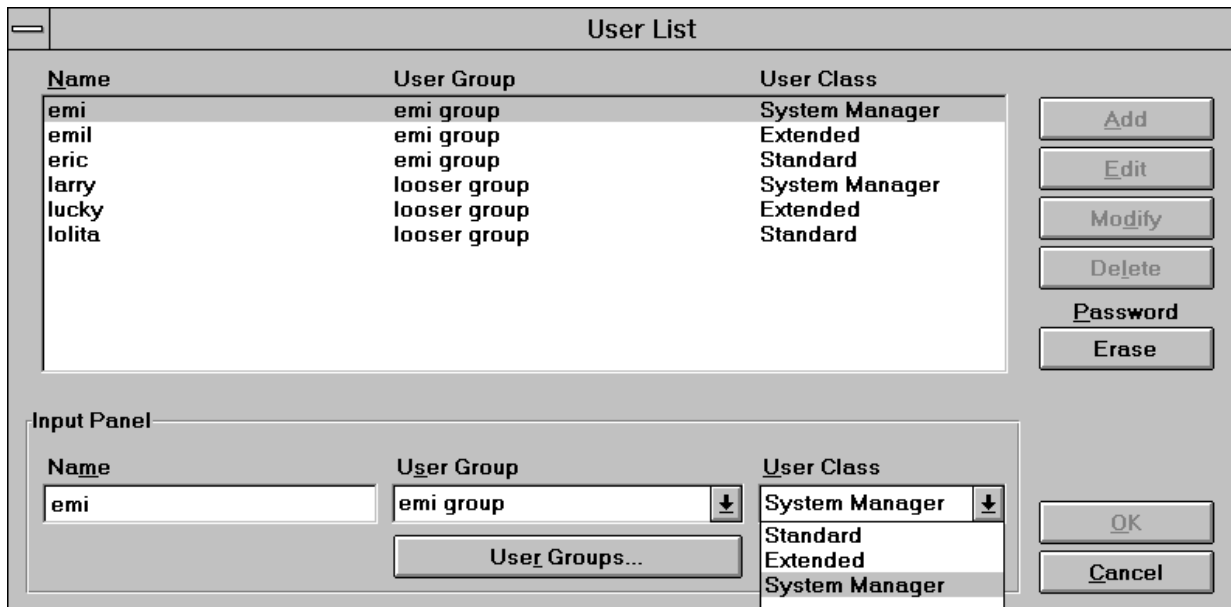
**Option Change Password**

To change the password, both the old and the new password must be entered (twice to avoid typing errors):

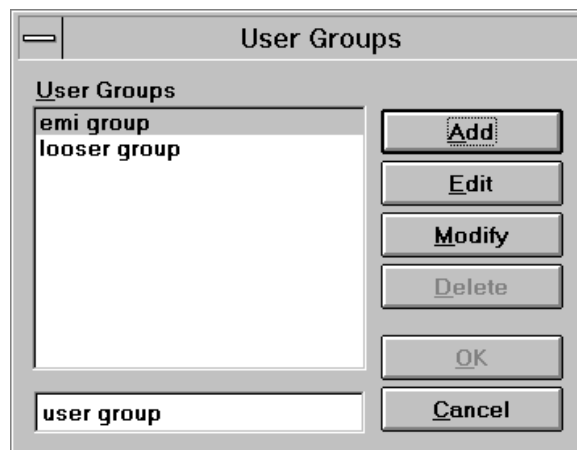


Option **User list**

In this dialog window, a user group and a user class are assigned to the user and made known to the system. The password can also be cancelled in this window, which permits the respective user to assign a new password without having to specify the old one:



For every user, an existing **user group** is to be selected and one of the three user classes allocated. The list of user groups can be edited via an extra dialog window:



**2.7.5 Edit Accessory and Configure Accessory**

see 2.8.4.2 Single Measurement

**2.7.6 Main Toolbar, Device Toolbar and Status Bar**

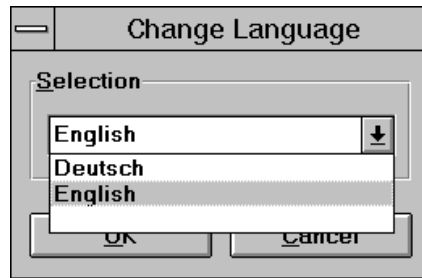
see 2.1 Overview

### 2.7.7 Background

see 2.1 Overview

### 2.7.8 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

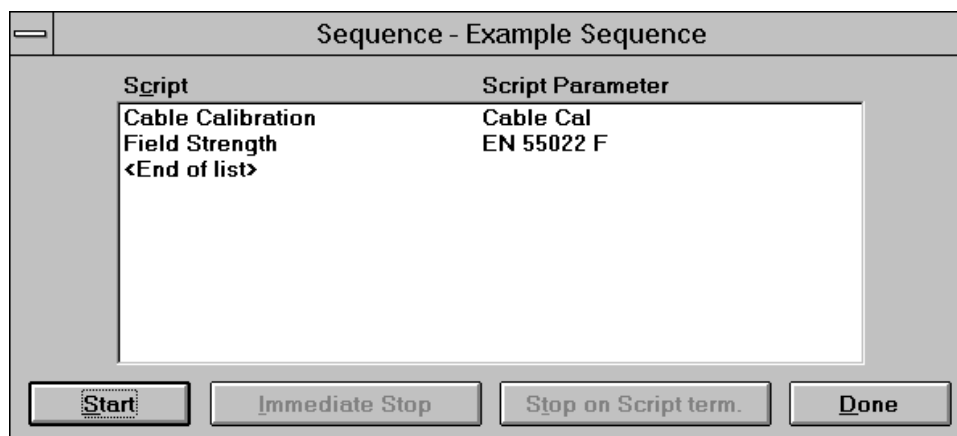
The menu **Test** is used e.g. for execution of the various measurement functions, for starting of scripts and for operation of the devices.

### 2.8.1 Interactive Device Dialog

**Set Device** permits to select a device entered in the device configuration 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. If an error occurs during the device access, the cause of the error must be determined by referring to the operating manual of the device involved. A detailed description of the dialog windows can be obtained from the respective description of the device driver.

### 2.8.2 Sequence

**Execute Sequence...** offers a choice of the provided sequences. A selected sequence can then be started using **Start** and is continued until the end unless it is aborted before by pressing the keys **Immediate Stop** or **Stop on Script term.**



### 2.8.3 Script

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





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.

## 2.8.4 Measurement Functions

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

- Y Scan
- Y Sweep
- Y Single measurement

### 2.8.4.1 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.

The screenshot shows the 'Scan Settings' dialog box with the following configuration:

- Scan Table:** EN 55022 Voltage
- Frequency List:** <none>
- Start Frequency:** 0.15 MHz
- Stop Frequency:** 30 MHz
- Result 1:** EN 55022 Volta MaxPk
- Result 2:** EN 55022 Voltage Avg
- Graphical Display:** EN 55022 Voltage
- Report Configuration:** (empty)
- Test Configuration:** (empty)
- Overwrite:**
- Autosave:**
- Create:**
- Overwrite (bottom):**

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.

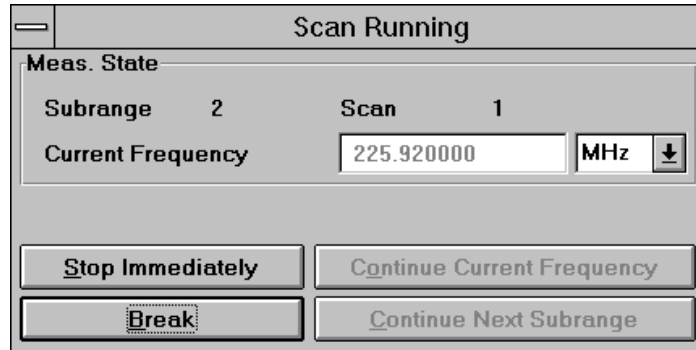
When starting a scan or a sweep, then besides the graphics configuration the software also can create a default **test configuration** or a default **report configuration**.

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).

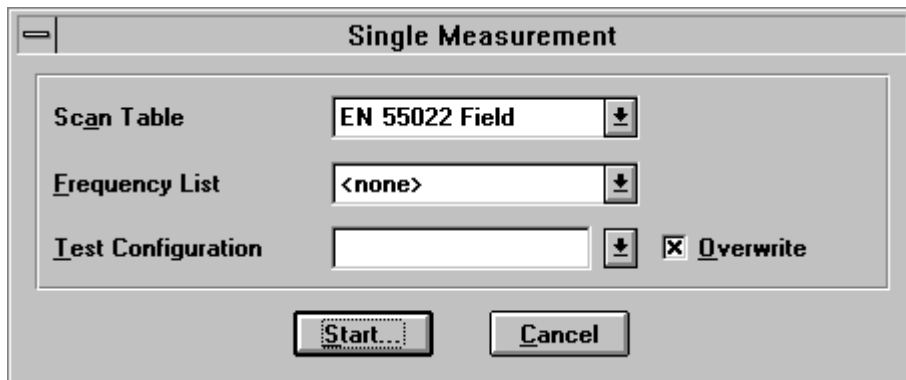
At the end of a scan or sweep, the frequency dependent transducer factor of the last range can optionally be programmed into the receiver - depending on the instrument's capabilities (if the number of correction values in the receiver is not sufficient then they will be interpolated). This way measurements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

#### 2.8.4.2 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 measurement result can be extended by **predefined columns** which will be automatically filled with the **settings of accessories** (polarisation, artificial mains network lines, etc.) at the time of the measurement
- the frequency display can be coupled to a **marker** located on a trace for display of the measurement result

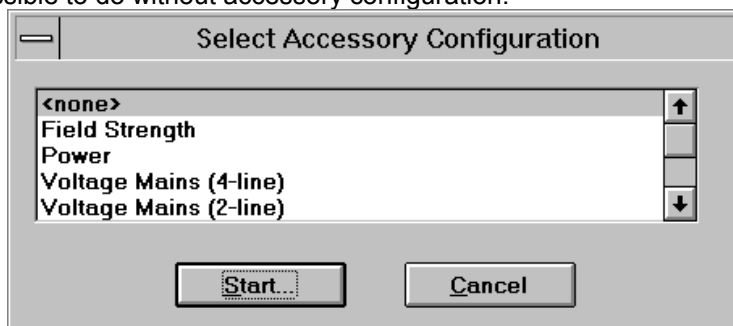
When a single measurement is started, the **Scan Table** to be used and an optional **Frequency List** are to be selected:



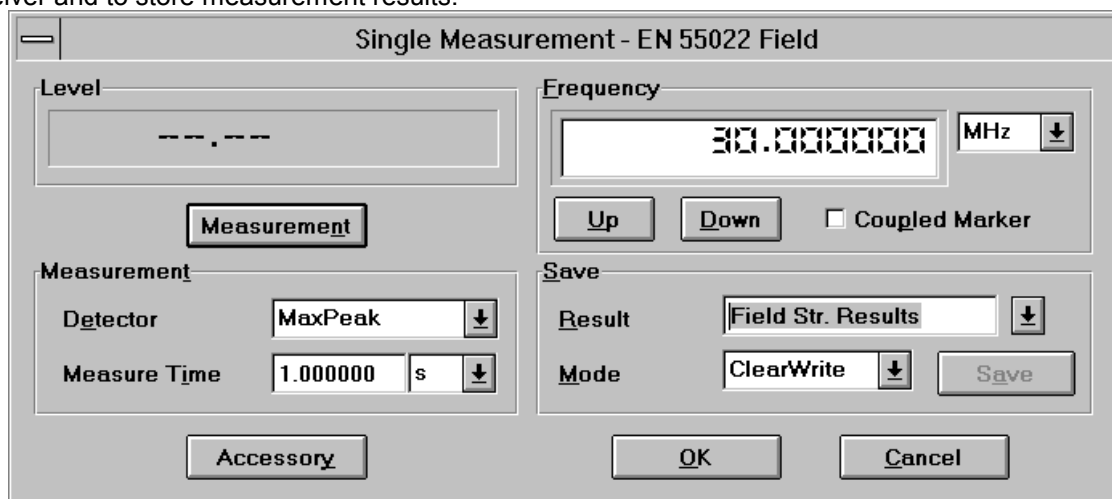
When starting a single measurement, then the software can optionally create a default **Test Configuration** which holds all referring files (scan/sweep table, transducer, system transducers, measurement result file).

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.

Subsequently, a choice of the **Accessory Configuration** is offered (determines the column layout of the produced measurement result and the accessory to be connected; for editing of the configuration see below). It is also possible to do without accessory 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 or vary it together with accessory settings if selected and if the associated device dialogs have been started before (see below).

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 device configuration 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.

Columns can automatically be added to the measurement result, in which the current settings of accessory devices are stored for each measurement. If a single measurement result is stored, the associated accessory settings are automatically entered in the respective fields (i.e. next to frequency and level, e.g. the turntable angle). To this end, the columns must be defined accordingly, i.e. the columns must be assigned to the accessory (e.g. an automatic antenna mast) and the associated parameter (e.g. polarisation). For this purpose, two dialogs are provided, the first one allowing to edit the setup of all columns, the second one to produce a combination of these columns.

The menu item **Edit Accessory** (options) is used to open a dialog which permits to define a column for each accessory parameter (of the accessory devices active in the device configuration):

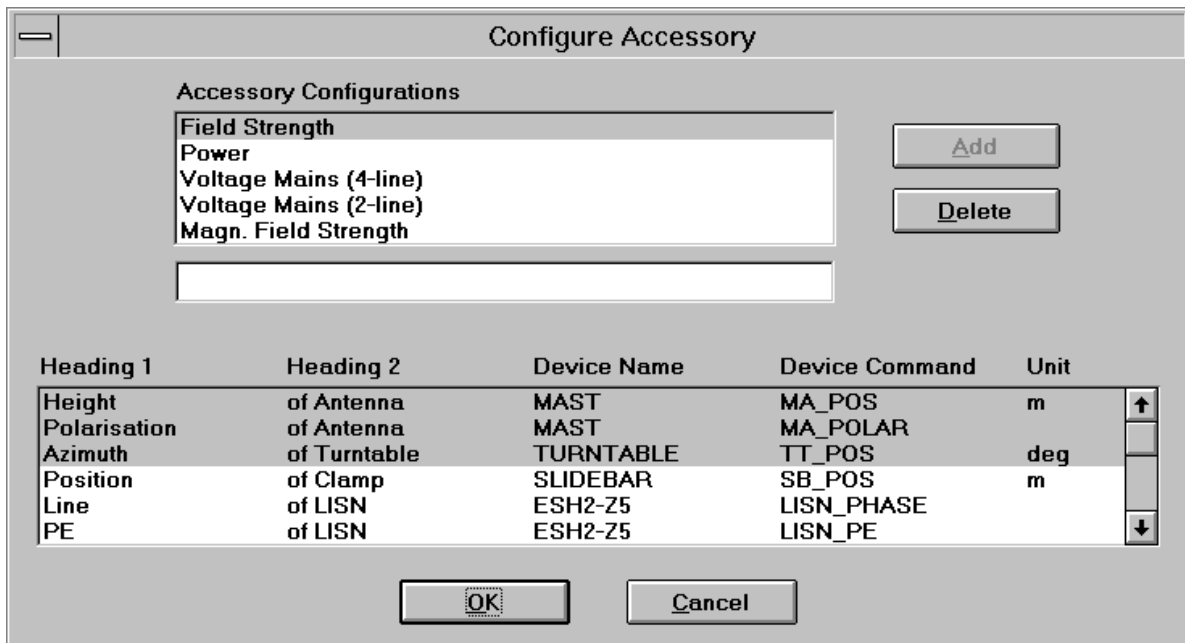
Heading 1	Heading 2	Device Name	Device Command	Unit
Height	of Antenna	MAST	MA_POS	m
Polarisation	of Antenna	MAST	MA_POLAR	
Azimuth	of Turntable	TURNTABLE	TT_POS	deg
Position	of Clamp	SLIDEBAR	SB_POS	m
Line	of LISN	ESH2-Z5	LISN_PHASE	
PE	of LISN	ESH2-Z5	LISN_PE	

Below the table, the following fields are visible:

- Heading 1:
- Heading 2:
- Device Name:
- Device Command:

The first heading must be clearly designated; the width of the column is determined by the longer one of the two headings (max. 15 characters). When a (symbolic) device name has been selected, the associated device command (query for a particular setting) must also be selected. Such a column definition can then be appended to the existing list and also modified or deleted subsequently.

The second dialog is started by means of the menu item **Configure Accessory** (options):



The upper field lists the names of the column configurations, whereas the lower field shows all existing column definitions (produced with the dialog **Edit Accessory**). When a name has been selected in the upper field, the associated columns are marked in the lower field; this marking can be changed at will (best to be done using the mouse key with simultaneously pressed Ctrl key) and any combinations can be formed, which become valid immediately when the dialog is terminated with OK. The edit field in the middle permits to generate new column configurations, which can be edited immediately or subsequently by means of a marking in the lower field.

To make a column configuration effective the following steps are needed:

First the device dialogs have to be started (they might be iconized).

Then the single measurement dialog has to be started, which requires to select a scan table (plus optionally a frequency list and a test configuration, see above) and a column configuration.

Now a measurement can be started.

The name of the measurement result file has to be entered or selected.

When the **Save** key is pressed for the first time the columns will be added to the file and the result along with the device positions will be stored.

## 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
- Subrange Minima Reduction
- Maxima Reduction
- Octave Maxima Reduction
- NB / BB Discrimination
- Conversion to ... / MHz
- Unit Conversion
- Merge Data
- Exclude Ambients
- Weighted Addition
- Reduce to Freq.List
- GTEM 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 GTEM 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.

**Acceptance Analysis**

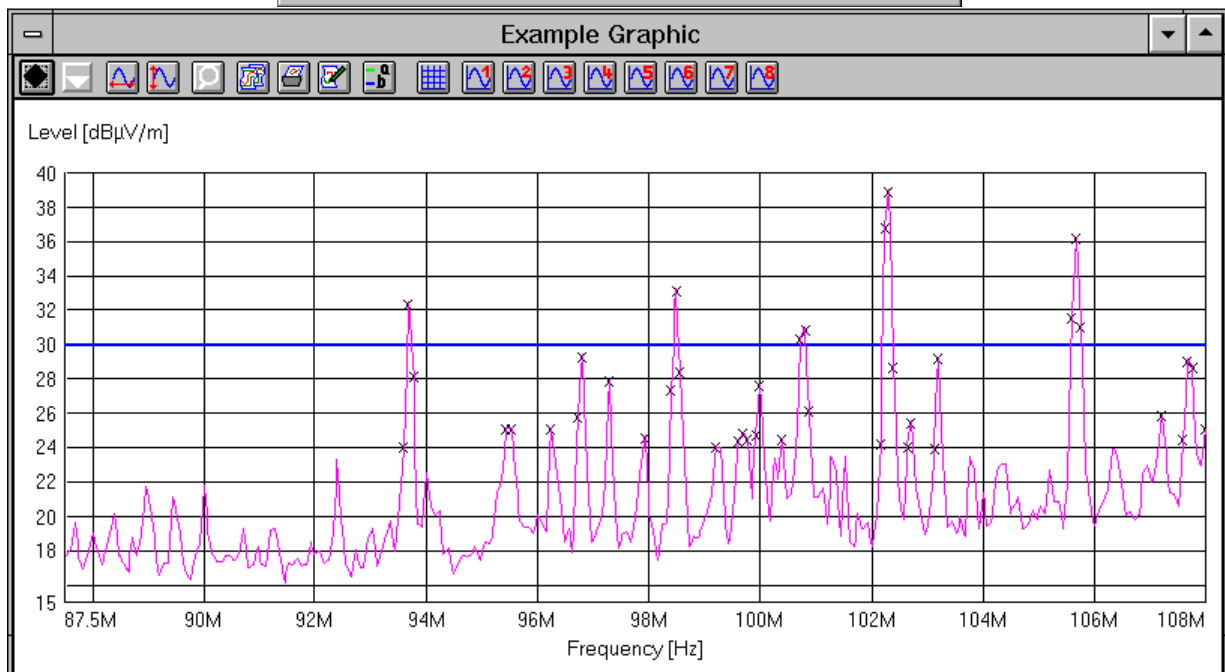
**Input File**  
 ↓

**Output File**  
  Autosave

**Limit Line**  
 ↓  
 Acceptance Offset  dB

**Graphical Display**  
 ↓



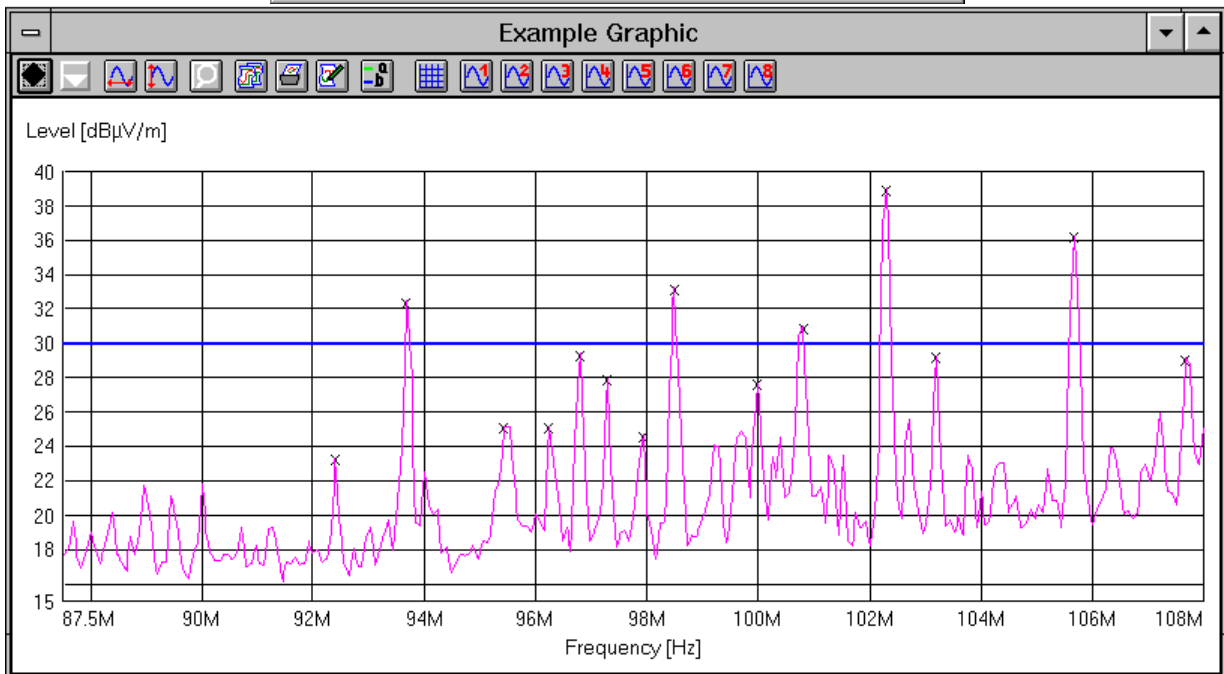
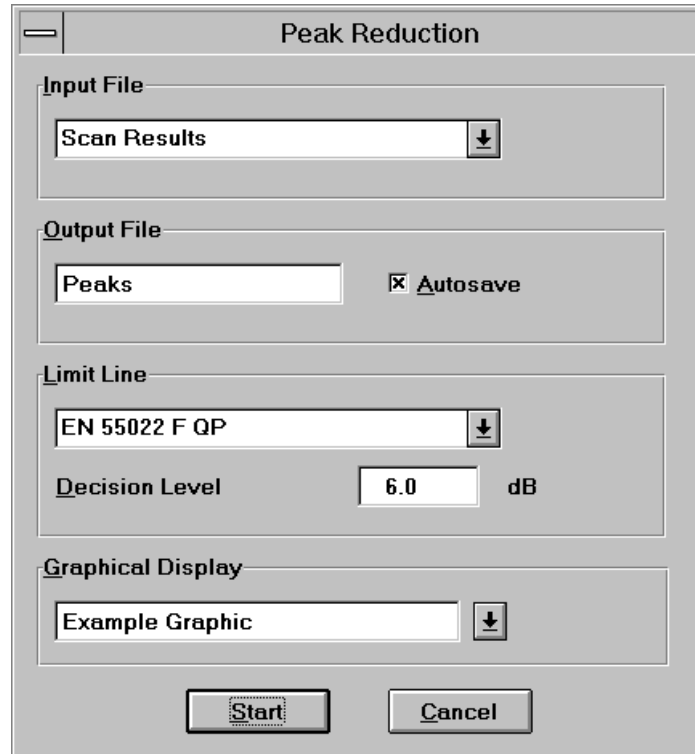
## 2.9.2 Peak Reduction

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.

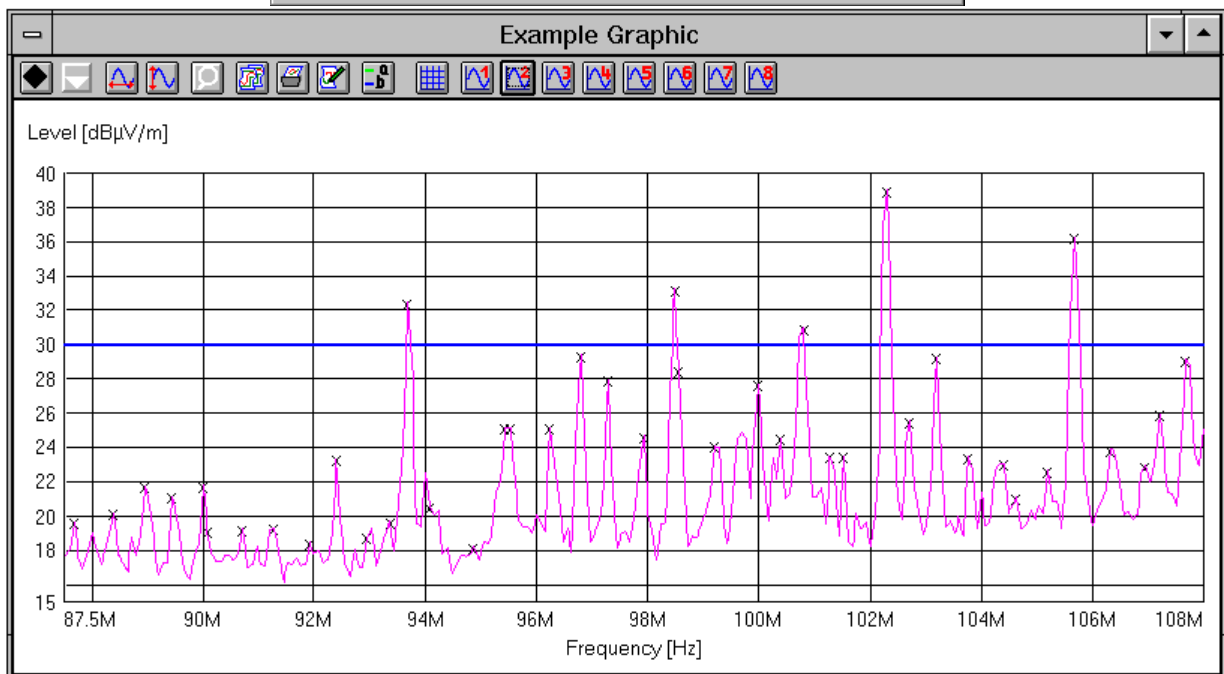
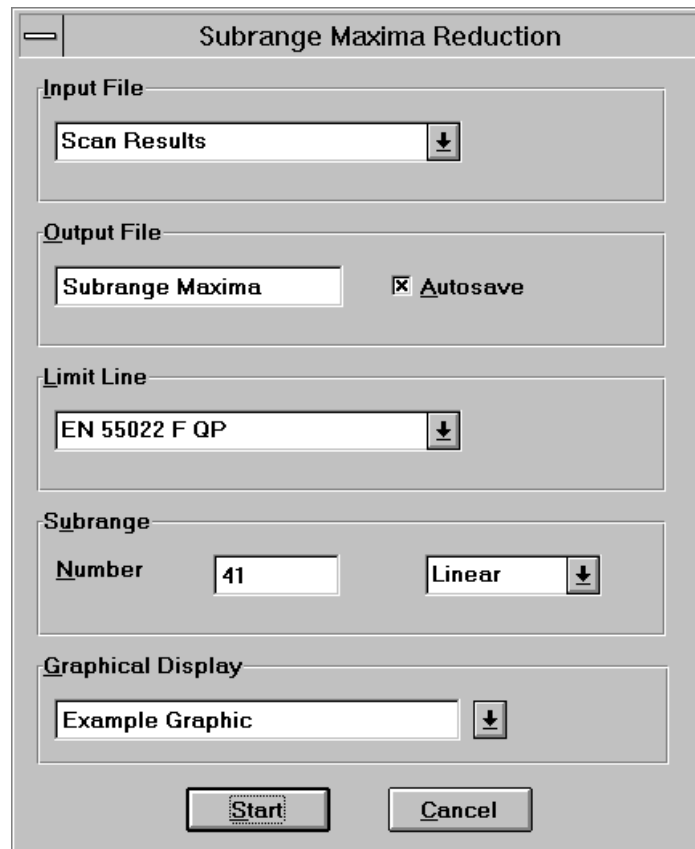




### 2.9.3 Subrange Maxima Reduction

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 Subrange Minima Reduction

This function is used to determine the subrange minima of a measurement result. It is used for example in open-area measurements: It permits to identify frequency points which are little or not at all occupied by external signals. Such frequencies are best suited for measuring antennas or similar. The handling of the parameters for subrange minima reduction is similar to that of the subrange maxima reduction (see 2.9.3).

### 2.9.5 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.

### 2.9.6 Octave Maxima Reduction

This function is used to split the trace of the input file into frequency octaves. For each octave, a given number of level maxima is determined and transferred 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.

### 2.9.7 Narrowband/Broadband Discrimination

This function is used to discriminate between narrowband (NB) and broadband interference (BB). Four methods are provided, the tuning methods analysing only the shape of the trace:

#### Peak/Average value comparison:

Two data lists are available, one being measured with the PEAK detector, the other with the AVERAGE detector.

Narrowband interference:

$$(\text{PEAK} - \text{AVERAGE}) \leq \text{decision level.}$$

Potential broadband interference:

$$(\text{PEAK} - \text{AVERAGE}) > \text{decision level.}$$

#### Peak/RMS value comparison:

Two data lists are available, one being measured with the PEAK detector, the other with the RMS detector (root mean square).

Narrowband interference:

$$(\text{PEAK} - \text{RMS}) \leq \text{decision level.}$$

Potential broadband interference:

$$(\text{PEAK} - \text{RMS}) > \text{decision level.}$$

## Tuning methods

### a) Tuning by +/- one bandwidth:

A data list is available that was measured with a scan step size of  
0.45 ... 0.55 \* IF bandwidth.

The decision range lies between reference level and the decision level (e.g. 3 dB below). A total of 2 adjacent levels are investigated.

Narrowband interference:

The 2nd adjacent levels lie below the decision range and the 1st adjacent levels lies below the reference level.

Potential broadband interference:

The point has not been identified as being a narrowband signal.

#### Note:

Those points at the edge of a scan range will also be analysed, with the "missing" point assumed as fulfilling the condition for narrowband interference.

Only potential **broadband interference** that is not located close to (+/- one IF bandwidth) narrowband interference is actually determined as broadband interference.

### b) Tuning by +/- two bandwidths:

A data list is available which was measured with a scan step size of  
0.60 ... 0.75 \* IF bandwidth (0.45 ... 0.60 \* IF bandwidth).

The decision range lies between reference level and the decision level (e.g. 3 dB below). A total of three (four) adjacent levels are investigated.

Narrowband interference:

The 3rd (4th) adjacent levels lies below the decision range and the remaining two (three) adjacent levels lie below the reference level.

Potential broadband interference:

The point has not been identified as being a narrowband signal.

#### Note:

Those points at the edge of a scan range will also be analysed, with the "missing" point(s) assumed as fulfilling the condition for narrowband interference.

Only potential **broadband interference** that is not located close to (+/- two IF bandwidths) narrowband interference is actually determined as broadband interference.

## 2.9.8 Conversion to ... / MHz

This function is used to add a broadband factor to a level as is required in particular specifications for the description of broadband interference.

The level unit is changed to "level unit per MHz" (for military specifications in the USA). The IF bandwidth depends on the scan or sweep table and the frequency at which the level has been measured. The broadband factor is:  $-20 * \log(\text{IF bandwidth} / 1 \text{ MHz})$ .

As a further "conversion" (numerical values remain unchanged), the unit can be changed to "level unit per bandwidth" (for military specifications in France).

The following conversions are possible:

Level unit before conversion	Level unit after conversion with .../MHz	Level unit after conversion with .../BW
"dB $\mu$ V"	"dB $\mu$ V/MHz"	"dB $\mu$ V/BW"
"dB $\mu$ V/m"	"dB $\mu$ V/m/MHz"	"dB $\mu$ V/m.BW"
"dB $\mu$ A"	"dB $\mu$ A/MHz"	"dB $\mu$ A/BW"
"dB $\mu$ A/m"	"dB $\mu$ A/m/MHz"	"dB $\mu$ A/m.BW"

## 2.9.9 Unit Conversion

This function is used for unit conversion. The following conversions are possible (R: characteristic impedance, e.g. R = 50 ohms):

Unit	Unit after conversion
dB $\mu$ V	$y \text{ dB}\mu\text{A} = x \text{ dB}\mu\text{V} - 20 \log(R)$
	$y \text{ dBpW} = x \text{ dB}\mu\text{V} - 10 \log(R)$
	$y \text{ dBm} = x \text{ dB}\mu\text{V} - 10 \log(R) - 90$
dB $\mu$ V/MHz	$y \text{ dB}\mu\text{A/MHz} = x \text{ dB}\mu\text{V/MHz} - 20 \log(R)$
dB $\mu$ V/m	$y \text{ dB}\mu\text{A/m} = x \text{ dB}\mu\text{V/m} - 20 \log(R)$
dB $\mu$ V/m/MHz	$y \text{ dB}\mu\text{A/m/MHz} = x \text{ dB}\mu\text{V/m/MHz} - 20 \log(R)$
dB $\mu$ A	$y \text{ dB}\mu\text{V} = x \text{ dB}\mu\text{A} + 20 \log(R)$
	$y \text{ dBpW} = x \text{ dB}\mu\text{A} + 10 \log(R)$
	$y \text{ dBm} = x \text{ dB}\mu\text{A} + 10 \log(R) - 90$
dB $\mu$ A/MHz	$y \text{ dB}\mu\text{V/MHz} = x \text{ dB}\mu\text{A/MHz} + 20 \log(R)$
dB $\mu$ A/m	$y \text{ dB}\mu\text{V/m} = x \text{ dB}\mu\text{A/m} + 20 \log(R)$
dB $\mu$ A/m/MHz	$y \text{ dB}\mu\text{V/m/MHz} = x \text{ dB}\mu\text{A/m/MHz} + 20 \log(R)$
dBm	$y \text{ dBpW} = x \text{ dBm} + 90$
	$y \text{ dB}\mu\text{A} = x \text{ dBm} + 90 - 10 \log(R)$
	$y \text{ dB}\mu\text{V} = x \text{ dBm} + 90 + 10 \log(R)$
dBpW	$y \text{ dBm} = x \text{ dBpW} - 90$
	$y \text{ dB}\mu\text{A} = x \text{ dBpW} - 10 \log(R)$
	$y \text{ dB}\mu\text{V} = x \text{ dBpW} + 10 \log(R)$
dBpT	--

### 2.9.10 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/minimum level (Maxhold/Minhold). If the frequencies are not the same, both lines will be entered into the data list. The column structure in the two data lists must comply with each other.

### 2.9.11 Exclude Ambients

This function is used for removing ambients from a measurement result.

Two methods can be selected:

1. All entries of the **frequency range** between a start and a stop frequency are removed.
2. Small ranges are removed according to a frequency list. A delta range about the frequencies must be entered with a **factor**:  
 Delta range = Frequency \* **Factor** \* 10 ppm (10 millionth)  
 z.B. Frequency= 100 MHz, Factor = 50  
 Delta range = 100 MHz \* 50 \* 10e-6 = 50 kHz , i.e. ± 25 kHz about 100 MHz

### 2.9.12 Weighted Addition

The **weighted addition** permits to treat two data sets in **correlated** (addition of the voltages), **uncorrelated** (addition of the powers) or even **direct** mode (addition of the levels). In the **direct** mode, even negative factors can be easily used, i.e. even any subtractions can be implemented, since the values are not logarithmized:

direct:  $\text{dest} = a * \text{source1} + b * \text{source2}$

correlated:  $\text{dest} = 20 \log [ a * 10^{\text{source1}/20} + b * 10^{\text{source2}/20} ]$

uncorrelated:  $\text{dest} = 10 \log [ a * 10^{\text{source1}/10} + b * 10^{\text{source2}/10} ]$

a, b: Factors (weighting) of the data sets.

### 2.9.13 Reduce to Frequency List

Using the evaluation function **Reduce to Frequ.List**, a frequency list can be generated from a measurement result: As input file, an existing measurement result file is selected and, by means of the evaluation function, an output file of the type frequency list is generated with the specified name. Figuratively speaking, only the first column of the measurement result, i.e. the one with the frequency, is transferred. Such a file may e.g. serve the purpose of running a scan only at the frequencies of this frequency list.

### 2.9.14 GTEM Correlation

This function is used for converting emitted EMI that has been measured by an EUT in a GTEM 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 GTEM 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 GTEM 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. In the case of an anechoic chamber with metal floor, the maximum fieldstrength of the various antenna heights is the corresponding electrical fieldstrength.

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. At least one input file must be specified. The scan or sweep tables of the input files must be identical. Input files that are not entered are set to zero. The output files correspond to the fieldstrengths for horizontal and vertical polarization. At least one output file must be specified. Output files that are not entered are not calculated.

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:

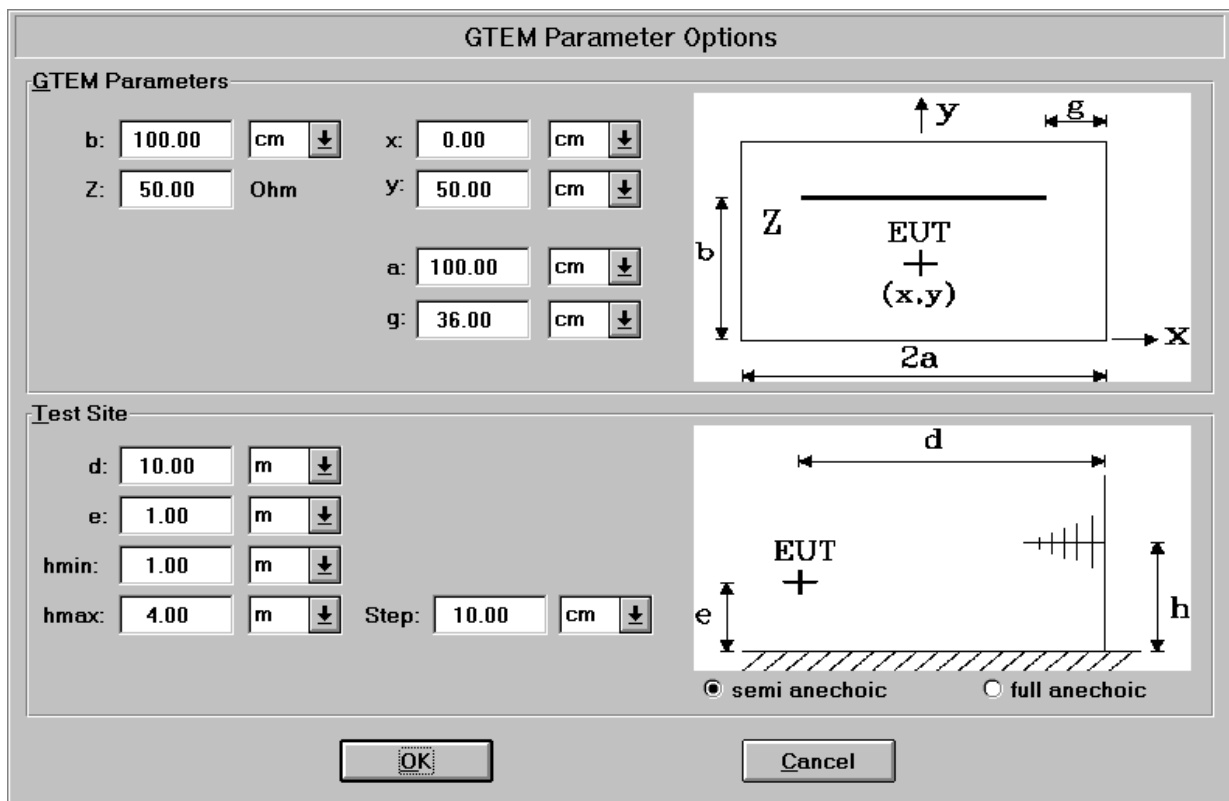
First of all, each point of the entered limit line (frequency / level) is converted.

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 files correspond to the respective voltage limit lines of the entered fieldstrength limit line of the standard used. A distinction is made between limit lines for horizontal, vertical and horizontal+vertical polarization. Output files that are not specified are not calculated.

The key **Start** checks the settings and the correlation is started. When selecting the key **Option ...** an additional dialog window for entering the parameters for the GTEM dimensions and the reference open-area test site is opened.



The fields **GTEM Parameters** permit to set the dimensions of the GTEM cell. The geometry of a GTEM cell is defined by  $a = b$  and  $g = 0.36 * a$ . The values  $x$  and  $y$  indicate the middle of the test item. These values are normally  $x = 0.0$  and  $y = 0.5 * b$ . When changing the value  $b$ , the values for  $a$ ,  $g$  and  $y$  are automatically adapted. The value  $Z$  indicates the impedance of the GTEM cell, the standard value for  $Z$  is 50 ohms.

The fields **Test Site** determine the dimensions of the reference open-area test site.

With **semi anechoic** selected, the measurement is simulated for a test site with conductive ground plane. In this case, the maximum level is calculated between minimum antenna height  $hmin$  and maximum antenna height  $hmax$ .

With **full anechoic** selected, on the other hand, the measurement is simulated for a test site with absorbing ground plane. In this case, the level is calculated for one antenna height only.

### 2.9.15 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 $\mu$ V] , L in [dB $\mu$ V/m] , f in [MHz]

C1: Cell Correction Factor

C2: OATS Correction Factor

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

**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**

V: 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.

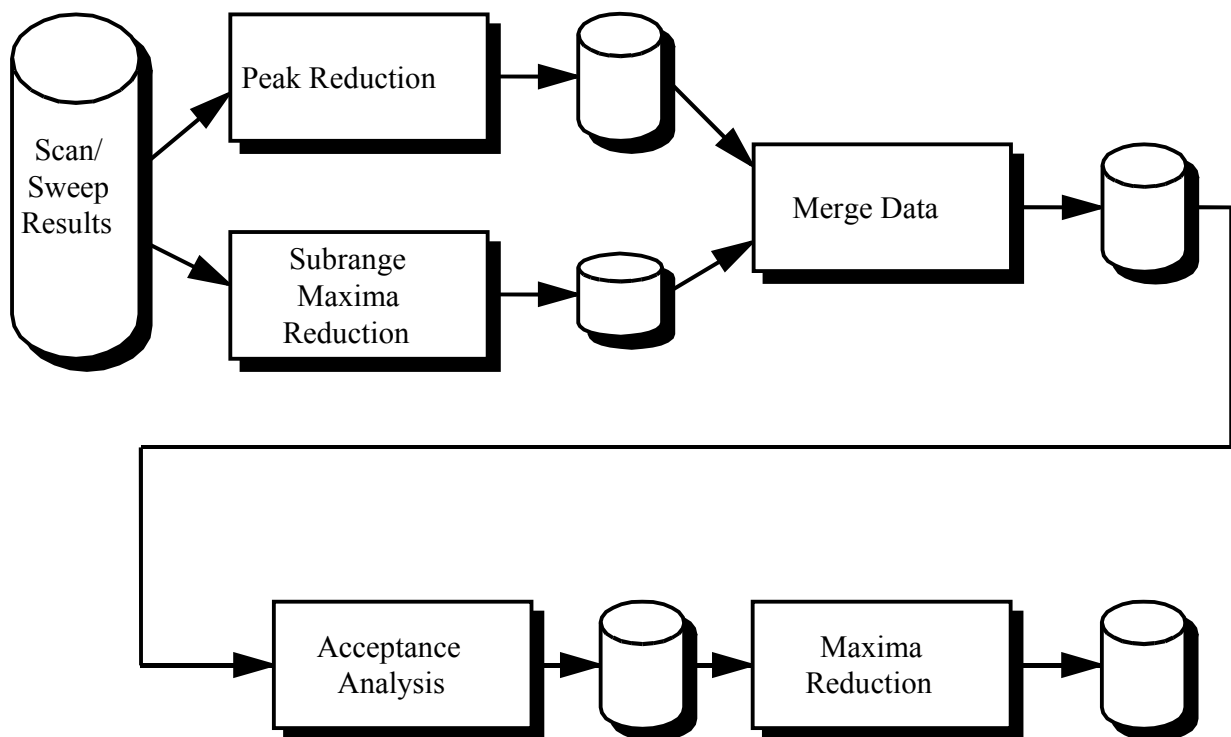
The design of the scripts helps to save time while still providing complete measurements as required for compliance testing. Through a wide range of parameters (accessible after starting a test) that can be stored and reloaded as "Script Parameters", it is possible to adapt and optimize the test proceedings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

- when a test has been completed, the **results can be partially overwritten through remeasuring** in a second test, defining a frequency band only
- 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 **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** (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, automatic turntable and antenna mast, etc.) can be specified for preview and final test separately, it is possible to **optimize the test to the test equipment** (the kind of test also influences the optimum concept):
  - **EMI analyzer (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);
  - **EMI test receiver** (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, labeled with the same name as the

corresponding source results; such a frequency list might be used to perform a scan on these frequencies

## Y

the data reduction has a very flexible design: the scan or sweep results are analyzed 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.



The optional interactive frequency selection enables to review the points that have been found through the automatic data reduction, i.e. you can remove points or add new ones for the test. To do so you have to position the marker accordingly and select "Remove" or "Test" in a dialog.

Before the standard scripts can be used, some data has to be imported from the **Standard Data import directories**:

- ÿ the **scripts** needed for testing plus the referring subscripts
- ÿ the **limit lines** for the required specifications
- ÿ 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)
- ÿ 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)

In addition the required **scan and / or sweep range tables** have to be imported from the corresponding **import directories** for the receivers(s) in use (ES-K1x); these range tables are already adapted to the receivers and 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.

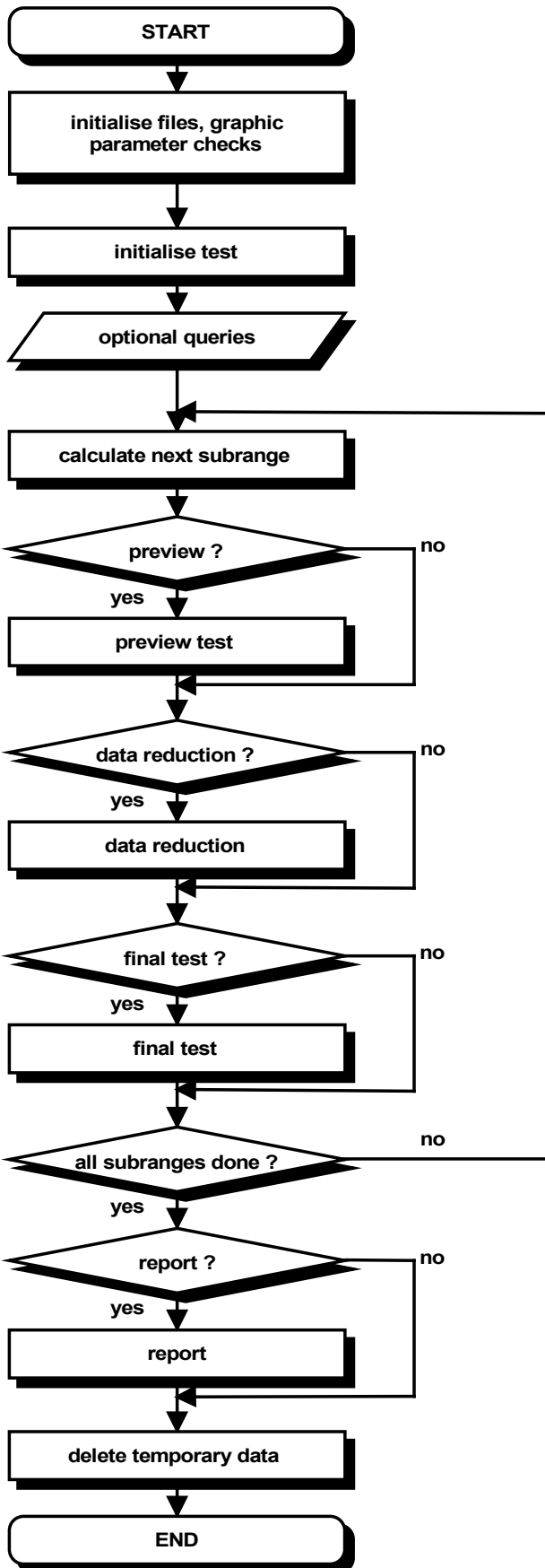
A running test may be aborted at any time with the **Stop** button (an active sweep or scan might have to be aborted before), but the measurements stored so far may be of only limited use. Afterwards the test can't be continued but restarted from the beginning.

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, colors, etc.), in the report header or in the report configuration, and then start the report with the selection of **Print...** in the **File** menu.

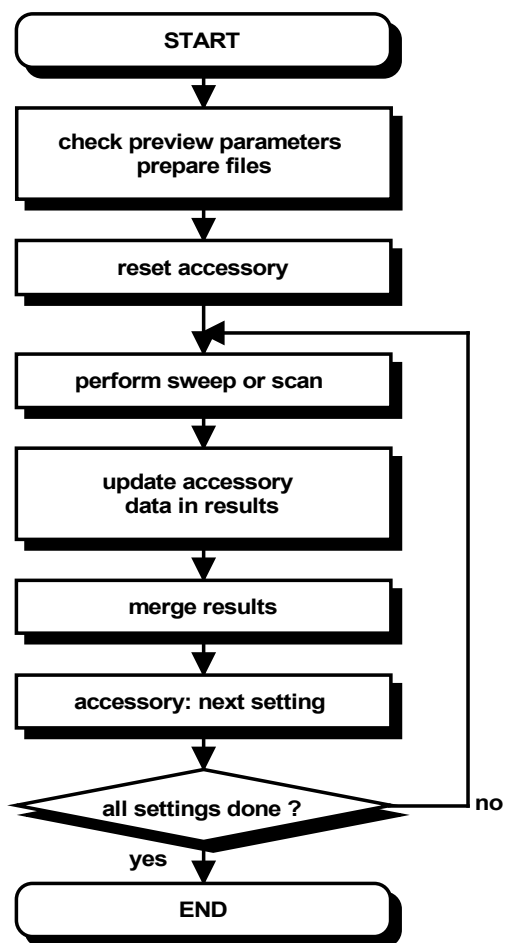
On the following pages there are some flowcharts that show in principle the steps of the tests:



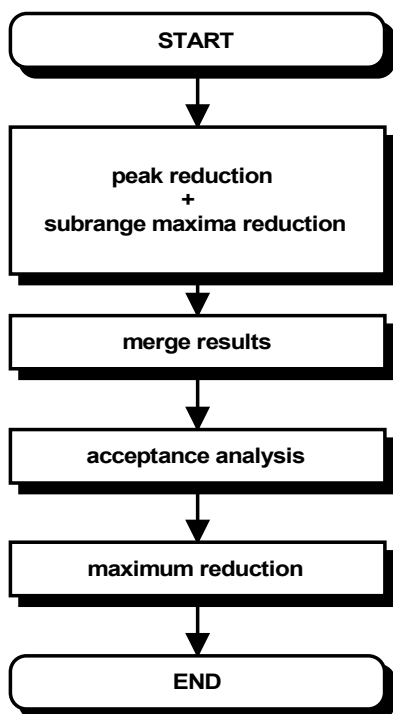
# Standard Test Procedure



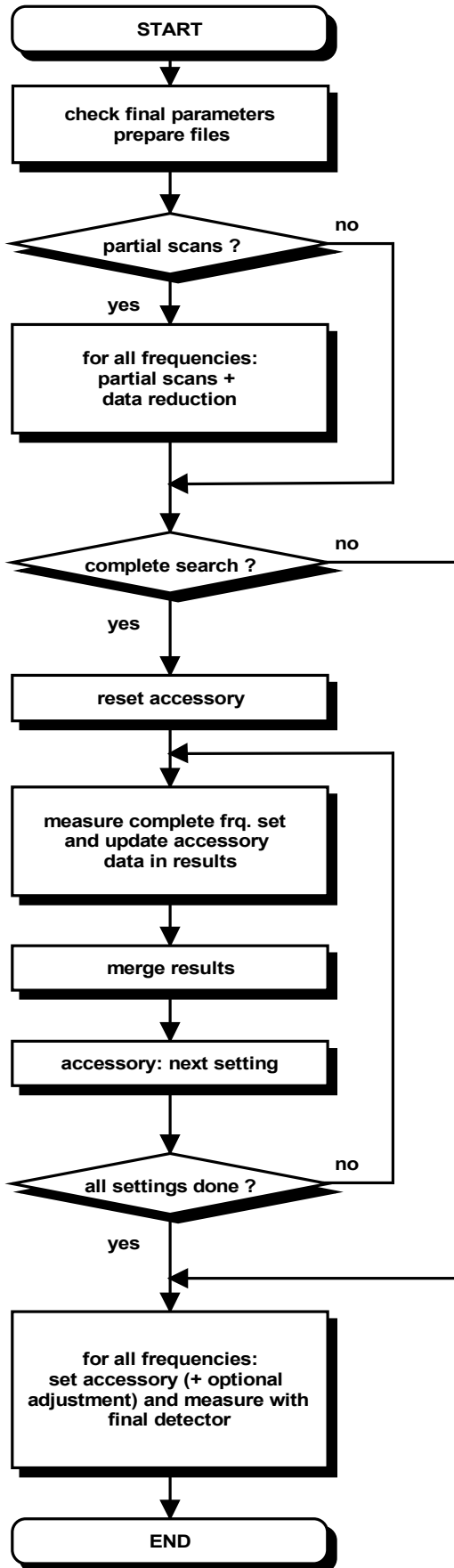
# Preview Test Procedure



# Data Reduction



# Final Test Procedure



## 3.1 Cable Calibration

### 3.1.1 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 ES-K1 (scan/sweep tables).

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

Since the test represents a two-gate measurement, a scan or sweep table has to be used that activates the tracking generator of the instrument; 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.

For measurements on a frequency list (not with scans/sweeps) an external generator can be used as a replacement for the tracking generator. This requires the option ES-K50 (Universal GPIB Driver).

If this option is installed, then the driver 'USER\_IEC' can be added to the device list; the assigned to this driver could be e.g. "GENERATOR" or the model name of the generator (e.g. "SMP"). The settings should first be checked with the corresponding interactive dialog ("Set Device...").

In the script parameters of **Topic "ExtGenerator"** the device has to be selected and the appropriate GPIB commands have to be entered.

The script parameters for the newer generators from R&S (SMxx) have to be set like this:

```
...
Topic           Calibration

Parameter:        04: scan table for measurements
Value:            [must be selected!]

Parameter:        05: optional frequ. list for single measurements
Value:            [must be selected!]

Parameter:        06: sweep table for measurements
Value:            <none>
...
Topic           ExtGenerator

Parameter:        02: GPIB initialization command
Value:            "*RST;*CLS;POW -10DBM;FREQ:CW 1E9;OUTP1 ON"

Parameter:        03: GPIB frequ. command incl. format string
Value:            "FREQ:CW %G"

Parameter:        04: frequency factor (e.g. 1E-6 for MHz)
Value:            1
...
```

### 3.1.2 List of the Script Parameters

Topic	Test
Parameter: Default value: Function:	01: ID max. 12 chars to be included in filenames "cable_0001" a short string that will be used for building up various default strings (see below); this string enables easy identification of files that belong to the same test
Parameter: Default value: Function:	02: global start frequency [MHz] for the test 0.1 no measurements will be done below this frequency
Parameter: Default value: Function:	03: global stop frequency [MHz] for the test 1000 no measurements will be done above this frequency
Parameter: Default value: Function:	04: suppress queries as far as possible not checked if not checked then additional queries will come up that help to avoid overwriting of files or to skip certain parts of the test
Parameter: Default value: Function:	05: test configuration, <none>: ID "<none>" optional filename of the test configuration (lists all files belonging to the test, for easy transfers through Export/Import/Move) to be created by the test; if no filename is specified then a default name will be used

#### Topic Calibration

Parameter: Default value: Function:	01: result file (default: ID) "<none>" optional filename for the results from the test (filetype is system transducer); if no filename is specified then a default name will be used
Parameter: Default value: Function:	02: name of correction factor from reference meas. "Cable Reference" filename of a reference correction factor to be used for the test: if a reference measurement shall be done, then the levels from the reference measurements with the reference cable attached will be stored as a system transducer of the given name, before the actual comparison test starts; any further tests - if run under the same conditions - then can be performed without the reference measurements (see next parameter) if the appropriate reference file is selected
Parameter: Default value: Function:	03: create new reference factor (else use given factor) checked 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: Default value: Function:	04: scan table for measurements "CAL" 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: generate RTF file  
 Default value: not checked  
 Function: if checked then a report file will be created using the "Rich Text Format" (a kind of generic MS Word format) which can be edited with many other text processing software products

Parameter: 03: RTF file: 'X:\<path>\<name8.3>', empty: dialog  
 Default value: "c:\xxx.rtf"  
 Function: path + file name (8.3 name format) of the RTF file if the RTF report is activated; if an empty string is used then a file selection dialog will come up

Parameter: 04: 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: 05: 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

Parameter: 06: optional text file to be included  
 Default value: "<none>"  
 Function: filename of an optional file of type 'Text' which shall be included in the report

### 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 EuT); 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 ExtGenerator**

Parameter: 01: external generator device  
 Default value: "<none>"  
 Function: symbolic name of the device for controlling of an external generator as defined in the device configuration

Parameter: 02: GPIB initialization command  
 Default value: "RECALL 09"  
 Function: GPIB command for the initialization of the external generator; it is recommended to store the settings (fixed RF level, no modulation, etc.) in the memory of the generator and to load them with this command

Parameter: 03: GPIB frequ. command incl. format string  
 Default value: "RF %G MHZ"  
 Function: GPIB command for the setup of the RF frequency of the external generator; the frequency - multiplied by the factor from the next parameter - will be inserted at the position of the format string "%G"; variations for the format string are possible as with the C function *printf()* or as described in the ES-K2 manual on the script function *convertf()*

Parameter: 04: frequency factor (e.g. 1E-6 for MHz)  
 Default value: 1.0E-6  
 Function: the frequency to be programmed is internally represented with the unit Hertz; the frequency will be multiplied by this factor to enable a GPIB output in i.e. MHz



## 3.2 Probe Calibration

### 3.2.1 Description

This test provides measuring of the transducer factor of antennas or any other probes through a comparing test with a probe of known transducer factor. The main result of the test is a probe transducer table that can directly be used for level correction in the ES-K1 (scan/sweep tables).

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

For open area test site (OATS) measurements, the test should run using a frequency list that has been modified so that any measurement of ambient signals will never happen.

Since the test represents a two-gate measurement, a scan or sweep table has to be used that activates the tracking generator of the instrument; 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.

Calibration of antennas is done best with vertical polarization and at a preferably high position (e.g. 4 m); the antennas should be mounted in a way so that their axes match exactly.

For measurements on a frequency list (not with scans/sweeps) an external generator can be used as a replacement for the tracking generator. This requires the option ES-K50 (Universal GPIB Driver).

If this option is installed, then the driver 'USER\_IEC' can be added to the device list; the assigned to this driver could be e.g. "GENERATOR" or the model name of the generator (e.g. "SMP"). The settings should first be checked with the corresponding interactive dialog ("Set Device...").

In the script parameters of **Topic "ExtGenerator"** the device has to be selected and the appropriate GPIB commands have to be entered.

The script parameters for the newer generators from R&S (SMxx) have to be set like this:

```

...
Topic           Calibration

Parameter:        04: scan table for measurements
Value:            [must be selected!]

Parameter:        05: optional frequ. list for single measurements
Value:            [must be selected!]

Parameter:        06: sweep table for measurements
Value:            <none>
...
Topic           ExtGenerator

Parameter:        02: GPIB initialization command
Value:            "*RST;*CLS;POW -10DBM;FREQ:CW 1E9;OUTP1 ON"

Parameter:        03: GPIB frequ. command incl. format string
Value:            "FREQ:CW %G"

Parameter:        04: frequency factor (e.g. 1E-6 for MHz)
Value:            1
...

```

### 3.2.2 List of the Script Parameters

<b>Topic</b>	<b>Test</b>
Parameter:	01: ID max. 12 chars to be included in filenames
Default value:	"probe_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: suppress queries as far as possible
Default value:	not checked
Function:	filename of a reference correction factor to be used for the test: if a reference measurement shall be done, then the levels from the reference measurements with the known probe will be stored as a system transducer of the given name, before the actual comparison test starts; any further tests - if run under the same conditions - then can be performed without the reference measurements (see next parameter) if the appropriate reference file is selected
Parameter:	05: 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 probe transducer); if no filename is specified then a default name will be used
Parameter:	02: name of correction factor from reference meas.
Default value:	"Probe Reference"
Function:	filename of a reference correction factor to be used for the test: if a reference measurement shall be done, then the levels from the reference measurements with the known probe will be stored as a system transducer of the given name, before the actual comparison test starts; any further tests - if run under the same conditions - then can be performed without the reference measurements (see next parameter) if the appropriate reference file is selected
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)

Parameter: 08: receive antenna reference probe transd. table  
 Default value: "<none>"  
 Function: probe transducer to be used for the reference measurements (transducer correction of the receiving antenna)

**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: generate RTF file  
 Default value: not checked  
 Function: if checked then a report file will be created using the "Rich Text Format" (a kind of generic MS Word format) which can be edited with many other text processing software products

Parameter: 03: RTF file: 'X:\<path>\<name8.3>', empty: dialog  
 Default value: "c:\xxx.rtf"  
 Function: path + file name (8.3 name format) of the RTF file if the RTF report is activated; if an empty string is used then a file selection dialog will come up

Parameter: 04: 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: 05: 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

Parameter: 06: optional text file to be included  
 Default value: "<none>"  
 Function: filename of an optional file of type 'Text' which shall be included in the report

**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: "Probe 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: probe name  
 Default value: "Probe"  
 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 EuT); 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 manual positioning only

Default value: checked

Function: if checked then manual control of the antenna mast through dialogue boxes will be used

Parameter: 02: use auto positioning only

Default value: not checked

Function: if checked then automatic control of the antenna mast will be used

Parameter: 03: symbolic name of autom. moved mast

Default value: "MAST"

Function: symbolic device name of the automatically controlled antenna mast as defined in the device configuration menu

Parameter: 04: antenna height [cm] for antenna mounting

Default value: 100

Function: defines the antenna height for mounting of the antenna (at the beginning and at the end of the test, each time with horizontal polarization)

Parameter: 04: antenna height [cm] for measurements

Default value: 400

Function: defines the antenna height for the measurements

**Topic Polarization**

Parameter: 01: use manual switching only

Default value: checked

Function: if checked then manual control of the antenna polarization through dialogue boxes will be used

Parameter: 02: use auto switching only

Default value: not checked

Function: if checked then automatic control of the antenna polarization will be used

Parameter: 03: symbolic name of autom. controlled polariz.

Default value: "MAST"

Function: symbolic device name of the automatically controlled antenna polarization as defined in the device configuration menu

Parameter: 04: delay time [sec] for auto switching

Default value: 4

Function: defines a waiting time with automatic switching of the antenna polarization; the delay time depends on the mechanical system and maybe also on the weight of the antenna (the driver never gives a feedback when the switching has been completed)

Parameter: 05: measurements with horizontal polariz. only

Default value: not checked

Function: if checked then the all measurements will be done with horizontal polarization only

Parameter: 06: measurements with vertical polariz. only

Default value: checked

Function: if checked then the all measurements will be done with vertical polarization only

### Topic **ExtGenerator**

Parameter: 01: external generator device

Default value: "<none>"

Function: symbolic name of the device for controlling of an external generator as defined in the device configuration

Parameter: 02: GPIB initialization command

Default value: "RECALL 09"

Function: GPIB command for the initialization of the external generator; it is recommended to store the settings (fixed RF level, no modulation, etc.) in the memory of the generator and to load them with this command

Parameter: 03: GPIB frequ. command incl. format string

Default value: "RF %G MHZ"

Function: GPIB command for the setup of the RF frequency of the external generator; the frequency - multiplied by the factor from the next parameter - will be inserted at the position of the format string "%G"; variations for the format string are possible as with the C function *printf()* or as described in the ES-K2 manual on the script function *convertf()*

Parameter: 04: frequency factor (e.g. 1E-6 for MHz)

Default value: 1.0E-6

Function: the frequency to be programmed is internally represented with the unit Hertz; the frequency will be multiplied by this factor to enable a GPIB output in i.e. MHz

## 3.3 Site Attenuation

### 3.3.1 Description

This test provides measuring of the normalized site attenuation (NSA).

The test can be performed with a scan or a sweep (plus data reduction), as well as on a given frequency list (also necessary for measurements with tuned dipoles).

For open area test site (OATS) measurements, the test should run with single measurements on a frequency list that has been modified so that measurements of ambient signals will never happen.

With a spectrum analyzer in combination with broadband antennas, measurement is also possible through continuous sweeps while the antenna captures the whole height range (as described in CISPR 16-1: "swept frequency method").

Since the test represents a two-gate measurement, a scan or sweep table has to be used that activates the tracking generator of the instrument; an "empty" (dummy) transducer (or simply "<none>") has to be declared as the probe transducer. The transducers tables of the transmit and receive antennas have to be selected with the script parameters for each subrange (max. 5) of the scan/sweep table. For scan tables it is recommended to use the average detector in combination with a very small IF bandwidth.

The ideal NSA is defined as a limit line; its name indicates the significant parameters of the test, including antenna type (tuned half wave **D**ipole or **B**roadband), distance between antennas (3 / 10 / 30 m), height of the transmit antenna (1 / 1.5 / 2 / 2.7 m) and antenna polarization (horizontal or vertical).

Example: "NSA B 10m h=1m ver" means

- antenna type = broad band dipole
- distance between antennas = 10 m
- height of transmit antenna = 1 m
- polarization of antennas = vertical

The following test setups are currently supported directly (see also CISPR 16, CISPR 22):

NSA B 3m h=2m hor  
NSA B 3m h=1m ver  
NSA B 3m h=1.5m ver

NSA B 10m h=1m hor  
NSA B 10m h=2m hor  
NSA B 10m h=1m ver  
NSA B 10m h=1.5m ver

NSA B 30m h=1m hor  
NSA B 30m h=2m hor  
NSA B 30m h=1m ver

NSA D 3m h=2m hor  
NSA D 3m h=2.7m ver

NSA D 10m h=2m hor  
NSA D 10m h=2.7m ver

NSA D 30m h=2m hor  
NSA D 30m h=2.7m ver

Optionally an additional correction (mutual impedance correction, defined as a system transducer) can be used to compensate for the coupling effects of the antennas in the near field (so far the mutual

impedance correction is defined only for tuned dipoles antennas 3 m apart; see CISPR 16-1 and CISPR 22).

Example: "CPL D 3m h=1m hor" means

- antenna type = tuned half wave dipole
- distance between antennas = 3 m
- height of transmit antenna = 1 m
- polarization of antennas = horizontal

To retrieve reference levels, a reference measurement will be done first for each subrange, which means that the cables that are normally connected to the antennas have to be put directly together. Once the reference levels have been stored (as a system transducer) they can be used again for further NSA tests.

The names of the transducer tables that refer to the transmitting and to the receiving antennas have to be specified for each (max. 5) range (of the scan / sweep table), as well as the stepsize for the height variation of the receiving antenna.

The NSA will be displayed with two diagrams, one for the absolute representation of the ideal and the measured NSA, and one for the relative representation of the measured NSA in comparison to the ideal NSA.

The columns of the result list contain the following:

- \* frequency
- \* measured level
- \* measured reference level
- \* measured NSA  
(measured level, corrected with reference level, mutual impedance correction and antenna transducer corrections)
- \* ideal NSA
- \* deviation of the measured NSA from the ideal NSA
- \* antenna height of minimum attenuation (not with continuous sweeps during height variation)

For measurements on a frequency list (not with scans/sweeps) an external generator can be used as a replacement for the tracking generator. This requires the option ES-K50 (Universal GPIB Driver).

If this option is installed, then the driver 'USER\_IEC' can be added to the device list; the assigned to this driver could be e.g. "GENERATOR" or the model name of the generator (e.g. "SMP"). The settings should first be checked with the corresponding interactive dialog ("Set Device...").

In the script parameters of **Topic "ExtGenerator"** the device has to be selected and the appropriate GPIB commands have to be entered.

The script parameters for the newer generators from R&S (SMxx) have to be set like this:

...

<b>Topic</b>	<b>NSA</b>
Parameter:	<b>07: scan table for measurements</b>
Value:	<b>[must be selected!]</b>
Parameter:	<b>08: optional frequ. list for single measurements</b>
Value:	<b>[must be selected!]</b>
Parameter:	10: sweep table for measurements
Value:	<none>

...

<b>Topic</b>	<b>ExtGenerator</b>
Parameter:	02: GPIB initialization command
Value:	<b>"*RST;*CLS;POW -10DBM;FREQ:CW 1E9;OUTP1 ON"</b>



Parameter: 03: GPIB frequ. command incl. format string  
Value: **"FREQ: CW %G"**

Parameter: 04: frequency factor (e.g. 1E-6 for MHz)  
Value: **1**

...

### 3.3.2 List of the Script Parameters

Topic	Test
Parameter: Default value: Function:	01: ID max. 12 chars to be included in filenames "site_0001" a short string that will be used for building up various default strings (see below); this string enables easy identification of files that belong to the same test
Parameter: Default value: Function:	02: global start frequency [MHz] for the test 30 no measurements will be done below this frequency
Parameter: Default value: Function:	03: global stop frequency [MHz] for the test 1000 no measurements will be done above this frequency
Parameter: Default value: Function:	04: suppress queries as far as possible not checked if not checked then additional queries will come up that help to avoid overwriting of files or to skip certain parts of the test
Parameter: Default value: Function:	05: test configuration, <none>: ID "<none>" optional filename of the test configuration (lists all files belonging to the test, for easy transfers through Export/Import/Move) to be created by the test; if no filename is specified then a default name will be used

Topic	NSA
Parameter: Default value: Function:	01: NSA name (defined as limit line) "<none>" filename of the ideal NSA, defined as a limit line
Parameter: Default value: Function:	02: opt. mutual imped. correction (defined as system transd.) "<none>" filename of the optional mutual impedance correction to compensate for the coupling effects of the antennas in the near field, defined as a system transducer
Parameter: Default value: Function:	03: result file (default: ID) "<none>" optional filename for the results from the test (filetype is system transducer); if no filename is specified then a default name will be used
Parameter: Default value: Function:	04: insert results into existing result file not checked if not checked then any existing result files with a filename identical to the filename used in the test will be deleted/overwritten; else: any existing result files will only partly be overwritten (within the specified frequency range): therefore it is possible to <b>remeasure certain bands of the spectrum</b> while keeping the rest unchanged
Parameter: Default value:	05: name of correction factor from reference "NSA Reference"

Function:	filename of the reference correction, stored as a system transducer: if a reference measurement will be done, then first then before the actual NSA test there will be measurements with the coaxial cables connected directly together; these results will be stored as a system transducer so that any further NSA tests can use these results - if the same cables are used - without another reference measurement (see next parameter)
Parameter:	06: 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:	07: scan table for measurements
Default value:	"NSA"
Function:	filename of the scan range table to be used for the test
Parameter:	08: opt. frequency list for single meas. mode
Default value:	"NSA"
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:	09: tuned dipoles (with single meas. only)
Default value:	not checked
Function:	if checked then with each new frequency the antenna will be put to horizontal polarization, set to the lowest height and the required dipole length be displayed; for measurements with vertical polarization the lowest position depends on the length of the dipoles; this mode can be used only in combination with single measurements based on a frequency list
Parameter:	10: sweep table for measurements
Default value:	"<none>"
Function:	filename of the sweep range table to be used for the test
Parameter:	11: continuous sweeping (with sweep table only)
Default value:	not checked
Function:	if checked then the antenna won't be moved step by step but continuously (and preferably slowly) over the whole range (upwards + down) while new sweeps will start all the time (see also CISPR 16-1: "swept frequency method"); this mode can be used only in combination with a selected sweep table and represents the fastest method although without information about corresponding antenna heights
Parameter:	12: time [sec] for single measurements
Default value:	1.0
Function:	a time that will be used for the single measurements based on a frequency list, regardless of the setting in the scan table
Parameter:	13: NSA tolerance [dB]
Default value:	4.0
Function:	tolerance level for the maximum deviation of the measured NSA from the ideal NSA (parameter will be used with a later version)
Parameter:	14: no. of results kept from scan/sweep per range
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                      Antennas**

Parameter: 01: 1st range: transmit antenna probe transd. table

Default value: "<none>"

Function: filename of the transducer table of the transmit antenna to be used for the 1st subrange of the scan/sweep table

Parameter: 02: 1st range: receive antenna probe transd. table

Default value: "<none>"

Function: filename of the transducer table of the receive antenna to be used for the 1st subrange of the scan/sweep table

Parameter: 03: 1st range: height step size [cm]

Default value: 20

Function: stepsize for the antenna movements to be used for the 1st subrange of the scan/sweep table

Parameter: 04: 2nd range: transmit antenna probe transd. table

Default value: "<none>"

Function: filename of the transducer table of the transmit antenna to be used for the 2nd subrange of the scan/sweep table

Parameter: 05: 2nd range: receive antenna probe transd. table

Default value: "<none>"

Function: filename of the transducer table of the receive antenna to be used for the 2nd subrange of the scan/sweep table

Parameter: 06: 2nd range: height step size [cm]

Default value: 10

Function: stepsize for the antenna movements to be used for the 2nd subrange of the scan/sweep table

Parameter: 07: 3rd range: transmit antenna probe transd. table

Default value: "<none>"

Function: filename of the transducer table of the transmit antenna to be used for the 3rd subrange of the scan/sweep table

Parameter: 08: 3rd range: receive antenna probe transd. table

Default value: "<none>"

Function: filename of the transducer table of the receive antenna to be used for the 3rd subrange of the scan/sweep table

Parameter: 09: 3rd range: height step size [cm]

Default value: 5

Function: stepsize for the antenna movements to be used for the 3rd subrange of the scan/sweep table

Parameter: 10: 4th range: transmit antenna probe transd. table

Default value: "<none>"

Function: filename of the transducer table of the transmit antenna to be used for the 4th subrange of the scan/sweep table

Parameter: 11: 4th range: receive antenna probe transd. table

Default value:	"<none>"
Function:	filename of the transducer table of the receive antenna to be used for the 4th subrange of the scan/sweep table
Parameter:	12: 4th range: height step size [cm]
Default value:	5
Function:	stepsize for the antenna movements to be used for the 4th subrange of the scan/sweep table
Parameter:	13: 5th range: transmit antenna probe transd. table
Default value:	"<none>"
Function:	filename of the transducer table of the transmit antenna to be used for the 5th subrange of the scan/sweep table
Parameter:	14: 5th range: receive antenna probe transd. table
Default value:	"<none>"
Function:	filename of the transducer table of the receive antenna to be used for the 5th subrange of the scan/sweep table
Parameter:	15: 5th range: height step size [cm]
Default value:	5
Function:	stepsize for the antenna movements to be used for the 5th subrange of the scan/sweep table

**Topic****Graphics**

Parameter:	01: 1st graphics config., <none>: ID
Default value:	"<none>"
Function:	optional filename for the graphics configuration to be used in the test (absolute representation); if no filename is specified then a default name will be used
Parameter:	02: 2nd graphics config., <none>: ID + '_rel'
Default value:	"<none>"
Function:	optional filename for the graphics configuration to be used in the test (relative representation); 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: generate RTF file
Default value:	not checked
Function:	if checked then a report file will be created using the "Rich Text Format" (a kind of generic MS Word format) which can be edited with many other text processing software products
Parameter:	03: RTF file: 'X:\<path>\<name8.3>', empty: dialog
Default value:	"c:\xxx.rtf"
Function:	path + file name (8.3 name format) of the RTF file if the RTF report is activated; if an empty string is used then a file selection dialog will come up
Parameter:	04: 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: 05: 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

Parameter: 06: optional text file to be included  
 Default value: "<none>"  
 Function: filename of an optional file of type 'Text' which shall be included in the report

### **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: "Site Attenuation"  
 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: NSA name  
 Default value: "NSA ..."  
 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 EuT); 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 manual positioning only  
 Default value: checked  
 Function: if checked then manual control of the antenna mast through dialogue boxes will be used

Parameter: 02: use auto positioning only  
 Default value: not checked  
 Function: if checked then automatic control of the antenna mast will be used

Parameter: 03: symbolic name of autom. moved mast  
 Default value: "MAST"  
 Function: symbolic device name of the automatically controlled antenna mast as defined in the device configuration menu

Parameter: 04: min. height [cm] to be measured  
 Default value: 100  
 Function: defines the minimum mast height for the measurements

Parameter: 05: max. height [cm] to be measured  
 Default value: 400  
 Function: defines the maximum mast height for the measurements

Parameter: 06: speed value for movements  
 Default value: 4  
 Function: defines the speed of the mast movements: faster for absolute positioning, slower for continuous sweeps

**Topic Polarization**

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

Parameter:	02: use auto switching only
Default value:	not checked
Function:	if checked then automatic control of the antenna polarization will be used
Parameter:	03: symbolic name of autom. controlled polariz.
Default value:	"MAST"
Function:	symbolic device name of the automatically controlled antenna polarization as defined in the device configuration menu
Parameter:	04: delay time [sec] for auto switching
Default value:	4
Function:	defines a waiting time with automatic switching of the antenna polarization; the delay time depends on the mechanical system and maybe also on the weight of the antenna (the driver never gives a feedback when the switching has been completed)
Parameter:	05: measurements with horizontal polariz. only
Default value:	not checked
Function:	if checked then the all measurements will be done with horizontal polarization only
Parameter:	06: measurements with vertical polariz. only
Default value:	checked
Function:	if checked then the all measurements will be done with vertical polarization only

**Topic****ExtGenerator**

Parameter:	01: external generator device
Default value:	"<none>"
Function:	symbolic name of the device for controlling of an external generator as defined in the device configuration
Parameter:	02: GPIB initialization command
Default value:	"RECALL 09"
Function:	GPIB command for the initialization of the external generator; it is recommended to store the settings (fixed RF level, no modulation, etc.) in the memory of the generator and to load them with this command
Parameter:	03: GPIB frequ. command incl. format string
Default value:	"RF %G MHZ"
Function:	GPIB command for the setup of the RF frequency of the external generator; the frequency - multiplied by the factor from the next parameter - will be inserted at the position of the format string "%G"; variations for the format string are possible as with the C function <i>printf()</i> or as described in the ES-K2 manual on the script function <i>convertf()</i>
Parameter:	04: frequency factor (e.g. 1E-6 for MHz)
Default value:	1.0E-6
Function:	the frequency to be programmed is internally represented with the unit Hertz; the frequency will be multiplied by this factor to enable a GPIB output in i.e. MHz



## **3.4 Overview Test**

### **3.4.1 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 any accessory dialogs (e.g. for a LISN or an automatic antenna mast) then these devices can be controlled all over the test, i.e. the user himself does the maximization through varying of the accessories.

### 3.4.2 List of the Script Parameters

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

#### Topic Preview

Parameter:	01: preview result file, <none>: ID + '_pre'
Default value:	"<none>"
Function:	optional filename for the results (1 <sup>st</sup> detector, e.g. PEAK) from the preview test; if no filename is specified then a default name will be used
Parameter:	02: 2nd preview result file, <none>: ID + '_pre2'
Default value:	"<none>"
Function:	optional filename for the results (2 <sup>nd</sup> detector, e.g. AVERAGE) 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: insert results into existing result file
Default value:	not checked
Function:	if not checked then any existing result files with a filename identical to the filename used in the preview test will be deleted/overwritten; else: any existing result files will only partly be overwritten (within the specified frequency range); this way it is possible to <b>remeasure certain bands of the spectrum</b> while keeping the rest unchanged
Parameter:	06: 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 (e.g. for PK or for PK+AV) or optionally two (e.g. 1 <sup>st</sup> for PK, 2 <sup>nd</sup> for AV) input files
Parameter:	07: 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 you can select and review the critical points (also those that have been found through the automatic data reduction if also the next parameter is activated), i.e. you can remove points or add new ones for the test;. to do so you have to position the marker accordingly and select "Remove" or "Test" in a dialog
Parameter:	02: perform automatic data reduction
Default value:	not checked
Function:	if checked then an automatic 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: 1st limit line
Default value:	"<none>"
Function:	a filename that corresponds to the limit line assigned to the 1 <sup>st</sup> detector (e.g.

## QUASIPEAK)

Parameter: 04: optional 1st 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 the preview results from the 1<sup>st</sup> detector; if used then the given value for the acceptance offset will be ignored

Parameter: 05: optional 2nd limit line  
 Default value: "<none>"  
 Function: a filename that corresponds to the limit line assigned to the 2<sup>nd</sup> detector (e.g. AVERAGE)

Parameter: 06: optional 2nd 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 preview results from the 2<sup>nd</sup> detector; 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"

Parameter: 10: freq. list of ambients to be cut out from preview  
 Default value: "<none>"  
 Function: optional name of a frequency list (ambient interference) with frequencies to be "cut out" from measurement results (preview test: scans/sweeps, final test: partial scans), each "cut" with a range corresponding to the current IF bandwidth, e.g. +/- 60 kHz around each of the frequencies if an IF bandwidth of 120 kHz is used; to blank a modulated interference it might be necessary to provide more than one frequency in the list

Parameter: 11: cutting width for sweeps (ambients): no. of IF-BWs  
 Default value: 10  
 Function: with sweeps the width of a "cut" range (see previous parameter) has to be larger because of the lower frequency resolution of the results; therefore this factor (=number of IF bandwidths) will be used to enlarge the range compared with the range used on scan results

**Topic**                      **Monitor**

Parameter: 01: scan table for partial scans  
 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; to observe the spectrum more easily it is recommended to define a scan table with continuous repetitions;

Parameter: 02: sweep table for partial sweeps  
 Default value: "<none>"  
 Function: filename of the sweep table to be used for partial sweeps; this parameter cannot be used together with the previous parameter; to observe the spectrum more easily it is recommended to define a sweep table with continuous repetitions; note that partial sweeps only give back a very small number of measurement points, e.g. a 1% portion of the frequency range as defined in the sweep table range will result in 1% of the sweep trace points only; this is due to a conceptual limitation to the handling of sweep trace data; the situation can be improved through a sweep table which is defined with many ranges so that a partial sweep still covers more than only a small fraction of the corresponding sweep range of the selected table; alternatively use partial scans

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 results (1<sup>st</sup> detector, e.g. QUASIPeAK) from the final measurements; if no filename is specified then a default name will be used

Parameter: 02: 2nd final result file, <none>: ID + '\_fin2'  
 Default value: "<none>"  
 Function: optional filename for the results (2<sup>nd</sup> detector, e.g. AVERAGE) from the final measurements; 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)

<b>Topic</b>	<b>Report</b>
Parameter: Default value: Function:	01: generate printer hardcopy checked if checked then a report configuration for printing will be generated and a hardcopy will be sent to the device which is defined as the printer for the software
Parameter: Default value: Function:	02: generate RTF file not checked if checked then a report file will be created using the "Rich Text Format" (a kind of generic MS Word format) which can be edited with many other text processing software products
Parameter: Default value: Function:	03: RTF file: 'X:\<path>\<name8.3>', empty: dialog "c:\xxx.rtf" path + file name (8.3 name format) of the RTF file if the RTF report is activated; if an empty string is used then a file selection dialog will come up
Parameter: Default value: Function:	04: report config. for printing, <none>: ID + '_prnt' "<none>" optional filename for the report configuration for printing, if printer output is selected; if no filename is specified then a default name will be used
Parameter: Default value: Function:	05: footnote, empty field: ID "" optional text as a footnote on the pages of the test report; if an empty string is used then the ID string of the test will be used
Parameter: Default value: Function:	06: optional text file to be included "<none>" filename of an optional file of type 'Text' which shall be included in the report

<b>Topic</b>	<b>ReportHeader</b>
Parameter: Default value: Function:	01: test report header, <none>: ID "<none>" optional filename for the report header to be used in the test; if no filename is specified then a default name will be used
Parameter: Default value: Function:	02: optional test report header template, <none>: ID "<none>" optional filename of a report header which shall be taken as a template for the one to be used in the test; if no filename is specified then a default name will be used
Parameter: Default value: Function:	03: 1st header line "TEST" a string that will be taken as the first header line; if no string is given then the referring entry of the report header won't be changed
Parameter: Default value: Function:	04: 2nd header line "Overview" a string that will be taken as the second header line; if no string is given then the referring entry of the report header won't be changed

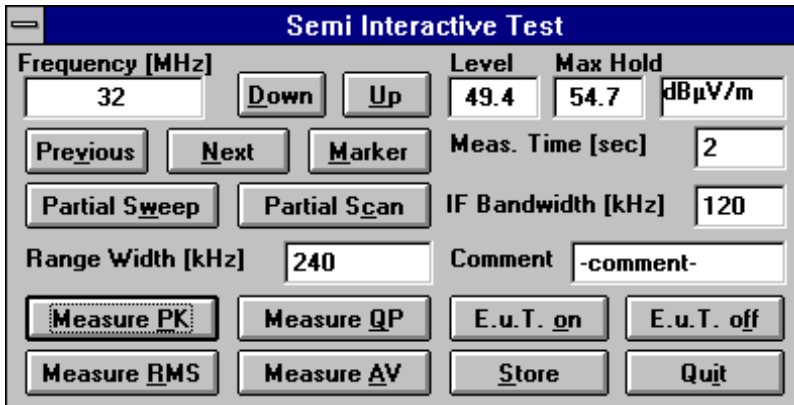
Parameter:	05: EuT name
Default value:	"EuT"
Function:	a string that will be taken as the description of the equipment under test; if no string is given then the referring entry of the report header won't be changed
Parameter:	06: manufacturer
Default value:	""
Function:	a string that will be taken as the name of the manufacturer (of the EuT); 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

### 3.5 Semi Interactive Test

#### 3.5.1 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 EuT off and on if possible or by looking at / listening to the signal) whether the field strength generated by the EuT 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:



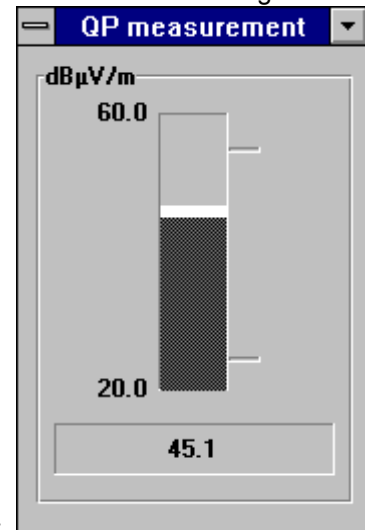
By clicking **Down** and **Up** the arbitrarily editable frequency will be decreased and increased by the step size defined in the scan table. If the test is based on a frequency list or on a measurement result list then with **Previous** and **Next** the dialogue will switch to the corresponding frequency. With measurement results the referring positions of the antenna and the EuT can optionally be set. 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 EuT can be remotely switched then by pressing **EuT on** and **EuT off** a line of the parallel port (device driver LPT I/O) can be used as a TTL control signal; this feature enhances the identification of interference signals on an OATS.





### 3.5.2 List of the Script Parameters

<b>Topic</b>	<b>Test</b>
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:	"<none>"
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:	"<none>"
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
<b>Topic</b>	<b>Final</b>
Parameter:	01: file for PEAK results, <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: file for QUASIPEAK results, <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: file for AVERAGE results, <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: file for RMS results, <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:	"<none>"
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:	"<none>"
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:	"<none>"
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; note that partial sweeps only give back a very small number of measurement points, e.g. a 1% portion of the frequency range as defined in the sweep table range will result in 1% of the sweep trace points only; this is due to a conceptual limitation to the handling of sweep trace data; the situation can be improved through a sweep table which is defined with many ranges so that a partial sweep still covers more than only a small fraction of the corresponding sweep range of the selected table; alternatively use partial scans
Parameter:	08: insert results into existing result file
Default value:	not checked
Function:	if not checked then any existing result files with a filename identical to the filename used in the final test will be deleted/overwritten; else: any existing result files will only partly be overwritten (within the specified frequency range); this way it is possible to <b>remeasure certain bands of the spectrum</b> while keeping the rest unchanged
Parameter:	09: use/store field mast/turntable data if available
Default value:	not checked
Function:	if checked then any information about mast/turntable positions will be used (measurement result list as a basis for the test, see parameter <i>Test 06</i> ); those positions will be directly set each time when a frequency is selected (previous or next); besides, the current positions will be stored in the result files of the test

**Topic****Limits**

Parameter:	01: optional PEAK 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 QUASIPeAK 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: AVERAGE  
 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: generate RTF file  
 Default value: not checked  
 Function: if checked then a report file will be created using the "Rich Text Format" (a kind of generic MS Word format) which can be edited with many other text processing software products

Parameter: 03: RTF file: 'X:\<path>\<name8.3>', empty: dialog  
 Default value: "c:\xxx.rtf"  
 Function: path + file name (8.3 name format) of the RTF file if the RTF report is activated; if an empty string is used then a file selection dialog will come up

Parameter: 04: 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: 05: 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

Parameter: 06: optional text file to be included  
 Default value: "<none>"  
 Function: filename of an optional file of type 'Text' which shall be included in the report

### **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: EuT name  
 Default value: "EuT"  
 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 EuT); 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 SwitchEUT**

Parameter: 01: symbolic name of autom. EuT switch  
 Default value: "LPTIO"  
 Function: symbolic device name of the CENTRONICS parallel I/O interface driver as defined in the device configuration menu; one output line will be used as a TTL control line

Parameter: 02: LPT I/O output pin no. (1-9)  
 Default value: 2  
 Function: defines an output line (connector pin no. 1 - 9) of the parallel port as the control line for automatic switching of the EuT

**Topic Mast**

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

Parameter: 02: use auto positioning only  
 Default value: not checked  
 Function: if checked then automatic control of the antenna mast will be used

Parameter: 03: symbolic name of autom. moved mast  
 Default value: "MAST"  
 Function: symbolic device name of the automatically controlled antenna mast as defined in the device configuration menu

Parameter: 04: speed value for movements  
 Default value: 4  
 Function: determines the speed of the automatically moved mast

**Topic Turntable**

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

Parameter: 02: use auto positioning only  
 Default value: not checked  
 Function: if checked then automatic control of the turntable will be used

Parameter: 03: symbolic name of autom. moved turntable  
 Default value: "TURNTABLE"  
 Function: symbolic device name of the automatically controlled turntable as defined in the device configuration menu

Parameter: 04: speed value for faster movements  
 Default value: 4  
 Function: determines the speed of the automatically moved turntable

### **Topic Polarization**

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

Parameter: 02: use auto switching only  
 Default value: not checked  
 Function: if checked then automatic control of the antenna polarization will be used

Parameter: 03: symbolic name of autom. controlled polariz.  
 Default value: "MAST"  
 Function: symbolic device name of the automatically controlled antenna polarization as defined in the device configuration menu

Parameter: 04: delay time [sec] for auto switching  
 Default value: 4  
 Function: defines a waiting time with automatic switching of the antenna polarization; the delay time depends on the mechanical system and maybe also on the weight of the antenna (the driver never gives a feedback when the switching has been completed)

## 3.6 Power Test

### 3.6.1 Description

This test provides automatic measurement of electromagnetic interference (power) using a power absorbing clamp moved along the mains cable, optionally with control of a sidebar for moving the clamp automatically.

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 (EuT); 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 analyzed; of course this method has its problems if one or more frequencies of ambient interference are identical to those critical ones of the EuT

If needed, an **auxiliary switch** can be used for additional switching (extra shielding, different operation modes, etc.), currently with the states ON and OFF only; if activated, an extra column, holding the state of that switch, will be added to the results. If both states are defined for searching, then this will double the number of states to be analyzed.

### 3.6.2 Parameter Sets

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

**EN 55014**

Frequency Range:	30 - 300 MHz
Detectors:	QP and AV
Test Samples:	Household Equipment

### 3.6.3 List of the Script Parameters

Topic	Test
Parameter: Default value: Function:	01: ID max. 12 chars to be included in filenames "pow_0001" a short string that will be used for building up various default strings (see below); this string enables easy identification of files that belong to the same test
Parameter: Default value: Function:	02: global start frequency [MHz] for the test 30 no measurements will be done below this frequency
Parameter: Default value: Function:	03: global stop frequency [MHz] for the test 300 no measurements will be done above this frequency
Parameter: Default value: Function:	04: suppress queries as far as possible not checked if not checked then additional queries will come up that help to avoid overwriting of files or to skip certain parts of the test
Parameter: Default value: Function:	05: confirmation for final test after data reduction not checked if checked then after data reduction a query will come up enables to skip the final test within the current test range
Parameter: Default value: Function:	06: split frequency range into test ranges checked the total frequency range of the test can optionally be split into <b>test ranges</b> (linear or logarithmic, with respect to the ranges of the scan/sweep range table) that are calculated by the script and will <b>be completely tested</b> (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 08</i> has to be interpreted as a minimum value; if the value is set to (typically) 1 then nevertheless for each subrange of the scan/sweep table which used for the preview test, a test range will be calculated (e.g. a field strength test with two antennas or scan/sweep ranges will lead to one test range each); if splitting is not used then the whole frequency range of the scan/sweep table will be tested as one single test range (but maybe with a number of messageboxes requiring to change the antenna !)
Parameter: Default value: Function:	07: if splitting of frequency range: do with log. scale checked if checked then the splitting of the frequency range (if activated) will lead to test ranges of equal width in the logarithmic scale, else in the linear scale
Parameter: Default value: Function:	08: no. of test ranges for splitting of frequency range 1 defines the number of test ranges that shall be calculated for the splitting of the frequency range
Parameter: Default value:	09: test configuration, <none>: ID "<none>"



Function: optional filename of the test configuration (lists all files belonging to the test, for easy transfers through Export/Import/Move) to be created by the test; if no filename is specified then a default name will be used

**Topic****Preview**

Parameter: 01: preview result file, <none>: ID + '\_pre'  
 Default value: "<none>"  
 Function: optional filename for the results (1<sup>st</sup> detector, e.g. PEAK) from the preview test; if no filename is specified then a default name will be used

Parameter: 02: 2<sup>nd</sup> preview result file, <none>: ID + '\_pre2'  
 Default value: "<none>"  
 Function: optional filename for the results (2<sup>nd</sup> detector, e.g. AVERAGE) 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 analyzer); 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)

Parameter: 06: insert results into existing result file  
 Default value: not checked  
 Function: if not checked then any existing result files with a filename identical to the filename used in the preview test will be deleted/overwritten; else: any existing result files will only partly be overwritten (within the specified frequency range); this way it is possible to **remeasure certain bands of the spectrum** while keeping the rest unchanged

**Topic****DataReduction**

Parameter: 01: also perform interactive frequency selection  
 Default value: not checked  
 Function: if checked then you can review the points that have been found through the automatic data reduction, i.e. you can remove points or add new ones for the test; to do so you have to position the marker accordingly and select "Remove" or "Test" in a dialog

Parameter: 02: 1st limit line  
 Default value: "<none>"  
 Function: a filename that corresponds to the limit line assigned to the 1<sup>st</sup> detector (e.g. QUASPEAK)

Parameter:	03: 2nd limit line
Default value:	"<none>"
Function:	a filename that corresponds to the limit line assigned to the 2 <sup>nd</sup> detector (e.g. AVERAGE)
Parameter:	04: 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:	05: 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:	06: 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:	07: freq. list of ambients to be cut out from preview
Default value:	"<none>"
Function:	optional name of a frequency list (ambient interference) with frequencies to be "cut out" from measurement results (preview test: scans/sweeps, final test: partial scans), each "cut" with a range corresponding to the current IF bandwidth, e.g. +/- 60 kHz around each of the frequencies if an IF bandwidth of 120 kHz is used; to blank a modulated interference it might be necessary to provide more than one frequency in the list
Parameter:	08: cutting width for sweeps (ambients): no. of IF-BWs
Default value:	10
Function:	with sweeps the width of a "cut" range (see previous parameter) has to be larger because of the lower frequency resolution of the results; therefore this factor (=number of IF bandwidths) will be used to enlarge the range compared with the range used on scan results
Parameter:	09: merge all points from both detectors into same list
Default value:	not checked
Function:	if checked then the points that have been found through the automatic data reduction from both detectors will be merged into one single list which in turn will be used for both detectors in the final test

**Topic****Final**

Parameter:	01: final result file, <none>: ID + '_fin'
Default value:	"<none>"
Function:	optional filename for the results (1 <sup>st</sup> detector, e.g. QUASIPeAK) from the final measurements; if no filename is specified then a default name will be used
Parameter:	02: 2nd final result file, <none>: ID + '_fin2'
Default value:	"<none>"
Function:	optional filename for the results (2 <sup>nd</sup> detector, e.g. AVERAGE) from the final measurements; if no filename is specified then a default name will be used

Parameter:	03: scan table for partial scans + maximization
Default value:	"<none>"
Function:	filename of the corresponding <b>scan range table</b> to be used for maximization measurements as well as for partial scans
Parameter:	04: perform partial scans
Default value:	not checked
Function:	if checked then additional partial scans will be performed around the frequencies to be analyzed; 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: 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:	06: 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:	07: partial scan width: ref. frequ. ratio
Default value:	0.01
Function:	determines the frequency range for partial scans (e.g. 0.01 means +/-0.5 %) in reference to the given mid frequency; the parameter is effective only if the previous parameter is set to 0
Parameter:	08: complete search (all accessory settings)
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:	09: 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 positions
Parameter:	10: 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 analyzed but the full positioning range of the absorbing clamp
Parameter:	11: scan table for final measurements
Default value:	"<none>"
Function:	filename of the corresponding <b>scan range table</b> to be used for the final measurements

Parameter:	12: opt. scan table for final meas. >1GHz
Default value:	"<none>"
Function:	filename of the corresponding <b>scan range table</b> to be used for the final measurements, but only for frequencies above 1 GHz; this way measurements above 1 GHz can be done with an other detector (e.g. PEAK) than those below 1 GHz (e.g. QUASPEAK)
Parameter:	13: insert results into existing result file
Default value:	not checked
Function:	if not checked then any existing result files with a filename identical to the filename used in the final test will be deleted/overwritten; else: any existing result files will only partly be overwritten (within the specified frequency range); this way it is possible to <b>remeasure certain bands of the spectrum</b> while keeping the rest unchanged
Parameter:	14: 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 (e.g. for PK or PK+AV) or optionally two (e.g. 1st for PK, 2nd for AV) input files
Parameter:	15: optional input: preview result file (2 <sup>nd</sup> det.)
Default value:	"<none>"
Function:	see previous parameter
Parameter:	16: 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 (e.g. for QP or QP+AV) or optionally two (e.g. 1st for QP, 2nd for AV) input files
Parameter:	17: optional input: frequency list (2nd det.)
Default value:	"<none>"
Function:	see previous parameter
Parameter:	18: 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 (e.g. for QP or QP+AV) or optionally two (e.g. 1st for QP, 2nd for AV) input files
Parameter:	19: 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

Parameter: 04: minimize graphics for test  
 Default value: not checked  
 Function: if checked then the graphics will be minimized before the measurements starts and it will be restored before generating the report; therefore no graphics updates will occur which in turn avoids any possible delays when handling very long scan curves

### **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: generate RTF file  
 Default value: not checked  
 Function: if checked then a report file will be created using the "Rich Text Format" (a kind of generic MS Word format) which can be edited with many other text processing software products

Parameter: 03: RTF file: 'X:\<path>\<name8.3>', empty: dialog  
 Default value: "c:\xxx.rtf"  
 Function: path + file name (8.3 name format) of the RTF file if the RTF report is activated; if an empty string is used then a file selection dialog will come up

Parameter: 04: 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: 05: 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

Parameter: 06: optional text file to be included  
 Default value: "<none>"  
 Function: filename of an optional file of type 'Text' which shall be included in the report

### **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: EuT name
Default value:	"EuT"
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 EuT); 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

<b>Topic</b>	<b>Clamp</b>
Parameter:	01: use manual positioning only
Default value:	checked
Function:	if checked then manual control of the absorbing clamp through dialogue boxes will be used
Parameter:	02: use auto positioning only
Default value:	not checked
Function:	if checked then automatic control of the absorbing clamp will be used
Parameter:	03: symbolic name of autom. moved clamp
Default value:	"CLAMP"
Function:	symbolic device name of the automatically controlled absorbing clamp as defined in the device configuration menu
Parameter:	04: speed value for slower movements
Default value:	2
Function:	determines the speed of the automatically moved clamp for the relatively slow movements for the "adjustment" in the final test (some 1 or 2 measurements per sec. only !)
Parameter:	05: speed value for faster movements
Default value:	4
Function:	determines the speed of the automatically moved clamp for the relatively fast movements for absolute positioning
Parameter:	06: 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:	07: 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:	08: 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:	09: 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: 10: 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

**Topic Auxiliary**

Parameter: 01: use manual auxiliary switching

Default value: not checked

Function: if checked then manual control of an auxiliary switch through dialogue boxes will be used; if activated an extra column, holding the state ("ON" or "OFF") of the switch will be added to the results

Parameter: 02: name of auxiliary device

Default value: "Auxiliary Device"

Function: name of the auxiliary switch (will be displayed with the dialog boxes for switching)

Parameter: 03: preview measurements with aux. switch OFF

Default value: not checked

Function: if checked then the preview measurements will (also) be done with the state "OFF"

Parameter: 04: preview measurements with aux. switch ON

Default value: not checked

Function: if checked then the preview measurements will (also) be done with the state "ON"

Parameter: 05: final measurements with aux. switch OFF

Default value: not checked

Function: if checked then the final measurements will (also) be done with the state "OFF"

Parameter: 06: final measurements with aux. switch ON

Default value: not checked

Function: if checked then the final measurements will (also) be done with the state "ON"



## 3.7 Voltage Mains Test

### 3.7.1 Description

This test provides automatic measurement of electromagnetic interference on supply lines, optionally with automatic control of an artificial mains network (LISN).

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

- Y 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
- Y with a **2-line LISN** like the ESH3-Z5 switching can be done automatically between lines N and L1, protective earth between grounded floating (with ENV 216: high pass setting)
- Y 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 (not with ENV 4200)

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).

The artificial mains networks ESH2-Z5 and ESH3-Z5 are normally controlled via the user port of the receiver. With this test procedure the parallel interface can alternatively be defined for controlling, using the LPT I/O driver. When doing so, the lines of the parallel port will be used as follows:

- DATA 0 (Pin No. 2): N
- DATA 1 (Pin No. 3): L1
- DATA 2 (Pin No. 4): L2 (ESH2-Z5 only)
- DATA 3 (Pin No. 5): L3 (ESH2-Z5 only)
- DATA 4 (Pin No. 6): PE for ESH2-Z5
- DATA 5 (Pin No. 7): PE for ESH3-Z5

If needed, an **auxiliary switch** can be used for additional switching (extra shielding, different operation modes, etc.), currently with the states ON and OFF only; if activated, an extra column, holding the state of that switch, will be added to the results. If both states are defined for searching, then this will double the number of states to be analyzed.

### 3.7.2 Parameter Sets

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

#### EN 55015

Frequency Range:	0.15 - 30 MHz
Detectors:	QP and AV
Test Samples:	Fluorescent Lamps and Luminaries

#### EN 55022

Frequency Range:	0.15 - 30 MHz
Detectors:	QP and AV
Test Samples:	ITE: Class B

### 3.7.3 List of the Script Parameters

Topic	Test
Parameter: Default value: Function:	01: ID max. 12 chars to be included in filenames "vol_0001" a short string that will be used for building up various default strings (see below); this string enables easy identification of files that belong to the same test
Parameter: Default value: Function:	02: global start frequency [MHz] for the test 0.15 no measurements will be done below this frequency
Parameter: Default value: Function:	03: global stop frequency [MHz] for the test 30 no measurements will be done above this frequency
Parameter: Default value: Function:	04: suppress queries as far as possible not checked if not checked then additional queries will come up that help to avoid overwriting of files or to skip certain parts of the test
Parameter: Default value: Function:	05: confirmation for final test after data reduction not checked if checked then after data reduction a query will come up enables to skip the final test within the current test range
Parameter: Default value: Function:	06: split frequency range into test ranges checked the total frequency range of the test can optionally be split into <b>test ranges</b> (linear or logarithmic, with respect to the ranges of the scan/sweep range table) that are calculated by the script and will <b>be completely tested</b> (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 08</i> has to be interpreted as a minimum value; if the value is set to (typically) 1 then nevertheless for each subrange of the scan/sweep table which used for the preview test, a test range will be calculated (e.g. a field strength test with two antennas or scan/sweep ranges will lead to one test range each); if splitting is not used then the whole frequency range of the scan/sweep table will be tested as one single test range (but maybe with a number of messageboxes requiring to change the antenna !)
Parameter: Default value: Function:	07: if splitting of frequency range: do with log. scale checked if checked then the splitting of the frequency range (if activated) will lead to test ranges of equal width in the logarithmic scale, else in the linear scale
Parameter: Default value: Function:	08: no. of test ranges for splitting of frequency range 1 defines the number of test ranges that shall be calculated for the splitting of the frequency range
Parameter: Default value:	09: test configuration, <none>: ID "<none>"

Function: optional filename of the test configuration (lists all files belonging to the test, for easy transfers through Export/Import/Move) to be created by the test; if no filename is specified then a default name will be used

**Topic****Preview**

Parameter: 01: preview result file, <none>: ID + '\_pre'  
 Default value: "<none>"  
 Function: optional filename for the results (1<sup>st</sup> detector, e.g. PEAK) from the preview test; if no filename is specified then a default name will be used

Parameter: 02: 2<sup>nd</sup> preview result file, <none>: ID + '\_pre2'  
 Default value: "<none>"  
 Function: optional filename for the results (2<sup>nd</sup> detector, e.g. AVERAGE) from the preview test; if no filename is specified then a default name will be used

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

Parameter: 04: opt. scan table for preview on LISN line L1  
 Default value: "<none>"  
 Function: filename of an additional scan range table for the preview test to be used only when measurements are done on line L1; if used then the first scan range table will only be used with measurements on line N

Parameter: 05: opt. scan table for preview on LISN line L2  
 Default value: "<none>"  
 Function: filename of an additional scan range table for the preview test to be used only when measurements are done on line L2

Parameter: 06: opt. scan table for preview on LISN line L3  
 Default value: "<none>"  
 Function: filename of an additional scan range table for the preview test to be used only when measurements are done on line L3

Parameter: 07: sweep table for preview (N)  
 Default value: "<none>"  
 Function: filename of the sweep range table to be used for the preview test

Parameter: 08: opt. sweep table for preview on LISN line L1  
 Default value: "<none>"  
 Function: filename of an additional sweep range table for the preview test to be used only when measurements are done on line L1; if used then the first sweep range table will only be used with measurements on line N

Parameter: 09: opt. sweep table for preview on LISN line L2  
 Default value: "<none>"  
 Function: filename of an additional sweep range table for the preview test to be used only when measurements are done on line L2

Parameter: 10 opt. sweep table for preview on LISN line L3  
 Default value: "<none>"  
 Function: filename of an additional sweep range table for the preview test to be used only when measurements are done on line L3

Parameter: 11: insert results into existing result file  
 Default value: not checked  
 Function: if not checked then any existing result files with a filename identical to the filename used in the preview test will be deleted/overwritten;  
 else: any existing result files will only partly be overwritten (within the specified frequency range); this way it is possible to **remeasure certain bands of the spectrum** while keeping the rest unchanged

### Topic DataReduction

Parameter: 01: also perform interactive frequency selection  
 Default value: not checked  
 Function: if checked then you can review the points that have been found through the automatic data reduction, i.e. you can remove points or add new ones for the test;. to do so you have to position the marker accordingly and select "Remove" or "Test" in a dialog

Parameter: 02: 1st limit line  
 Default value: "<none>"  
 Function: a filename that corresponds to the limit line assigned to the 1<sup>st</sup> detector (e.g. QUASPEAK)

Parameter: 03: 2nd limit line  
 Default value: "<none>"  
 Function: a filename that corresponds to the limit line assigned to the 2<sup>nd</sup> detector (e.g. AVERAGE)

Parameter: 04: 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: 05: 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: 06: 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: 07: merge all points from both detectors into same list  
 Default value: not checked  
 Function: if checked then the points that have been found through the automatic data reduction from both detectors will be merged into one single list which in turn will be used for both detectors in the final test

### Topic Final

Parameter: 01: final result file, <none>: ID + '\_fin'  
 Default value: "<none>"  
 Function: optional filename for the results (1<sup>st</sup> detector, e.g. QUASPEAK) from the final measurements; if no filename is specified then a default name will be used

Parameter:	02: 2nd final result file, <none>: ID + '_fin2'
Default value:	"<none>"
Function:	optional filename for the results (2 <sup>nd</sup> detector, e.g. AVERAGE) from the final measurements; if no filename is specified then a default name will be used
Parameter:	03: scan table for partial scans + maximization (N)
Default value:	"<none>"
Function:	filename of the corresponding <b>scan range table</b> to be used for maximization measurements as well as for partial scans
Parameter:	04: opt. scan table for partial scans + max. (L1)
Default value:	"<none>"
Function:	filename of an additional scan range table for maximization measurements and for partial scans to be used only when measurements are done on line L1; if used then the first scan range table will only be used with measurements on line N
Parameter:	05: opt. scan table for partial scans + max. (L2)
Default value:	"<none>"
Function:	filename of an additional scan range table for maximization measurements and for partial scans to be used only when measurements are done on line L2
Parameter:	06: opt. scan table for partial scans + max. (L3)
Default value:	"<none>"
Function:	filename of an additional scan range table for maximization measurements and for partial scans to be used only when measurements are done on line L3
Parameter:	07: perform partial scans
Default value:	not checked
Function:	if checked then additional partial scans will be performed around the frequencies to be analyzed; 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:	08: 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:	09: 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:	10: partial scan width: ref. frequ. ratio
Default value:	0.01
Function:	determines the frequency range for partial scans (e.g. 0.01 means +/-0.5 %) in reference to the given mid frequency; the parameter is effective only if the previous parameter is set to 0
Parameter:	11: 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 analyzers)
Parameter:	12: scan table for final measurements (N)
Default value:	"<none>"
Function:	filename of the corresponding <b>scan range table</b> to be used for the final measurements
Parameter:	13: opt. scan table for final measurements (L1)
Default value:	"<none>"
Function:	filename of an additional scan range table for the final measurements to be used only when measurements are done on line L1; if used then the first scan range table will only be used with measurements on line N
Parameter:	14: opt. scan table for final measurements (L2)
Default value:	"<none>"
Function:	filename of an additional scan range table for the final measurements to be used only when measurements are done on line L2
Parameter:	15: opt. scan table for final measurements (L3)
Default value:	"<none>"
Function:	filename of an additional scan range table for the final measurements to be used only when measurements are done on line L3
Parameter:	16: QP limit relaxation according to FCC
Default value:	not checked
Function:	if checked then every final measurement with the 1 <sup>st</sup> detector will be extended through an additional measurement with the AVERAGE detector; should the QUASISPEAK level then be more than 6 dB above the AVERAGE level, then we have a broadband signal; as a consequence the QUASISPEAK limit will be increased (relaxed) by 13 dB as described in the FCC standard
Parameter:	17: insert results into existing result file
Default value:	not checked
Function:	if not checked then any existing result files with a filename identical to the filename used in the final test will be deleted/overwritten; else: any existing result files will only partly be overwritten (within the specified frequency range); this way it is possible to <b>remeasure certain bands of the spectrum</b> while keeping the rest unchanged
Parameter:	18: 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 (e.g. for PK or for PK+AV) or optionally two (e.g. 1 <sup>st</sup> for PK, 2 <sup>nd</sup> for AV) input files
Parameter:	19: optional input: preview result file (2nd det.)
Default value:	"<none>"
Function:	see previous parameter
Parameter:	20: 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 (e.g. for QP or for QP+AV) or optionally two (e.g. 1 <sup>st</sup> for QP, 2 <sup>nd</sup> for AV) input files
Parameter:	21: optional input: frequency list (2nd det.)
Default value:	"<none>"
Function:	see previous parameter
Parameter:	22: 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 (e.g. for QP or for QP+AV) or optionally two (e.g. 1 <sup>st</sup> for QP, 2 <sup>nd</sup> for AV) input files
Parameter:	23: 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
Parameter:	04: minimize graphics for test
Default value:	not checked
Function:	if checked then the graphics will be minimized before the measurements starts and it will be restored before generating the report; therefore no graphics updates will occur which in turn avoids any possible delays when handling very long scan curves

### 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: generate RTF file
Default value:	not checked
Function:	if checked then a report file will be created using the "Rich Text Format" (a kind of generic MS Word format) which can be edited with many other text processing software products
Parameter:	03: RTF file: 'X:\<path>\<name8.3>', empty: dialog
Default value:	"c:\xxx.rtf"
Function:	path + file name (8.3 name format) of the RTF file if the RTF report is activated; if an empty string is used then a file selection dialog will come up
Parameter:	04: 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:	05: 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
Parameter:	06: optional text file to be included
Default value:	"<none>"
Function:	filename of an optional file of type 'Text' which shall be included in the report

**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: EuT name
Default value:	"EuT"
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 EuT); 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 auto switching only  
 Default value: not checked  
 Function: if checked then automatic control of the artificial mains network (LISN) will be used

Parameter: 03: use LPT I/O switching only  
 Default value: not checked  
 Function: if checked then automatic control of the artificial mains network (LISN) via the driver LPT I/O will be used; in this case the lines of the parallel port will be used as follows:  
 DATA 0 (Pin No. 2): N  
 DATA 1 (Pin No. 3): L1  
 DATA 2 (Pin No. 4): L2 (ESH2-Z5 only)  
 DATA 3 (Pin No. 5): L3 (ESH2-Z5 only)  
 DATA 4 (Pin No. 6): PE for ESH2-Z5  
 DATA 5 (Pin No. 7): PE for ESH3-Z5

---

Parameter:	04: symbolic device name of autom. switched LISN
Default value:	"ESH2-Z2"
Function:	symbolic device name of the automatically controlled artificial mains network as defined in the device configuration menu; the device properties must match with the controlling device (e.g. IEEE command strings for an EMI test receiver)
Parameter:	05: single line LISN
Default value:	not checked
Function:	if checked then a single-line-LISN for measurements on a number of supply lines is assumed
Parameter:	06: sgl.: no. of lines to be measured for preview
Default value:	0
Function:	specifies the number of lines to be analyzed in the preview test, if a single-line-LISN is used
Parameter:	07: sgl.: no. of lines to be measured for finals
Default value:	0
Function:	specifies the number of lines to be analyzed in the final test, if a single-line-LISN is used
Parameter:	08: 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:	09: 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:	10: 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:	11: preview measurements on line L1
Default value:	checked
Function:	if checked then the preview measurements will (also) be done on the line L1
Parameter:	12: preview measurements on line L2
Default value:	checked
Function:	if checked then the preview measurements will (also) be done on the line L2
Parameter:	13: preview measurements on line L3
Default value:	checked
Function:	if checked then the preview measurements will (also) be done on the line L3
Parameter:	14: 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:	15: 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: 16: 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: 17: final measurements on line L1  
 Default value: checked  
 Function: if checked then the final measurements will (also) be done on the line L1

Parameter: 18: final measurements on line L2  
 Default value: checked  
 Function: if checked then the final measurements will (also) be done on the line L2

Parameter: 19: final measurements on line L3  
 Default value: checked  
 Function: if checked then the final measurements will (also) be done on the line L3

**Topic Auxiliary**

Parameter: 01: use manual auxiliary switching  
 Default value: not checked  
 Function: if checked then manual control of an auxiliary switch through dialogue boxes will be used; if activated an extra column, holding the state ("ON" or "OFF") of the switch will be added to the results

Parameter: 02: name of auxiliary device  
 Default value: "Auxiliary Device"  
 Function: name of the auxiliary switch (will be displayed with the dialog boxes for switching)

Parameter: 03: preview measurements with aux. switch OFF  
 Default value: not checked  
 Function: if checked then the preview measurements will (also) be done with the state "OFF"

Parameter: 04: preview measurements with aux. switch ON  
 Default value: not checked  
 Function: if checked then the preview measurements will (also) be done with the state "ON"

Parameter: 05: final measurements with aux. switch OFF  
 Default value: not checked  
 Function: if checked then the final measurements will (also) be done with the state "OFF"

Parameter: 06: final measurements with aux. switch ON  
 Default value: not checked  
 Function: if checked then the final measurements will (also) be done with the state "ON"

## 3.8 Voltage Terminal Test

### 3.8.1 Description

This test provides automatic measurement of conducted electromagnetic interference on the antenna terminals of TV sets, VCRs and radios.

The test starts with a preview test to look for critical frequencies while the tuner is in a "channel search mode". If there are any of them (ambient signals can optionally be cut out according to a frequency list), then the user can decide whether to continue testing with test signals. In that case (a power divider will be required and the signal loss has to be defined as a system transducer for the sweep/scan tables) the critical frequencies will be analyzed to find the corresponding channel (IF will be subtracted and a frequency list with channel width information will be used):

A message will come up to provide a test signal (channel + carrier frequency) for the (next) required channel. The oscillator frequency and all harmonic frequencies within the test range will be evaluated against the matching limit. Then these frequencies will be cut out from the spectrum and the rest will be evaluated against the limit that is defined for "other" signals. The procedure will be repeated for all critical frequencies from the preview test. In the test report for all QP measurements (if level is above the acceptance line) a note will indicate the signal type and the corresponding carrier frequency.

Without QP measurements, the list with the critical points from the preview test (PK results) will be shown in the test report.

### 3.8.2 Parameter Sets

Currently the following specification is supported by the ES-K1 Standard Data:

**EN 55013**

Frequency Range:	0.15 - 30 MHz
Detectors:	QP and AV
Test Samples:	Television Sets, FM Tuners, VCRs, DVD Players, etc.

### 3.8.3 List of the Script Parameters

Topic	Test
Parameter: Default value: Function:	01: ID max. 12 chars to be included in filenames "vterm_0001" a short string that will be used for building up various default strings (see below); this string enables easy identification of files that belong to the same test
Parameter: Default value: Function:	02: global start frequency [MHz] for the test 30 no measurements will be done below this frequency
Parameter: Default value: Function:	03: global stop frequency [MHz] for the test 1000 no measurements will be done above this frequency
Parameter: Default value: Function:	04: suppress queries as far as possible not checked if not checked then additional queries will come up that help to avoid overwriting of files or to skip certain parts of the test
Parameter: Default value: Function:	05: confirmation for final test after data reduction not checked if checked then after data reduction a query will come up enables to skip the final test within the current test range
Parameter: Default value: Function:	06: split frequency range into test ranges checked the total frequency range of the test can optionally be split into <b>test ranges</b> (linear or logarithmic, with respect to the ranges of the scan/sweep range table) that are calculated by the script and will <b>be completely tested</b> (preview test, data reduction, final test), therefore reducing the time elapsed between preview and final test, which is very useful with interference drifting over frequency; besides, this method reduces manual interaction, if more than one probe transducer has to be used for the test (e.g. two antennas for 30 - 1000 MHz in a field strength test); the value given with parameter <i>Test 07</i> has to be interpreted as a minimum value; if the value is set to (typically) 1 then nevertheless for each subrange of the scan/sweep table which used for the preview test, a test range will be calculated (e.g. a field strength test with two antennas or scan/sweep ranges will lead to one test range each); if splitting is not used then the whole frequency range of the scan/sweep table will be tested as one single test range (but maybe with a number of messageboxes requiring to change the antenna !)
Parameter: Default value: Function:	07: if splitting of frequency range: do with log. scale checked if checked then the splitting of the frequency range (if activated) will lead to test ranges of equal width in the logarithmic scale, else in the linear scale
Parameter: Default value: Function:	08: no. of test ranges for splitting of frequency range 1 defines the number of test ranges that shall be calculated for the splitting of the frequency range
Parameter: Default value:	09: frequency list with channel info "<none>"

Function: defines the channel list to be used in the test, a frequency list which also holds information like channel names and channel widths

Parameter: 10: measurement of wanted signals (ignore IF offset)

Default value: not checked

Function: if checked then the test is configured for the measurement of "wanted signals" (e.g. for measuring VCRs or DVD players): the value of the tuner IF offset will be ignored and the carrier will not be cut off the spectrum

Parameter: 11: 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'

Default value: "<none>"

Function: optional filename for the results (1<sup>st</sup> detector, e.g. PEAK) from the preview test; if no filename is specified then a default name will be used

Parameter: 02: scan table for preview

Default value: "<none>"

Function: filename of the scan range table to be used for the preview test

Parameter: 03: sweep table for preview

Default value: "<none>"

Function: filename of the sweep range table to be used for the preview test

Parameter: 04: insert results into existing result file

Default value: not checked

Function: if not checked then any existing result files with a filename identical to the filename used in the preview test will be deleted/overwritten;  
else: any existing result files will only partly be overwritten (within the specified frequency range); this way it is possible to **remeasure certain bands of the spectrum** while keeping the rest unchanged

## Topic

### DataReduction

Parameter: 01: all/others limit line

Default value: "<none>"

Function: a filename that corresponds to the required limit line for all "other" (not fundamental and harmonic) frequencies (e.g. a QUASISPEAK limit)

Parameter: 02: fundamentals limit line

Default value: "<none>"

Function: a filename that corresponds to the required limit line for the oscillator's fundamental frequencies (e.g. a QUASISPEAK limit)

Parameter: 03: harmonics limit line

Default value: "<none>"

Function: a filename that corresponds to the required limit line for the oscillator's harmonic frequencies (e.g. a QUASISPEAK limit)

Parameter: 04: max. no. of results kept per testrange

Default value:	6
Function:	the maximum number of results that will be kept from each testrange through data reduction
Parameter:	05: 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:	06: 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:	07: frequency list of ambients to be cut out of from preview
Default value:	"<none>"
Function:	optional name of a frequency list (ambient interference) with frequencies to be "cut out" from measurement results (preview test: scans/sweeps, final test: partial scans), each "cut" with a range corresponding to the current IF bandwidth, e.g. +/- 60 kHz around each of the frequencies if an IF bandwidth of 120 kHz is used; to blank a modulated interference it might be necessary to provide more than one frequency in the list
Parameter:	08: cut factor for sweeps (ambients+osc.+har.)
Default value:	10
Function:	with sweeps the width of a "cut" range has to be larger because of the lower frequency resolution of the results; therefore this factor (=number of IF bandwidths) will be used to enlarge the range compared with the range used on scan results
<b>Topic</b>	<b>Final</b>
Parameter:	01: final result file, <none>: ID + '_fin'
Default value:	"<none>"
Function:	optional filename for the (QUASIPeAK) results from the final test; if no filename is specified then a default name will be used
Parameter:	02: final result file, <none>: ID + '_fin2'
Default value:	"<none>"
Function:	optional filename for the (PeAK) results from the final test; if no filename is specified then a default name will be used
Parameter:	03: scan table for meas. with carrier on
Default value:	"<none>"
Function:	filename of the scan range table to be used for the final test, when a carrier signal is present
Parameter:	04: sweep table for meas. with carrier on
Default value:	"<none>"
Function:	filename of the sweep range table to be used for the final test, when a carrier signal is present
Parameter:	05: scan table for partial scans
Default value:	"<none>"

Function:	filename of the corresponding <b>scan range table</b> to be used for partial scans
Parameter:	06: perform partial scans
Default value:	not checked
Function:	if checked then additional partial scans will be performed around the frequencies to be analyzed; 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:	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 +/-0.5 %) in reference to the given mid frequency; the parameter is effective only if the previous parameter is set to 0
Parameter:	09: scan table for final measurements
Default value:	"<none>"
Function:	filename of the corresponding <b>scan range table</b> to be used for the final measurements
Parameter:	10: opt. scan table for final meas. >1GHz
Default value:	"<none>"
Function:	filename of the corresponding <b>scan range table</b> to be used for the final measurements, but only for frequencies above 1 GHz; this way measurements above 1 GHz can be done with an other detector (e.g. PEAK) than those below 1 GHz (e.g. QUASIPeAK)
Parameter:	11: insert results into existing result file
Default value:	not checked
Function:	if not checked then any existing result files with a filename identical to the filename used in the final test will be deleted/overwritten; else: any existing result files will only partly be overwritten (within the specified frequency range); this way it is possible to <b>remeasure certain bands of the spectrum</b> while keeping the rest unchanged
Parameter:	12: 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
Parameter:	13: 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
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



<b>Topic</b>	<b>Graphics</b>
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)

<b>Topic</b>	<b>Report</b>
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: generate RTF file
Default value:	not checked
Function:	if checked then a report file will be created using the "Rich Text Format" (a kind of generic MS Word format) which can be edited with many other text processing software products
Parameter:	03: RTF file: 'X:\<path>\<name8.3>', empty: dialog
Default value:	"c:\xxx.rtf"
Function:	path + file name (8.3 name format) of the RTF file if the RTF report is activated; if an empty string is used then a file selection dialog will come up
Parameter:	04: 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:	05: 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
Parameter:	06: optional text file to be included
Default value:	"<none>"
Function:	filename of an optional file of type 'Text' which shall be included in the report

<b>Topic</b>	<b>ReportHeader</b>
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 Terminal 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: EuT name
Default value:	"EuT"
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 EuT); 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

## 3.9 Azimuth Chart Test

### 3.9.1 Description

With this test the radiation pattern of an EuT as well as the azimuth pattern of an antenna can be measured and be displayed in a polar chart.

For gaining the radiation pattern of an EuT, the device has to be mounted onto a turntable.

The azimuth pattern of an antenna can be retrieved by turning the (receiving) antenna (optionally with a turntable) while transmitting antenna - e.g. mounted on a tripod - radiates with a constant level (provided by the tracking generator of the receiver). Maximum eight frequencies will be measured with each azimuth step. The measured levels will be stored along with the azimuths and displayed in a polar diagram (level against azimuth; one curve per frequency). The display of the levels may be either absolute or relative to the levels of the main azimuth (an offset can be defined); the levels of the main azimuth can be stored as a reference so that with another test they can be used for a relative display.

For measurements on a frequency list (not with scans/sweeps) an external generator can be used as a replacement for the tracking generator. This requires the option ES-K50 (Universal GPIB Driver).

If this option is installed, then the driver 'USER\_IEC' can be added to the device list; the assigned to this driver could be e.g. "GENERATOR" or the model name of the generator (e.g. "SMP"). The settings should first be checked with the corresponding interactive dialog ("Set Device...").

In the script parameters of **Topic "ExtGenerator"** the device has to be selected and the appropriate GPIB commands have to be entered.

The script parameters for the newer generators from R&S (SMxx) have to be set like this:

...

<b>Topic</b>	<b>Calibration</b>
Parameter:	04: <b>scan table for measurements</b>
Value:	<b>[must be selected!]</b>
Parameter:	05: optional <b>frequ. list for single measurements</b>
Value:	<b>[must be selected!]</b>
Parameter:	06: sweep table for measurements
Value:	<none>

...

<b>Topic</b>	<b>ExtGenerator</b>
Parameter:	02: GPIB initialization command
Value:	<b>"*RST;*CLS;POW -10DBM;FREQ:CW 1E9;OUTP1 ON"</b>
Parameter:	03: GPIB frequ. command incl. format string
Value:	<b>"FREQ:CW %G"</b>
Parameter:	04: frequency factor (e.g. 1E-6 for MHz)
Value:	<b>1</b>

...

### 3.9.2 List of the Script Parameters

<b>Topic</b>	<b>Test</b>
Parameter:	01: ID max. 12 chars to be included in filenames
Default value:	"chart_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: frequ. list for single measurements
Default value:	"CAL"
Function:	frequency with the frequencies to be measured; only the first eight frequencies within the given and available frequency range will be used
Parameter:	03: global start frequency [MHz] for the test
Default value:	30
Function:	no measurements will be done below this frequency
Parameter:	04: global stop frequency [MHz] for the test
Default value:	1000
Function:	no measurements will be done above this frequency
Parameter:	05: main azimuth [deg] (used as azimuth offset)
Default value:	0
Function:	defines the main azimuth; the value will be used as an offset for the results
Parameter:	06: relative display
Default value:	not checked
Function:	if checked then the levels will be calculated relatively either to the main azimuth or to the loaded reference
Parameter:	07: 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:	08: name of reference results to be used
Default value:	""
Function:	name of the reference file (stored as a transducer) which shall be used for the relative display of the levels
Parameter:	09: name of reference results to be stored
Default value:	""
Function:	name of the reference file which holds the levels of the main azimuth (will be stored as a transducer)
Parameter:	10: 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

<b>Topic</b>	<b>Measurement</b>
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Parameter:	01: scan table for single measurements
Default value:	"<none>"

Function: filename of the scan range table to be used for the (single) measurements

### 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: minimum level

Default value: 0

Function: defines the minimum level of the polar graphics diagram

Parameter: 03: maximum level

Default value: 80

Function: defines the maximum level of the polar graphics diagram

### 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: generate RTF file

Default value: not checked

Function: if checked then a report file will be created using the "Rich Text Format" (a kind of generic MS Word format) which can be edited with many other text processing software products

Parameter: 03: RTF file: 'X:\<path>\<name8.3>', empty: dialog

Default value: "c:\xxx.rtf"

Function: path + file name (8.3 name format) of the RTF file if the RTF report is activated; if an empty string is used then a file selection dialog will come up

Parameter: 04: 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: 05: 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

Parameter: 06: optional text file to be included

Default value: "<none>"

Function: filename of an optional file of type 'Text' which shall be included in the report

### 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:	"Azimuth Chart"
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: EuT name
Default value:	"EuT"
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 EuT); 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

<b>Topic</b>	<b>Turntable</b>
Parameter:	01: use manual positioning only
Default value:	checked
Function:	if checked then manual control of the turntable through dialogue boxes will be used
Parameter:	02: use auto positioning only
Default value:	not checked
Function:	if checked then automatic control of the turntable will be used
Parameter:	03: symbolic name of autom. moved turntable
Default value:	"TURNTABLE"
Function:	symbolic device name of the automatically controlled turntable as defined in the device configuration menu
Parameter:	04: min. azimuth [deg]
Default value:	0
Function:	defines the minimum azimuth for the measurements
Parameter:	05: max. azimuth [deg]
Default value:	360
Function:	defines the maximum azimuth for the measurements
Parameter:	06: azimuth stepsize [deg] for finals
Default value:	45
Function:	defines the stepsize for the azimuth variation
Parameter:	07: speed value for positioning movements
Default value:	4
Function:	determines the speed of the automatically moved turntable
Parameter:	08: use continuous movements
Default value:	not checked
Function:	if checked then the turntable will not be moved in steps but will rotate continuously while the single measurements are being performed and stored along with their current azimuth; the azimuth steps are somewhat random because they depend on the measurement time and the turntable speed
Parameter:	09: speed value for continuous movements
Default value:	4
Function:	determines the speed of the automatically moved turntable for continuous movements

<b>Topic</b>	<b>ExtGenerator</b>
Parameter:	01: external generator device
Default value:	"<none>"
Function:	symbolic name of the device for controlling of an external generator as defined in the device configuration
Parameter:	02: GPIB initialization command
Default value:	"RECALL 09"
Function:	GPIB command for the initialization of the external generator; it is recommended

to store the settings (fixed RF level, no modulation, etc.) in the memory of the generator and to load them with this command

Parameter: 03: GPIB frequ. command incl. format string  
Default value: "RF %G MHZ"  
Function: GPIB command for the setup of the RF frequency of the external generator; the frequency - multiplied by the factor from the next parameter - will be inserted at the position of the format string "%G"; variations for the format string are possible as with the C function *printf()* or as described in the ES-K2 manual on the script function *convertf()*

Parameter: 04: frequency factor (e.g. 1E-6 for MHz)  
Default value: 1.0E-6  
Function: the frequency to be programmed is internally represented with the unit Hertz; the frequency will be multiplied by this factor to enable a GPIB output in i.e. MHz



## 3.10 Field Strength Test

### 3.10.1 Description

This test provides automatic measurement of electric field strength with antennas, optionally with control of an automatic antenna tower for setting the antenna height and polarization automatically (two masts are also possible), as well as an automatic turntable for setting the orientation of the equipment under test (EuT).

For a complete test the critical frequencies have to be measured with all settings of the three "dimensions" antenna height, antenna polarization 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-Detector, 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 EuTs.

For the preview test it is important to find all disturbances from the EuT (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 polarization; the antenna should be directed both to the front and to the back of the EuT; 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 EuT 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 analyzed.

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 but 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 analyzed; of course this method has its problems if one or more frequencies of ambient interference are identical to those critical ones of the EuT; in this case the operator has to find out (e.g. through switching the EuT off and on if possible or by looking at the signal with a smaller IF bandwidth) whether the field strength generated by the EuT 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 analyzers 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.

For so called **ERP measurements** (ERP = effective radiated power; unit in dBm; power in reference to a half wave dipole) that have to include the test site attenuation, it is necessary to have an individual level correction for each polarization, i.e., two sweep/scan tables that are identical except different system transducers will be used. A second range table for preview and final test respectively has to be defined that will be effective for all measurements with vertical polarization, whereas the first range table will be active with horizontal polarization. That means the range table have different additional corrections (1.

site attenuation for the corresponding polarization and distance; 2. correction factor of the half wave dipole; 3. conversion of electrical voltage [dBuV] into electrical power [dBm]).

If two automatic antenna masts are available then each of them can be used for a complete antenna range (e.g. a biconical antenna: 30 - 300 MHz / a log. per. antenna: 300 - 1000 MHz), thus eliminating manual interaction (if signal switching is done with a relay matrix) when antennas have to be changed (a second symbolic name, e.g. "MAST2" has to be specified for mast and polarization). To compensate for the azimuth deviation of each mast against the zero position axis of the turntable, azimuth correction values have to be defined (e.g. +20 / -20 deg).

Annotation: There are antennas now available that are suitable for the whole frequency range from 30 MHz up to 1 GHz; this way any changing of antennas can be made totally superfluous within that range.

If needed, an **auxiliary switch** can be used for additional switching (extra shielding, different operation modes, etc.), currently with the states ON and OFF only; if activated, an extra column, holding the state of that switch, will be added to the results. If both states are defined for searching, then this will double the number of states to be analyzed.

### 3.10.2 Parameter Sets

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

**EN 55022**

Frequency Range: 30 - 1000 MHz  
 Detector: QP  
 Test Samples: ITE: Class B  
 Distance: 10m

**FCC Part 15 Class A**

Frequency Range: 30 - 18000 MHz  
 Detector: QP below 1GHz; AV above 1 GHz  
 Test Samples:  
 Distance: 10m

**FCC Part 15 Class B**

Frequency Range: 30 - 5000 MHz  
 Detector: QP below 1GHz; AV above 1 GHz  
 Test Samples:  
 Distance: 10m

### 3.10.3 List of the Script Parameters

Topic	Test
Parameter: Default value: Function:	01: ID max. 12 chars to be included in filenames "field_0001" a short string that will be used for building up various default strings (see below); this string enables easy identification of files that belong to the same test
Parameter: Default value: Function:	02: global start frequency [MHz] for the test 30 no measurements will be done below this frequency
Parameter: Default value: Function:	03: global stop frequency [MHz] for the test 1000 no measurements will be done above this frequency
Parameter: Default value: Function:	04: suppress queries as far as possible not checked if not checked then additional queries will come up that help to avoid overwriting of files or to skip certain parts of the test
Parameter: Default value: Function:	05: confirmation for final test after data reduction not checked if checked then after data reduction a query will come up enables to skip the final test within the current test range
Parameter: Default value: Function:	06: split frequency range into test ranges checked the total frequency range of the test can optionally be split into <b>test ranges</b> (linear or logarithmic, with respect to the ranges of the scan/sweep range table) that are calculated by the script and will <b>be completely tested</b> (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 08</i> has to be interpreted as a minimum value; if the value is set to (typically) 1 then nevertheless for each subrange of the scan/sweep table which used for the preview test, a test range will be calculated (e.g. a field strength test with two antennas or scan/sweep ranges will lead to one test range each); if splitting is not used then the whole frequency range of the scan/sweep table will be tested as one single test range (but maybe with a number of messageboxes requiring to change the antenna !)
Parameter: Default value: Function:	07: if splitting of frequency range: do with log. scale checked if checked then the splitting of the frequency range (if activated) will lead to test ranges of equal width in the logarithmic scale, else in the linear scale
Parameter: Default value: Function:	08: no. of test ranges for splitting of frequency range 1 defines the number of test ranges that shall be calculated for the splitting of the frequency range
Parameter: Default value:	09: test configuration, <none>: ID "<none>"

Function: optional filename of the test configuration (lists all files belonging to the test, for easy transfers through Export/Import/Move) to be created by the test; if no filename is specified then a default name will be used

### Topic Preview

Parameter: 01: preview result file, <none>: ID + '\_pre'  
 Default value: "<none>"  
 Function: optional filename for the results (1<sup>st</sup> detector, e.g. PEAK) from the preview test; if no filename is specified then a default name will be used

Parameter: 02: 2<sup>nd</sup> preview result file, <none>: ID + '\_pre2'  
 Default value: "<none>"  
 Function: optional filename for the results (2<sup>nd</sup> detector, e.g. AVERAGE) 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 polarization; if used then the first scan range table will be used with horizontal polarization 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 polarization; if used then the first sweep range table will be used with horizontal polarization 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/polarization parameters for the preview test (recommended for preview tests with sweeps, e.g. with an EMI analyzer); 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)

Parameter: 08: insert results into existing result file  
 Default value: not checked  
 Function: if not checked then any existing result files with a filename identical to the filename used in the preview test will be deleted/overwritten; else: any existing result files will only partly be overwritten (within the specified frequency range); this way it is possible to **remeasure certain bands of the spectrum** while keeping the rest unchanged

### Topic DataReduction

Parameter: 01: also perform interactive frequency selection

Default value:	not checked
Function:	if checked then you can review the points that have been found through the automatic data reduction, i.e. you can remove points or add new ones for the test;. to do so you have to position the marker accordingly and select "Remove" or "Test" in a dialog
Parameter:	02: 1st limit line
Default value:	"<none>"
Function:	a filename that corresponds to the limit line assigned to the 1 <sup>st</sup> detector (e.g. QUASIPEAK)
Parameter:	03: optional 1st 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 the preview results from the 1 <sup>st</sup> detector; if used then the given value for the acceptance offset will be ignored
Parameter:	04: optional 2nd limit line
Default value:	"<none>"
Function:	a filename that corresponds to the limit line assigned to the 2 <sup>nd</sup> detector (e.g. AVERAGE)
Parameter:	05: optional 2nd 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 preview results from the 2 <sup>nd</sup> detector; if used then the given value for the acceptance offset will be ignored
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: freq. list of ambients to be cut out from preview
Default value:	"<none>"
Function:	optional name of a frequency list (ambient interference) with frequencies to be "cut out" from measurement results (preview test: scans/sweeps, final test: partial scans), each "cut" with a range corresponding to the current IF bandwidth, e.g. +/- 60 kHz around each of the frequencies if an IF bandwidth of 120 kHz is used; to blank a modulated interference it might be necessary to provide more than one frequency in the list

Parameter: 10: cutting width for sweeps (ambients): no. of IF-BWs  
 Default value: 10  
 Function: with sweeps the width of a "cut" range (see previous parameter) has to be larger because of the lower frequency resolution of the results; therefore this factor (=number of IF bandwidths) will be used to enlarge the range compared with the range used on scan results

Parameter: 11: merge all points from both detectors into same list  
 Default value: not checked  
 Function: if checked then the points that have been found through the automatic data reduction from both detectors will be merged into one single list which in turn will be used for both detectors in the final test

### Topic Final

Parameter: 01: final result file, <none>: ID + '\_fin'  
 Default value: "<none>"  
 Function: optional filename for the results (1<sup>st</sup> detector, e.g. QUASIPeAK) from the final measurements; if no filename is specified then a default name will be used

Parameter: 02: 2nd final result file, <none>: ID + '\_fin2'  
 Default value: "<none>"  
 Function: optional filename for the results (2<sup>nd</sup> detector, e.g. AVERAGE) from the final measurements; if no filename is specified then a default name will be used

Parameter: 03: scan table for partial scans + maximization  
 Default value: "<none>"  
 Function: filename of the corresponding **scan range table** to be used for maximization measurements as well as for partial scans

Parameter: 04: optional 2nd scan table (vertical)  
 Default value: "<none>"  
 Function: filename of the corresponding **scan range table** to be used for maximization measurements as well as for partial scans; it will be used only when measurements are done with vertical polarization; if used then the first scan range table will be used with horizontal polarization 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 analyzed; 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: emulate partial scans through single meas.  
 Default value: not checked  
 Function: if checked then each partial scan will not be performed as a real scan, but instead will be emulated through single measurements at the corresponding frequencies; this is necessary if the receiver only provides a spectrum analyzer mode (pseudo single measurements through zero-span-sweeps plus 'marker-to-peak' to gain the level result)

Parameter: 07: 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: 08: 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: 09: partial scan width: ref. frequ. ratio  
 Default value: 0.01  
 Function: determines the frequency range for partial scans (e.g. 0.01 means +/-0.5 %) in reference to the given mid frequency; the parameter is effective only if the previous parameter is set to 0
- Parameter: 10: 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/turntable/polarization settings as specified with the corresponding parameters for the final test (recommended when the preview test has been performed with a fixed setting); else: measurements will be done on those mast/turntable/polarization settings that were determined through a "complete search" in the preview test
- Parameter: 11: 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 of mast and turntable
- Parameter: 12: 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 analyzed but the full positioning range (mast and turntable)
- Parameter: 13: scan table for final measurements  
 Default value: "<none>"  
 Function: filename of the corresponding **scan range table** to be used for the final measurements
- Parameter: 14: optional 2nd scan table (vertical)  
 Default value: "<none>"  
 Function: filename of the corresponding **scan range table** to be used for the final measurements; it will be used only when measurements are done with vertical polarization; if used then the first scan range table will be used with horizontal polarization only
- Parameter: 15: opt. scan table for final meas. >1GHz  
 Default value: "<none>"  
 Function: filename of the corresponding **scan range table** to be used for the final measurements, but only for frequencies above 1 GHz; this way measurements above 1 GHz can be done with an other detector (e.g. PEAK) than those below 1 GHz (e.g. QUASPEAK)
- Parameter: 16: optional 2<sup>nd</sup> scan table (vertical)

Default value:	"<none>"
Function:	filename of the corresponding <b>scan range table</b> to be used for the final measurements, but only for frequencies above 1 GHz; it will be used only when measurements are done with vertical polarization; if used then the first scan range table will be used with horizontal polarization only
Parameter:	17: insert results into existing result file
Default value:	not checked
Function:	if not checked then any existing result files with a filename identical to the filename used in the final test will be deleted/overwritten; else: any existing result files will only partly be overwritten (within the specified frequency range); this way it is possible to <b>remeasure certain bands of the spectrum</b> while keeping the rest unchanged
Parameter:	18: 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 (e.g. for PK or PK+AV) or optionally two (e.g. 1st for PK, 2nd for AV) input files
Parameter:	19: optional input: preview result file (2 <sup>nd</sup> det.)
Default value:	"<none>"
Function:	see previous parameter
Parameter:	20: 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 (e.g. for QP or QP+AV) or optionally two (e.g. 1st for QP, 2nd for AV) input files
Parameter:	21: optional input: frequency list (2nd det.)
Default value:	"<none>"
Function:	see previous parameter
Parameter:	22: 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 (e.g. for QP or QP+AV) or optionally two (e.g. 1st for QP, 2nd for AV) input files
Parameter:	23: 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: minimize graphics for test  
 Default value: not checked  
 Function: if checked then the graphics will be minimized before the measurements starts and it will be restored before generating the report; therefore no graphics updates will occur which in turn avoids any possible delays when handling very long scan curves

### 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: generate RTF file  
 Default value: not checked  
 Function: if checked then a report file will be created using the "Rich Text Format" (a kind of generic MS Word format) which can be edited with many other text processing software products

Parameter: 03: RTF file: 'X:\<path>\<name8.3>', empty: dialog  
 Default value: "c:\xxx.rtf"  
 Function: path + file name (8.3 name format) of the RTF file if the RTF report is activated; if an empty string is used then a file selection dialog will come up

Parameter: 04: 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: 05: 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

Parameter: 06: optional text file to be included  
 Default value: "<none>"  
 Function: filename of an optional file of type 'Text' which shall be included in the report

### 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: EuT name
Default value:	"EuT"
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 EuT); 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 manual positioning only
Default value:	checked
Function:	if checked then manual control of the antenna mast through dialogue boxes will be used
Parameter:	02: use auto positioning only

Default value:	not checked
Function:	if checked then automatic control of the antenna mast will be used
Parameter:	03: symbolic name of autom. moved mast
Default value:	"MAST"
Function:	symbolic device name of the automatically controlled antenna mast as defined in the device configuration menu
Parameter:	04: azimuth offset [deg] of mast
Default value:	0
Function:	if two automatic masts are used so that these mast are not located in the 0 degree axis of the turntable, then a <b>value for the azimuth correction</b> can be used
Parameter:	05: symbolic name of optional 2nd automatic mast
Default value:	"MAST2"
Function:	symbolic device name of the optional 2nd automatically controlled antenna mast as defined in the device configuration menu; to make the script run with two masts, an appropriate stop message has to be defined for each subrange in the scan/sweep tables used for the preview or final test; example: 1st mast "1 " or "1 xxxxx" (string has to start with a 2nd Mast "2 " or "2 xxxxx" digit followed by a blank) for a full automatic test (without manual interaction) an additional relay matrix (RSU) would have to be used for switching between antennas (the corresponding signal paths would have to be selected in the scan/sweep tables)
Parameter:	06: azimuth offset [deg] of optional 2nd mast
Default value:	0
Function:	if two automatic masts are used so that these mast are not located in the 0 degree axis of the turntable, then a <b>value for the azimuth correction</b> can 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 polarization): 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

Parameter: 14: speed value for slower movements  
 Default value: 2  
 Function: determines the speed of the mast for the relatively slow movements for the "adjustment" in the final test (some 1 or 2 measurements per sec. only !)

Parameter: 15: speed value for faster movements  
 Default value: 4  
 Function: determines the speed of the automatically moved mast for the relatively fast movements for absolute positioning

## Topic

## Turntable

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

Parameter: 02: use auto positioning only  
 Default value: not checked  
 Function: if checked then automatic control of the turntable will be used

Parameter: 03: symbolic name of autom. moved turntable  
 Default value: "TURNTABLE"  
 Function: symbolic device name of the automatically controlled turntable as defined in the device configuration menu

Parameter: 04: 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 polarization): a value of 1 means highest priority, 3 means lowest priority

Parameter: 05: 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:	06: 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:	07: 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:	08: 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:	09: 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:	10: 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
Parameter:	11: speed value for slower movements
Default value:	2
Function:	determines the speed of the turntable for the relatively slow movements for the "adjustment" in the final test (some 1 or 2 measurements per sec. only !)
Parameter:	12: speed value for faster movements
Default value:	4
Function:	determines the speed of the automatically moved turntable for the relatively fast movements for absolute positioning
<b>Topic</b>	<b>Polarization</b>
Parameter:	01: use manual switching only
Default value:	checked
Function:	if checked then manual control of the antenna polarization through dialogue boxes will be used

Parameter:	02: use auto switching only
Default value:	not checked
Function:	if checked then automatic control of the antenna polarization will be used
Parameter:	03: symbolic name of autom. controlled polariz.
Default value:	"MAST"
Function:	symbolic device name of the automatically controlled antenna polarization as defined in the device configuration menu
Parameter:	04: symbolic name of optional 2nd autom. polariz.
Default value:	"<none>"
Function:	symbolic device name of an optional 2nd automatically controlled antenna polarization as defined in the device configuration menu (see also <b>Topic Mast</b> )
Parameter:	05: control priority level (1=highest)
Default value:	3
Function:	defines the priority level of the controlling of the antenna polarization (in combination with antenna height and turntable azimuth): a value of 1 means highest priority, 3 means lowest priority
Parameter:	06: delay time [sec] for auto switching
Default value:	4
Function:	defines a waiting time with automatic switching of the antenna polarization; the delay time depends on the mechanical system and maybe also on the weight of the antenna (the driver never gives a feedback when the switching has been completed)
Parameter:	07: preview measurements with horizontal polariz.
Default value:	not checked
Function:	if checked then the preview measurements will (also) be done with horizontal polarization
Parameter:	08: preview measurements with vertical polariz.
Default value:	not checked
Function:	if checked then the preview measurements will (also) be done with vertical polarization
Parameter:	09: final measurements with horizontal polariz.
Default value:	not checked
Function:	if checked then the final measurements will (also) be done with horizontal polarization
Parameter:	10: final measurements with vertical polariz.
Default value:	not checked
Function:	if checked then the final measurements will (also) be done with vertical polarization

**Topic****Auxiliary**

Parameter:	01: use manual auxiliary switching
Default value:	not checked
Function:	if checked then manual control of an auxiliary switch through dialogue boxes will be used; if activated an extra column, holding the state ("ON" or "OFF") of the switch will be added to the results
Parameter:	02: name of auxiliary device

Default value:	"Auxiliary Device"
Function:	name of the auxiliary switch (will be displayed with the dialog boxes for switching)
Parameter:	03: preview measurements with aux. switch OFF
Default value:	not checked
Function:	if checked then the preview measurements will (also) be done with the state "OFF"
Parameter:	04: preview measurements with aux. switch ON
Default value:	not checked
Function:	if checked then the preview measurements will (also) be done with the state "ON"
Parameter:	05: final measurements with aux. switch OFF
Default value:	not checked
Function:	if checked then the final measurements will (also) be done with the state "OFF"
Parameter:	06: final measurements with aux. switch ON
Default value:	not checked
Function:	if checked then the final measurements will (also) be done with the state "ON"

## 3.11 Field Strength Test (fast)

### 3.11.1 Description

Basically this test offers the same functionality as the normal "Field Strength Test", but it is optimized for using an automatic antenna mast and an automatic turntable:

The preview test can be performed with sweeps only (a genuine EMI test receiver cannot be used!) with the turntable **simultaneously** being moved. This way the total time for the preview test should be reduced in half.

In the final test a partial scan will be done for each critical frequency.

### 3.11.2 Parameter Sets

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

#### EN 55022

Frequency Range:	30 - 1000 MHz
Detector:	QP
Test Samples:	ITE: Class B
Distance:	10m

#### FCC Part 15 Class A

Frequency Range:	30 - 18000 MHz
Detector:	QP below 1GHz; AV above 1 GHz
Test Samples:	
Distance:	10m

#### FCC Part 15 Class B

Frequency Range:	30 - 5000 MHz
Detector:	QP below 1GHz; AV above 1 GHz
Test Samples:	
Distance:	10m



### 3.11.3 List of the Script Parameters

Topic	Test
Parameter: Default value: Function:	01: ID max. 12 chars to be included in filenames "fast_0001" a short string that will be used for building up various default strings (see below); this string enables easy identification of files that belong to the same test
Parameter: Default value: Function:	02: global start frequency [MHz] for the test 30 no measurements will be done below this frequency
Parameter: Default value: Function:	03: global stop frequency [MHz] for the test 1000 no measurements will be done above this frequency
Parameter: Default value: Function:	04: suppress queries as far as possible not checked if not checked then additional queries will come up that help to avoid overwriting of files or to skip certain parts of the test
Parameter: Default value: Function:	05: confirmation for final test after data reduction not checked if checked then after data reduction a query will come up enables to skip the final test within the current test range
Parameter: Default value: Function:	06: split frequency range into test ranges checked the total frequency range of the test can optionally be split into <b>test ranges</b> (linear or logarithmic, with respect to the ranges of the scan/sweep range table) that are calculated by the script and will <b>be completely tested</b> (preview test, data reduction, final test), therefore reducing the time elapsed between preview and final test, which is very useful with interference drifting over frequency; besides, this method reduces manual interaction, if more than one probe transducer has to be used for the test (e.g. two antennas for 30 - 1000 MHz in a field strength test); the value given with parameter <i>Test 07</i> has to be interpreted as a minimum value; if the value is set to (typically) 1 then nevertheless for each subrange of the scan/sweep table which used for the preview test, a test range will be calculated (e.g. a field strength test with two antennas or scan/sweep ranges will lead to one test range each); if splitting is not used then the whole frequency range of the scan/sweep table will be tested as one single test range (but maybe with a number of messageboxes requiring to change the antenna !)
Parameter: Default value: Function:	07: if splitting of frequency range: do with log. scale checked if checked then the splitting of the frequency range (if activated) will lead to test ranges of equal width in the logarithmic scale, else in the linear scale
Parameter: Default value: Function:	08: no. of test ranges for splitting of frequency range 1 defines the number of test ranges that shall be calculated for the splitting of the frequency range
Parameter: Default value:	09: test configuration, <none>: ID "<none>"

Function: optional filename of the test configuration (lists all files belonging to the test, for easy transfers through Export/Import/Move) to be created by the test; if no filename is specified then a default name will be used

### Topic Preview

Parameter: 01: preview result file, <none>: ID + '\_pre'  
 Default value: "<none>"  
 Function: optional filename for the results (1<sup>st</sup> detector, e.g. PEAK) 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 + '\_pre2'  
 Default value: "<none>"  
 Function: optional filename for the results (2<sup>nd</sup> detector, e.g. AVERAGE) from the preview test; if no filename is specified then a default name will be used

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

Parameter: 04: 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 polarization; if used then the first sweep range table will be used with horizontal polarization only

Parameter: 05: insert results into existing result file  
 Default value: not checked  
 Function: if not checked then any existing result files with a filename identical to the filename used in the preview test will be deleted/overwritten;  
 else: any existing result files will only partly be overwritten (within the specified frequency range); this way it is possible to **remeasure certain bands of the spectrum** while keeping the rest unchanged

### Topic DataReduction

Parameter: 01: also perform interactive frequency selection  
 Default value: not checked  
 Function: if checked then you can review the points that have been found through the automatic data reduction, i.e. you can remove points or add new ones for the test; to do so you have to position the marker accordingly and select "Remove" or "Test" in a dialog

Parameter: 02: 1st limit line  
 Default value: "<none>"  
 Function: a filename that corresponds to the limit line assigned to the 1<sup>st</sup> detector (e.g. QUASPEAK)

Parameter: 03: optional 1st 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 the preview results from the 1<sup>st</sup> detector; if used then the given value for the acceptance offset will be ignored

Parameter: 04: optional 2nd limit line

Default value:	"<none>"
Function:	a filename that corresponds to the limit line assigned to the 2 <sup>nd</sup> detector (e.g. AVERAGE)
Parameter:	05: optional 2nd 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 preview results from the 2 <sup>nd</sup> detector; if used then the given value for the acceptance offset will be ignored
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: merge all points from both detectors into same list
Default value:	not checked
Function:	if checked then the points that have been found through the automatic data reduction from both detectors will be merged into one single list which in turn will be used for both detectors in the final test
<b>Topic</b>	<b>Final</b>
Parameter:	01: final result file, <none>: ID + '_fin'
Default value:	"<none>"
Function:	optional filename for the results (1 <sup>st</sup> detector, e.g. QUASPEAK) from the final measurements; if no filename is specified then a default name will be used
Parameter:	02: 2nd final result file, <none>: ID + '_fin2'
Default value:	"<none>"
Function:	optional filename for the results (2 <sup>nd</sup> detector, e.g. AVERAGE) from the final measurements; if no filename is specified then a default name will be used
Parameter:	03: scan table for partial scans + maximization
Default value:	"<none>"
Function:	filename of the corresponding <b>scan range table</b> to be used for maximization measurements as well as for partial scans
Parameter:	04: optional 2nd scan table (vertical)
Default value:	"<none>"
Function:	filename of the corresponding <b>scan range table</b> to be used for maximization measurements as well as for partial scans; it will be used only when measurements are done with vertical polarization; if used then the first scan

range table will be used with horizontal polarization only

Parameter:	05: emulate partial scans through single meas.
Default value:	not checked
Function:	if checked then each partial scan will not be performed as a real scan, but instead will be emulated through single measurements at the corresponding frequencies; this is necessary if the receiver only provides a spectrum analyzer mode (pseudo single measurements through zero-span-sweeps plus 'marker-to-peak' to gain the level result)
Parameter:	06: 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:	07: partial scan width: ref. frequ. ratio
Default value:	0.01
Function:	determines the frequency range for partial scans (e.g. 0.01 means +/-0.5 %) in reference to the given mid frequency; the parameter is effective only if the previous parameter is set to 0
Parameter:	08: 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 analyzed but the full positioning range (mast and turntable)
Parameter:	09: scan table for final measurements
Default value:	"<none>"
Function:	filename of the corresponding <b>scan range table</b> to be used for the final measurements
Parameter:	10: optional 2nd scan table (vertical)
Default value:	"<none>"
Function:	filename of the corresponding <b>scan range table</b> to be used for the final measurements; it will be used only when measurements are done with vertical polarization; if used then the first scan range table will be used with horizontal polarization only
Parameter:	11: opt. scan table for final meas. >1GHz
Default value:	"<none>"
Function:	filename of the corresponding <b>scan range table</b> to be used for the final measurements, but only for frequencies above 1 GHz; this way measurements above 1 GHz can be done with an other detector (e.g. PEAK) than those below 1 GHz (e.g. QUASPEAK)
Parameter:	12: optional 2 <sup>nd</sup> scan table (vertical)
Default value:	"<none>"
Function:	filename of the corresponding <b>scan range table</b> to be used for the final measurements, but only for frequencies above 1 GHz; it will be used only when measurements are done with vertical polarization; if used then the first scan range table will be used with horizontal polarization only
Parameter:	13: insert results into existing result file
Default value:	not checked
Function:	if not checked then any existing result files with a filename identical to the

filename used in the final test will be deleted/overwritten;  
 else: any existing result files will only partly be overwritten (within the specified frequency range); this way it is possible to **remeasure certain bands of the spectrum** while keeping the rest unchanged

**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: minimize graphics for test  
 Default value: not checked  
 Function: if checked then the graphics will be minimized before the measurements starts and it will be restored before generating the report; therefore no graphics updates will occur which in turn avoids any possible delays when handling very long scan curves

**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: generate RTF file  
 Default value: not checked  
 Function: if checked then a report file will be created using the "Rich Text Format" (a kind of generic MS Word format) which can be edited with many other text processing software products

Parameter: 03: RTF file: 'X:\<path>\<name8.3>', empty: dialog  
 Default value: "c:\xxx.rtf"  
 Function: path + file name (8.3 name format) of the RTF file if the RTF report is activated; if an empty string is used then a file selection dialog will come up

Parameter: 04: 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: 05: 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

Parameter: 06: optional text file to be included  
 Default value: "<none>"

Function: filename of an optional file of type 'Text' which shall be included in the report

**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: "Electric Field Strength"

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: EuT name

Default value: "EuT"

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 EuT); 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 auto positioning  
 Default value: checked  
 Function: if checked then automatic control of the antenna mast will be used

Parameter: 02: symbolic name of autom. moved mast  
 Default value: "MAST"  
 Function: symbolic device name of the automatically controlled antenna mast as defined in the device configuration menu

Parameter: 03: azimuth offset [deg] of mast  
 Default value: 0  
 Function: if two automatic masts are used so that these mast are not located in the 0 degree axis of the turntable, then a **value for the azimuth correction** can be used

Parameter: 04: symbolic name of optional 2nd automatic mast  
 Default value: "MAST2"  
 Function: symbolic device name of the optional 2nd automatically controlled antenna mast as defined in the device configuration menu; to make the script run with two masts, an appropriate stop message has to be defined for each subrange in the scan/sweep tables used for the preview or final test;  
 example:  
 1st mast "1 " or "1 xxxxx" (string has to start with a  
 2nd mast "2 " or "2 xxxxx" digit followed by a blank)  
 for a full automatic test (without manual interaction) an additional relay matrix (RSU) would have to be used for switching between antennas (the corresponding signal paths would have to be selected in the scan/sweep tables)

Parameter: 05: azimuth offset [deg] of optional 2nd mast  
 Default value: 0  
 Function: if two automatic masts are used so that these mast are not located in the 0 degree axis of the turntable, then a **value for the azimuth correction** can be used

Parameter: 06: control priority level (1=highest)  
 Default value: 1  
 Function: defines the priority level of the controlling of the antenna height (in combination with the antenna polarization) in the preview test: a value of 1 means highest priority (after the turntable) , 2 means lowest priority

Parameter: 07: min. height [cm] to be measured for preview  
 Default value: 100  
 Function: defines the minimum height to be used in the preview test

Parameter: 08: max. height [cm] to be measured for preview

Default value:	300
Function:	defines the maximum height to be used in the preview test
Parameter:	09: height stepsize [cm] for preview
Default value:	200
Function:	defines the stepsize for height variation in the preview test
Parameter:	10: min. height [cm] to be measured for adjustment
Default value:	100
Function:	defines the minimum height to be used for the adjustment measurements
Parameter:	11: max. height [cm] to be measured for adjustment
Default value:	400
Function:	defines the maximum height to be used for the adjustment measurements
Parameter:	12: height range [cm] for adjustment
Default value:	50
Function:	defines the height range for the adjustment measurements; normally the value corresponds to the height stepsize for the preview test (parameter 09)
Parameter:	13: speed value for faster movements
Default value:	4
Function:	determines the speed of the automatically moved mast for the relatively fast movements for absolute positioning
Parameter:	14: speed value for slower movements
Default value:	2
Function:	determines the speed of the mast for the relatively slow movements for the "adjustment" in the final test (some 1 or 2 measurements per sec. only !)

**Topic****Turntable**

Parameter:	01: use auto positioning
Default value:	checked
Function:	if checked then automatic control of the turntable will be used
Parameter:	02: symbolic name of autom. moved turntable
Default value:	"TURNTABLE"
Function:	symbolic device name of the automatically controlled turntable as defined in the device configuration menu
Parameter:	03: min. azimuth [deg] to be measured for preview
Default value:	90
Function:	defines the minimum azimuth to be used in the preview test
Parameter:	04: max. azimuth [deg] to be measured for preview
Default value:	270
Function:	defines the maximum azimuth to be used in the preview test
Parameter:	05: bidirectional azimuth sweeps at each position
Default value:	not checked
Function:	if checked then at each position (made up of polarization and mast height) not one but two movements - each in another direction - will be done within the given azimuth limits
Parameter:	06: min. azimuth [deg] to be measured for final adjustment



Default value: 0  
 Function: defines the minimum azimuth to be used for the adjustment measurements

Parameter: 07: max. azimuth [deg] to be measured for final adjustment  
 Default value: 360  
 Function: defines the maximum azimuth to be used for the adjustment measurements

Parameter: 08: azimuth stepsize [deg] for finals  
 Default value: 45  
 Function: defines the azimuth range for the adjustment measurements; normally the value corresponds to the azimuth range being covered by one sweep in the preview test

Parameter: 09: fast speed value for absolute positioning  
 Default value: 4  
 Function: determines the speed of the automatically moved turntable for the relatively fast movements for absolute positioning

Parameter: 10: speed value for azimuth sweeps  
 Default value: 1  
 Function: determines the (typically slowest) speed of the turntable for the movements in the preview test when sweeps will be simultaneously be performed

Parameter: 11: slow speed value for adjustment  
 Default value: 2  
 Function: determines the speed of the turntable for the relatively slow movements for the "adjustment" in the final test (some 1 or 2 measurements per sec. only !)

**Topic Polarization**

Parameter: 01: use auto switching only  
 Default value: checked  
 Function: if checked then automatic control of the antenna polarization will be used

Parameter: 02: symbolic name of autom. controlled polariz.  
 Default value: "MAST"  
 Function: symbolic device name of the automatically controlled antenna polarization as defined in the device configuration menu

Parameter: 03: symbolic name of optional 2nd autom. polariz.  
 Default value: "<none>"  
 Function: symbolic device name of an optional 2nd automatically controlled antenna polarization as defined in the device configuration menu (see also **Topic Mast**)

Parameter: 04: control priority level (1=highest)  
 Default value: 2  
 Function: defines the priority level of the controlling of the antenna polarization (in combination with the antenna height) in the preview test: a value of 1 means highest priority (after the turntable), 2 means lowest priority

Parameter: 05: delay time [sec] for auto switching  
 Default value: 4  
 Function: defines a waiting time with automatic switching of the antenna polarization; the delay time depends on the mechanical system and maybe also on the weight of the antenna (the driver never gives a feedback when the switching has been completed)

Parameter: 06: preview measurements with horizontal polariz.  
Default value: not checked  
Function: if checked then the preview measurements will (also) be done with horizontal polarization

Parameter: 07: preview measurements with vertical polariz.  
Default value: not checked  
Function: if checked then the preview measurements will (also) be done with vertical polarization

## 3.12 Magnetic Field Strength Test

### 3.12.1 Description

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

Besides, an automatic turntable can be controlled to turn the EuT.

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

### 3.12.2 Parameter Sets

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

#### **VDE0875/211**

Frequency Range:	0.009 - 30 MHz
Detector:	QP
Test Samples:	ISM

### 3.12.3 List of the Script Parameters

Topic	Test
Parameter: Default value: Function:	01: ID max. 12 chars to be included in filenames "mfield_0001" a short string that will be used for building up various default strings (see below); this string enables easy identification of files that belong to the same test
Parameter: Default value: Function:	02: global start frequency [MHz] for the test 0.09 no measurements will be done below this frequency
Parameter: Default value: Function:	03: global stop frequency [MHz] for the test 30 no measurements will be done above this frequency
Parameter: Default value: Function:	04: suppress queries as far as possible not checked if not checked then additional queries will come up that help to avoid overwriting of files or to skip certain parts of the test
Parameter: Default value: Function:	05: confirmation for final test after data reduction not checked if checked then after data reduction a query will come up enables to skip the final test within the current test range
Parameter: Default value: Function:	06: split frequency range into test ranges checked the total frequency range of the test can optionally be split into <b>test ranges</b> (linear or logarithmic, with respect to the ranges of the scan/sweep range table) that are calculated by the script and will <b>be completely tested</b> (preview test, data reduction, final test), therefore reducing the time elapsed between preview and final test, which is very useful with interference drifting over frequency; besides, this method reduces manual interaction, if more than one probe transducer has to be used for the test (e.g. two antennas for 30 - 1000 MHz in a field strength test); the value given with parameter <i>Test 07</i> has to be interpreted as a minimum value; if the value is set to (typically) 1 then nevertheless for each subrange of the scan/sweep table which used for the preview test, a test range will be calculated (e.g. a field strength test with two antennas or scan/sweep ranges will lead to one test range each); if splitting is not used then the whole frequency range of the scan/sweep table will be tested as one single test range (but maybe with a number of messageboxes requiring to change the antenna !)
Parameter: Default value: Function:	07: if splitting of frequency range: do with log. scale checked if checked then the splitting of the frequency range (if activated) will lead to test ranges of equal width in the logarithmic scale, else in the linear scale
Parameter: Default value: Function:	08: no. of test ranges for splitting of frequency range 1 defines the number of test ranges that shall be calculated for the splitting of the frequency range
Parameter: Default value:	09: test configuration, <none>: ID "<none>"

Function: optional filename of the test configuration (lists all files belonging to the test, for easy transfers through Export/Import/Move) to be created by the test; if no filename is specified then a default name will be used

**Topic****Preview**

Parameter: 01: preview result file, <none>: ID + '\_pre'  
 Default value: "<none>"  
 Function: optional filename for the results (1<sup>st</sup> detector, e.g. PEAK) from the preview test; if no filename is specified then a default name will be used

Parameter: 02: 2nd preview result file, <none>: ID + '\_pre2'  
 Default value: "<none>"  
 Function: optional filename for the results (2<sup>nd</sup> detector, e.g. AVERAGE) 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 settings** as specified with the turntable parameters for the preview test (recommended for preview tests with sweeps, e.g. with an EMI analyzer);  
 else only sweeps/scans will be done **with one fixed setting** as specified with turntable parameters for the preview test (recommended for preview tests with scans, e.g. with an EMI test receiver)

Parameter: 06: insert results into existing result file  
 Default value: not checked  
 Function: if not checked then any existing result files with a filename identical to the filename used in the preview test will be deleted/overwritten;  
 else: any existing result files will only partly be overwritten (within the specified frequency range); this way it is possible to **remeasure certain bands of the spectrum** while keeping the rest unchanged

**Topic****DataReduction**

Parameter: 01: also perform interactive frequency selection  
 Default value: not checked  
 Function: if checked then you can review the points that have been found through the automatic data reduction, i.e. you can remove points or add new ones for the test; to do so you have to position the marker accordingly and select "Remove" or "Test" in a dialog

Parameter: 02: 1st limit line  
 Default value: "<none>"  
 Function: a filename that corresponds to the limit line assigned to the 1<sup>st</sup> detector (e.g. QUASPEAK)

Parameter: 03: 2nd limit line

Default value:	"<none>"
Function:	a filename that corresponds to the limit line assigned to the 2 <sup>nd</sup> detector (e.g. AVERAGE)
Parameter:	04: 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:	05: 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:	06: 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:	07: freq. list of ambients to be cut out from preview
Default value:	"<none>"
Function:	optional name of a frequency list (ambient interference) with frequencies to be "cut out" from measurement results (preview test: scans/sweeps, final test: partial scans), each "cut" with a range corresponding to the current IF bandwidth, e.g. +/- 60 kHz around each of the frequencies if an IF bandwidth of 120 kHz is used; to blank a modulated interference it might be necessary to provide more than one frequency in the list
Parameter:	08: cutting width for sweeps (ambients): no. of IF-BWs
Default value:	10
Function:	with sweeps the width of a "cut" range (see previous parameter) has to be larger because of the lower frequency resolution of the results; therefore this factor (=number of IF bandwidths) will be used to enlarge the range compared with the range used on scan results
Parameter:	09: merge all points from both detectors into same list
Default value:	not checked
Function:	if checked then the points that have been found through the automatic data reduction from both detectors will be merged into one single list which in turn will be used for both detectors in the final test

**Topic****Final**

Parameter:	01: final result file, <none>: ID + '_fin'
Default value:	"<none>"
Function:	optional filename for the results (1 <sup>st</sup> detector, e.g. QUASPEAK) from the final measurements; if no filename is specified then a default name will be used
Parameter:	02: 2nd final result file, <none>: ID + '_fin2'
Default value:	"<none>"
Function:	optional filename for the results (2 <sup>nd</sup> detector, e.g. AVERAGE) from the final measurements; if no filename is specified then a default name will be used
Parameter:	03: scan table for partial scans + maximization

Default value:	"<none>"
Function:	filename of the corresponding <b>scan range table</b> to be used for maximization measurements as well as for partial scans
Parameter:	04: perform partial scans
Default value:	not checked
Function:	if checked then additional partial scans will be performed around the frequencies to be analyzed; 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: 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:	06: 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:	07: partial scan width: ref. frequ. ratio
Default value:	0.01
Function:	determines the frequency range for partial scans (e.g. 0.01 means +/-0.5 %) in reference to the given mid frequency; the parameter is effective only if the previous parameter is set to 0
Parameter:	08: 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 and turntable 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 and turntable settings that were determined through a "complete search" in the preview test
Parameter:	09: 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 turntable; this is recommended, if the preview test was performed with only one or a small number of positions of the turntable
Parameter:	10: 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 analyzed but the full positioning range (mast and turntable)
Parameter:	11: scan table for final measurements
Default value:	"<none>"
Function:	filename of the corresponding <b>scan range table</b> to be used for the final measurements

Parameter: 12: insert results into existing result file  
 Default value: not checked  
 Function: if not checked then any existing result files with a filename identical to the filename used in the final test will be deleted/overwritten; else: any existing result files will only partly be overwritten (within the specified frequency range); this way it is possible to **remeasure certain bands of the spectrum** while keeping the rest unchanged

Parameter: 13: 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 (e.g. for PK or for PK+AV) or optionally two (e.g. 1<sup>st</sup> for PK, 2<sup>nd</sup> for AV) input files

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

Parameter: 15: 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 (e.g. for QP or for QP+AV) or optionally two (e.g. 1<sup>st</sup> for QP, 2<sup>nd</sup> for AV) input files

Parameter: 16: optional input: frequency list (2nd det.)  
 Default value: "<none>"  
 Function: see previous parameter

Parameter: 17: 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 (e.g. for QP or for QP+AV) or optionally two (e.g. 1<sup>st</sup> for QP, 2<sup>nd</sup> for AV) input files

Parameter: 18: 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: minimize graphics for test  
 Default value: not checked  
 Function: if checked then the graphics will be minimized before the measurements starts and it will be restored before generating the report; therefore no graphics updates will occur which in turn avoids any possible delays when handling very



long scan curves

<b>Topic</b>	<b>Report</b>
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: generate RTF file
Default value:	not checked
Function:	if checked then a report file will be created using the "Rich Text Format" (a kind of generic MS Word format) which can be edited with many other text processing software products
Parameter:	03: RTF file: 'X:\<path>\<name8.3>', empty: dialog
Default value:	"c:\xxx.rtf"
Function:	path + file name (8.3 name format) of the RTF file if the RTF report is activated; if an empty string is used then a file selection dialog will come up
Parameter:	04: 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:	05: 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
Parameter:	06: optional text file to be included
Default value:	"<none>"
Function:	filename of an optional file of type 'Text' which shall be included in the report

<b>Topic</b>	<b>ReportHeader</b>
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: EuT name  
 Default value: "EuT"  
 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 EuT); 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 manual switching only  
 Default value: checked  
 Function: if checked then manual control of the loop antenna through dialogue boxes will be used

Parameter: 02: use auto switching only  
 Default value: not checked  
 Function: if checked then automatic control of the triple loop antenna will be used

Parameter: 03: symbolic name of autom. switched triple loop  
 Default value: "HM020"  
 Function: symbolic device name of the automatically controlled triple loop antenna as

defined in the device configuration menu; the device properties must match with the controlling device (e.g. IEEE command strings for an EMI test receiver)

Parameter: 04: 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: 05: 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: 06: 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: 07: 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: 08: 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: 09: 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 manual positioning only  
 Default value: checked  
 Function: if checked then manual control of the turntable through dialogue boxes will be used

Parameter: 02: use auto positioning only  
 Default value: not checked  
 Function: if checked then automatic control of the turntable will be used

Parameter: 03: symbolic name of autom. moved turntable  
 Default value: "TURNTABLE"  
 Function: symbolic device name of the automatically controlled turntable as defined in the device configuration menu

Parameter: 04: 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: 05: fixed/max. azimuth [deg] to be measured for preview

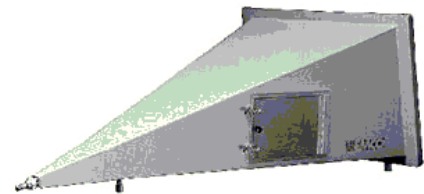
---

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:	06: 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:	07: 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:	08: 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:	09: 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
Parameter:	10: speed value for slower movements
Default value:	2
Function:	determines the speed of the turntable for the relatively slow movements for the "adjustment" in the final test (some 1 or 2 measurements per sec. only !)
Parameter:	11: speed value for faster movements
Default value:	4
Function:	determines the speed of the automatically moved turntable for the relatively fast movements for absolute positioning

## 3.13 GTEM Test

### 3.13.1 Description

This test provides automatic measurement of radiated electromagnetic interference with an **GTEM** 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.

For measurements optionally a "manipulator" for positioning the EuT can be used. This requires the option ES-K50 (Universal GPIB Driver).

If this option is installed, then the driver 'USER\_IEC' can be added to the device list; the assigned to this driver could be e.g. "MANIPULATOR" or the model name of the device (e.g. "BOSS"). The settings should first be checked with the corresponding interactive dialog ("Set Device...").

In the script parameters of **Topic "Manipulator"** the device has to be selected and the appropriate GPIB commands have to be entered.

### 3.13.2 Parameter Sets

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

#### EN 55022

Frequency Range:	30 - 1000 MHz
Detector:	Pk
Test Samples:	(small and without preferred orientation)

### 3.13.3 List of the Script Parameters

Topic	Test
Parameter: Default value: Function:	01: ID max. 12 chars to be included in filenames "gtem_0001" a short string that will be used for building up various default strings (see below); this string enables easy identification of files that belong to the same test
Parameter: Default value: Function:	02: global start frequency [MHz] for the test 30 no measurements will be done below this frequency
Parameter: Default value: Function:	03: global stop frequency [MHz] for the test 1000 no measurements will be done above this frequency
Parameter: Default value: Function:	04: suppress queries as far as possible not checked if not checked then additional queries will come up that help to avoid overwriting of files or to skip certain parts of the test
Parameter: Default value: Function:	05: confirmation for final test after data reduction not checked if checked then after data reduction a query will come up enables to skip the final test within the current test range
Parameter: Default value: Function:	06: split frequency range into test ranges checked the total frequency range of the test can optionally be split into <b>test ranges</b> (linear or logarithmic, with respect to the ranges of the scan/sweep range table) that are calculated by the script and will <b>be completely tested</b> (preview test, data reduction, final test), therefore reducing the time elapsed between preview and final test, which is very useful with interference drifting over frequency; besides, this method reduces manual interaction, if more than one probe transducer has to be used for the test (e.g. two antennas for 30 - 1000 MHz in a field strength test); the value given with parameter <i>Test 07</i> has to be interpreted as a minimum value; if the value is set to (typically) 1 then nevertheless for each subrange of the scan/sweep table which used for the preview test, a test range will be calculated (e.g. a field strength test with two antennas or scan/sweep ranges will lead to one test range each); if splitting is not used then the whole frequency range of the scan/sweep table will be tested as one single test range (but maybe with a number of messageboxes requiring to change the antenna !)
Parameter: Default value: Function:	07: if splitting of frequency range: do with log. scale checked if checked then the splitting of the frequency range (if activated) will lead to test ranges of equal width in the logarithmic scale, else in the linear scale
Parameter: Default value: Function:	08: no. of test ranges for splitting of frequency range 1 defines the number of test ranges that shall be calculated for the splitting of the frequency range
Parameter: Default value:	09: test configuration, <none>: ID "<none>"

Function: optional filename of the test configuration (lists all files belonging to the test, for easy transfers through Export/Import/Move) to be created by the test; if no filename is specified then a default name will be used

**Topic****Preview**

Parameter: 01: GTEM 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: GTEM 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: GTEM 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 H preview result, <none>: ID + '\_pre H'

Default value: "<none>"

Function: optional filename for the **correlated field strength results** (horizontal polarization) from the preview test; if no filename is specified then a default name will be used

Parameter: 05: OATS V preview result, <none>: ID + '\_pre V'

Default value: "<none>"

Function: optional filename for the **correlated field strength results** (vertical polarization) from the preview test; if no filename is specified then a default name will be used

Parameter: 06: scan table for preview

Default value: "<none>"

Function: filename of the scan range table to be used for the preview test

Parameter: 07: sweep table for preview

Default value: "<none>"

Function: filename of the sweep range table to be used for the preview test

Parameter: 08: insert results into existing result file

Default value: not checked

Function: if not checked then any existing result files with a filename identical to the filename used in the preview test will be deleted/overwritten;  
else: any existing result files will only partly be overwritten (within the specified frequency range); this way it is possible to **remeasure certain bands of the spectrum** while keeping the rest unchanged

**Topic****DataReduction**

Parameter: 01: also perform interactive frequency selection

Default value: not checked

Function: if checked then you can review the points that have been found through the automatic data reduction, i.e. you can remove points or add new ones for the test;. to do so you have to position the marker accordingly and select "Remove"

or "Test" in a dialog

Parameter: 02: 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: 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

## Topic Final

Parameter: 01: GTEM 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: GTEM 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: GTEM 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 H final result, <none>: ID + '\_pre H'  
 Default value: "<none>"  
 Function: optional filename for the **correlated field strength results** (horizontal polarization) from the final test; if no filename is specified then a default name will be used

Parameter: 05: OATS V final result, <none>: ID + '\_pre V'  
 Default value: "<none>"  
 Function: optional filename for the **correlated field strength results** (vertical polarization) from the final test; if no filename is specified then a default name will be used

Parameter: 06: perform partial scans  
 Default value: not checked  
 Function: if checked then additional partial scans will be performed around the frequencies to be analyzed; 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:	07: 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:	08: 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:	09: partial scan width: ref. frequ. ratio
Default value:	0.01
Function:	determines the frequency range for partial scans (e.g. 0.01 means +/-0.5 %) in reference to the given mid frequency; the parameter is effective only if the previous parameter is set to 0
Parameter:	10: scan table for partial scans
Default value:	"<none>"
Function:	filename of the corresponding <b>scan range table</b> to be used for partial scans
Parameter:	11: scan table for final measurements
Default value:	"<none>"
Function:	filename of the corresponding <b>scan range table</b> to be used for the single measurements
Parameter:	12: opt. scan table for final meas. >1GHz
Default value:	"<none>"
Function:	filename of the corresponding <b>scan range table</b> to be used for the final measurements, but only for frequencies above 1 GHz; this way measurements above 1 GHz can be done with an other detector (e.g. PEAK) than those below 1 GHz (e.g. QUASIPeAK)
Parameter:	13: insert results into existing result file
Default value:	not checked
Function:	if not checked then any existing result files with a filename identical to the filename used in the final test will be deleted/overwritten; else: any existing result files will only partly be overwritten (within the specified frequency range); this way it is possible to <b>remeasure certain bands of the spectrum</b> while keeping the rest unchanged
Parameter:	14: 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: GTEM 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 GTEM 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: generate RTF file  
 Default value: not checked  
 Function: if checked then a report file will be created using the "Rich Text Format" (a kind of generic MS Word format) which can be edited with many other text processing software products

Parameter: 03: RTF file: 'X:\<path>\<name8.3>', empty: dialog  
 Default value: "c:\xxx.rtf"  
 Function: path + file name (8.3 name format) of the RTF file if the RTF report is activated; if an empty string is used then a file selection dialog will come up

Parameter: 04: 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: 05: 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

Parameter: 06: optional text file to be included  
 Default value: "<none>"  
 Function: filename of an optional file of type 'Text' which shall be included in the report

**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: "GTEM 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: EuT name  
 Default value: "EuT"  
 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 EuT); 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 GTEM**

Parameter: 01: GTEM parameter 'a' (cell size) [m]  
 Default value: 0.5

Function:	defines the GTEM cell parameter 'a' (see chapter 2.9) which represents the size of the cell
Parameter:	02: GTEM parameter 'b' (septum height) [m]
Default value:	1.0
Function:	defines the GTEM cell parameter 'b' (see chapter 2.9) which represents the height of the septum
Parameter:	03: GTEM parameter 'g' (septum gap) [m]
Default value:	0.36
Function:	defines the GTEM cell parameter 'g' (see chapter 2.9) which represents the gap besides the septum
Parameter:	04: GTEM parameter 'x' (EuT position) [m]
Default value:	0.0
Function:	defines the GTEM cell parameter 'x' (see chapter 2.9) which represents the horizontal position of the EuT
Parameter:	05: GTEM parameter 'y' (EuT position) [m]
Default value:	0.5
Function:	defines the GTEM cell parameter 'y' (see chapter 2.9) which represents the vertical position of the EuT
Parameter:	06: GTEM parameter 'Z' (impedance) [Ohm]
Default value:	50
Function:	defines the GTEM cell parameter 'Z' (see chapter 2.9) which represents the impedance of the cell
Parameter:	07: OATS parameter 'd' (distance) [m]
Default value:	10
Function:	defines the OATS parameter 'd' (see chapter 2.9) which represents the measurement distance
Parameter:	08: OATS parameter 'e' (EuT height) [m]
Default value:	0.5
Function:	defines the OATS parameter 'e' (see chapter 2.9) which represents the vertical position of the EuT
Parameter:	09: OATS parameter 'hmin' (antenna height) [m]
Default value:	1.0
Function:	defines the OATS parameter 'h <sub>min</sub> ' (see chapter 2.9) which represents the minimum antenna height
Parameter:	10: OATS parameter 'hmax' (antenna height) [m]
Default value:	4.0
Function:	defines the OATS parameter 'h <sub>max</sub> ' (see chapter 2.9) which represents the maximum antenna height
Parameter:	11: OATS parameter 'height step size' [m]
Default value:	0.5
Function:	defines the OATS parameter 'height step size' (see chapter 2.9) which represents the virtual step size of the antenna height positions
Parameter:	12: OATS parameter 'fully absorbing ground plane'
Default value:	not checked
Function:	if checked then a fully absorbing ground plane is assumed, else a metal ground

plane (see chapter 2.9)

**Topic****Manipulator**

Parameter:	01: external manipulator device
Default value:	"<none>"
Function:	symbolic name of the device for controlling of a GTEM EuT manipulator as defined in the device configuration
Parameter:	02: GPIB initialization command
Default value:	" *RST;PLD;RTL "
Function:	GPIB command for the initialization of the manipulator
Parameter:	03: GPIB command for position 'X'
Default value:	"P4"
Function:	GPIB command make the manipulator move the EuT to the X position
Parameter:	04: GPIB command for position 'Y'
Default value:	"P5"
Function:	GPIB command make the manipulator move the EuT to the Z position
Parameter:	05: GPIB command for position 'Z'
Default value:	"P6"
Function:	GPIB command make the manipulator move the EuT to the Z position
Parameter:	06: waiting time in [s] for positioning
Default value:	10
Function:	defines a waiting time positioning of the EuT; the delay time depends on the mechanical system and maybe also on the weight of the EuT

## 3.14 S-LINE Test

### 3.14.1 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.



### 3.14.2 Parameter Sets

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

**EN 55022**

Frequency Range:

30 - 1000 MHz

Detector:

Pk

Test Samples:

(small and without preferred orientation)

### 3.14.3 List of the Script Parameters

Topic	Test
Parameter: Default value: Function:	01: ID max. 12 chars to be included in filenames "s-line_0001" a short string that will be used for building up various default strings (see below); this string enables easy identification of files that belong to the same test
Parameter: Default value: Function:	02: global start frequency [MHz] for the test 30 no measurements will be done below this frequency
Parameter: Default value: Function:	03: global stop frequency [MHz] for the test 1000 no measurements will be done above this frequency
Parameter: Default value: Function:	04: suppress queries as far as possible not checked if not checked then additional queries will come up that help to avoid overwriting of files or to skip certain parts of the test
Parameter: Default value: Function:	05: confirmation for final test after data reduction not checked if checked then after data reduction a query will come up enables to skip the final test within the current test range
Parameter: Default value: Function:	06: split frequency range into test ranges checked the total frequency range of the test can optionally be split into <b>test ranges</b> (linear or logarithmic, with respect to the ranges of the scan/sweep range table) that are calculated by the script and will <b>be completely tested</b> (preview test, data reduction, final test), therefore reducing the time elapsed between preview and final test, which is very useful with interference drifting over frequency; besides, this method reduces manual interaction, if more than one probe transducer has to be used for the test (e.g. two antennas for 30 - 1000 MHz in a field strength test); the value given with parameter <i>Test 07</i> has to be interpreted as a minimum value; if the value is set to (typically) 1 then nevertheless for each subrange of the scan/sweep table which used for the preview test, a test range will be calculated (e.g. a field strength test with two antennas or scan/sweep ranges will lead to one test range each); if splitting is not used then the whole frequency range of the scan/sweep table will be tested as one single test range (but maybe with a number of messageboxes requiring to change the antenna !)
Parameter: Default value: Function:	07: if splitting of frequency range: do with log. scale checked if checked then the splitting of the frequency range (if activated) will lead to test ranges of equal width in the logarithmic scale, else in the linear scale
Parameter: Default value: Function:	08: no. of test ranges for splitting of frequency range 1 defines the number of test ranges that shall be calculated for the splitting of the frequency range
Parameter: Default value:	09: test configuration, <none>: ID "<none>"

Function: optional filename of the test configuration (lists all files belonging to the test, for easy transfers through Export/Import/Move) to be created by the test; if no filename is specified then a default name will be used

**Topic****Preview**

Parameter: 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 field 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

Parameter: 07: insert results into existing result file

Default value: not checked

Function: if not checked then any existing result files with a filename identical to the filename used in the preview test will be deleted/overwritten;  
else: any existing result files will only partly be overwritten (within the specified frequency range); this way it is possible to **remeasure certain bands of the spectrum** while keeping the rest unchanged

**Topic****DataReduction**

Parameter: 01: also perform interactive frequency selection

Default value: not checked

Function: if checked then you can review the points that have been found through the automatic data reduction, i.e. you can remove points or add new ones for the test;. to do so you have to position the marker accordingly and select "Remove" or "Test" in a dialog

Parameter: 02: 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: 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

### 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 analyzed; 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: 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 +/-0.5 %) in reference to the given mid frequency; the parameter is effective only if the previous parameter is set to 0

Parameter: 09: scan table for partial scans  
 Default value: "<none>"  
 Function: filename of the corresponding **scan range table** to be used for partial scans

Parameter: 10: scan table for final measurements  
 Default value: "<none>"  
 Function: filename of the corresponding **scan range table** to be used for the single measurements

Parameter: 11: opt. scan table for final meas. >1GHz  
 Default value: "<none>"  
 Function: filename of the corresponding **scan range table** to be used for the final measurements, but only for frequencies above 1 GHz; this way measurements above 1 GHz can be done with an other detector (e.g. PEAK) than those below 1 GHz (e.g. QUASIPeAK)

Parameter: 12: insert results into existing result file  
 Default value: not checked  
 Function: if not checked then any existing result files with a filename identical to the filename used in the final test will be deleted/overwritten; else: any existing result files will only partly be overwritten (within the specified frequency range); this way it is possible to **remeasure certain bands of the spectrum** while keeping the rest unchanged

Parameter: 13: 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: generate RTF file
Default value:	not checked
Function:	if checked then a report file will be created using the "Rich Text Format" (a kind of generic MS Word format) which can be edited with many other text processing software products
Parameter:	03: RTF file: 'X:\<path>\<name8.3>', empty: dialog
Default value:	"c:\xxx.rtf"
Function:	path + file name (8.3 name format) of the RTF file if the RTF report is activated; if an empty string is used then a file selection dialog will come up
Parameter:	04: 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:	05: 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
Parameter:	06: optional text file to be included
Default value:	"<none>"
Function:	filename of an optional file of type 'Text' which shall be included in the report

**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: EuT name
Default value:	"EuT"

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 EuT); 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)

## 3.15 Automotive Test

### 3.15.1 Description

This test provides measurement of conducted and radiated electromagnetic interference according to the automotive standard CISPR 25 (EN55025).

This standard defines limits for narrowband (NB) and broadband (BB) interference.

The NB/BB discrimination is done through a comparison of the PEAK and AVERAGE levels. This requires a sufficiently low noise floor to avoid that NB interferers will be interpreted as BB interferers.

For radiated emissions the script supports measurements with horizontal and vertical antenna polarization (optionally with automatic switching).

The preview test will be done with the PEAK detector.

If the preview test is done with PEAK+AVERAGE, then the 2<sup>nd</sup> detector is informative only.

Those points critical referring to the NB limit will be evaluated with PEAK and AVERAGE, the BB interferers optionally with QUASIPEAK. The NB/BB discrimination is realized through a simple calculation of the difference (variable threshold) between PEAK and AVERAGE levels.

### 3.15.2 Parameter Sets

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

#### **CISPR 25 (EN 55025) conducted**

Frequency Range: 0.15 - 108 MHz  
Detector: Pk (AV) / QP

#### **CISPR 25 (EN 55025) radiated**

Frequency Range: 0.15 - 960 MHz  
Detector: Pk (AV) / QP

### 3.15.3 List of the Script Parameters

Topic	Test
Parameter: Default value: Function:	01: ID max. 12 chars to be included in filenames "auto_0001" a short string that will be used for building up various default strings (see below); this string enables easy identification of files that belong to the same test
Parameter: Default value: Function:	02: global start frequency [MHz] for the test 30 no measurements will be done below this frequency
Parameter: Default value: Function:	03: global stop frequency [MHz] for the test 300 no measurements will be done above this frequency
Parameter: Default value: Function:	04: suppress queries as far as possible not checked if not checked then additional queries will come up that help to avoid overwriting of files or to skip certain parts of the test
Parameter: Default value: Function:	05: confirmation for final test after data reduction not checked if checked then after data reduction a query will come up enables to skip the final test within the current test range
Parameter: Default value: Function:	06: split frequency range into test ranges checked the total frequency range of the test can optionally be split into <b>test ranges</b> (linear or logarithmic, with respect to the ranges of the scan/sweep range table) that are calculated by the script and will <b>be completely tested</b> (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 08</i> has to be interpreted as a minimum value; if the value is set to (typically) 1 then nevertheless for each subrange of the scan/sweep table which used for the preview test, a test range will be calculated (e.g. a field strength test with two antennas or scan/sweep ranges will lead to one test range each); if splitting is not used then the whole frequency range of the scan/sweep table will be tested as one single test range (but maybe with a number of messageboxes requiring to change the antenna !)
Parameter: Default value: Function:	07: if splitting of frequency range: do with log. scale checked if checked then the splitting of the frequency range (if activated) will lead to test ranges of equal width in the logarithmic scale, else in the linear scale
Parameter: Default value: Function:	08: no. of test ranges for splitting of frequency range 1 defines the number of test ranges that shall be calculated for the splitting of the frequency range
Parameter: Default value:	09: test configuration, <none>: ID "<none>"

Function: optional filename of the test configuration (lists all files belonging to the test, for easy transfers through Export/Import/Move) to be created by the test; if no filename is specified then a default name will be used

**Topic****Preview**

Parameter: 01: preview result file, <none>: ID + '\_pre'  
 Default value: "<none>"  
 Function: optional filename for the results (1<sup>st</sup> detector, e.g. PEAK) from the preview test; if no filename is specified then a default name will be used

Parameter: 02: 2<sup>nd</sup> preview result file, <none>: ID + '\_pre2'  
 Default value: "<none>"  
 Function: optional filename for the results (2<sup>nd</sup> detector, e.g. AVERAGE) 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 polarization; if used then the first scan range table will be used with horizontal polarization 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 polarization; if used then the first sweep range table will be used with horizontal polarization only

Parameter: 07: insert results into existing result file  
 Default value: not checked  
 Function: if not checked then any existing result files with a filename identical to the filename used in the preview test will be deleted/overwritten;  
 else: any existing result files will only partly be overwritten (within the specified frequency range); this way it is possible to **remeasure certain bands of the spectrum** while keeping the rest unchanged

**Topic****DataReduction**

Parameter: 01: also perform interactive frequency selection  
 Default value: not checked  
 Function: if checked then you can review the points that have been found through the automatic data reduction, i.e. you can remove points or add new ones for the test;. to do so you have to position the marker accordingly and select "Remove" or "Test" in a dialog

Parameter: 02: NB limit line  
 Default value: "<none>"  
 Function: a filename that corresponds to the NB limit line



Parameter: 03: optional NB 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; if used then the given value for the acceptance offset will be ignored

Parameter: 04: BB limit line (PK)  
 Default value: "<none>"  
 Function: a filename that corresponds to the BB limit for PEAK measurements

Parameter: 05: optional BB limit line (QP)  
 Default value: "<none>"  
 Function: a filename that corresponds to the optional BB limit for QUASIPEAK measurements

Parameter: 04: 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: 05: 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: 06: 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 Final

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

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

Parameter: 03: scan table for partial scans + maximization  
 Default value: "<none>"  
 Function: filename of the corresponding **scan range table** to be used for maximization measurements as well as for partial scans

Parameter: 04: optional 2nd scan table (vertical)  
 Default value: "<none>"  
 Function: filename of the corresponding **scan range table** to be used for maximization measurements as well as for partial scans; it will be used only when measurements are done with vertical polarization; if used then the first scan range table will be used with horizontal polarization 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 analyzed; 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: 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 +/-0.5 %) in reference to the given mid frequency; the parameter is effective only if the previous parameter is set to 0
Parameter:	09: complete search on selected polarisations
Default value:	checked
Function:	determines the search mode for the preview test: complete search means that measurements will be done on all polarization settings as specified with the polarization parameters for the final test; else: measurements will be done on those clamp settings that were determined through the preview test
Parameter:	10: scan table for final measurements
Default value:	"<none>"
Function:	filename of the corresponding <b>scan range table</b> to be used for the final measurements
Parameter:	11: optional 2nd scan table (vertical)
Default value:	"<none>"
Function:	filename of the corresponding <b>scan range table</b> to be used for the final measurements; it will be used only when measurements are done with vertical polarization; if used then the first scan range table will be used with horizontal polarization only
Parameter:	12: decision threshold [dB] for NB/BB discrimination
Default value:	6
Function:	determines the decision level threshold for the selected NB/BB discrimination; the standard requires a value of 6.0 dB
Parameter:	13: opt. scan table for final QP measurements
Default value:	"<none>"
Function:	optional filename of the corresponding <b>scan range table</b> to be used for the final QP measurements

Parameter: 14: optional 2<sup>nd</sup> scan table (vertical)  
 Default value: "<none>"  
 Function: optional filename of the corresponding **scan range table** to be used for the final QP measurements; it will be used only when measurements are done with vertical polarization; if used then the first scan range table will be used with horizontal polarization only

Parameter: 15: insert results into existing result file  
 Default value: not checked  
 Function: if not checked then any existing result files with a filename identical to the filename used in the final test will be deleted/overwritten; else: any existing result files will only partly be overwritten (within the specified frequency range); this way it is possible to **remeasure certain bands of the spectrum** while keeping the rest unchanged

## 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: minimize graphics for test  
 Default value: not checked  
 Function: if checked then the graphics will be minimized before the measurements starts and it will be restored before generating the report; therefore no graphics updates will occur which in turn avoids any possible delays when handling very long scan curves

## 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: generate RTF file  
 Default value: not checked  
 Function: if checked then a report file will be created using the "Rich Text Format" (a kind of generic MS Word format) which can be edited with many other text processing software products

Parameter: 03: RTF file: 'X:\<path>\<name8.3>', empty: dialog  
 Default value: "c:\xxx.rtf"  
 Function: path + file name (8.3 name format) of the RTF file if the RTF report is activated; if an empty string is used then a file selection dialog will come up

Parameter: 04: 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: 05: 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

Parameter: 06: optional text file to be included  
 Default value: "<none>"  
 Function: filename of an optional file of type 'Text' which shall be included in the report

### **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: "Automotive 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: EuT name  
 Default value: "EuT"  
 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 EuT); 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 Polarization**

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

Parameter: 02: use auto switching only  
 Default value: not checked  
 Function: if checked then automatic control of the antenna polarization will be used

Parameter: 03: symbolic name of autom. controlled polariz.  
 Default value: "MAST"  
 Function: symbolic device name of the automatically controlled antenna polarization as defined in the device configuration menu

Parameter: 04: delay time [sec] for auto switching  
 Default value: 4  
 Function: defines a waiting time with automatic switching of the antenna polarization; the delay time depends on the mechanical system and maybe also on the weight of the antenna (the driver never gives a feedback when the switching has been completed)

Parameter: 05: measurements with horizontal polarization  
 Default value: not checked  
 Function: if checked then the all measurements will (also) be done with horizontal polarization

Parameter: 06: measurements with vertical polarization  
 Default value: checked  
 Function: if checked then the all measurements will (also) be done with vertical polarization

## 3.16 EMI STD Test

### 3.16.1 Description

This test provides automatic measurement of conducted and radiated electromagnetic interference according to those specifications that do not require a classification for narrowband (NB) and broadband (BB) signals ( e.g. MIL STD 461/462 D, DEF-STAN, etc.). The test starts with a preview test (sweep or scan with single detector) and does a data reduction. In the final test optionally partial scans can be performed; at all critical points simple single measurements - based on a scan table - will be done.

### 3.16.2 Parameter Sets

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

#### **MIL STD 461 D CE101**

Frequency Range: 0.03 - 10 kHz

Detector: Pk

Test Samples: Power Leads

#### **MIL STD 461 D CE102**

Frequency Range: 0.01 - 10 MHz

Detector: Pk

Test Samples: Power Leads

#### **MIL STD 461 D RE101**

Frequency Range: 0.03 - 100 kHz

Detector: Pk

Test Samples: Magnetic Field Emissions

#### **MIL STD 461 D RE102**

Frequency Range: 10 kHz - 18 GHz

Detector: Pk

Test Samples: Electric Field Emissions

### 3.16.3 List of the Script Parameters

Topic	Test
Parameter: Default value: Function:	01: ID max. 12 chars to be included in filenames "emi_0001" a short string that will be used for building up various default strings (see below); this string enables easy identification of files that belong to the same test
Parameter: Default value: Function:	02: global start frequency [MHz] for the test 30e-6 no measurements will be done below this frequency
Parameter: Default value: Function:	03: global stop frequency [MHz] for the test 10e3 no measurements will be done above this frequency
Parameter: Default value: Function:	04: suppress queries as far as possible not checked if not checked then additional queries will come up that help to avoid overwriting of files or to skip certain parts of the test
Parameter: Default value: Function:	05: split frequency range into test ranges checked the total frequency range of the test can optionally be split into <b>test ranges</b> (linear or logarithmic, with respect to the ranges of the scan/sweep range table) that are calculated by the script and will <b>be completely tested</b> (preview test, data reduction, final test), therefore reducing the time elapsed between preview and final test, which is very useful with interference drifting over frequency; besides, this method reduces manual interaction, if more than one probe transducer has to be used for the test (e.g. two antennas for 30 - 1000 MHz in a field strength test); the value given with parameter <i>Test 07</i> has to be interpreted as a minimum value; if the value is set to (typically) 1 then nevertheless for each subrange of the scan/sweep table which used for the preview test, a test range will be calculated (e.g. a field strength test with two antennas or scan/sweep ranges will lead to one test range each); if splitting is not used then the whole frequency range of the scan/sweep table will be tested as one single test range (but maybe with a number of messageboxes requiring to change the antenna !)
Parameter: Default value: Function:	06: if splitting of frequency range: do with log. scale checked if checked then the splitting of the frequency range (if activated) will lead to test ranges of equal width in the logarithmic scale, else in the linear scale
Parameter: Default value: Function:	07: no. of test ranges for splitting of frequency range 1 defines the number of test ranges that shall be calculated for the splitting of the frequency range
Parameter: Default value: Function:	08: test configuration, <none>: ID "<none>" optional filename of the test configuration (lists all files belonging to the test, for easy transfers through Export/Import/Move) to be created by the test; if no filename is specified then a default name will be used

**Topic**                      **Preview**

Parameter:	01: preview result file, <none>: ID + '_pre'
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: scan table for preview
Default value:	"<none>"
Function:	filename of the scan range table to be used for the preview test
Parameter:	03: sweep table for preview
Default value:	"<none>"
Function:	filename of the sweep range table to be used for the preview test
Parameter:	04: insert results into existing result file
Default value:	not checked
Function:	if not checked then any existing result files with a filename identical to the filename used in the preview test will be deleted/overwritten; else: any existing result files will only partly be overwritten (within the specified frequency range); this way it is possible to <b>remeasure certain bands of the spectrum</b> while keeping the rest unchanged

## Topic **DataReduction**

Parameter:	01: limit line
Default value:	"<none>"
Function:	a filename that corresponds to the required limit line
Parameter:	02: optional 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; if used then the given value for the acceptance offset will be ignored
Parameter:	03: broadband correction (/MHz) of results
Default value:	not checked
Function:	if checked then an additional bandwidth correction will be done on the results which therefore will be displayed with the broadband unit (required by standard RTCA/DO-160); in that case the limit has to be defined with that level unit, too
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"



Topic	Final
Parameter: Default value: Function:	01: final result file, <none>: ID + '_fin' "<none>" optional filename for the (PEAK) results from the final test; if no filename is specified then a default name will be used
Parameter: Default value: Function:	02: scan table for partial scans + single meas. "<none>" filename of the corresponding <b>scan range table</b> to be used for the final test, for partial scans as well as for single measurements
Parameter: Default value: Function:	03: perform partial scans not checked if checked then additional partial scans will be performed around the frequencies to be analyzed; in this case the final measurements will be done on those frequencies that have been found (through data reduction) with these partial scans (recommended when preview was done with sweeps or when drifting interference is to be expected)
Parameter: Default value: Function:	04: max. no. of results kept from partial scans 2 when a partial scan is performed then after data reduction there might still be more than one significant frequency linked to interference; this parameter limits the number of results from a partial scan (after data reduction)
Parameter: Default value: Function:	05: partial scan width: no. of IF-BWs (0=use ratio) 0 determines the frequency range for partial scans expressed in multiples of the IF bandwidth used in the referring scan/sweep table; if the value is set to 0 then the calculation of the partial scan width is based on the following parameter
Parameter: Default value: Function:	06: partial scan width: ref. frequ. ratio 0.01 determines the frequency range for partial scans (e.g. 0.01 means +/-0.5 %) in reference to the given mid frequency; the parameter is effective only if the previous parameter is set to 0
Parameter: Default value: Function:	07: scan table for final measurements "<none>" filename of the corresponding <b>scan range table</b> to be used for the final measurements
Parameter: Default value: Function:	08: opt. scan table for final meas. >1GHz "<none>" filename of the corresponding <b>scan range table</b> to be used for the final measurements, but only for frequencies above 1 GHz; this way measurements above 1 GHz can be done with an other detector (e.g. PEAK) than those below 1 GHz (e.g. QUASIPeAK)
Parameter: Default value: Function:	09: insert results into existing result file not checked if not checked then any existing result files with a filename identical to the filename used in the final test will be deleted/overwritten; else: any existing result files will only partly be overwritten (within the specified

frequency range); this way it is possible to **remeasure certain bands of the spectrum** while keeping the rest unchanged

**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: minimize graphics for test  
 Default value: not checked  
 Function: if checked then the graphics will be minimized before the measurements starts and it will be restored before generating the report; therefore no graphics updates will occur which in turn avoids any possible delays when handling very long scan curves

**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: generate RTF file  
 Default value: not checked  
 Function: if checked then a report file will be created using the "Rich Text Format" (a kind of generic MS Word format) which can be edited with many other text processing software products

Parameter: 03: RTF file: 'X:\<path>\<name8.3>', empty: dialog  
 Default value: "c:\xxx.rtf"  
 Function: path + file name (8.3 name format) of the RTF file if the RTF report is activated; if an empty string is used then a file selection dialog will come up

Parameter: 04: 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: 05: 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

Parameter: 06: optional text file to be included  
 Default value: "<none>"  
 Function: filename of an optional file of type 'Text' which shall be included in the report

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

referring entry of the report header won't be changed

Parameter: 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

## 3.17 MIL STD 461/462 C Test

### 3.17.1 Description

This test provides automatic measurement of conducted and radiated electromagnetic interference according to the American MIL STD 461/462 C specifications. Some of the specifications require a classification for narrowband (NB) and broadband (BB) signals.

A NB/BB discrimination can be done only on scan results (from a preview scan or from partial scans in the final test); single measurements will not be performed.

To make use of the PK-AV method the selected scan table has to be defined with exactly these detectors (1st PK, 2nd AV).

The tuning methods require certain scan step sizes, depending on the defined IF bandwidth; for the points at the edge of the scan table's subranges there won't be any NB/BB results because the algorithm works within these subranges only.

The PK-AV method is the most reliable discrimination method but the scans require more time to perform (two detectors).

Above 1 GHz no discrimination will be done; for that frequency range the specifications don't have BB limits.

### 3.17.2 Parameter Sets

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

#### **MIL STD 461 C CE01**

Frequency Range:	0.03 - 15 kHz
Detector:	Pk (NB)
Test Samples:	Part 3 Equipment

#### **MIL STD 461 C CE03**

Frequency Range:	0.015 - 50 MHz
Detector:	Pk (NB), Pk/MHz (BB)
Test Samples:	Part 3 Equipment: Navy and Air Force

#### **MIL STD 461 C RE01**

Frequency Range:	0.03 - 50 kHz
Detector:	Pk (NB)
Test Samples:	Part 3 Equipment

#### **MIL STD 461 C RE02**

Frequency Range:	0.014 - 10000 MHz (NB), 0.014 - 1000 MHz (BB)
Detector:	Pk (NB), Pk/MHz (BB)
Test Samples:	Part 3 Equipment (Curve #1)

### 3.17.3 List of the Script Parameters

<b>Topic</b>	<b>Test</b>
Parameter:	01: ID max. 12 chars to be included in filenames
Default value:	"mil_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:	30e-6
Function:	no measurements will be done below this frequency
Parameter:	03: global stop frequency [MHz] for the test
Default value:	10e3
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 <b>test ranges</b> (linear or logarithmic, with respect to the ranges of the scan/sweep range table) that are calculated by the script and will <b>be completely tested</b> (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'
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 + '_pre2'
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: insert results into existing result file
Default value:	not checked
Function:	if not checked then any existing result files with a filename identical to the filename used in the preview test will be deleted/overwritten; else: any existing result files will only partly be overwritten (within the specified frequency range); this way it is possible to <b>remeasure certain bands of the spectrum</b> while keeping the rest unchanged

## Topic DataReduction

Parameter:	01: NB limit line
Default value:	"<none>"
Function:	a filename that corresponds to the required NB limit line
Parameter:	02: optional NB 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 NB results; if used then the given value for the acceptance offset will be ignored
Parameter:	03: BB limit line
Default value:	"<none>"
Function:	a filename that corresponds to the required BB limit line
Parameter:	04: optional BB 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 BB results; if used then the given value for the acceptance offset will be ignored
Parameter:	05: 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:	06: 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:	07: 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:	08: 0/1/2/3: NB/BB discr.: none/tun1BW/tun2BW/PK-AV
Default value:	2
Function:	type of narrowband/broadband discrimination: no discrimination / tuning method +/- 1 IF bandwidth / tuning method +/- 2 IF bandwidths / PK/AV comparison method
Parameter:	09: decision threshold [dB] for NB/BB reduction
Default value:	6.0
Function:	determines the decision level threshold for the selected NB/BB discrimination; recommended values are 6 dB for the tuning methods and 12 dB for the PK-AV comparison method
Parameter:	10: max. no. of BB results kept per octave
Default value:	3
Function:	maximum number of BB results to be kept per octave from the final results

**Topic****Final**

Parameter:	01: final NB result file, default: ID + '_fin NB'
Default value:	"<none>"
Function:	optional filename for the NB results from the final test; if no filename is specified then a default name will be used
Parameter:	02: final BB result file, default: ID + '_fin BB'
Default value:	"<none>"
Function:	optional filename for the BB results from the final test; if no filename is specified then a default name will be used
Parameter:	03: scan table for partial scans
Default value:	"<none>"
Function:	filename of the corresponding <b>scan range table</b> to be used for partial scans in the final test
Parameter:	04: perform partial scans
Default value:	not checked
Function:	if checked then additional partial scans will be performed around the frequencies to be analyzed; 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: 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: 06: 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: 07: partial scan width: ref. frequ. ratio  
 Default value: 0.01  
 Function: determines the frequency range for partial scans (e.g. 0.01 means +/-0.5 %) in reference to the given mid frequency; the parameter is effective only if the previous parameter is set to 0

Parameter: 08: insert results into existing result file  
 Default value: not checked  
 Function: if not checked then any existing result files with a filename identical to the filename used in the final test will be deleted/overwritten; else: any existing result files will only partly be overwritten (within the specified frequency range); this way it is possible to **remeasure certain bands of the spectrum** while keeping the rest unchanged

## Topic Graphic

Parameter: 01: NB graphics configuration, default: ID + ' NB'  
 Default value: "<none>"  
 Function: optional filename for the graphics configuration to be used for the NB results; if no filename is specified then a default name will be used

Parameter: 02: BB graphics configuration, default: ID + ' BB'  
 Default value: "<none>"  
 Function: optional filename for the graphics configuration to be used for the BB results; if no filename is specified then a default name will be used

Parameter: 03: minimize graphics for test  
 Default value: not checked  
 Function: if checked then the graphics will be minimized before the measurements starts and it will be restored before generating the report; therefore no graphics updates will occur which in turn avoids any possible delays when handling very long scan curves

## 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: generate RTF file  
 Default value: not checked  
 Function: if checked then a report file will be created using the "Rich Text Format" (a kind of generic MS Word format) which can be edited with many other text processing software products

Parameter: 03: RTF file: 'X:\<path>\<name8.3>', empty: dialog

Default value:	"c:\xxx.rtf"
Function:	path + file name (8.3 name format) of the RTF file if the RTF report is activated; if an empty string is used then a file selection dialog will come up
Parameter:	04: 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:	05: 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
Parameter:	06: optional text file to be included
Default value:	"<none>"
Function:	filename of an optional file of type 'Text' which shall be included in the report

**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:	"MIL STD 461/462C 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: EuT name
Default value:	"EuT"
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 EuT); 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

## **3.18 MIL STD D Limits**

### **3.18.1 Description**

In the U.S. norm 'MIL-STD 461/462 D' for conducted measurements, depending on the actual current on the leads, the level limit may be increased. With this auxiliary script it is very easy to derive a corresponding new limit line.

### 3.18.2 List of the Script Parameters

Topic	Conversion
Parameter: Default value: Function:	01: Name of the reference limit line "<none>" name of the limit line which shall be used as a reference
Parameter: Default value: Function:	02: Name of the new limit line "<none>" name of the new limit line which shall be calculated (parallel shift by the offset value)
Parameter: Default value: Function:	03: Current in Ampere 1.0 value of the lead current in Ampere
Parameter: Default value: Function:	04: Name of graphics configuration "<none>" name of the graphics configuration to be used
Parameter: Default value: Function:	05: Limit shifting according to CE 101-1 not checked if checked then a constant offset will be calculated to define the new limit line a the sum of the reference limit line and of the offset: current $\leq$ 3.0 A : offset = 0 dB current $\geq$ 185.0 A : offset = 35 dB else: offset = $20 * \log_{10}(\text{current} / 3.0)$
Parameter: Default value: Function:	06: Limit shifting according to CE 101-2 not checked if checked then a constant offset will be calculated to define the new limit line a the sum of the reference limit line and of the offset: current $\leq$ 1.0 A : offset = 0 dB else: offset = $20 * \log_{10}(\text{current} / 3.0)$
Parameter: Default value: Function:	07: Limit shifting according to CE 101-3 not checked if checked then a constant offset will be calculated to define the new limit line a the sum of the reference limit line and of the offset: current $\leq$ 2.0 A : offset = 0 dB else: offset = $20 * \log_{10}(\text{current} / 3.0)$

## 3.19 GAM Test

### 3.19.1 Description

This test provides automatic measurement of conducted and radiated electromagnetic interference according to the French military standard GAM EG 13. Some of the specifications require a classification for narrowband (NB) and broadband (BB) signals.

A NB/BB discrimination can be done only on scan results (from a preview scan or from partial scans in the final test); single measurements will not be performed.

To make use of the PK-AV method the selected scan table has to be defined with exactly these detectors (1st PK, 2nd AV).

The tuning methods require certain scan step sizes, depending on the defined IF bandwidth; for the points at the edge of the scan table's subranges there won't be any NB/BB results because the algorithm works within these subranges only.

The PK-AV method is the most reliable discrimination method but the scans require more time to perform (two detectors).

Above 1 GHz no discrimination will be done; for that frequency range the specifications don't have BB limits.

The standard requires final measurements of NB interferers with AV, BB interferers with PK.

### 3.19.2 Parameter Sets

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

#### **GAM EG 13 C1**

Frequency Range: 30 Hz - 50 MHz (NB), 10 kHz - 50 MHz (BB)  
 Detector: Pk (NB), Pk (BB)

#### **GAM EG 13 C2**

Frequency Range: 0.01 - 50 MHz  
 Detector: Pk (NB)

#### **GAM EG 13 C3**

Frequency Range: 0.01 - 50 MHz  
 Detector: Pk (NB), Pk (BB)

#### **GAM EG 13 R1**

Frequency Range: 0.03 - 50 kHz  
 Detector: Pk (NB)

#### **GAM EG 13 R3**

Frequency Range: 0.01 - 10000 MHz (NB), 0.01 - 1000 MHz (BB)  
 Detector: Pk (NB), Pk (BB)

### 3.19.3 List of the Script Parameters

<b>Topic</b>	<b>Test</b>
Parameter:	01: ID max. 12 chars to be included in filenames
Default value:	"gam_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:	30e-6
Function:	no measurements will be done below this frequency
Parameter:	03: global stop frequency [MHz] for the test
Default value:	10e3
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 <b>test ranges</b> (linear or logarithmic, with respect to the ranges of the scan/sweep range table) that are calculated by the script and will <b>be completely tested</b> (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'
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 + '_pre2'
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: insert results into existing result file
Default value:	not checked
Function:	if not checked then any existing result files with a filename identical to the filename used in the preview test will be deleted/overwritten; else: any existing result files will only partly be overwritten (within the specified frequency range); this way it is possible to <b>remeasure certain bands of the spectrum</b> while keeping the rest unchanged

## Topic **DataReduction**

Parameter:	01: NB limit line
Default value:	"<none>"
Function:	a filename that corresponds to the required NB limit line
Parameter:	02: optional NB 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 NB results; if used then the given value for the acceptance offset will be ignored
Parameter:	03: BB limit line
Default value:	"<none>"
Function:	a filename that corresponds to the required BB limit line
Parameter:	04: optional BB 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 BB results; if used then the given value for the acceptance offset will be ignored
Parameter:	05: 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:	06: 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:	07: 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:	08: 0/1/2/3: NB/BB discr.: none/tun1BW/tun2BW/PK-AV
Default value:	2
Function:	type of narrowband/broadband discrimination: no discrimination / tuning method +/- 1 IF bandwidth / tuning method +/- 2 IF bandwidths / PK/AV comparison method
Parameter:	09: decision threshold [dB] for NB/BB reduction
Default value:	6.0
Function:	determines the decision level threshold for the selected NB/BB discrimination; recommended values are 6 dB for the tuning methods and 12 dB for the PK-AV comparison method
Parameter:	10: max. no. of BB results kept per octave
Default value:	3
Function:	maximum number of BB results to be kept per octave from the final results

**Topic****Final**

Parameter:	01: final NB result file, default: ID + '_fin NB'
Default value:	"<none>"
Function:	optional filename for the NB results from the final test; if no filename is specified then a default name will be used
Parameter:	02: final BB result file, default: ID + '_fin BB'
Default value:	"<none>"
Function:	optional filename for the BB results from the final test; if no filename is specified then a default name will be used
Parameter:	03: scan table for partial scans
Default value:	"<none>"
Function:	filename of the corresponding <b>scan range table</b> to be used for partial scans in the final test
Parameter:	04: perform partial scans
Default value:	not checked
Function:	if checked then additional partial scans will be performed around the frequencies to be analyzed; 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: 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: 06: 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: 07: partial scan width: ref. frequ. ratio  
 Default value: 0.01  
 Function: determines the frequency range for partial scans (e.g. 0.01 means +/-0.5 %) in reference to the given mid frequency; the parameter is effective only if the previous parameter is set to 0

Parameter: 08: scan table for final measurements  
 Default value: "<none>"  
 Function: filename of the corresponding **scan range table** to be used for the final measurements; according to GAM EG 13 use: 1<sup>st</sup> detector AV for the NB interferers and 2<sup>nd</sup> detector PK for the BB interferers

Parameter: 08: insert results into existing result file  
 Default value: not checked  
 Function: if not checked then any existing result files with a filename identical to the filename used in the final test will be deleted/overwritten; else: any existing result files will only partly be overwritten (within the specified frequency range); this way it is possible to **remeasure certain bands of the spectrum** while keeping the rest unchanged

## Topic **Graphic**

Parameter: 01: NB graphics configuration, default: ID + ' NB'  
 Default value: "<none>"  
 Function: optional filename for the graphics configuration to be used for the NB results; if no filename is specified then a default name will be used

Parameter: 02: BB graphics configuration, default: ID + ' BB'  
 Default value: "<none>"  
 Function: optional filename for the graphics configuration to be used for the BB results; if no filename is specified then a default name will be used

Parameter: 03: PK curve graphics config., <none>: ID + ' PK'  
 Default value: "<none>"  
 Function: optional filename for the graphics configuration to be used for the PEAK results (preview curve); if no filename is specified then a default name will be used

Parameter: 04: minimize graphics for test  
 Default value: not checked  
 Function: if checked then the graphics will be minimized before the measurements starts and it will be restored before generating the report; therefore no graphics updates will occur which in turn avoids any possible delays when handling very long scan curves

## 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: generate RTF file
Default value:	not checked
Function:	if checked then a report file will be created using the "Rich Text Format" (a kind of generic MS Word format) which can be edited with many other text processing software products
Parameter:	03: RTF file: 'X:\<path>\<name8.3>', empty: dialog
Default value:	"c:\xxx.rtf"
Function:	path + file name (8.3 name format) of the RTF file if the RTF report is activated; if an empty string is used then a file selection dialog will come up
Parameter:	04: 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:	05: 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
Parameter:	06: optional text file to be included
Default value:	"<none>"
Function:	filename of an optional file of type 'Text' which shall be included in the report

**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:	"GAM EG 13 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: EuT name
Default value:	"EuT"
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 EuT); 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

## 3.20 RF Exposure Test

### 3.20.1 Description

This test provides automatic measurement of electromagnetic power, including the calculation of the absolute and (referring to a limit line) the relative power flux density.

The purpose of the test is to evaluate the total ambient RF power that affects a human being at a certain location. To achieve this, the electric field strength will be measured over a large frequency range with antennas that have a receiving characteristic similar to that of a human body (e.g. vertically polarized rod antennas).

The (proposed) limits existing so far describe the equivalent field strength (V/m) against frequency that a single sinusoidal carrier (nothing else in the whole spectrum) may reach: the relative power flux density then has exactly a value of 1.0 .

The units of the limits of the equivalent field strength can be converted using the following formulas:

$E_g$                     limit of the equivalent electric field strength [V/m]  
 $E_g'$                     logarithmic value of the limit of the equivalent electric field strength [dBuV/m]

$$E_g' = 20 \log_{10}(E_g \cdot 10^6)$$

and respectively

$$E_g = (10^{(E'/20)} \cdot 10^{-6})$$

The actual power flux density can be evaluated through summing up of all contributions to the spectrum (3 dB bandwidth of the IF filter):

Absolute power flux density  $S_{abs}$  [W/m<sup>2</sup>]

$E$                     electric field strength [V/m]  
 $E'$                     logarithmic value of the electric field strength [dBuV/m]  
 $Z_o$                     electromagnetic impedance in space ( $120 \cdot \pi$  Ohm = 377 Ohm)

$$\begin{aligned} S_{abs} &= \text{SUM} [E^2 / Z_o] \\ &= 1 / Z_o \cdot \text{SUM} [E]^2 \\ &= 1 / Z_o \cdot \text{SUM} [10^{(E'/20)} \cdot 10^{-6}]^2 \\ &= 1 / Z_o \cdot \text{SUM} [10^{(E'/10)} \cdot 10^{-12}] \\ &= 1 / Z_o \cdot \text{SUM} [10^{(E'/10 - 12)}] \end{aligned}$$

Relative power flux density  $S_{rel}$  (has no unit)

E	electric field strength [V/m]
E'	logarithmic value of the electric field strength [dBuV/m]
$E_g$	limit of the equivalent electric field strength [V/m]
$E_g'$	logarithmic value of the limit of the equivalent electric field strength [dBuV/m]

$$\begin{aligned}
 S_{rel} &= \text{SUM} [ E / E_g ]^2 \\
 &= \text{SUM} [ ( 10^{(E'/20)} * 10^{-6} ) / ( 10^{(E_g'/20)} * 10^{-6} ) ]^2 \\
 &= \text{SUM} [ 10^{(E'-E_g')/20} ]^2 \\
 &= \text{SUM} [ 10^{(E'-E_g')/10} ]
 \end{aligned}$$

The time for calculating the relative power flux density can significantly be shortened if a predefined uncertainty (e.g. maximum 2 %) is tolerable, i.e., if only those parts of the spectrum will be considered that contribute enough to the result; this method is realized through an acceptance analysis for each range of constant step size and IF bandwidth, with an acceptance offset (in dB) that will be calculated using the following formula:

B	step size = 3 dB bandwidth of the IF filter [Hz] (typ. 0.7 * nominal IF bandwidth)
sw	frequency range under consideration (scan width) [Hz] (in the test the width of the current subrange)
tol	tolerance (maximum uncertainty) [%]

$$\text{Offset} = 10 * \log_{10}( sw / ( B * tol/100 ) )$$

For those frequency ranges where no limit is defined, only the absolute power flux density can be evaluated.

The step size in the scan range table has to match with the IF bandwidth in use (step size = 3 dB bandwidth), so that the whole spectrum will be evaluated without any gaps and also without any overlaps; the only detector suitable for the test is the RMS detector, which means that a receiving instrument without an RMS detector can't be used for the test. The names of the antenna factors to be used in the test have also to be specified in the scan range table.

### 3.20.2 Parameter Sets

Currently the following specification is supported by the ES-K1 Standard Data:

#### VDE 0848 Part 2

Frequency Range:	30 kHz - 300 GHz
Detector:	RMS
Test Samples:	(exposition range)

### 3.20.3 List of the Script Parameters

Topic	Test
Parameter: Default value: Function:	01: ID max. 12 chars to be included in filenames "exp_0001" a short string that will be used for building up various default strings (see below); this string enables easy identification of files that belong to the same test
Parameter: Default value: Function:	02: global start frequency [MHz] for the test 30e-3 no measurements will be done below this frequency
Parameter: Default value: Function:	03: global stop frequency [MHz] for the test 300e9 no measurements will be done above this frequency
Parameter: Default value: Function:	04: suppress queries as far as possible not checked if not checked then additional queries will come up that help to avoid overwriting of files or to skip certain parts of the test
Parameter: Default value: Function:	05: test configuration, <none>: ID "<none>" optional filename of the test configuration (lists all files belonging to the test, for easy transfers through Export/Import/Move) to be created by the test; if no filename is specified then a default name will be used

Topic	Preview
Parameter: Default value: Function:	01: preview result file, <none>: ID + '_pre' "<none>" optional filename for the (PEAK) results from the preview test; if no filename is specified then a default name will be used
Parameter: Default value: Function:	02: scan table for preview "<none>" filename of the scan range table to be used for the preview test

Topic	Graphics
Parameter: Default value: Function:	01: graphics configuration, <none>: ID "<none>" optional filename for the graphics configuration to be used in the test; if no filename is specified then a default name will be used
Parameter: Default value: Function:	02: optional graphics template (new graph only) "<none>" optional file name of a predefined graphics configuration, from which the graphics configuration to be used in the test shall be derived (line type and color settings)
Parameter: Default value: Function:	03: minimize graphics for test not checked if checked then the graphics will be minimized before the measurements starts and it will be restored before generating the report; therefore no graphics

updates will occur which in turn avoids any possible delays when handling very long scan curves

**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: generate RTF file  
 Default value: not checked  
 Function: if checked then a report file will be created using the "Rich Text Format" (a kind of generic MS Word format) which can be edited with many other text processing software products

Parameter: 03: RTF file: 'X:\<path>\<name8.3>', empty: dialog  
 Default value: "c:\xxx.rtf"  
 Function: path + file name (8.3 name format) of the RTF file if the RTF report is activated; if an empty string is used then a file selection dialog will come up

Parameter: 04: 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: 05: 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

Parameter: 06: optional text file to be included  
 Default value: "<none>"  
 Function: filename of an optional file of type 'Text' which shall be included in the report

**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: "RF Exposure"



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: EuT name  
 Default value: "EuT"  
 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 EuT); 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 (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 RfExposure**

Parameter: 01: limit line  
 Default value: "<none>"  
 Function: limit line for the test

Parameter: 02: rel. power flux: result tolerance [%] (0: no acc. analysis)  
 Default value: 0  
 Function: defines the maximum uncertainty of the relative power flux density if a data reduction shall be done through an acceptance analysis; if the value is set to 0 then all measurements will be considered for the calculation

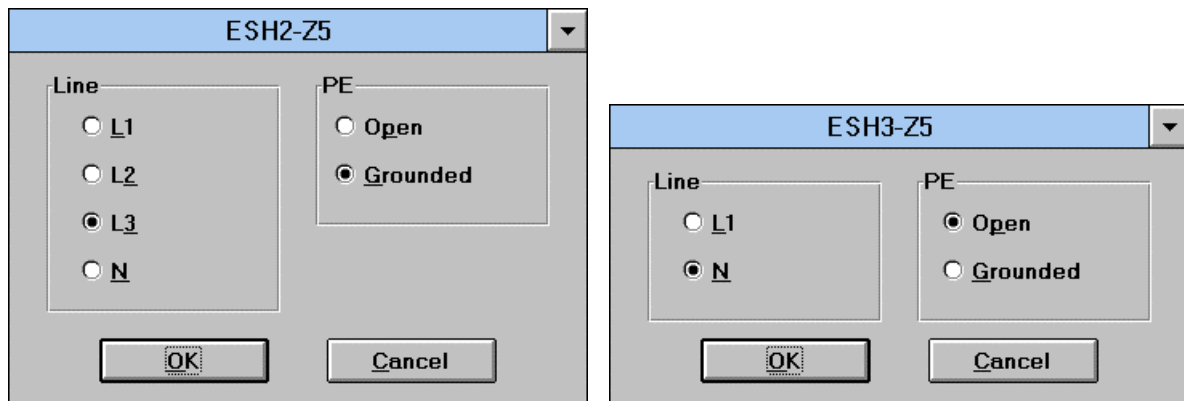
# 4 Standard Device Drivers

## 4.1 V Networks ESH2-Z5 / ENV 4200 and ES-H3-Z5 / ENV 216

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 / ENV 216 (two line V-network) from Rohde&Schwarz.

### 4.1.1 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; with ENV 216 this will set the optional high pass filter) to be either open (floating) or grounded.

### 4.1.2 Script Mode

In the script mode the settings of the artificial mains network are done by means of the commands `set_device(...)` and `get_device(...)`. A detailed description is given in chapter 5.2 of the "script development kit".

#### Setup of the line to be tested

**Command:** LISN\_PHASE

**Parameter:** "N", "P1"  
"P2", "P3" (ESH2-Z5 only)

#### Setup of the PE (floating / grounded)

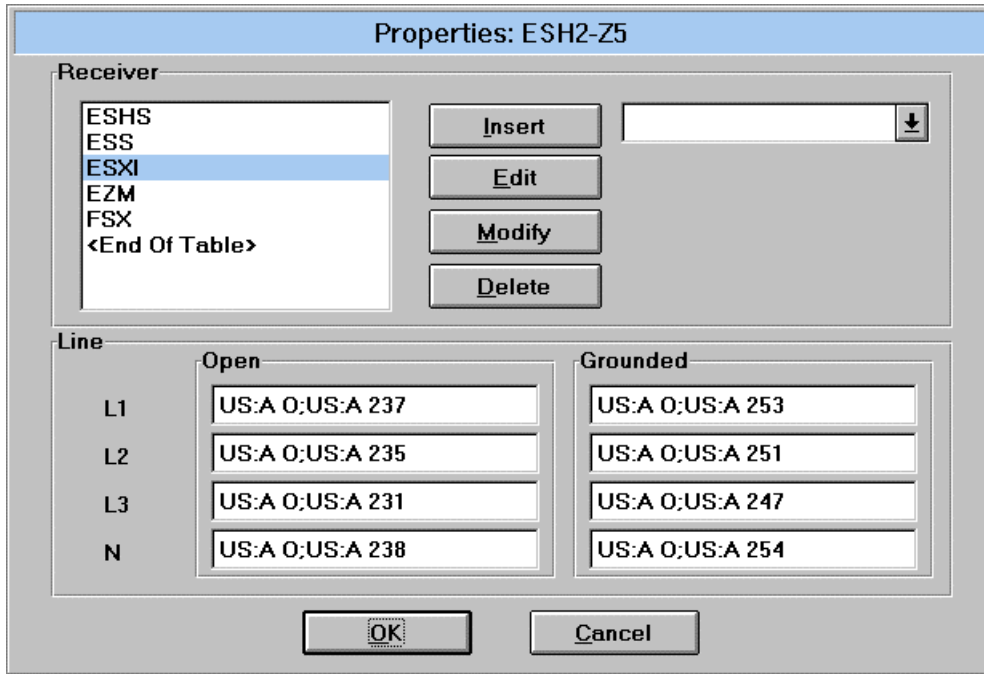
**Command:** LISN\_PE

**Parameter:** "FLO", "GND"

### 4.1.3 IEEE Bus Commands

The IEEE bus commands for remote control are dependant on the instrument to which the artificial mains network is connected to. The control works via the user port of that instrument.

The settings have to be done in the dialogue Properties in the menu Device configuration with respect to the referring instrument.



With the installation of an option ES-K1x all necessary commands are already provided (files *S\_NN2.INI* for ESH2-Z5 / ENV 4200, *S\_NN3.INI* for ESH3-Z5).

Through double clicking of a certain receiver all IEEE bus commands that are suited to control the user port will be displayed in the corresponding fields. Receivers that are not used might be deleted from the list (the commands for those receivers will also be deleted!), and only "active" receivers can be inserted into the list.

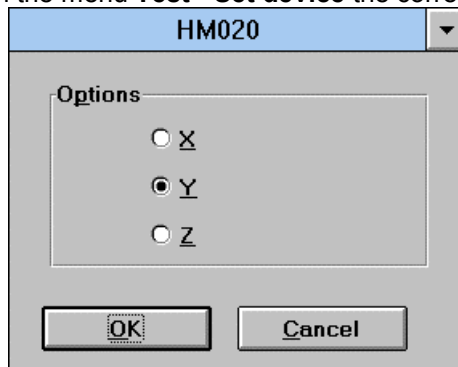
The commands can be arbitrarily edited (max. 50 characters) so that the driver could also be used for other purposes, e.g. for switching - via the user port - of a device under test.

## 4.2 Triple Loop Antenna HM020

The drivers provide all functions that are necessary for controlling the triple loop antenna HM020 from Rohde&Schwarz.

### 4.2.1 Interactive Mode

With the selection of **HM020...** in the menu **Test - Set device** the corresponding dialogue comes up:



One of the three loops can be selected.

### 4.2.2 Script Mode

In the script mode the settings of the triple loop antenna are done by means of the commands `set_device(...)` and `get_device(...)`. A detailed description is given in chapter 5.2 of the "script development kit".

#### Setup of the loop to be tested

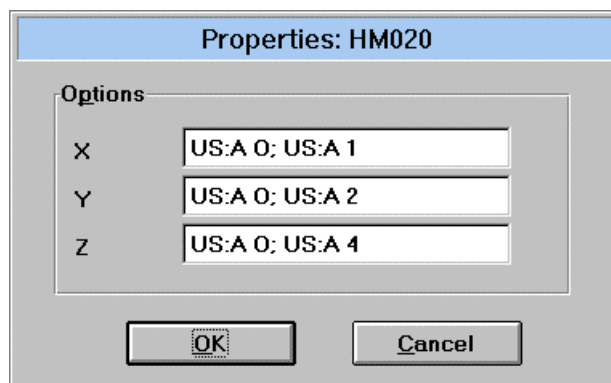
**Command:** LOOP

**Parameter:** "X", "Y", "Z"

### 4.2.3 IEEE Bus Commands

The IEEE bus commands for remote control are dependant on the instrument to which the artificial mains network is connected to. The control works via the user port of that instrument.

The settings have to be done in the dialogue Properties in the menu Device configuration with respect to the referring instrument.



With the installation of an option ES-K1x all necessary commands are already provided (file `SH_HM020.INI`) but depending on the cable to be used, other settings might be required (check with volt meter).

The commands can be arbitrarily edited (max. 50 characters) so that the driver could also be used for other purposes, e.g. for switching - via the user port - of a device under test.

## 4.3 Relay Matrix RSU/PSU

The drivers provide all functions that are necessary for controlling the relay matrix devices RSU and PSU from Rohde&Schwarz. The RSU is identical to the PSU except the electrical specifications of the RF relays.

### 4.3.1 Concept

The software can control up to four RSU units. These units can be used separately as well as combined. For a combined usage there's an extra driver SUPER-RSU that is not associated to any interface but can address any of the installed RSU drivers. Therefore the SUPER-RSU driver is a means to handle a set of RSU drivers, e.g.:

```

SUPER-RSU => {RSU1}
or
SUPER-RSU => {RSU1 + RSU2 + RSU3 + RSU4}

```

Automatic switching of one or more RSUs during sweeps/scans (change of antennas or receivers) is possible only through making use of the SUPER-RSU driver; here additional system transducers should be defined to take respect of the signal loss through the relay cabling. For all other purposes it is sufficient to use of the RSU driver(s) only.

### 4.3.2 Setup of the RSU Drivers

To get the drivers into the device list, one has to go into the device configuration, press the **Load** button and then go into the selection box 'Device'.

Select the RSU, edit the name (e.g. RSU1 if you want to use more than one RSU) and the GPIB address, then add the device to the list.

Repeat this for all (max. 4) RSUs you want to install.

If needed, also select the SUPER-RSU and add it to the device list now.

Now the relay switch definitions have to be made:

For each RSU driver go to the **Properties...** and define switching paths ('Signal Path') and the corresponding commands, e.g.:

for *RSU1* (path name / command):

'Path X'	'S1 R2'	(set relay 1; reset relay 2)
'Path Y'	'R1 R2'	(reset relay 1; reset relay 2)
'Path Z'	'R1 S2'	(reset relay 1; set relay 2)

for *RSU2* (path name / command):

'Path Left'	'S3 S4'	(set relay 3; set relay 4)
'Path Right'	'R3 R4'	(reset relay 3; reset relay 4)

Now leave the dialogs and test all path definitions through the interactive dialog(s) for the relay matrix:

```
'Test' => 'Set device...' => 'RSU1'
```

Select a path and press **Switch**. Check the relay settings through the RSU's front panel LEDs.

### 4.3.3 Setup of the SUPER-RSU Driver

Before you define any settings for the SUPER-RSU you should first define system transducers for the cables you're using, e.g. '*Cable low range*' and '*Cable hi range*'.

Now look at the following example:

You want to use relay 3 of RSU2 to switch automatically between Antenna1 and Antenna2 during scans/sweeps.

```

Antenna1      'Cable low range'
>>>-----|
              |
              |#####
              |# RSU2 #-----('Cable standard')-----> Receiver
              |#####
              |
>>>-----|
Antenna2      'Cable hi range'

```

You have to go into the **Properties...** dialog (Device Configuration). Define a global 'Signal Path Name' and associate the referring RSUx paths (select and add), along with the corresponding system transducer (cable loss), e.g.:

```

Antenna1
  RSU2: 'Path Left'
  (RSUx: '...')
  System Transducer: 'Cable low range'
Antenna2
  RSU2: 'Path Left'
  (RSUx: '...')
  System Transducer: 'Cable hi range'

```

Now when you create or edit any scan/sweep range table, select the required 'Signal Path' for each range, e.g.:

```

0 - 300 MHz
  Antenna1 (text 'Cable low range' will appear)
300 - 1000 MHz
  Antenna2 (text 'Cable hi range' will appear)
Any cables that belong to both signal paths can be added as "Additional Transducers".

```

### 4.3.4 Script Mode

In the script mode the settings of the RSU devices are done by means of the commands `set_device(...)` and `get_device(...)`. A detailed description is given in chapter 5.2 of the "script development kit".

## 4.4 Driver LPT I/O

### 4.4.1 Overview

The driver LPT I/O provides all functions that are necessary for controlling a parallel port of the PC. The driver can be used for simple monitoring and controlling purposes.

### 4.4.2 Hardware

The parallel port can be used as a controlling/monitoring interface, i.e., the lines of the interface can separately be set as output lines or be read as input lines. Setting and reading of the lines will occur only when the driver is being told to do so, not permanently in the background.

The driver LPT I/O makes use of the following signals (pin no. in brackets):

Reading: /ERROR (Pin # 15), SLCT (# 13), PE (# 12), /ACK (#10), /BUSY (# 11)

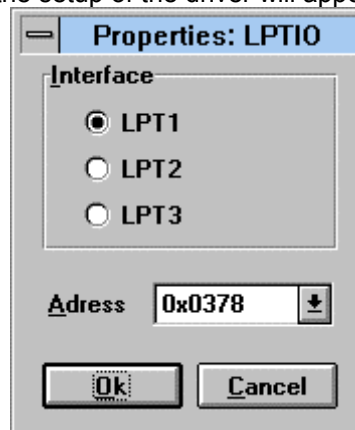
Writing: D0 - D7 (# 2-9), /STROBE (# 1), AUTO FEED (# 14), /INIT (# 16), SLCT IN (# 17)

The hardware control registers will be directly accessed.

A more detailed description of the PC's parallel port can be found in various publications.

### 4.4.3 Properties

Through selecting of the LPT I/O driver in the **device configuration** and clicking onto the button **Properties**, the following dialog for the setup of the driver will appear:



In the upper area of the dialog, one of the parallel ports can be selected as an **interface** (normally there's no problem if the hardlock is attached to the same interface port). With the field **Address** the base I/O address of the port can be selected. If the address is not known then e.g. start the diagnostics program *MSD.EXE* and look for the LPT ports.

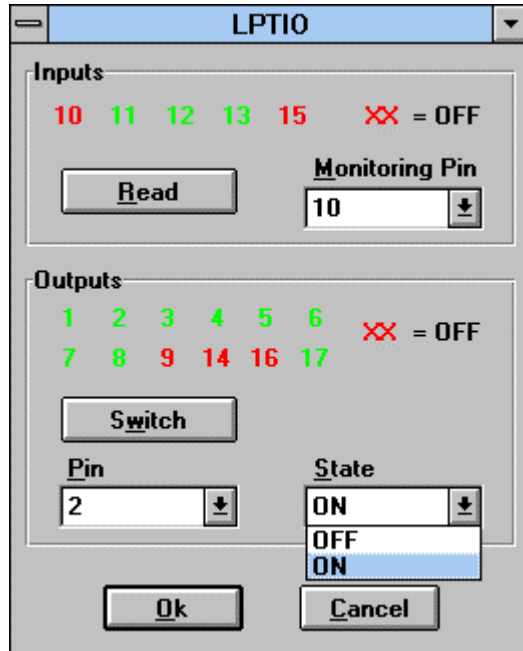
**Parameter:** Interface  
**Function:** selection of the parallel port  
**Value range:** LPT1, LPT2, LPT3.

**Parameter:** Address  
**Function:** selection of the base I/O address  
**Value range:** 03BChex, 0378hex, 0278hex

### 4.4.4 Dialog mode

When selecting the LPT I/O driver in the **Test -> Set device...** then the referring dialog comes up:





The dialog consists of two areas, one for reading the input lines and one for setting the output lines. The numbers refer to the hardware pins of the parallel port.

**Display:** current states of the **inputs**  
**Function:** Display of the input line states. The state of each line is represented by its colour.

**Button:** **Read**  
**Function:** Reads and displays the the states of all input lines

**Parameter:** **Monitoring Pin**  
**Function:** Selects the input line to be read (redundant functionality).

**Display:** current states of the **outputs**  
**Function:** Display of the output line states. The state of each line is represented by its colour.

**Parameter:** **Pin**  
**Function:** Selects the output line to be switched.

**Parameter:** **State**  
**Function:** Selects the state of the line selected with **Pin**.  
**Value range:** ON, OFF

**Button:** **Switch**  
**Function:** Switches the selected line to the selected state and updates the display of the output lines.

#### 4.4.5 Script Commands

##### Syntax of the script commands:

```
INTEGER get_device (STRING device, INTEGER cmnd, VOID param,
                   VAR INTEGER device_err_no, VAR STRING device_err_txt)
INTEGER set_device (STRING device, INTEGER cmnd, VOID param,
                   VAR INTEGER device_err_no, VAR STRING device_err_txt)
```

**Parameter:** description of the operation  
**Data type:** description of the data type of the referring data  
**Transfer:** Internal means, the data will be transferred to or from the software driver only.  
 External means, the command directly affects the device.

The information about the state of a pin ("high" or "low") is done by a character "S" (Set) or "R" (Reset) in the data string of the script function call.

##### ICS\_OUT

Usage: get\_device, set\_device  
 Parameter: set\_device: state of a single output line to be switched  
 get\_device: state of a single output line (selected by ICS\_INDEX)  
 Data type: STRING  
 Transfer: external  
 Note: set\_device: "S16" means pin 16 will be set (to "high")  
 get\_device: gives the state of a single output line (selected by ICS\_INDEX)  
 syntax: e.g. "S12", "R1".

##### ICS\_IN

Usage: get\_device  
 Parameter: state of a single input line (selected by ICS\_INDEX)  
 Data type: STRING  
 Transfer: external  
 Note: syntax z.B. "S10", "R15".

##### ICS\_INDEX

Usage: get\_device, set\_device  
 Parameter: pin index  
 Data type: INTEGER  
 Transfer: internal  
 Note: value range 1, ..., 17.

## 4.5 Relay Matrix TS-RSP

The TS-RSP device driver provides the functionality required for controlling the relays in the RF Relay Switch Matrix TS-RSP produced by Rohde & Schwarz. The device is controlled via the IEEE bus interface.

All functions can be performed in two different modes:

- **Physical Mode:**

All settings are transferred to the relay switch matrix.

- **Virtual Mode:**

The operation of the device is software simulated. The switch matrix is not addressed.

The device driver provides the following dialog boxes:

- **Device Operation Dialog,**
- **Properties Dialog.**

The TS-RSP device driver may also be controlled by a script.

### 4.5.1 Device

The TS-RSP is controlled via IEEE bus interface. It consists out of a main frame which contains an IEEE bus controlled I/O interface. Using this interface allows the control of RF relays which are located on a plug-in board. For making the RF relay switch matrix ready for flexible use in different systems, several relay boards with different types of relays are available:

RSP-EMI	(EMI Test System, 6 koaxial relays with 1 input and 2 outputs)
RSP-EMS	(EMS Test System, 11 Koaxial Relays with 1 input and 2 outputs, RF power meter)
RSP-BRF	(RF Test System, 4 Koaxial Relays with 1 input and 6 outputs)

The following combinations the relay plug-in boards are possible:

RSP-EMI + RSP-BRF  
RSP-EMS + RSP-BRF

### 4.5.2 Properties

Multiple use of the device driver under a variety of logical names is possible in the **Device Configuration** dialog box.

After selecting the TS-RSP device in the **Device Configuration** Dialog and clicking the **Properties...** button the Properties Dialog Box will appear.

The dialog window is separated into two areas. In the upper area all already defined paths with their names, the used relay board and the corresponding relay settings are displayed in the field **Paths**. These settings can be modified in the lower area of the dialog using the fields **Relay Board** and **Relay Settings**.

First in the field **Relay Board** is selected, which relay board in the TS-RSP shall be addressed. After this the used relays are activated and configured. Using this principle two independent paths (each using different relays) can be switched without influencing each other. The path names are used via the device dialog, via a script or via the super driver **SUPER-RSU**.

#### Description of the Elements:

**List: Paths**

List of paths which can be set at the TS-RSP. The path name, the used relay board and the corresponding relay setting is displayed.

**Parameter: Relay Board**

**Function:** Selection of the desired relay board in the TS-RSP main frame.

**Range:** RSP-EMS, RSP-EMI, RSP-BRF.

**Parameter: Relay Setting**

**Function:** In this field all available relays for the selected relay board are displayed (for RSP-EMS and RSP-EMI this are two paths switches, for RSP-BRF this are four 6 path switches). For each relay the user can select whether it should be switched for the current path and if yes, to which position it should be set (NC = relay closed, NO = relay opened).

**Range:** dependent from the current selected relay board.

**Parameter: Path**

**Function:** Input field for the path name.

**Range:** Maximum 20 characters.

**Button: Insert**

The settings in the edit fields are added to the **Paths** list in the upper dialog area. But before this move, a check is made that the path does not exist already.

**Button: Edit**

The marked path settings are moved to the edit fields **path**, **relay board** and **relay setting**. A double click on the desired settings has the same effect.

**Button: Modify**

The modified settings are moved to the **Paths** list in the upper area of the dialog window. But first, a check is made, that the path is not available double:

**Button: Delete**

A marked path in the **Paths** list is deleted.

**Button: Clear**

All relays in the field **relay setting** are set to the not selected state. Additionally the edit field **Path** is cleared.

**Button: OK**

The dialog box is closed after the settings have been saved.

**Button: Cancel**

The dialog box is closed without the settings being saved.

**4.5.3 Operating Dialog**

When selecting the RSU device driver from the menu **Test >> Set Device** the Device Operation Dialog Box will appear.

The paths of the TS-RSP are to be switched here. When a path is switched a corresponding IEEE bus command is sent to the TS-RSP device. Several commands can be sent at the same time if they don't collide.

The settings are made in script mode with the commands `set_device(...)` and `get_device(...)`. A detailed description of the commands will be found in 4.5.4 Overview of the Script Commands.

### **Description of the General Elements:**

#### **Button: OK**

Saves the settings and closes the dialog box.

#### **Button: Cancel**

Closes the dialog box without saving the settings.

#### **Display: Paths**

List of all paths possible to switch at the TS-RSP device, defined in the Properties.

#### **List: Selected Paths**

Path to be switched. One of the paths the Paths list contains which is selected via the Select button.

#### **Button: Select**

The marked path is copied to the Selected Paths list. If the new path collides with any path available already in this list, the old path is deleted from the list.

#### **Button: Switch**

**Function:** Switches the paths in the Selected Paths list.  
**Range:** All path names defined in the properties dialog box.  
**Script command:** RSU\_SETPATH  
 Type: STRING  
 Direct transfer to device.

#### **Display: Relay State**

In this field the current state of all relays available in the relay board are displayed.

## **4.5.4 Overview of the Script Commands**

### **Script Command Syntax:**

INTEGER `get_device` (STRING Device, INTEGER Command, VOID Data,  
 VAR INTEGER Device Error Code, VAR STRING Device Error Message)  
 INTEGER `set_device` (STRING Device, INTEGER Command, VOID Data,  
 VAR INTEGER Device Error Code, VAR STRING Device Error Message)

**Parameter:** Description of the data to be transferred.  
**Data Type:** Identifies the type of data to be transferred.  
**Transfer:** Internal Data is transferred to or from the device driver.  
 External Command is sent directly to the device.

**IDENT**

**Used in:** get\_device  
**Parameter:** Device identification  
**Data type:** STRING  
**Transfer:** Internal

**PHYNAME**

**Used in:** get\_device  
**Parameter:** Physical name of the device.  
**Data type:** STRING  
**Transfer:** Internal

**RSU\_SETPATH**

**Can be used in:** set\_device  
**Parameter:** Path to be switched at the TS-RSP.  
**Data type:** STRING

**RSU\_SETCOMMAND**

**Can be used in:** set\_device  
**Parameter:** Sends an IEEE bus command string to the TS-RSP.  
**Datentyp:** STRING

# **5 Dynamic Data Exchange (DDE)**

## 5.1 General

DDE (Dynamic Data Exchange) enables to dynamically exchange data between two Windows applications, provided both applications support the DDE functionality of Windows.

Applications that support DDE are MS WORD for WINDOWS as well as MS EXCEL, SUPERBASE, SQL and WordPro and many others.

Different from data transfer via the clipboard, DDE represents a direct communication between two applications. Therefore for DDE transfers both applications (ES-K1 as well as e.g. MS WORD) must have been started from Windows.

The advantage of DDE over the clipboard is that data transfers can be automated. This way data transfers and data updates can be done with minimum user effort.

One of the two applications, the so called "client" (e.g. MS WORD) controls the communication. The other application (ES-K1) works as the "server", which on request delivers data to the client application. The ES-K1 transfers these data as pure text, except the graphics which will be delivered in a vector format.

*Note: Office XP does not support DDE any more!*

### 5.1.1 DDE Commands

Generally a DDE command consists of three parts:

Syntax: **Service Name Topic Name Item Name**

The preparation of a DDE transfer is done via the client application through providing of the server application name (ES-K1 in this case), the topic name and the item name. The kind of available data depends on the server application (see chapter 5.3)

The exact Syntax of DDE commands depends on the client application. A detailed description of the command syntax for MS WORD follows.

## 5.2 DDE with MS WORD for Windows™

DDE enables to use all the presentation functionality in MS WORD for the creation of user defined test reports based on data from the application ES-K1. The automation of this process can be achieved through design of suitable document templates (also see chapter 5.2.2). The WORD document then works as the client which controls the transfers.

### 5.2.1 General Command Syntax with WORD for Windows™

The buildup of a DDE connection from MS WORD is done by making use of the field functions "DDE" and "DDEAuto".

Syntax: **{DDE Service Topic Item}**

**{DDEAuto Service Topic Item}**

DDE, DDEAuto: WORD field function for dynamic data transfer

Service : The service name. Here the name **ES-K1** has to be given.

Topic : The topic name. Could be e.g. a file type.

Item: The item name. Should be the name of the data to be transferred.

Example: **{DDE ES-K1 System Topics}**

This command lists all topics that are available from the server application ES-K1.

The item name consists of the ES-K1 database name and - if necessary - a subitem name which must be separated from the database name by a '\$' character.

First an empty function field must be inserted by pressing **STRG+F9**. The cursor will be positioned between the brackets that work as field indicators. Now a field function DDE or DDEAuto can be entered, along with the required names. Pressing **F9** updates the field. WORD then automatically changes to the display of the field's result, provided that the global settings of the fields allow to do so.

The field function DDEAuto works different from DDE in that the data will be automatically updated, i.e., a change in the ES-K1 file immediately leads to a change in the WORD document.



### **5.2.2 Creating a Test Report**

For creating a test report via DDE it is a good idea to make use of the powerful table and style functions of MS WORD.

In a first step the layout of the report has to be designed in a WORD document or document template. To do so, tables should be assigned to the topics.

In a second step the items and subitems have to be inserted into the rows and columns of the table.

The style of the function fields can be defined as with normal text. So any kind of style (character font and size, etc.) can be used. The style will also be valid for the result of the field after updating. A resulting graphical diagram can be modified like any other graphics in MS WORD.

Example:

{company logo as a bitmap}  
**{DDE ES-K1 RPH "vol 0001\$HDR HEAD1"}**

{DDE ES-K1 RPH "vol_0001\$HDT_EUT"}	{DDE ES-K1 RPH "vol_0001\$HDR_EUT"}
{DDE ES-K1 RPH "vol_0001\$HDT_MANU"}	{DDE ES-K1 RPH "vol_0001\$HDR_MANU"}
{DDE ES-K1 RPH "vol_0001\$HDT_OP_COND"}	{DDE ES-K1 RPH "vol_0001\$HDR_OP_COND"}
{DDE ES-K1 RPH "vol_0001\$HDT_OPER"}	{DDE ES-K1 RPH "vol_0001\$HDR_OPER"}
{DDE ES-K1 RPH "vol_0001\$HDT_TEST_SPEC"}	{DDE ES-K1 RPH "vol_0001\$HDR_TEST_SPEC"}
{DDE ES-K1 RPH "vol_0001\$HDT_COM1"}	{DDE ES-K1 RPH "vol_0001\$HDR_COM1"}

**Comment:** If the device under test is used in the operating mode then the supply lines have to fulfill the regulation ABC123 ...

Start	Stop	Step	IFBW	Detector	Meastime	RF-ATTN	Preampl.
{DDE ES-K1 SCT "EN 55022 Voltage fin\$S_S TART_F REQ\$S 1"}	{DDE ES-K1 SCT "EN 55022 Voltage fin\$S_S TOP_F REQ\$S 1"}	{DDE ES-K1 SCT "EN 55022 Voltage fin\$S_S TEP_FR EQ\$S1"}	{DDE ES-K1 SCT "EN 55022 Voltage fin\$S_IF BW\$S1" }	{DDE ES-K1 SCT "EN 55022 Voltage fin\$S_DET_C URVE1\$S1"}	{DDE ES-K1 SCT "EN 55022 Voltage fin\$S_MEAS TIME\$S1"}	{DDE ES-K1 SCT "EN 55022 Voltage fin\$S_RF_AT TN\$S1"}	{DDE ES-K1 SCT "EN 55022 Voltage fin\$S_PREA MP\$S1"}

{DDE ES-K1 GRC "vol\_0001"}

**Measurement Results (QP Detector)**

Frequency	Level	Limit	Margin	Exceed	Line	PE
{DDE ES-K1 MES "vol_0001_fin\$R1 C1:R99C1"}	{DDE ES-K1 MES "vol_0001_fin\$R1C2: R99C2"}	{DDE ES-K1 MES "vol_0001_fin\$R1C3: R99C3"}	{DDE ES-K1 MES "vol_0001_fin\$R1 C4:R99C4"}	{DDE ES-K1 MES "vol_0001_fin\$R1C5: R99C5"}	{DDE ES-K1 MES "vol_0001_fin\$R1C6: R99C6"}	{DDE ES-K1 MES "vol_0001_fin\$R1C7: R99C7"}

Result: With updating of the marked function fields the style settings will be used for the resulting elements. Graphics will always be inserted with minimum size (can be stretched to desired size). Graphics can then be modified like any other graphics imported e.g. with the clipboard.

A result of the final example report is shown on the following pages.



# ROHDE & SCHWARZ

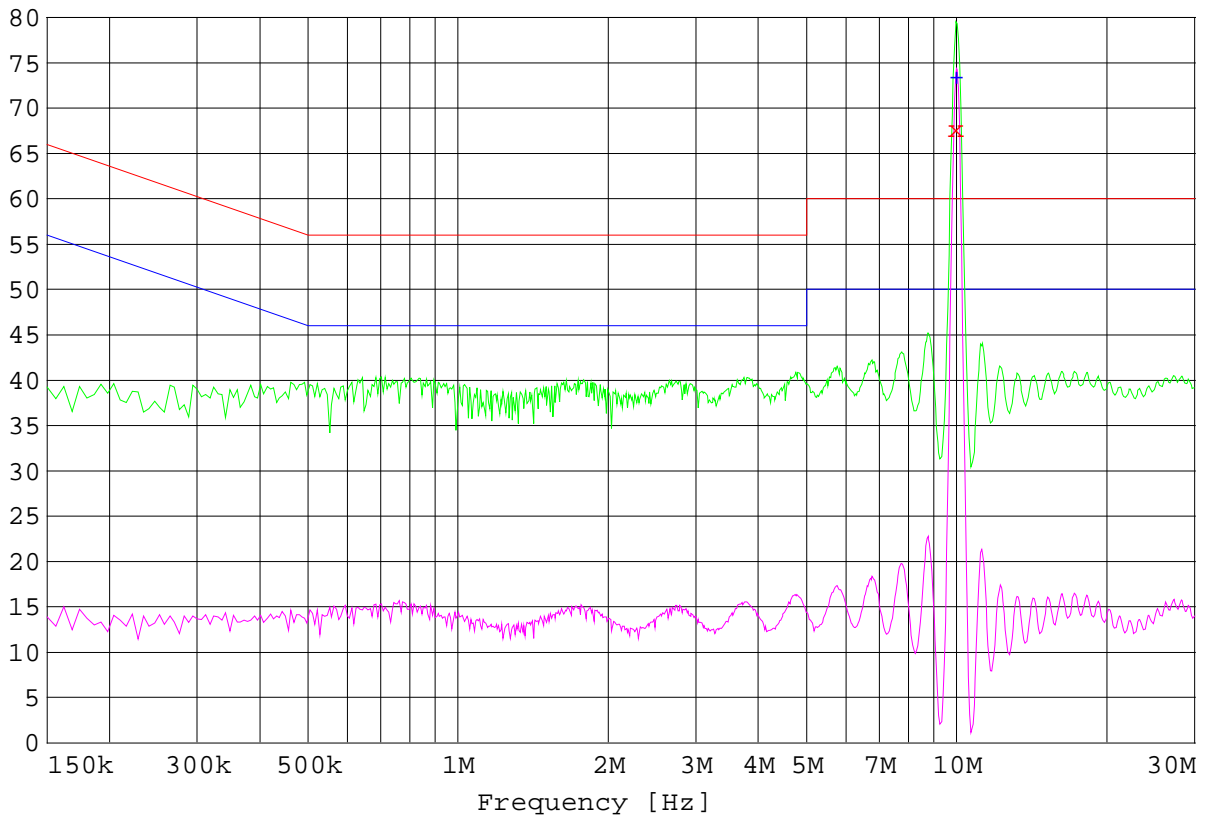
TEST

EUT E.u.T.  
 Manufacturer  
 Operating Condition  
 Operator Donald Duck  
 Test Specification  
 Comment

**Comment:** *If the device under test is used in the operating mode then the supply lines have to fulfill the regulation ABC123 ...*

Start	Stop	Step	IFBW	Detector	Meastime	RF-ATTN	Preampl.
150.0 kHz	30.0 MHz	6.0 kHz	10 kHz	MaxPeak	10.0 ms	0 dB	Off

Level [dBμV]



- x x MESvol\_0001\_fin QP
- + + MESvol\_0001\_fin AV
- MESvol\_0001\_pre PK
- MESvol\_0001\_pre AV
- LIMEN 55022 V QP
- LIMEN 55022 V AV

**Measurement Results (QP Detector)**

Frequency	Level	Limit	Margin	Exceed	Line	PE
9.978000	67.79	60.00	-7.79	*	L3	FLO

**Measurement Results (AV Detector)**

Frequency	Level	Limit	Margin	Exceed	Line	PE
10.008000	73.49	50.00	-23.49	*	L2	FLO

## 5.3 DDE Commands of the Application ES-K1

### 5.3.1 ES-K1 DDE Topics

The following topics are available:

	System general state of the system
MES	measurement result
LIM	limit line
XTP	probe transducer
XTS	system transducer
GRC	graphics configuration
FRL	frequency list
RPH	report header
RPC	report configuration
SCT	scan table
SWT	sweep table

**Note:** The use of database names or codes for table elements works case sensitive. If a database name holds spaces then the whole item name has to be put between " " characters.

#### 5.3.1.1 General State of the System

If the topic System is used then the DDE connection does not refer to a specific file. It can be used to get general information on the data in the ES-K1.

Topic name: **SYSTEM**

The following items can be retrieved:

<b>Topics</b>	lists all available topics in the format <name><tab>
<b>Systems</b>	lists all available items to the current topic in the format <name><tab>
<b>Formats</b>	lists all available data formats in the format <name><tab>

Example with MS WORD:

**{DDE ES-K1 System Formats}**

### 5.3.1.2 Lists

Topic name: **MES** (measurement results)  
 Topic name: **LIM** (limit line)  
 Topic name: **XTP** (probe transducer)  
 Topic name: **XTS** (system transducer)  
 Topic name: **FRL** (frequency list)

The following items can be retrieved:

**Systems** lists all available items to the current topic in the format <name><tab>  
**FileType** gives the description of the data type  
**FileNames** gives a list of database names, separated through tabs  
**SubItems** lists all available subitems (commands after <database name>\$) in the format <subitem name><tab>  
**Database name** If no subitem is given after the database name then the whole table will be transferred in the following format:  
 <text line 1><CR><LF>  
 <text line 2><CR><LF>  
 <text line 3><CR><LF>  
 <text line 4><CR><LF>  
 <value lines 1...n><CR><LF>  
 <CR><LF><CR><LF>  
 <Tab><additional data elements 1...n><CR><LF>

The item name consists of an ES-K1 database name and optionally of a subitem name, separated through a '\$' character. No spaces are allowed between database name and subitem name.

The following subitems can be retrieved:

**Name** delivers the name of the database element  
**Time** delivers the time (last modification) of the database element  
**Date** delivers the date (last modification) of the database element  
**TabSize** delivers the size of the table in the format  
 RrCc<tab>Ss  
 r number of rows (including text lines)  
 c number of columns  
 s number of additional (single) values

**R[H]r1Cc1:RmCcn** delivers a rectangular portion from the table, rows r1 to m, columns c1 to cn; the columns are separated by <tab>, the rows by <tab><linefeed> with **R** only the values will be transferred; no text lines will appear with **RH** the four text lines (description, units, etc.) come before the values

**Ss1:Ssn** delivers additional single values in the format  
 <tab><description><CR><LF>.  
 s2 delivers the name of the range table (scan/sweep table) in measurement results

Example with MS WORD:

**{DDE ES-K1 MES "Example Result\$RH1C1:R8C2"}**

### 5.3.1.3 Graphics Configuration

Topic name: **GRC**

The following items can be retrieved:

- Systems** lists all available items to the current topic in the format <name><tab>
- FileType** gives the description of the data type
- FileNames** gives a list of database names, separated through tabs
- Subitems** lists all available subitems (commands after <database name>\$) in the format <subitem name><tab>
- Database name** If no subitem is given after the database name then the whole graphics will be transferred in a vector format.

The item name consists of an ES-K1 database name and optionally of a subitem name, separated through a '\$' character. No spaces are allowed between database name and subitem name.

The following subitems can be retrieved:

- Name** delivers the name of the database element
- Time** delivers the time (last modification) of the database element
- Date** delivers the date (last modification) of the database element

Example with MS WORD:

```
{DDE ES-K1 GRC "Example Graphics"}
```

### 5.3.1.4 Report Header

Topic name: **RPH**

The following items can be retrieved:

- Systems** lists all available items to the current topic in the format <name><tab>
- FileType** gives the description of the data type
- FileNames** gives a list of database names, separated through tabs
- SubItems** lists all available subitems (commands after <database name>\$) in the format <subitem name><tab>
- Database name** If no subitem is given after the database name then the whole report header will be transferred in the following format:  
<subitem description>:<tab><subitem text>  
<CR><LF>

The item name consists of an ES-K1 database name and optionally of a subitem name, separated through a '\$' character. No spaces are allowed between database name and subitem name.

With the subitems those with a name **HDT...** give the description of the referring element, those with a name **HDR...** the text of the element.

The following subitems can be retrieved:

- Name** delivers the name of the database element
- Time** delivers the time (last modification) of the database element
- Date** delivers the date (last modification) of the database element
- HDR\_HEAD1, HDT\_HEAD1**  
1st top line
- HDR\_HEAD2, HDT\_HEAD2**  
2nd top line
- HDR\_EUT, HDT\_EUT**  
description of the E.u.T.
- HDR\_MANU, HDT\_MANU**  
description of the manufacturer
- HDR\_OP\_COND, HDT\_OP\_COND**  
description of the operating conditions
- HDR\_TEST\_SITE, HDT\_TEST\_SITE**  
description of the test site
- HDR\_OPER, HDT\_OPER**  
description of the operator
- HDR\_TEST\_SPEC, HDT\_TEST\_SPEC**  
description of the test specification
- HDR\_COM1, HDT\_COM1**  
1st comment line
- HDR\_COM2, HDT\_COM2**  
2nd comment line

Example with MS WORD:

```
{DDE ES-K1 RPH "Example Header$HDT_HEAD1"}
```



### 5.3.1.5 Report Configuration

Topic name: **RPC**

The following items can be retrieved:

<b>Systems</b>	lists all available items to the current topic in the format <name><tab>
<b>FileType</b>	gives the description of the data type
<b>FileNames</b>	gives a list of database names, separated through tabs
<b>SubItems</b>	lists all available subitems (commands after <database name>\$) in the format <subitem name><tab>
<b>Database name</b>	If no subitem is given after the database name then the whole report configuration will be transferred in the following format: <subitem description>: <tab><subitem text1>            <tab>...            <tab><subitem-textn> <CR><LF>

The item name consists of an ES-K1 database name and optionally of a subitem name, separated through a '\$' character. No spaces are allowed between database name and subitem name.

The following subitems can be retrieved:

<b>Name</b>	delivers the name of the database element
<b>Time</b>	delivers the time (last modification) of the database element
<b>Date</b>	delivers the date (last modification) of the database element
<b>RPH</b>	delivers the database name of the report header that belongs to this report configuration
<b>LIM</b>	delivers a list holding the database names (separated by tabs) of the limit lines that belong to this report configuration
<b>MES</b>	delivers a list holding the database names (separated by tabs) of the measurement results that belong to this report configuration
<b>SCT</b>	delivers a list holding the database names (separated by tabs) of the scan tables that belong to this report configuration
<b>SWT</b>	delivers a list holding the database names (separated by tabs) of the sweep tables that belong to this report configuration
<b>XTS</b>	delivers a list holding the database names (separated by tabs) of the system transducers that belong to this report configuration
<b>XTP</b>	delivers a list holding the database names (separated by tabs) of the probe transducers that belong to this report configuration
<b>GRC</b>	delivers a list holding the database names (separated by tabs) of the graphics configurations that belong to this report configuration
<b>REP_FOOTNOTE</b>	delivers the setting of the report footnote that belongs to this report configuration
<b>REP_FTNOTETXT</b>	delivers the report footnote text that belongs to this report configuration
<b>REP_PICTURE</b>	delivers the setting of the graphics output (full or half)

Example with MS WORD:

```
{DDE ES-K1 RPC "Example Report"}
```

### 5.3.1.6 Scan/Sweep Table

Topic name: **SCT** (scan table)

Topic name: **SWT** (sweep table)

The following items can be retrieved:

**Systems** lists all available items to the current topic in the format <name><tab>  
**FileType** gives the description of the data type  
**FileNames** gives a list of database names, separated through tabs  
**SubItems** lists all available subitems (commands after <database name>\$) in the format <subitem name><tab>  
**Database name** If no subitem is given after the database name then the whole table will be transferred in the following format:  
**Ss:**<subitem description>: <tab><subitem text>  
 <CR><LF>  
 s: number of the range; range 0 is used for elements that are not dependent on the ranges

The item name consists of an ES-K1 database name and optionally of a subitem name, separated through a '\$' character. No spaces are allowed between database name and subitem name.

To retrieve the single values of a scan/sweep table the subitem name will be extended through a subrange description, separated through a '\$' character.

A subrange can be defined either through an index or through the frequency:

**Ss** selection of the subrange through an index  
 s index  
**Ff** selection of the subrange through a frequency  
 f frequency in Hz.  
**Kf** frequency in kHz.  
**Mf** frequency in MHz.  
**Gf** frequency in GHz.

A subrange with index 0 is used for elements that are not dependent on the subranges. If the subrange information is not given although the value of the item depends on the subrange, then an item will be transferred for all subranges. Single elements are transferred in the following format:

<tab><subitem value>

In all other cases the format is as follows:

Ss:<subitem description>:<tab><subitem value><CR><LF>

The following subitems can be retrieved:

**Name** delivers the name of the database element  
**Time** delivers the time (last modification) of the database element  
**Date** delivers the date (last modification) of the database element  
**ALL<s>** delivers all elements of a subrange in the following format:  
 Ss: <subitem description>:<tab><subitem value>  
 <CR><LF>.

Subitems that are valid for all subranges:

**S\_COUNT\_SUB** delivers the number of subranges

Example with MS WORD:

**{DDE ES-K1 SCT "Example Scan Table\$ALL\$S1"}**

delivers all elements of the 1st subrange

**{DDE ES-K1 SCT " Example Scan Table \$\$\_UNIT"}**

delivers the level unit of the scan table

**{DDE ES-K1 SCT " Example Scan Table \$\$\_START\_FREQ"}**

delivers the start frequency for each of the subranges

**{DDE ES-K1 SCT " Example Scan Table \$\$\_START\_FREQ\$S2"}**

delivers the start frequency of the 2nd subrange