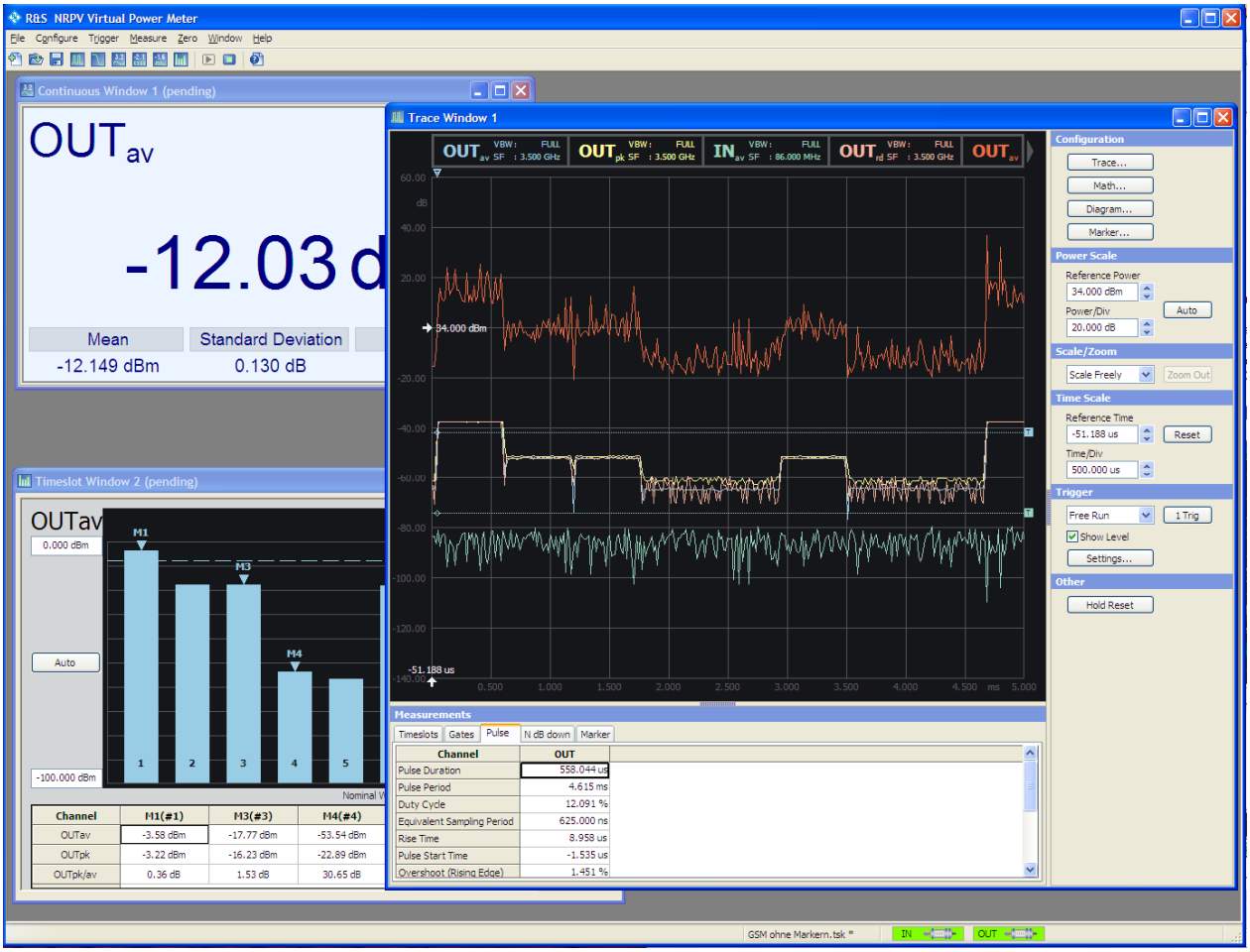
R&S®NRPV
Virtual Power Meter
Software Manual



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Test and Measurement

Software Manual

ROHDE&SCHWARZ

The manual describes the R&S®NRPV Virtual Power Meter software application for R&S®NRP-Zxx Power Sensors from Rohde & Schwarz.

The software of the instrument makes use of valuable open source software and freeware packages. The most important of them are listed below together with their corresponding open source and freeware license. The verbatim license texts are provided on the user documentation CD-ROM (included in delivery).

Package	Link	License
TinyXML	http://www.grinninglizard.com/tinyxml	Zlib License
wxWidgets	http://www.wxwidgets.org	wxWindows Library Licence v. 3.1
wxSheet	http://www.sourceforge.net/showcomp.php	wxWindows Library Licence v. 3.1

Rohde&Schwarz would like to thank the open source community for their valuable contribution to embedded computing.

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The following abbreviations are used throughout this manual:
R&S®NRPV is abbreviated as R&S NRPV.
R&S®NRPVis abbreviated as R&S NRP-Zxx.

Basic Safety Instructions

Always read through and comply with the following safety instructions!

All plants and locations of the Rohde & Schwarz group of companies make every effort to keep the safety standards of our products up to date and to offer our customers the highest possible degree of safety. Our products and the auxiliary equipment they require are designed, built and tested in accordance with the safety standards that apply in each case. Compliance with these standards is continuously monitored by our quality assurance system. The product described here has been designed, built and tested in accordance with the attached 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, you must observe all instructions and warnings provided in this manual. If you have any questions regarding these safety instructions, the Rohde & Schwarz group of companies will be happy to answer them.

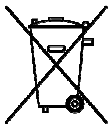
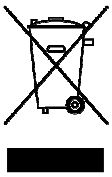
Furthermore, it is your responsibility to use the product in an appropriate manner. This product is designed for use solely in industrial and laboratory environments or, if expressly permitted, also in the field and must not be used in any way that may cause personal injury or property damage. You are responsible if the product is used for any purpose 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 product documentation and within its performance limits (see data sheet, documentation, the following safety instructions). Using the product requires technical skills and, in some cases, a basic knowledge of English. It is therefore essential that only skilled and specialized staff or thoroughly trained personnel with the required skills be allowed to use the product. If personal safety gear is required for using Rohde & Schwarz products, this will be indicated at the appropriate place in the product documentation. Keep the basic safety instructions and the product documentation in a safe place and pass them on to the subsequent users.

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 and when using the product. It is also absolutely essential to observe the additional safety instructions on personal safety, for example, that appear in relevant parts of the product documentation. In these safety instructions, the word "product" refers to all merchandise sold and distributed by the Rohde & Schwarz group of companies, including instruments, systems and all accessories. For product-specific information, see the data sheet and the product documentation.

Symbols and safety labels

Symbol	Meaning	Symbol	Meaning
	Notice, general danger location Observe product documentation		ON/OFF supply voltage
	Caution when handling heavy equipment		Standby indication
	Danger of electric shock		Direct current (DC)

Symbol	Meaning	Symbol	Meaning
	Warning! Hot surface		Alternating current (AC)
	Protective conductor terminal		Direct/alternating current (DC/AC)
	Ground		Device fully protected by double (reinforced) insulation
	Ground terminal		EU labeling for batteries and accumulators For additional information, see section "Waste disposal/Environmental protection", item 1.
	Be careful when handling electrostatic sensitive devices		EU labeling for separate collection of electrical and electronic devices For additonal information, see section "Waste disposal/Environmental protection", item 2.
	Warning! Laser radiation For additional information, see section "Operation", item 7.		

Signal words and their meaning

The following signal words are used in the product documentation in order to warn the reader about risks and dangers.

DANGER Indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.

WARNING Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.

CAUTION Indicates a potentially hazardous situation which, if not avoided, could result in minor or moderate injury.

NOTICE Indicates the possibility of incorrect operation which can result in damage to the product.
In the product documentation, the word ATTENTION is used synonymously.

These signal words 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 in other economic areas or military applications. It is therefore essential to make sure that the signal words described here are always used only in connection with the related product documentation and the related product. The use of signal words in connection with unrelated products or documentation can result in misinterpretation and in personal injury or material damage.

Operating states and operating positions

The product may be operated only under the operating conditions and in the positions specified by the manufacturer, without the product's ventilation being obstructed. If the manufacturer's specifications are not observed, this can result in electric shock, fire and/or serious personal injury or death. Applicable local or national safety regulations and rules for the prevention of accidents must be observed in all work performed.

1. Unless otherwise specified, the following requirements apply to Rohde & Schwarz products: predefined operating position is always with the housing floor facing down, IP protection 2X, use only indoors, max. operating altitude 2000 m above sea level, max. transport altitude 4500 m above sea level. A tolerance of ±10 % shall apply to the nominal voltage and ±5 % to the nominal frequency, overvoltage category 2, pollution severity 2.
2. 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). An installation that is not carried out as described in the product documentation could result in personal injury or even death.
3. Do not place the product on heat-generating devices such as radiators or fan heaters. The ambient temperature must not exceed the maximum temperature specified in the product documentation or in the data sheet. Product overheating can cause electric shock, fire and/or serious personal injury or even death.

Electrical safety

If the information on electrical safety is not observed either at all or to the extent necessary, electric shock, fire and/or serious personal injury or death may occur.

1. Prior to switching on the product, always ensure 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.
2. In the case of products of safety class I with movable power cord and connector, operation is permitted only on sockets with a protective conductor contact and protective conductor.
3. Intentionally breaking the protective conductor 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.
4. If there is no power switch for disconnecting the product from the AC supply network, or if the power switch is not suitable for this purpose, use the plug of the connecting cable to disconnect the product from the AC supply network. In such cases, always ensure that the power plug is easily reachable and accessible at all times. For example, if the power plug is the disconnecting device, the length of the connecting cable must not exceed 3 m. Functional or electronic switches are not suitable for providing disconnection from the AC supply network. If products without power switches are integrated into racks or systems, the disconnecting device must be provided at the system level.
5. Never use the product if the power cable is damaged. Check the power cables on a regular basis to ensure that they are in proper operating condition. 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, for example, tripping over the cable or suffering an electric shock.

6. The product may be operated only from TN/TT supply networks fuse-protected with max. 16 A (higher fuse only after consulting with the Rohde & Schwarz group of companies).
7. Do not insert the plug into sockets that are dusty or dirty. Insert the plug firmly and all the way into the socket provided for this purpose. Otherwise, sparks that result in fire and/or injuries may occur.
8. Do not overload any sockets, extension cords or connector strips; doing so can cause fire or electric shocks.
9. For measurements in circuits with voltages V_{rms} > 30 V, suitable measures (e.g. appropriate measuring equipment, fuse protection, current limiting, electrical separation, insulation) should be taken to avoid any hazards.
10. Ensure that the connections with information technology equipment, e.g. PCs or other industrial computers, comply with the IEC60950-1/EN60950-1 or IEC61010-1/EN 61010-1 standards that apply in each case.
11. Unless expressly permitted, never remove the cover or any part of the housing while the product is in operation. Doing so will expose circuits and components and can lead to injuries, fire or damage to the product.
12. If a product is to be permanently installed, the connection between the protective conductor terminal on site and the product's protective conductor must be made first before any other connection is made. The product may be installed and connected only by a licensed electrician.
13. For permanently installed equipment without built-in fuses, circuit breakers or similar protective devices, the supply circuit must be fuse-protected in such a way that anyone who has access to the product, as well as the product itself, is adequately protected from injury or damage.
14. Use suitable overvoltage protection to ensure that no overvoltage (such as that caused by a bolt of lightning) can reach the product. Otherwise, the person operating the product will be exposed to the danger of an electric shock.
15. Any object that is not designed to be placed in the openings of the housing must not be used for this purpose. Doing so can cause short circuits inside the product and/or electric shocks, fire or injuries.
16. Unless specified otherwise, products are not liquid-proof (see also section "Operating states and operating positions", item 1). Therefore, the equipment must be protected against penetration by liquids. If the necessary precautions are not taken, the user may suffer electric shock or the product itself may be damaged, which can also lead to personal injury.
17. Never use the product under conditions in which condensation has formed or can form in or on the product, e.g. if the product has been moved from a cold to a warm environment. Penetration by water increases the risk of electric shock.
18. Prior to cleaning the product, disconnect it completely from the power supply (e.g. AC supply network or battery). Use a soft, non-linting cloth to clean the product. Never use chemical cleaning agents such as alcohol, acetone or diluents for cellulose lacquers.

Operation

1. Operating the products requires special training and intense concentration. Make sure that persons who use the products are physically, mentally and emotionally fit enough to do so; otherwise, injuries or material damage may occur. It is the responsibility of the employer/operator to select suitable personnel for operating the products.

2. Before you move or transport the product, read and observe the section titled "Transport".
3. As with all industrially manufactured goods, the use of substances that induce an allergic reaction (allergens) such as nickel cannot be generally excluded. If you develop an allergic reaction (such as a skin rash, frequent sneezing, red eyes or respiratory difficulties) when using a Rohde & Schwarz product, consult a physician immediately to determine the cause and to prevent health problems or stress.
4. Before you start processing the product mechanically and/or thermally, or before you take it apart, be sure to read and pay special attention to the section titled "Waste disposal/Environmental protection", item 1.
5. Depending on the function, certain products such as RF radio equipment can produce an elevated level of electromagnetic radiation. Considering that unborn babies require increased protection, pregnant women must be protected by appropriate measures. Persons with pacemakers may also be exposed to risks from electromagnetic radiation. The employer/operator must evaluate workplaces where there is a special risk of exposure to radiation and, if necessary, take measures to avert the potential danger.
6. Should a fire occur, the product may release hazardous substances (gases, fluids, etc.) that can cause health problems. Therefore, suitable measures must be taken, e.g. protective masks and protective clothing must be worn.
7. Laser products are given warning labels that are standardized according to their laser class. Lasers can cause biological harm due to the properties of their radiation and due to their extremely concentrated electromagnetic power. If a laser product (e.g. a CD/DVD drive) is integrated into a Rohde & Schwarz product, absolutely no other settings or functions may be used as described in the product documentation. The objective is to prevent personal injury (e.g. due to laser beams).
8. EMC classes (in line with CISPR 11)
   Class A: Equipment suitable for use in all environments except residential environments and environments that are directly connected to a low-voltage supply network that supplies residential buildings.
   Class B: Equipment suitable for use in residential environments and environments that are directly connected to a low-voltage supply network that supplies residential buildings.

Repair and service

1. The product may be opened only by authorized, specially trained personnel. Before any work is performed on the product or before the product is opened, it must be disconnected from the AC supply network. Otherwise, personnel will be exposed to the risk of an electric shock.
2. Adjustments, replacement of parts, maintenance and repair may be performed only by electrical experts 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, protective conductor test, insulation resistance measurement, leakage current measurement, functional test). This helps ensure the continued safety of the product.

Batteries and rechargeable batteries/cells

If the information regarding batteries and rechargeable batteries/cells is not observed either at all or to the extent necessary, product users may be exposed to the risk of explosions, fire and/or serious personal injury, and, in some cases, death. Batteries and rechargeable batteries with alkaline electrolytes (e.g. lithium cells) must be handled in accordance with the EN 62133 standard.

1. Cells must not be taken apart or crushed.
2. Cells or batteries must not be exposed to heat or fire. Storage in direct sunlight must be avoided. Keep cells and batteries clean and dry. Clean soiled connectors using a dry, clean cloth.
3. Cells or batteries must not be short-circuited. Cells or batteries must not be stored in a box or in a drawer where they can short-circuit each other, or where they can be short-circuited by other conductive materials. Cells and batteries must not be removed from their original packaging until they are ready to be used.
4. Cells and batteries must not be exposed to any mechanical shocks that are stronger than permitted.
5. If a cell develops a leak, the fluid must not be allowed to come into contact with the skin or eyes. If contact occurs, wash the affected area with plenty of water and seek medical aid.
6. Improperly replacing or charging cells or batteries that contain alkaline electrolytes (e.g. lithium cells) can cause explosions. Replace cells or batteries only with the matching Rohde & Schwarz type (see parts list) in order to ensure the safety of the product.
7. Cells and batteries must be recycled and kept separate from residual waste. Rechargeable batteries and normal batteries that contain lead, mercury or cadmium are hazardous waste. Observe the national regulations regarding waste disposal and recycling.

Transport

1. The product may be very heavy. Therefore, the product must be handled with care. In some cases, the user may require a suitable means of lifting or moving the product (e.g. with a lift-truck) to avoid back or other physical injuries.
2. Handles on the products are designed exclusively to enable personnel to transport the product. It is therefore not permissible to use handles to fasten the product to or on transport equipment such as cranes, fork lifts, wagons, etc. The user is responsible for securely fastening the products to or on the means of transport or lifting. Observe the safety regulations of the manufacturer of the means of transport or lifting. Noncompliance can result in personal injury or material damage.
3. If you use the product in a vehicle, it is the sole responsibility of the driver to drive the vehicle safely and properly. The manufacturer assumes no responsibility for accidents or collisions. Never use the product in a moving vehicle if doing so could distract the driver of the vehicle. Adequately secure the product in the vehicle to prevent injuries or other damage in the event of an accident.

Waste disposal/Environmental protection

1. Specially marked equipment has a battery or accumulator that must not be disposed of with unsorted municipal waste, but must be collected separately. It may only be disposed of at a suitable collection point or via a Rohde & Schwarz customer service center.

2. Waste electrical and electronic equipment must not be disposed of with unsorted municipal waste, but must be collected separately.
   Rohde & Schwarz GmbH & Co. KG has developed a disposal concept and takes full responsibility for take-back obligations and disposal obligations for manufacturers within the EU. Contact your Rohde & Schwarz customer service center for environmentally responsible disposal of the product.
3. If products or their 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 by specially trained personnel. Improper disassembly may be hazardous to your health. National waste disposal regulations must be observed.
4. If handling the product releases 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. The improper disposal of hazardous substances or fuels can cause health problems and lead to environmental damage.

For additional information about environmental protection, visit the Rohde & Schwarz website.

Instrucciones de seguridad elementales

¡Es imprescindible leer y cumplir las siguientes instrucciones e informaciones de seguridad!

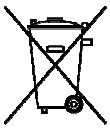
El principio del grupo de empresas Rohde & Schwarz consiste en tener nuestros productos siempre al día con los estándares de seguridad y de ofrecer a nuestros clientes el máximo grado de seguridad. Nuestros productos y todos los equipos adicionales son siempre fabricados y examinados según las normas de seguridad vigentes. Nuestro sistema de garantía de calidad controla constantemente que sean cumplidas estas normas. El presente producto ha sido fabricado y examinado según el certificado de conformidad adjunto de la UE y ha salido de nuestra planta en estado impecable según los estándares técnicos de seguridad. Para poder preservar este estado y garantizar un funcionamiento libre de peligros, el usuario deberá atenerse a todas las indicaciones, informaciones de seguridad y notas de alerta. El grupo de empresas Rohde & Schwarz está siempre a su disposición en caso de que tengan preguntas referentes a estas informaciones de seguridad.

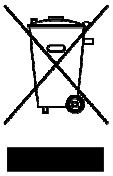
Además queda en la responsabilidad del usuario utilizar el producto en la forma debida. Este producto está destinado exclusivamente al uso en la industria y el laboratorio o, si ha sido expresamente autorizado, para aplicaciones de campo y de ninguna manera deberá ser utilizado de modo que alguna persona/cosa pueda sufrir daño. El uso del producto fuera de sus fines definidos o sin tener en cuenta las instrucciones del fabricante queda en la responsabilidad del usuario. El fabricante no se hace en ninguna forma responsable de consecuencias a causa del mal uso del producto.

Se parte del uso correcto del producto para los fines definidos si el producto es utilizado conforme a las indicaciones de la correspondiente documentación del producto y dentro del margen de rendimiento definido (ver hoja de datos, documentación, informaciones de seguridad que siguen). El uso del producto hace necesarios conocimientos técnicos y ciertos conocimientos del idioma inglés. Por eso se debe tener en cuenta que el producto solo pueda ser operado por personal especializado o personas instruidas en profundidad con las capacidades correspondientes. Si fuera necesaria indumentaria de seguridad para el uso de productos de Rohde & Schwarz, encontraría la información debida en la documentación del producto en el capítulo correspondiente. Guarde bien las informaciones de seguridad elementales, así como la documentación del producto, y entréguelas a usuarios posteriores.

Tener en cuenta las informaciones de seguridad sirve para evitar en lo posible lesiones o daños por peligros de toda clase. Por eso es imprescindible leer detalladamente y comprender por completo las siguientes informaciones de seguridad antes de usar el producto, y respetarlas durante el uso del producto. Deberán tenerse en cuenta todas las demás informaciones de seguridad, como p. ej. las referentes a la protección de personas, que encontrarán en el capítulo correspondiente de la documentación del producto y que también son de obligado cumplimiento. En las presentes informaciones de seguridad se recogen todos los objetos que distribuye el grupo de empresas Rohde & Schwarz bajo la denominación de "producto", entre ellos también aparatos, instalaciones así como toda clase de accesorios. Los datos específicos del producto figuran en la hoja de datos y en la documentación del producto.

Símbolos y definiciones de seguridad

Símbolo	Significado	Símbolo	Significado
	Aviso: punto de peligro general Observar la documentación del producto		Tensión de alimentación de PUESTA EN MARCHA / PARADA
	Atención en el manejo de dispositivos de peso elevado		Indicación de estado de espera (standby)
	Peligro de choque eléctrico		Corriente continua (DC)
	Advertencia: superficie caliente		Corriente alterna (AC)
	Conexión a conductor de protección		Corriente continua / Corriente alterna (DC/AC)
	Conexión a tierra		El aparato está protegido en su totalidad por un aislamiento doble (reforzado)
	Conexión a masa		Distintivo de la UE para baterías y acumuladores Más información en la sección "Eliminación/protección del medio ambiente", punto 1.

Símbolo	Significado	Símbolo	Significado
	Aviso: Cuidado en el manejo de dispositivos sensibles a la electrostática (ESD)		Distintivo de la UE para la eliminación por separado de dispositivos eléctricos y electrónicos Más información en la sección "Eliminación/protección del medio ambiente", punto 2.
	Advertencia: rayo láser Más información en la sección "Funcionamiento", punto 7.		

Palabras de señal y su significado

En la documentación del producto se utilizan las siguientes palabras de señal con el fin de advertir contra riesgos y peligros.

PELIGRO identifica un peligro inminente con riesgo elevado que provocará muerte o lesiones graves si no se evita.

ADVERTENCIA identifica un posible peligro con riesgo medio de provocar muerte o lesiones (graves) si no se evita.

ATENCIÓN identifica un peligro con riesgo reducido de provocar lesiones leves o moderadas si no se evita.

AVISO indica la posibilidad de utilizar mal el producto y, como consecuencia, dañarlo.
En la documentación del producto se emplea de forma sinónima el término CUIDADO.

Las palabras de señal corresponden a la definición habitual para aplicaciones civiles en el área económica europea. Pueden existir definiciones diferentes a esta definición en otras áreas económicas o en aplicaciones militares. Por eso se deberá tener en cuenta que las palabras de señal aquí descritas sean utilizadas siempre solamente en combinación con la correspondiente documentación del producto 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 interpretaciones equivocadas y tener por consecuencia daños en personas u objetos.

Estados operativos y posiciones de funcionamiento

El producto solamente debe ser utilizado según lo indicado por el fabricante respecto a los estados operativos y posiciones de funcionamiento sin que se obstruya la ventilación. Si no se siguen las indicaciones del fabricante, pueden producirse choques eléctricos, incendios y/o lesiones graves con posible consecuencia de muerte. En todos los trabajos deberán ser tenidas en cuenta las normas nacionales y locales de seguridad del trabajo y de prevención de accidentes.

1. Si no se convino de otra manera, es para los productos Rohde & Schwarz válido lo que sigue: como posición de funcionamiento se define por principio la posición con el suelo de la caja para abajo, modo de protección IP 2X, uso solamente en estancias interiores, utilización hasta 2000 m sobre el nivel del mar, transporte hasta 4500 m sobre el nivel del mar. Se aplicará una tolerancia de ±10 % sobre el voltaje nominal y de ±5 % sobre la frecuencia nominal. Categoría de sobrecarga eléctrica 2, índice de suciedad 2.
2. No sitúe el producto encima de superficies, vehículos, estantes o mesas, que por sus características de peso o de estabilidad no sean aptos para él. Siga siempre las instrucciones de instalación del fabricante cuando instale y asegure el producto en objetos o estructuras (p. ej. paredes y estantes). Si se realiza la instalación de modo distinto al indicado en la documentación del producto, se pueden causar lesiones o, en determinadas circunstancias, incluso la muerte.
3. No ponga el producto sobre aparatos que generen calor (p. ej. radiadores o calefactores). La temperatura ambiente no debe superar la temperatura máxima especificada en la documentación del producto o en la hoja de datos. En caso de sobrecalentamiento del producto, pueden producirse choques eléctricos, incendios y/o lesiones graves con posible consecuencia de muerte.

Seguridad eléctrica

Si no se siguen (o se siguen de modo insuficiente) las indicaciones del fabricante en cuanto a seguridad eléctrica, pueden producirse choques eléctricos, incendios y/o lesiones graves con posible consecuencia de muerte.

1. Antes de la puesta en marcha del producto se deberá comprobar siempre que la tensión preseleccionada en el producto coincida con la de la red de alimentación eléctrica. Si es necesario modificar el ajuste de tensión, también se deberán cambiar en caso dado los fusibles correspondientes del producto.
2. Los productos de la clase de protección I con alimentación móvil y enchufe individual solamente podrán enchufarse a tomas de corriente con contacto de seguridad y con conductor de protección conectado.
3. Queda prohibida la interrupción intencionada del conductor de protección, tanto en la toma de corriente como en el mismo producto. La interrupción puede tener como consecuencia el riesgo de que el producto sea fuente de choques eléctricos. Si se utilizan cables alargadores o regletas de enchufe, deberá garantizarse la realización de un examen regular de los mismos en cuanto a su estado técnico de seguridad.
4. Si el producto no está equipado con un interruptor para desconectarlo de la red, o bien si el interruptor existente no resulta apropiado para la desconexión de la red, el enchufe del cable de conexión se deberá considerar como un dispositivo de desconexión.
   El dispositivo de desconexión se debe poder alcanzar fácilmente y debe estar siempre bien accesible. Si, p. ej., el enchufe de conexión a la red es el dispositivo de desconexión, la longitud del cable de conexión no debe superar 3 m).
   Los interruptores selectores o electrónicos no son aptos para el corte de la red eléctrica. Si se integran productos sin interruptor en bastidores o instalaciones, se deberá colocar el interruptor en el nivel de la instalación.
5. No utilice nunca el producto si está dañado el cable de conexión a red. Compruebe regularmente el correcto estado de los cables de conexión a red. Asegúrese, mediante las medidas de protección y de instalación adecuadas, de que el cable de conexión a red no pueda ser dañado o de que nadie pueda ser dañado por él, p. ej. al tropezar o por un choque eléctrico.

6. Solamente está permitido el funcionamiento en redes de alimentación TN/TT aseguradas con fusibles de 16 A como máximo (utilización de fusibles de mayor amperaje solo previa consulta con el grupo de empresas Rohde & Schwarz).
7. 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. La no observación de estas medidas puede provocar chispas, fuego y/o lesiones.
8. No sobrecargue las tomas de corriente, los cables alargadores o las regletas de enchufe ya que esto podría causar fuego o choques eléctricos.
9. En las mediciones en circuitos de corriente con una tensión U_{eff} > 30 V se deberán tomar las medidas apropiadas para impedir cualquier peligro (p. ej. medios de medición adecuados, seguros, limitación de tensión, corte protector, aislamiento etc.).
10. Para la conexión con dispositivos informáticos como un PC o un ordenador industrial, debe comprobarse que éstos cumplan los estándares IEC60950-1/EN60950-1 o IEC61010-1/EN 61010-1 válidos en cada caso.
11. A menos que esté permitido expresamente, no retire nunca la tapa ni componentes de la carcasa mientras el producto esté en servicio. Esto pone a descubierto los cables y componentes eléctricos y puede causar lesiones, fuego o daños en el producto.
12. Si un producto se instala en un lugar fijo, se deberá primero conectar el conductor de protección fijo con el conductor de protección del producto antes de hacer cualquier otra conexión. La instalación y la conexión deberán ser efectuadas por un electricista especializado.
13. En el caso de dispositivos fijos que no estén provistos de fusibles, interruptor automático ni otros mecanismos de seguridad similares, el circuito de alimentación debe estar protegido de modo que todas las personas que puedan acceder al producto, así como el producto mismo, estén a salvo de posibles daños.
14. Todo producto debe estar protegido contra sobretensión (debida p. ej. a una caída del rayo) mediante los correspondientes sistemas de protección. Si no, el personal que lo utilice quedará expuesto al peligro de choque eléctrico.
15. No debe introducirse en los orificios de la caja del aparato ningún objeto que no esté destinado a ello. Esto puede producir cortocircuitos en el producto y/o puede causar choques eléctricos, fuego o lesiones.
16. Salvo indicación contraria, los productos no están impermeabilizados (ver también el capítulo "Estados operativos y posiciones de funcionamiento", punto 1). Por eso es necesario tomar las medidas necesarias para evitar la entrada de líquidos. En caso contrario, existe peligro de choque eléctrico para el usuario o de daños en el producto, que también pueden redundar en peligro para las personas.
17. No utilice el producto en condiciones en las que pueda producirse o ya se hayan producido condensaciones sobre el producto o en el interior de éste, como p. ej. al desplazarlo de un lugar frío a otro caliente. La entrada de agua aumenta el riesgo de choque eléctrico.
18. Antes de la limpieza, desconecte por completo el producto de la alimentación de tensión (p. ej. red de alimentación o batería). Realice la limpieza de los aparatos con un paño suave, que no se deshilache. No utilice bajo ningún concepto productos de limpieza químicos como alcohol, acetona o diluyentes para lacas nitrocelulósicas.

Funcionamiento

1. El uso del producto requiere instrucciones especiales y una alta concentración durante el manejo. Debe asegurarse que las personas que manejen el producto estén a la altura de los requerimientos necesarios en cuanto a aptitudes físicas, psíquicas y emocionales, ya que de otra manera no se pueden excluir lesiones o daños de objetos. El empresario u operador es responsable de seleccionar el personal usuario apto para el manejo del producto.
2. Antes de desplazar o transportar el producto, lea y tenga en cuenta el capítulo "Transporte".
3. Como con todo producto de fabricación industrial no puede quedar excluida en general la posibilidad de que se produzcan alergias provocadas por algunos materiales empleados —los llamados alérgenos (p. ej. el níquel)—. Si durante el manejo de productos Rohde & Schwarz se producen reacciones alérgicas, como p. ej. irritaciones cutáneas, estornudos continuos, enrojecimiento de la conjuntiva o dificultades respiratorias, debe avisarse inmediatamente a un médico para investigar las causas y evitar cualquier molestia o daño a la salud.
4. Antes de la manipulación mecánica y/o térmica o el desmontaje del producto, debe tenerse en cuenta imprescindiblemente el capítulo "Eliminación/protección del medio ambiente", punto 1.
5. Ciertos productos, como p. ej. las instalaciones de radiocomunicación RF, pueden a causa de su función natural, emitir una radiación electromagnética aumentada. Deben tomarse todas las medidas necesarias para la protección de las mujeres embarazadas. También las personas con marcapasos pueden correr peligro a causa de la radiación electromagnética. El empresario/operador tiene la obligación de evaluar y señalizar las áreas de trabajo en las que exista un riesgo elevado de exposición a radiaciones.
6. Tenga en cuenta que en caso de incendio pueden desprenderse del producto sustancias tóxicas (gases, líquidos etc.) que pueden generar daños a la salud. Por eso, en caso de incendio deben usarse medidas adecuadas, como p. ej. máscaras antigás e indumentaria de protección.
7. Los productos con láser están provistos de indicaciones de advertencia normalizadas en función de la clase de láser del que se trate. Los rayos láser pueden provocar daños de tipo biológico a causa de las propiedades de su radiación y debido a su concentración extrema de potencia electromagnética. En caso de que un producto Rohde & Schwarz contenga un producto láser (p. ej. un lector de CD/DVD), no debe usarse ninguna otra configuración o función aparte de las descritas en la documentación del producto, a fin de evitar lesiones (p. ej. debidas a irradiación láser).
8. Clases CEM (según CISPR 11)
   Clase A: dispositivo apropiado para el uso en cualquier zona excepto en áreas residenciales y en aquellas zonas que se encuentran conectadas a una red de suministro de baja tensión que alimenta un edificio de viviendas.
   Clase B: dispositivo apropiado para el uso en áreas residenciales y en aquellas zonas que se encuentran conectadas a una red de suministro de baja tensión que alimenta un edificio de viviendas.

Reparación y mantenimiento

1. El producto solamente debe ser abierto por personal especializado con autorización para ello. Antes de manipular el producto o abrirlo, es obligatorio desconectarlo de la tensión de alimentación, para evitar toda posibilidad de choque eléctrico.

2. El ajuste, el cambio de partes, el mantenimiento y la reparación deberán ser efectuadas solamente por electricistas autorizados por Rohde & Schwarz. Si se reponen partes con importancia para los aspectos de seguridad (p. ej. el enchufe, los transformadores o los fusibles), solamente podrán ser sustituidos por partes originales. Después de cada cambio de partes relevantes para la seguridad deberá realizarse un control de seguridad (control a primera vista, control del conductor de protección, medición de resistencia de aislamiento, medición de la corriente de fuga, control de funcionamiento). Con esto queda garantizada la seguridad del producto.

Baterías y acumuladores o celdas

Si no se siguen (o se siguen de modo insuficiente) las indicaciones en cuanto a las baterías y acumuladores o celdas, pueden producirse explosiones, incendios y/o lesiones graves con posible consecuencia de muerte. El manejo de baterías y acumuladores con electrolitos alcalinos (p. ej. celdas de litio) debe seguir el estándar EN 62133.

1. No deben desmontarse, abrirse ni triturarse las celdas.
2. Las celdas o baterías no deben someterse a calor ni fuego. Debe evitarse el almacenamiento a la luz directa del sol. Las celdas y baterías deben mantenerse limpias y secas. Limpiar las conexiones sucias con un paño seco y limpio.
3. Las celdas o baterías no deben cortocircuitarse. Es peligroso almacenar las celdas o baterías en estuches o cajones en cuyo interior puedan cortocircuitarse por contacto recíproco o por contacto con otros materiales conductores. No deben extraerse las celdas o baterías de sus embalajes originales hasta el momento en que vayan a utilizarse.
4. Las celdas o baterías no deben someterse a impactos mecánicos fuertes indebidos.
5. En caso de falta de estanqueidad de una celda, el líquido vertido no debe entrar en contacto con la piel ni los ojos. Si se produce contacto, lavar con agua abundante la zona afectada y avisar a un médico.
6. En caso de cambio o recarga inadecuados, las celdas o baterías que contienen electrolitos alcalinos (p. ej. las celdas de litio) pueden explotar. Para garantizar la seguridad del producto, las celdas o baterías solo deben ser sustituidas por el tipo Rohde & Schwarz correspondiente (ver lista de recambios).
7. Las baterías y celdas deben reciclarse y no deben tirarse a la basura doméstica. Las baterías o acumuladores que contienen plomo, mercurio o cadmio deben tratarse como residuos especiales. Respete en esta relación las normas nacionales de eliminación y reciclaje.

Transporte

1. El producto puede tener un peso elevado. Por eso es necesario desplazarlo o transportarlo con precaución y, si es necesario, usando un sistema de elevación adecuado (p. ej. una carretilla elevadora), a fin de evitar lesiones en la espalda u otros daños personales.
2. Las asas instaladas en los productos sirven solamente de ayuda para el transporte del producto por personas. Por eso no está permitido utilizar las asas para la sujeción en o sobre medios de transporte como p. ej. grúas, carretillas elevadoras de horquilla, carros etc. Es responsabilidad suya fijar los productos de manera segura a los medios de transporte o elevación. Para evitar daños personales o daños en el producto, siga las instrucciones de seguridad del fabricante del medio de transporte o elevación utilizado.

3. Si se utiliza el producto dentro de un vehículo, recae de manera exclusiva en el conductor la responsabilidad de conducir el vehículo de manera segura y adecuada. El fabricante no asumirá ninguna responsabilidad por accidentes o colisiones. No utilice nunca el producto dentro de un vehículo en movimiento si esto pudiera distraer al conductor. Asegure el producto dentro del vehículo debidamente para evitar, en caso de un accidente, lesiones u otra clase de daños.

Eliminación/protección del medio ambiente

1. Los dispositivos marcados contienen una batería o un acumulador que no se debe desechar con los residuos domésticos sin clasificar, sino que debe ser recogido por separado. La eliminación se debe efectuar exclusivamente a través de un punto de recogida apropiado o del servicio de atención al cliente de Rohde & Schwarz.
2. Los dispositivos eléctricos usados no se deben desechar con los residuos domésticos sin clasificar, sino que deben ser recogidos por separado.
   Rohde & Schwarz GmbH & Co.KG ha elaborado un concepto de eliminación de residuos y asume plenamente los deberes de recogida y eliminación para los fabricantes dentro de la UE. Para desechar el producto de manera respetuosa con el medio ambiente, diríjase a su servicio de atención al cliente de Rohde & Schwarz.
3. Si se trabaja de manera mecánica y/o térmica cualquier producto o componente más allá del funcionamiento previsto, pueden liberarse sustancias peligrosas (polvos con contenido de metales pesados como p. ej. plomo, berilio o níquel). Por eso el producto solo debe ser desmontado por personal especializado con formación adecuada. Un desmontaje inadecuado puede ocasionar daños para la salud. Se deben tener en cuenta las directivas nacionales referentes a la eliminación de residuos.
4. En caso de que durante el trato del producto se formen sustancias peligrosas o combustibles que deban tratarse como residuos especiales (p. ej. refrigerantes o aceites de motor con intervalos de cambio definidos), deben tenerse en cuenta las indicaciones de seguridad del fabricante de dichas sustancias y las normas regionales de eliminación de residuos. Tenga en cuenta también en caso necesario las indicaciones de seguridad especiales contenidas en la documentación del producto. La eliminación incorrecta de sustancias peligrosas o combustibles puede causar daños a la salud o daños al medio ambiente.

Se puede encontrar más información sobre la protección del medio ambiente en la página web de Rohde & Schwarz.

Qualitätszertifikat
Certificate of quality
Certificat de qualité

Certified Quality System
ISO 9001

Certified Environmental System
ISO 14001

Sehr geehrter Kunde,
Sie haben sich für den Kauf eines Rohde&Schwarz-Produktes entschieden. Hiermit erhalten Sie ein nach modernsten Fertigungsmethoden hergestelltes Produkt. Es wurde nach den Regeln unseres Qualitätsmanagementsystems entwickelt, gefertigt und geprüft. Das Rohde&Schwarz-Qualitätsmanagementsystem ist u.a. nach ISO 9001 und ISO 14001 zertifiziert.

Der Umwelt verpflichtet
- Energie-effiziente, RoHS-konforme Produkte
- Kontinuierliche Weiterentwicklung nachhaltiger Umweltkonzepte
- ISO 14001-zertifiziertes Umweltmanagementsystem

Dear Customer,
You have decided to buy a Rohde&Schwarz product. You are thus assured of receiving a product that is manufactured using the most modern methods available. This product was developed, manufactured and tested in compliance with our quality management system standards. The Rohde&Schwarz quality management system is certified according to standards such as ISO 9001 and ISO 14001.

Environmental commitment
- Energy-efficient products
- Continuous improvement in environmental sustainability
- ISO 14001-certified environmental management system

Cher client,
Vous avez choisi d'acheter un produit Rohde&Schwarz. Vous disposez donc d'un produit fabriqué d'après les méthodes les plus avancées. Le développement, la fabrication et les tests respectent nos normes de gestion qualité. Le système de gestion qualité de Rohde&Schwarz a été homologué, entre autres, conformément aux normes ISO 9001 et ISO 14001.

Engagement écologique
- Produits à efficience énergétique
- Amélioration continue de la durabilité environnementale
- Système de gestion de l'environnement certifié selon ISO 14001

ROHDE&SCHWARZ

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Customer Support

Technical support – where and when you need it

For quick, expert help with any Rohde & Schwarz equipment, contact one of our Customer Support Centers. A team of highly qualified engineers provides telephone support and will work with you to find a solution to your query on any aspect of the operation, programming or applications of Rohde & Schwarz equipment.

Up-to-date information and upgrades

To keep your instrument up-to-date and to be informed about new application notes related to your instrument, please send an e-mail to the Customer Support Center stating your instrument and your wish. We will take care that you will get the right information.

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ROHDE&SCHWARZ

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Table of Contents

Documentation Map

The user documentation describes the virtual power meter software R&S NRPV, comprising the following topics:

- Installation software
- Release Notes for the most current information
- Manual in pdf format
- Online help system in html format
- Data sheet, including brochure and specification in printable form
- Operating manuals of the R&S NRP-Zxx power sensors
- Links to different useful sites in the R&S Internet

Versions for pdf and chm

It is recommended that you use Adobe® Reader® for pdf files. The latest Adobe® Reader® version for Windows is provided on the Website http://www.adobe.com.

Manual - Chapter Overview

Chapter 1, this chapter, introduces to the virtual power meter software R&S NRPV.

Chapter 2 "System Setup" on page 5 provides information required to prepare the application for power measurement. The chapter covers soft- and hardware requirements, describes how to install the software on a personal computer and how to get the application started.

Chapter 3 "Quick Start Guide" on page 23 covers a short description of the application and some basic information about power measurement. To quickly get started, a step-by step procedure describes how to perform a continuous average measurement.

Chapter 4 "Operating Concept" on page 46 introduces the operating concept with the basic components of the graphical user interface and how to operate.

Chapter 5 "Settings - GUI Reference" on page 67 describes menus and functions of the application in detail.

The "Appendix" on page 183 provides an index and makes familiar with the conventions used in this manual. It covers information on warning messages and R&S information for customer support and service.

1 Welcome to R&S®NRPV...

… the power meter software application for R&S Instruments

This chapter introduces to the R&S NRPV Virtual Power Meter, including main features, scope and system overview. A chapter overview gives information about the contents of this manual.

1.1 Introduction

The power meter software application R&S NRPV represents power measurement for the most relevant frequency bands and power classes. By communicating with R&S NRP-Zxx Power Sensors the program covers a wide range of applications. Besides the basic continuous average measurement function, R&S NRPV also includes the measurement modes timeslot, burst and scope measurement.

Sensors of the R&S NRP-Zxx series are highly accurate standalone measuring instruments. With their internal CPU the R&S NRP-Zxx Power Sensors process the measurement results and communicate directly with a PC via an USB connection. With a high dynamic range and automatic error correction the power sensors are suitable for nearly every measurement task. As an example, among other duties, the R&S NRP-Z81 is able to measure pulse parameters automatically, and the R&S NRPV Virtual Power Meter software represents the results.

For measurements of any number of R&S NRP-Zxx power sensors the graphical user interface of R&S NRPV offers functionality and operation comparable to a multi-channel oscilloscope.

1.2 Main Features

The R&S NRPV represents all sensor features and settings virtual and supports the following measurement modes:

- **Trace** measurement for representing signal power in time domain. In communication with an e.g. R&S NRP-Z8x power sensor R&S NRPV also supports **pulse analysis**.

- Numerical measurements modes as
  - **Continuous** mode to measure the average power of continuous signals
  - **Burst** mode to analyze pulsed signals. R&S NRPV automatically recognizes the start and end of a burst. It is possible to exclude pulse build up and decay phases, for example to omit signal overshoots.
  - **Timeslot** mode to display the values in a defined time segment. The start and stop of a pulse signal can be excluded optionally, for example to fade out slow edges. It is also possible to exclude time domains during measurements, for example if power fails in certain ranges.
  - **Gates** mode to exclude time segments during a measurement
- **Statistics** measurements to evaluate the ratio of the signal density/distribution versus power

Several measurements can be set up in parallel. While one measurement is active, the others are in standby mode. Switching between the measurements and activating another measurement is very fast. The application acquires data, processes and evaluates it, and visualizes the results graphically and/or numerically.

1.3 Scope of Applications

R&S NRPV covers apart from other functions the following fields of application:

- test setups and procedures for **power amplifiers**
- measuring the **frequency** and/or **level response**
- fast measurement of the **transmission characteristics** of filters, amplifiers and frequency converters over a large frequency and dynamic range
- measurement on **radar systems** and their components
- measurements compliant with major communication **base station standards** such as GSM, WCDMA, etc.

2 System Setup

System setup provides information required to prepare the application for power measurement. The chapter contains soft- and hardware requirements, describes how to install the software on a personal computer and how to get started.

The R&S NRPV Virtual Power Meter is provided free of charge on the internet at the download site of Rohde & Schwarz:

http://www.rohde-schwarz.com/product/NRPZ.html

Power measurement with an R&S NRP-Zxx series power sensor is activated by purchasing a license key for each sensor.

Contact the R&S sales department for purchase. The license key comes with an instruction to activate the power sensor in the R&S NRPV Virtual Power Meter.

2.1 Hardware

For controlling the sensors by a PC the following hardware prerequisites must be fulfilled:

Table 2-1: Hardware requirements

	Minimum
CPU	Pentium IV 1 GHz or higher
RAM	1 Gbyte
Hard disk	50 Mbyte free space
Monitor	XGA monitor (1024 x 768)
Interfaces	USB 1.1 or USB 2.0

2.1.1 Accessories (optionally)

- High-speed hubs for USB 2.0 with own power supply for connecting several power sensors. For information on recommended USB hubs refer to "Multiple Measurement Setup" on page 12.
- R&S NRP-Z3, active USB adapter cable 3

  Provides applications requiring external triggering of the power sensor and offers separate power supply.

- R&S NRP-Z4, passive USB adapter cable

  Provides handling the transmission of settings and measurement data and the power supply of the sensor via the USB bus.

- R&S NRP-Z5, 4 port USB hub adapter box

  The R&S NRP-Z5 Sensor Hub covers a high-speed USB 2.0 hub. This sensor hub allows connection of up to four R&S NRP-Zxx power sensors, and various trigger modes, such as:

  - bidirectional triggering from a host, like a PC or an R&S instrument
  - internal triggering
  - external synchronous triggering
  - triggering in master mode together with the R&S NRP-Z8x sensors.

  Connection to a sensor is possible with the USB adapter cable R&S NRP-Z4 and with corresponding cable extensions (as follows).

  The R&S NRP-Z5 can be connected to a PC either with the R&S NRP-Z4 adappter cable, or with a standard USB cable. Separate power supply is not required.

- R&S NRP-Z2, extension cable .

  Sensor extension cords of 3 m, of 5 m up to 10 m cable length are available.

2.1.2 Supported R&S NRP-Zxx Power Sensors

Table 2-2: Supported R&S NRP-Zxx Power Sensors

Sensor	Cont Av	Trace	Timeslot	Statistics
NRP-Z11	X	X	X	
NRP-Z21	X	X	X	
NRP-Z22	X	X	X	
NRP-Z23	X	X	X	
NRP-Z24	X	X	X	
NRP-Z27	X			
NRP-Z28	X	X	X	
NRP-Z31	X	X	X	
NRP-Z37	X			
NRP-Z51	X			
NRP-Z52	X			
NRP-Z55	X			
NRP-Z56	X			
NRP-Z57	X			
NRP-Z81	X	X	X	X
NRP-Z85	X	X	X	X
NRP-Z86	X	X	X	X
NRP-Z91	X			
NRP-Z92	X			
NRP-Z98	X			

2.2 Software

The R&S NRPV Virtual Power Meter software runs on PCs with Microsoft®Windows operating system.

R&S NRPV is available free of charge. You can find the program:

`NRPV_SetupV1.x.y.z.exe`

at the R&S website:

http://www.rohde-schwarz.com/product/NRPZ.html

x, **y** and **z** are sub-version and build numbers.

2.2.1 R&S NRPV Software Components

The setup program contains all components required for installation and operation of the R&S NRPV Virtual Power Meter.

These include:

- `RS_NRPV.exe` the executable application file
- `ReleaseNotes.txt` with up-to date notes on the individual components and software versions.
- R&S NRP Toolkit package

  The R&S NRP-Toolkit provides all USB drivers for R&S NRP-Zxx series power sensors. The package also contains some utilities and tools for working with the power sensors.
- Microsoft® Runtime `vcredist_x86.exe`

2.2.2 R&S NRP-Zxx Power Sensor Firmware

Since R&S NRPV works closely with the functionality of the R&S NRP-Zxx power sensors, some sensors might need a newer firmware version. Therefore, R&S NRPV checks the firmware version, when you connect a sensor, or if any sensors are already connected at startup, and lists the sensors that require a firmware update.

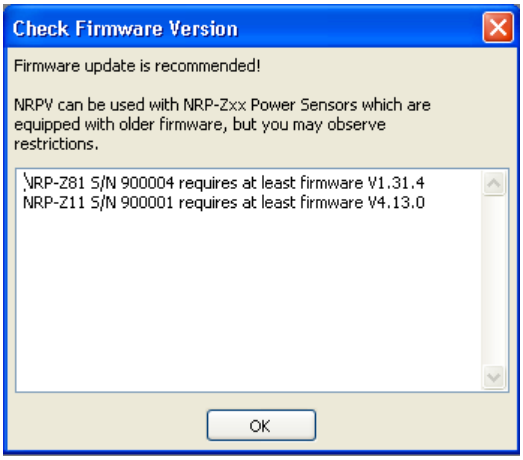


Figure 2-1: Check Firmware Version

To update the sensor firmware, use the R&S NRP Toolkit. You find the latest firmware version in the download area of the R&S website:

http://www.rohde-schwarz.com/product/NRPZ.html

Table 2-3: required firmware versions

	Minimum
R&S NRP-Z1x	V4.13 or later
R&S NRP-Z2x	V4.13 or later
R&S NRP-Z3x	V4.13 or later
R&S NRP-Z5x	V4.13 or later
R&S NRP-Z8x	V1.31.04 or later
R&S NRP-Z9x	V4.13 or later

Note: The Installation wizard of the R&S NRPV also provides installation of the R&S NRP toolkit. The latest version is also available on the R&S website.

2.3 Installing R&S NRPV Virtual Power Meter Software

This section describes the installation of the R&S NRPV software on a Microsoft®Windows based PC. Additionally, the section contains information on the software packages, prerequisites and uninstalling.

Prerequisites

- It is recommended that you use the latest version of the R&S NRPV software. It is provided at the R&S website http://www.rohde-schwarz.com/product/NRPZ.html.
- Close all running applications before installing.

2.3.1 Installation

R&S NRPV requires at least 50 MB of free disk space.

1. Download or copy the latest version of R&S NRPV setup program. from the R&S website http://www.rohde-schwarz.com/product/NRPZ.html.
2. Execute `NRPV_SetupV1.x.y.z.exe`,
   and follow the instructions of the setup wizard.

During installation, the setup program:
- installs the "Microsoft VC Runtime libraries", which may take some time.
- updates a former version of the NRP Toolkit automatically
- provides selection of the toolkit components
- provides selection of the destination directories for the R&S NRPV and NRP Toolkit application files.

2.3.2 Uninstalling R&S NRPV

Uninstall a version of R&S NRPV with the aid of the PC´s control panel:

1. "Start > Settings > Control Panel" in the windows task bar and then open the "Add or Remove Programs" dialog.
2. Select R&S NRPV **Virtual Power Meter V1.x.y.z** and uninstall the program with "Remove" (x.y.z. represents the version).

2.4 Connecting R&S Power Sensors and the PC

This section shows some basic test setups and briefly describes the connecting.

NOTICE

Putting the R&S NRP-Zxx Power Sensor into Operation

- Functions and features your R&S power sensor is described in the corresponding operating manual of the sensor, included in delivery.
- To prevent damage to the sensor, precisely follow the instructions on how to put the sensor into operation.
- Make sure that all sensors are connected to the PC (either directly or via USB hubs) when starting R&S NRPV. For Information on how to check that an R&S NRP-Zxx is working properly see "Check that an R&S NRP-Zxx is working properly" on page 20.

  Note: At the moment the program operates with maximum 4 sensors. An extension is intended for future releases.

If an R&S NRP-Zxx power sensor is being connected to the PC the first time, the application installs the USB driver for the sensor automatically. USB drivers for the NRP-Zxx sensors are provided by the R&S NRP-Toolkit.

2.4.1 Single Measurement Setup

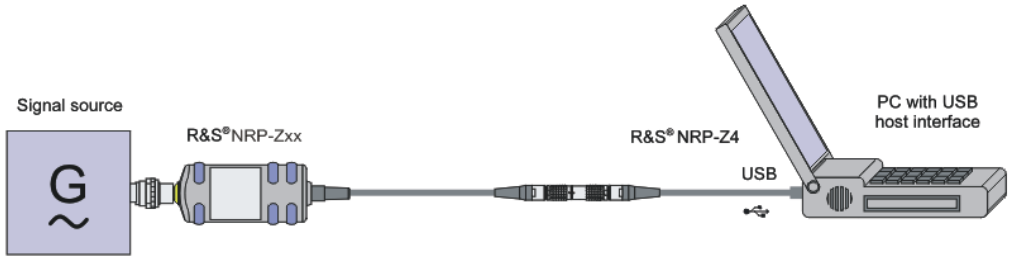


Figure 2-2: Measurement setup with a passive adapter cable R&S NRP-Z4

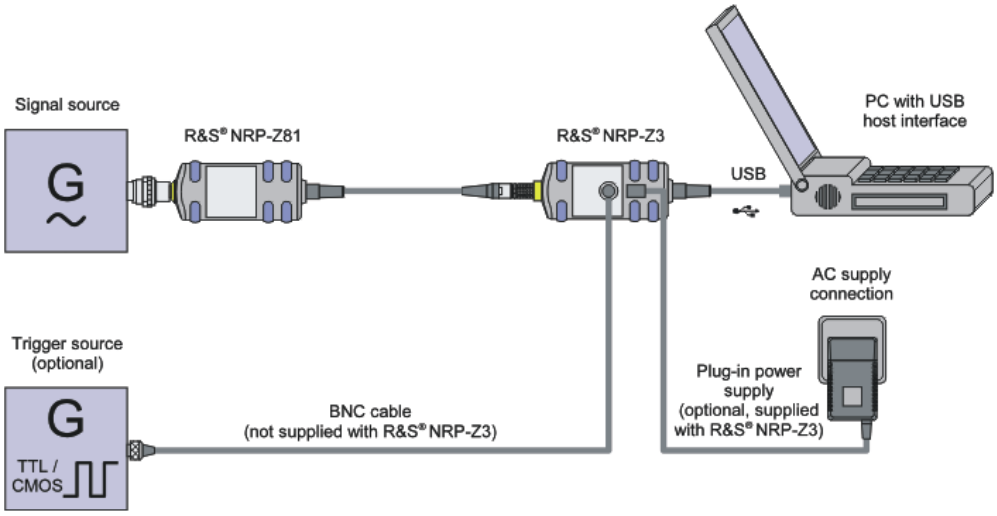


Figure 2-3: Measurement setup with an active adapter cable R&S NRP-Z3

1. Connect the R&S NRP-Zxx power sensor with the USB port of the PC using the R&S NRP-Z3 or R&S NRP-Z4 adapter cables.
2. Connect the signal source (DUT - Device Under Test) and the power sensor.

2.4.2 Multiple Measurement Setup

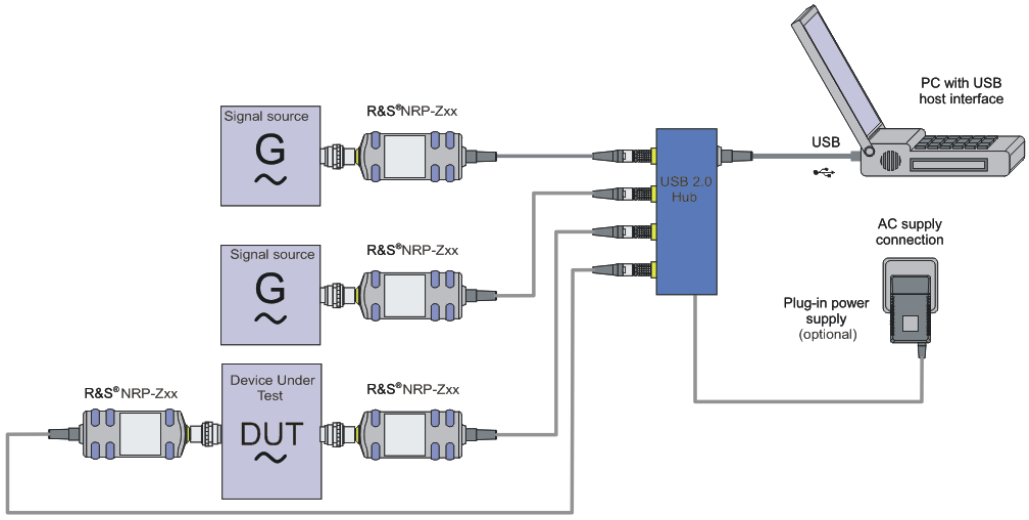


Figure 2-4: Multiple measurement setup with a USB 2.0 hub

If more than one NRP-Zxx power sensor will be used it is likely that a USB Hub is necessary. It is recommended that you use an R&S NRP-Z5 Sensor Hub which perfectly fits to R&S power sensors.

1. Connect the R&S NRP-Zxx power sensors and the USB hub using the R&S NRP-Z3 or R&S NRP-Z4 adapter cables
2. Connect the USB Hub's upstream port to a USB port of the PC.
3. Connect the signal sources and the power sensors

The following section provides additional information related to the USB interface and information on operating multiple sensors simultaneously.

Multiple Sensors

If multiple sensors need to be connected to a single computer, make sure that the USB equipment is able to provide the required amount of current for all sensors. Depending on the sensor type, each sensor draws between 300 mA and 500 mA.

Example:

The R&S NRP-Z81 sensor is rated up to 500 mA supply current. Using 4 sensors simultaneously on one USB hub requires a total current of at least 2 Amperes.

Even if the rated current values are given in the data sheets, commercially available USB hubs often do not reliably provide this amount of supply current over a long period of time.

It is recommended that you use the R&S NRP-Z5 Sensor Hub, a 4 port USB hub adapter box, which perfectly fits to R&S power sensors.

Otherwise, for industrial-grade applications USB hubs for DIN rail mount can provide up to 1 Ampere per USB port and run off a 24 V power supply.

The following manufacturers provide such devices:

Beckhoff www.beckhoff.com CU8005

Luetze http://www.luetze.de 745581 DIOHUB USB 4

2.4.3 Complex Measurement Setup

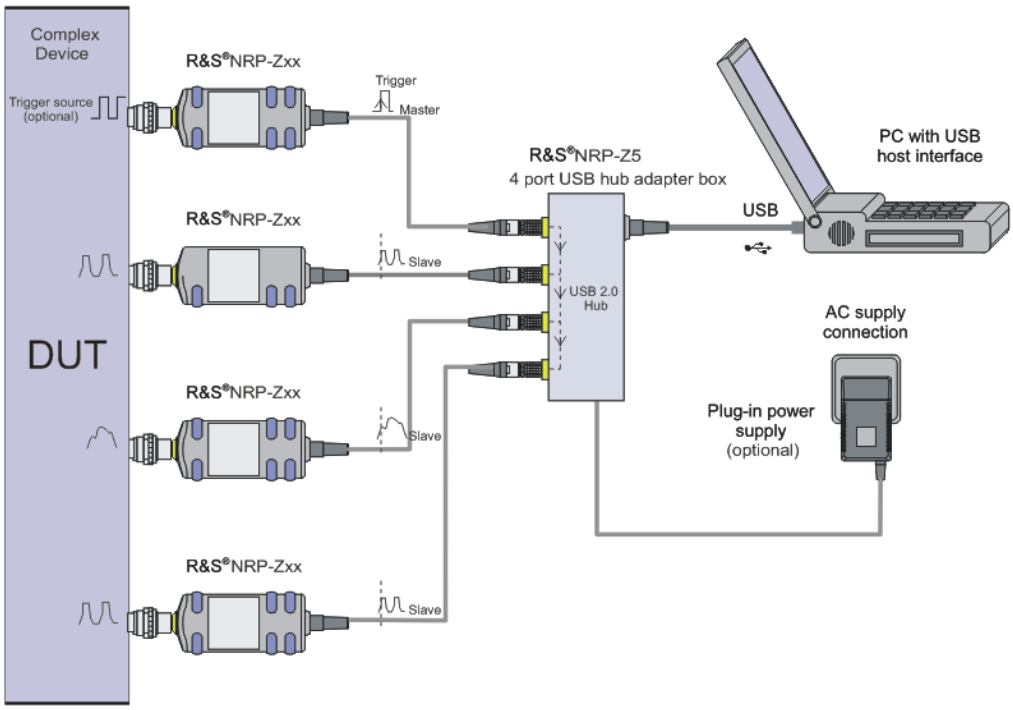


Figure 2-5: Complex measurement setup with a 4 port USB hub adapter box R&S NRP-Z5

1. Connect the plug in power supply
2. Connect the external trigger source
3. Connect the R&S NRP-Zxx power sensors and the USB hub using the R&S NRP-Z3 or R&S NRP-Z4 adapter cables
4. Connect the signal sources and the power sensors

2.5 Starting the R&S NRPV Software

License required

Power measurement with R&S NRP-Zxx Power Sensors and R&S NRPV requires a license key for activating the sensor. Contact the R&S sales department for purchase.

If you already purchased license(s), refer to “Activate an R&S NRP-Zxx Power Sensor in ” > “Activating with License” on page 17 for activating your sensor in the R&S NRPV.

If a sensor is connected without a license, you can activate the sensor temporarily, for example, to explore the functionality of the software. See “Activate an R&S NRP-Zxx Power Sensor in ” > “Activating without License for Temporary Use” on page 19.

► Start R&S NRPV either via:

- the menu Start > Programs > NRPV Virtual Power Meter > R&S NRPV Virtual Power Meter, or

Figure 2-6: Start R&S NRPV

- an icon on the desktop (via shortcut), or

Figure 2-7: R&S NRPV Desktop icon

- directly via `%PROGRAMFILES%\Rohde-Schwarz\RS_NRPV.exe`, where `%PROGRAMFILES%` is a system variable and refers to the directory, programs are installed in.

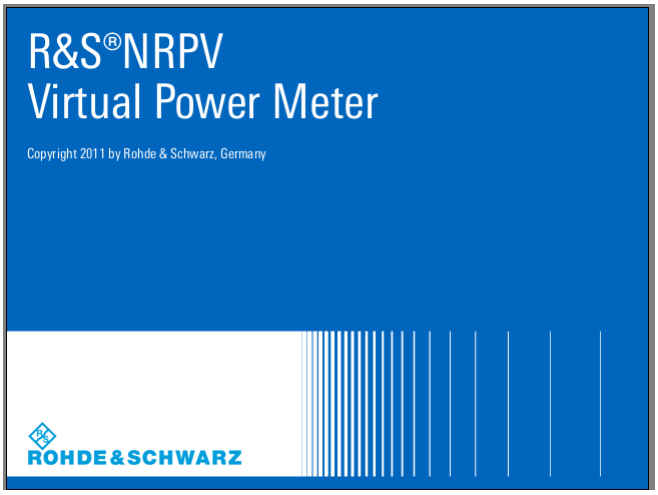


Figure 2-8: Startup Screen

Immediately after turning on the start screen appears until the application is ready for operation. The application opens in a specific presettable configuration, ”Startup Configuration” on page 72.

R&S NRPV Startup Configuration

In this dialog you can select the following startup configuration:

- the last active state
- a user definable mode, specified in a task file.
- default settings

2.6 Activate an R&S NRP-Zxx Power Sensor in R&S NRPV

A power sensor needs to be activated for performing power measurements with R&S NRPV.

If you already purchased a license key for your sensor, proceed as described in the following chapter. Alternatively, to get to know R&S NRPV, and to evaluate the scope of its benefits, you can activate a power sensor for temporary use without license key.

2.6.1 Activating with License

In the delivery you find a license key that unlocks your R&S NRP-Zxx sensor in the R&S NRPV Virtual Power Meter. If you liked to perform tasks with several power-sensors, you need a license key for each sensor.

To activate, proceed as follows:

1. Start R&S NRPV and first connect the sensor.
2. Select "File > Licensing"

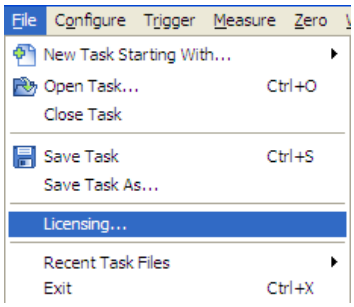


Figure 2-9: File > Sensor licensing

The "Licensing NRP-Z Power Sensors for NRPV" dialog opens.

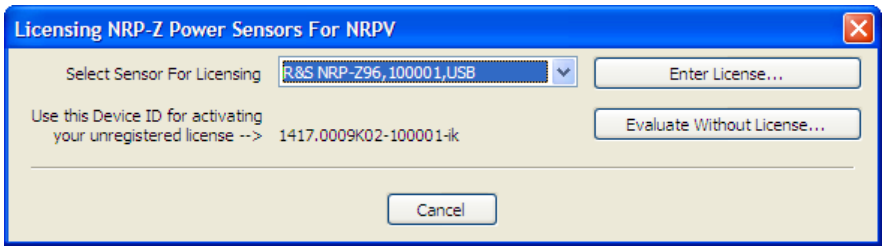


Figure 2-10: Licensing NRP-Z Power Sensor for R&S NRPV

The "Licensing NRP-Z Power Sensors for R&S NRPV" dialog indicates all currently connected sensors for selection.

3. Select the sensor and click "Enter License".

The "License Activation" subdialog opens.

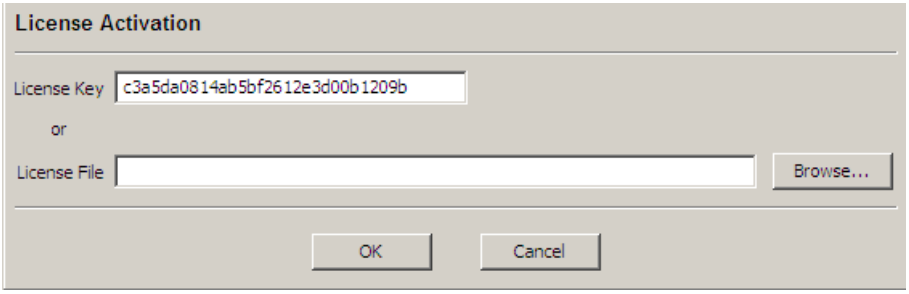


Figure 2-11: License Activation

4. Enter the license key either manually or with the key code file.
5. Confirm with "OK" to return to the "Licensing NRP-Z Power Sensors for NRPV" dialog.

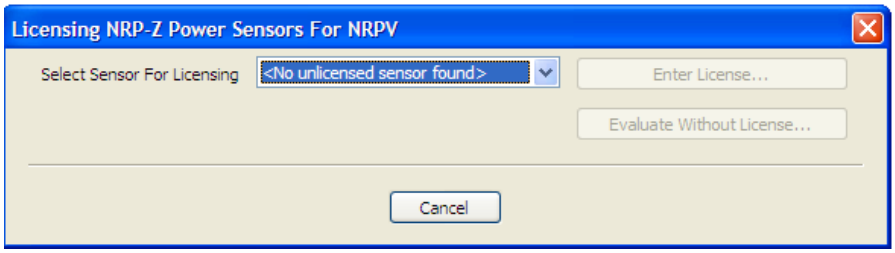


Figure 2-12: Licensing NRP-Z Power Sensor for R&S NRPV > completed

Are there still sensors listed, repeat the process for each one, provided you have the appropriate number of licenses.

The <No unknown sensor found> message confirms that no unlicensed sensor is connected.

All sensors are enabled and ready for operation with R&S NRPV.

2.6.2 Activating without License for Temporary Use

If you want to evaluate the R&S NRPV Virtual Power Meter before buying a license for your R&S NRP-Zxx power sensor:

1. Click “Evaluate Without License…”

   This function activates your power sensor for a period of time.

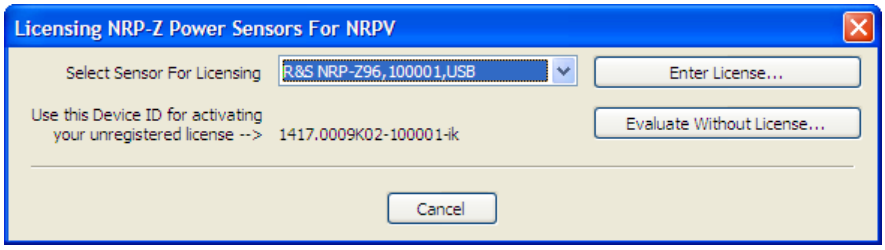


Figure 2-13: Licensing NRP-Z Power Sensor for R&S NRPV > evaluate without license

   The "Input Text" dialog opens and displays a code sequence for activation.

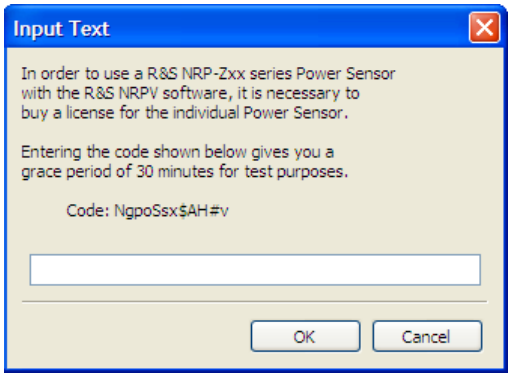


Figure 2-14: Licensing NRP-Z Power Sensor for R&S NRPV > code without license

2. Enter the displayed “Code” string exactly as shown in the "Input Text" dialog box. The coding is case sensitive.

   The code is generated randomly and changes with each new call.

Power sensors which are enabled temporarily show a thin red bar beneath their icon in the program’s status bar. The length of this bar decreases until the evaluation period is expired.

2.7 Troubleshooting for Setup Related Problems

This chapter contains information to possibly arising problems concerning restrictions, the USB interface or if several sensors are attached.

2.7.1 Known Restrictions

Only one instance of R&S NRPV can run at a time, multiple program invocation is not supported. At program start, a test routine checks if any other instance is aleady running. If the program is started twice, a warning message pops up.

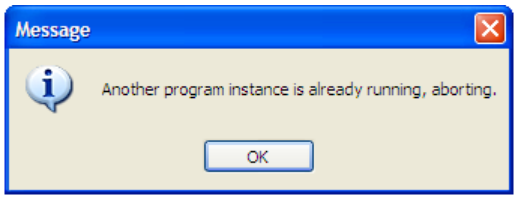


Figure 2-15Single instance warning

A simultaneous operation of R&S NRPV with other software using the R&S NRP-Zxx power sensors (for example R&S Power Viewer Plus) is also not supported.

2.7.2 Check that an R&S NRP-Zxx is working properly

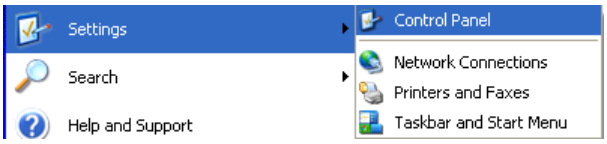


Figure 2-16: Settings > Control Panel

1. Select Start > Settings > Control Panel and open the "System Properties" dialog.

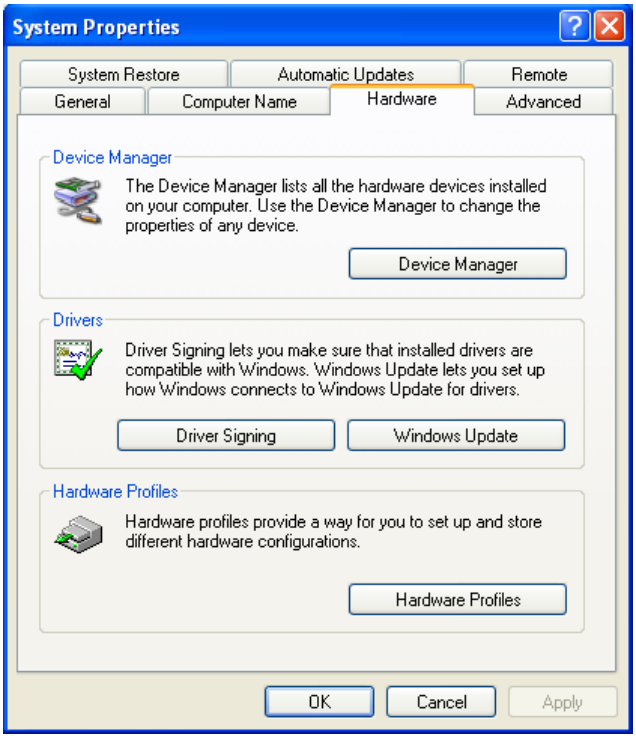


Figure 2-17: System Properties

2. On Hardware tab select Device Manager.

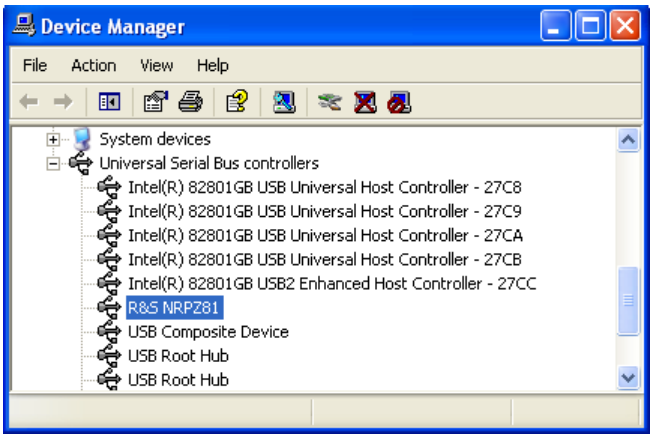


Figure 2-18: Device Manager

If the R&S NRP-Zxx and its drivers are installed and working properly, it is listed in the USB controllers section of the Device Manager. If an unknown device is shown instead, check the items listed in the following section, "USB Related Problems", page 22.

2.7.3 USB Related Problems

Hardware

- Use only high-speed hubs with own power supply.
- Disconnect the power supply of the hub when switching off the computer. Connect the hub's power supply before starting Microsoft® Windows.
- Do not cascade hubs unnecessarily.
- Use only connection cables of high speed USB 2.0 hubs.
- Exchange hub if all points above are not successful.

Software

- Use Microsoft®Windows XP operating system with the latest available service pack for Microsoft®Windows XP, i.e. SP2 or higher.
- Use the latest version of the R&S NRP Toolkit software (version 1.7.9. or higher, available at http://www.rohde-schwarz.com/product/nrp-z under **Downloads > Firmware/Software**).
- Use latest remote control driver (version 1.80 or higher available at http://www.rohde-schwarz.com/product/nrp-z under **Downloads > Drivers**).

3 Quick Start Guide

This chapter contains an introduction to the graphical user interface and some basic information on power measurement. An instruction to perform a standard continuous average power measurement takes the user step-by-step through the information required, while getting used to the R&S NRPV basic modes of operation.

The Quick Start Guide describes...

"GUI Overview" on page 23	This section describes briefly the main components of the user interface. In general, the menus, dialogs and functions are largely self-explanatory. If there are some special points for specific applications or settings, an explanation is given clearly. For detailed information on every item of the GUI refer to "Graphical User Interface (GUI)" on page 46.
"Basic Information on Power Measurement" on page 29	The section contains some information on power measurement for RF and microwave signals and some basically fundamentals for getting started by means of an example of Continuous Average Measurement, described in "Performing an R&S NRPV Measurement" on page 31.
"Setting up the measurement" on page 31	Describes how to prepare a test run, by selecting the power sensor, the signal channel, configuring the test sweep and results display.
"Generating the Test Signal" on page 32	A step-by-step introduction to standard power measurements with R&S NRPV.

3.1 GUI Overview

Starting the R&S NRPV software the main application window opens. The appearance is based on the Microsoft®Windows layout. The main window of the application covers a menu bar with several pull-down menus and a toolbar with icons of the most important functions. Similar to Microsoft®Office functionality, the icon buttons are the alternative possibility for starting a function. The status bar at the bottom of the window covers information on the connected power sensors and the currently active tasks.

3.1.1 Windows

Main application window

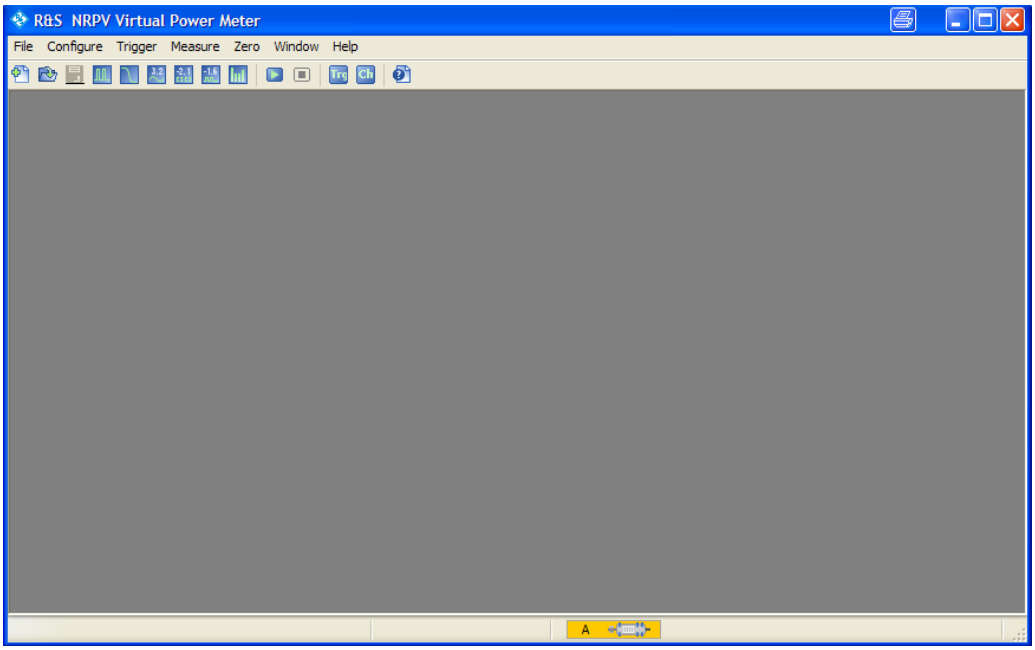


Figure 3-1: Main application window of R&S NRPV

For measurements additional windows open. The appearance of those windows varies, depending on the measurement mode and the required settings.

Measurement windows

Measurement windows look different depending on the measurement mode. It is distinguished between numerical and graphic measurement windows.

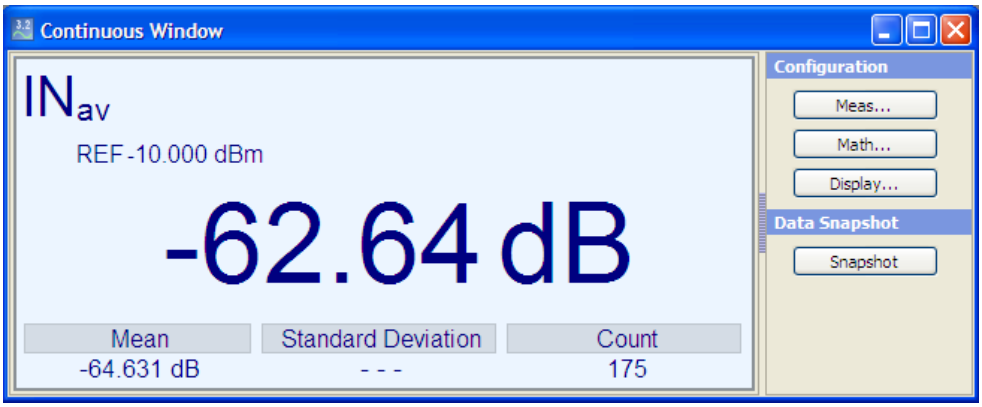


Figure 3-2: Numeric measurement window of R&S NRPV

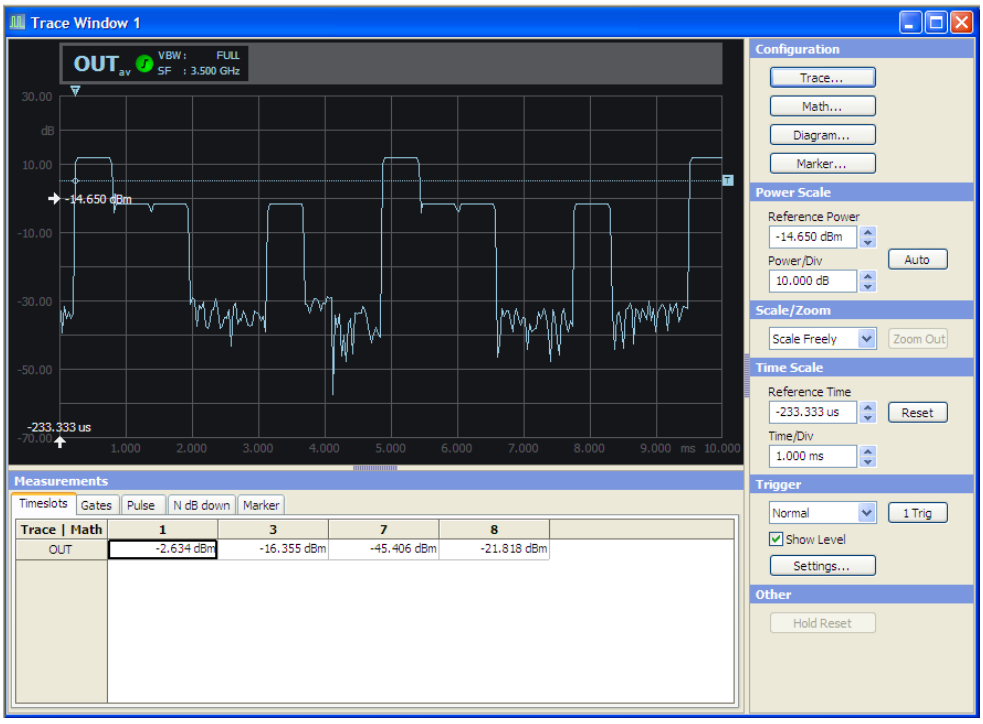


Figure 3-3: Trace window of R&S NRPV

Measurement windows are tiled in several sections. In the display area the measurement results can be graphically displayed. On the right a control panel is located, containing softkeys for calling further submenus and entry fields for measurement related settings. In the lower area of the window, measurement panels indicate numerical measurement results.

Additionally, you can open a context sensitive menu within each results display, providing access to further functions.

3.1.2 Dialogs

Configuration dialogs are designed in Microsoft®Windows format, covering the same main elements, as e.g. entry fields, checkboxes or buttons. Some entry fields are partially structured in tabs. Each dialog provides buttons to apply, to confirm or to cancel the entered settings.

Configuration dialog

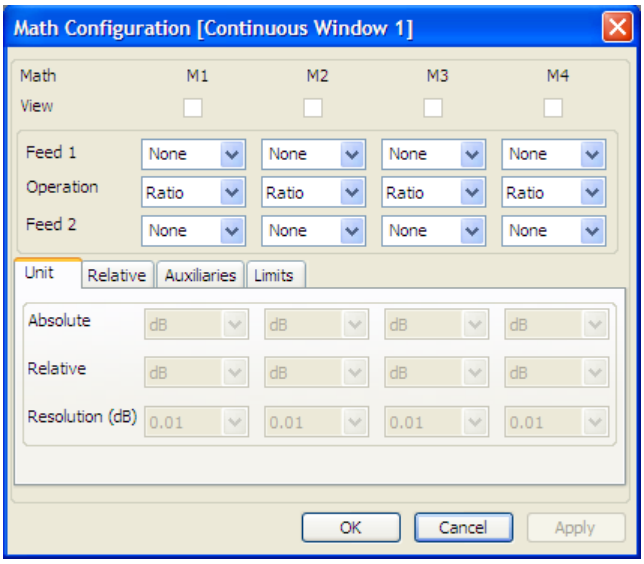


Figure 3-4: Configuration dialog

Configuration dialogs cover entry fields for measurement related settings, partially structured using separate tabs.

3.1.3 Menus

The menu bar R&S NRPV contains main menu items. Some items include submenus with additional functions.

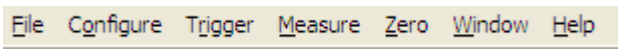


Figure 3-5: Menu bar

The following main menus are available:

- **File:** Contains all functions that belong to file management.
- **Configure:** Contains functions for setting basic measurement parameters, including signal frequency, channel settings and settings of digital standard communication signals. You can also set the colors for all displays and curves individually.

- **Trigger:** Menu for setting the parameters of externally connected trigger sources.
- **Measure:** Menu for selecting the measurement mode.
- **Zero:** Menu for zero error correction.
- **Window:** Menu containing functions for window handling.
- **Help:** R&S NRPV Help.

Menus can be opened with the aid of a mouse or by using the ALT+<key> combination on the keyboard.

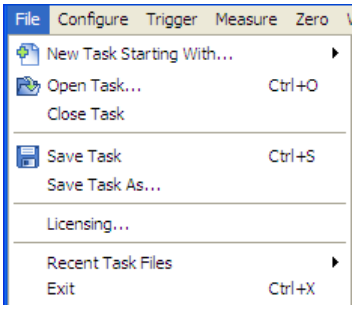


Figure 3-6: Standard menu

Within the results display of a measurement window, you can also access the configuration dialogs and additional functions via context-sensitive menus.

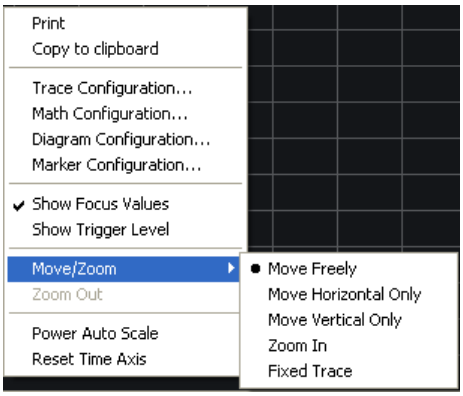


Figure 3-7: Context-sensitive menu

Open a context menu by pressing the right mouse button. Refer to "Context-sensitive Menus" on page 58 for detailed information.

3.1.4 Toolbar

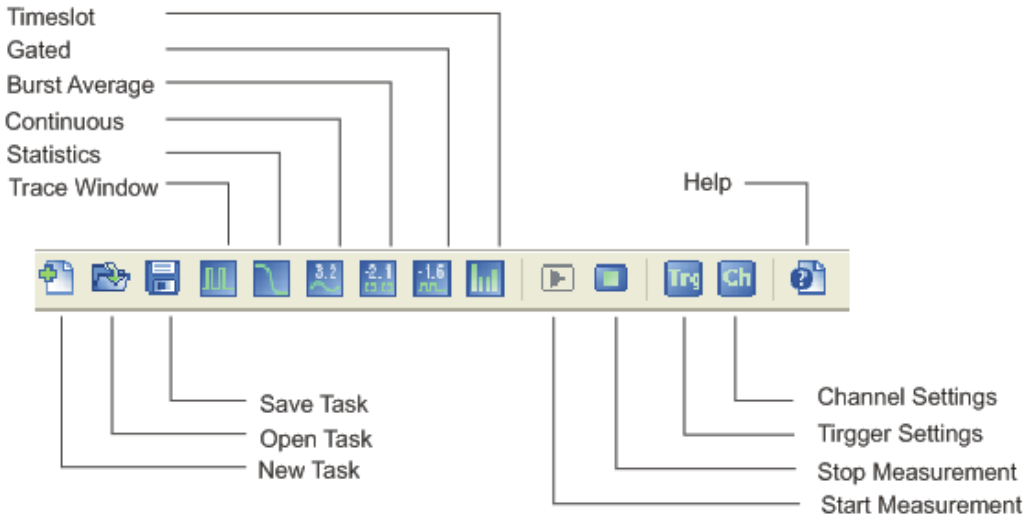


Figure 3-8: Toolbar

The toolbar of the main application window covers icons of the most important functions. The functions can be started from the toolbar by clicking the icon buttons with the mouse. Additionally, various shortcuts are specified to quickly start a function by using the keyboard.

Each icon button features a corresponding item in the menu lists. For detailed assignment on icons and shortcuts to the corresponding functions see "Icons, Toolbar and Shortcuts" on page 59.

3.2 Basic Information on Power Measurement

The following sections contain some information on power measurement for RF and microwave signals and some fundamentals for getting started with the continuous average measurement, described in "Performing an R&S NRPV Measurement" on page 31.

Note: Some contents of the following sections are taken from the R&S brochure *Voltage and Power Measurements - Fundamentals, Definitions, and Products*. The brochure can be downloaded from the R&S Website http://www2.rohde-schwarz.com.

3.2.1 Introduction

The intensity of RF and microwave signals is given in terms of power. On that account measuring electrical power is significant for RF and microwave applications.

With the development of carrier-based telecommunications also the measurement of power, voltage and current has improved. Mainly based on converting electrical energy into heat, direct voltage and current measurement can be made up into the GHz range.

Voltage and current are less appropriate because they depend on the physical characteristics of the transmission medium and field strength. They differ for the same transmitted power. Also, voltage and current can not directly be measured in waveguides and for standing waves large measurement errors occur.

The rate of energy flow, **power**, is the absolute measurable value of the wave intensity. In high frequencies ranges the wavelength the electromagnetic field affects the wave properties and characteristics, caused by lines and subassemblies. To be taken into account for power measurement, wavelength and magnitude of the electromagnetic field are of the same order as the signal wavelength. Additionally, all components in a power transmitter or amplifier, e.g. the AC line connector, the cooling system or coaxial RF output, depend on the magnitude of the RF power.

Besides the effects mentioned above, several critical factors may cause errors in the measurement of RF power. For instance, the loading effects of measuring equipment on the DUT, inherent physical factors or unsuitable probes may increase measurement uncertainty.

To carry out a power measurement correctly, it is essential to assort the most appropriate measurement equipment for the respective application. For a wide variety of tasks R&S provides suitable power meters and power sensors.

3.2.2 Definition of Electrical Power

Power is defined as the amount of energy absorbed or transferred in a system per unit of time. The power transmitted across an interface is then the product of the instantaneous values of current and voltage at that interface.

$p_{(t)} = v_{(t)} \cdot i_{(t)}$

For **sinusoidal signals** encountered in RF and microwave engineering, the instantaneous power $p_{(t)}$ oscillates about the average power at a frequency that is twice that of the original waveform. Only the average power can be measured in practice and is referred to as power *P*. **P** is referred to as **active power** and is related to the RMS voltage ***V***, the RMS current ***I*** and the phase φ by the following equation:

$P = V \cdot I \cdot \cos\varphi$

For **modulated sinusoidal signals** the average of *P* over the modulation period is called the **average power** P_{avg}

This power e.g. is indicated by a thermal power meter (sensor).

3.2.3 Units and Power Level

Electrical power is measured in W [Watt]. Because of the large power ranges that have to be measured, values are usually expressed as the log of a power ratio. A relative power level L_Y is expressed in terms of the log of the ratio of a power *P* to an arbitrary reference power P_0. The units of the power ratios are dB.

$L_Y = 10\ log_{10}\ (P/P_0)\ dB$

Absolute power level L_Y is referred to **1 mW** and measured in dBm:

$L_{abs} = 10\ log_{10}\ (P/1mW)\ dB$

$P = 1 \cdot 10^{Labs/10dBm}\ mW$

A list of corresponding absolute and relative power levels is given in the list below with a range of values of 10^{18}:

Table 3-1: Units and power level

Power P	Level Labs [dBm]	Power Ratio
1 pW	-90	10-9
1 nW	-60	10-6
1 µW	-30	10-3
0,1 µW	-10	0,1
0,25 mW	-6	0,25
0,5 mW	-3	0,5
1 mW	0	1
2 mW	+3	2
4 mW	+6	4
10 mW	+10	10
100 mW	+20	100
1 W	+30	103
1 kW	+60	106
1 MW	+90	109

3.3 Performing an R&S NRPV Measurement

This section describes briefly how to basically set up a power measurement, by using an R&S signal generator as signal source and an R&S NRP-Z81 as the measuring instrument. Due to the power measurement system being terminated, the R&S NRP-Z81 also acts as the load, set up without external triggering and power supply. Source and load are connected to a standard coaxial transmission line with the characteristic impedance. The signal source generates an RF test signal. The R&S NRPV indicates the signal power measured by the R&S NRP-Z81 power sensor. The sensor runs with continuous initialization enabled and thus sends measurement results without waiting for any trigger events.

In continuous average mode the average signal power is continuously measured without the measurement window and signal being synchronized.

Over the duration of the measurement window samples of equally spaced time intervals are taken. A partial measurement is formed from these samples. The results of two adjacent measurement windows are combined and the average is either output as the final result or, as intermediate result, is used to further averaging.

3.3.1 Setting up the measurement

Make sure all required components for setting up the measurement are available:

1. Check that the required system components are available as listed below:
   - PC
   - R&S Power Sensor (e.g. R&S NRP-Z81)
   - R&S Signal Generator
   - passive adapter cable R&S NRP-Z4
2. Check that the system is setup as shown in the figure below:

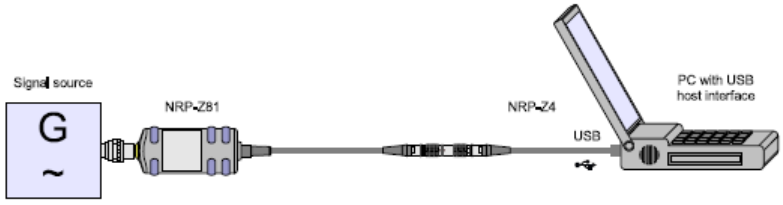


Figure 3-9: Setting up a measurement

Note: In case the hardware components are not connected yet, set up the measurement system as described in "Single Measurement Setup" on page 11.

3. Check that the PC is ready for operation, assumed that all software components are installed as described in "Installing R&S NRPV Virtual Power Meter Software" on page 10.

4. Switch on the R&S Signal Generator.
5. Start R&S NRPV on the PC:

   ► Start > Programs > RS-NRPV > Virtual Power Meter
6. Check that the R&S NRP-Z81 power sensor has reached its operating temperature.

3.3.2 Generating the Test Signal

An RF signal with 1 GHz and 0 dBm level is generated, in accordance with the digital signal standard GSM, a worldwide used TDMA standard for cellular mobile radio networks.

For setting the signal parameters on your generator, proceed as described below:

1. Activate default (preset) state for starting from a known position.
2. Select and activate digital standard signal.
3. Set signal level and frequency.
4. Activate signal output.

3.3.3 Measuring Average Power

3.3.3.1 Channel, Sensor and Signal Frequency Configuration

1. Configure channel settings

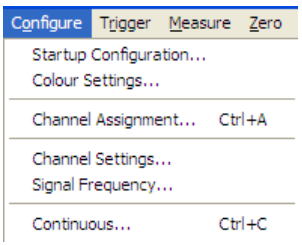


Figure 3-10: Context-sensitive menu

► Configure > Channel Assignment

In the "Channel Assignment" dialog you can assign a short name to a sensor.

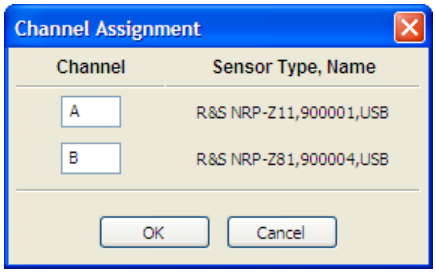


Figure 3-11: Channel assignment dialog

By default, each sensor is denoted by capital letters.

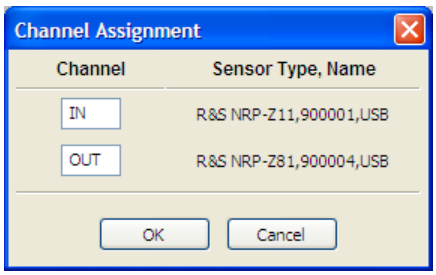


Figure 3-12: Channel assignment > assigned name

At a maximum three letters can be assigned, as for example "IN" or "OUT" etc. Each connected sensor is listed with information on sensor type, serial number and connectivity.

Note: With one power sensor connected the R&S NRPV program automatically assigns the power sensor to channel A.

In case more sensors are connected, proceed as follows:

a. Select the channel intended for measurement.
b. Click Apply to assign the selection.

   Skip these steps if the channel is already activated.

c. Confirm with OK.

2. Zeroing the power sensor

Initializing the power sensor

To prevent any previous settings from causing incorrect results always run a new measurement with reset of the sensor.

Zeroing

Turn off the test signal before zeroing. An active test signal during zeroing causes an error because the measured power is too high.

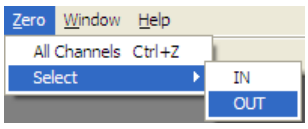


Figure 3-13: Zero channel

► Zero > Select > OUT

Starts zeroing in channel "OUT". This procedure checks the confidence level of the sensor results.

Zeroing takes several seconds. At run time a "Zeroing in progress..." message pops up. When completed the message terminates zeroing successfully or reports an error (Success / Failed).

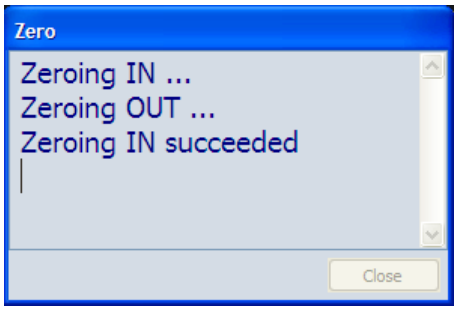


Figure 3-14: Zeroing in process

3. Setting the frequency

   The carrier frequency of the applied signal must be set for reaching the specified measurement accuracy.

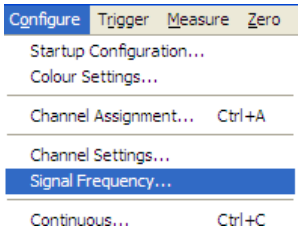


Figure 3-15: Configure > Signal frequency

► Configure > Signal Frequency

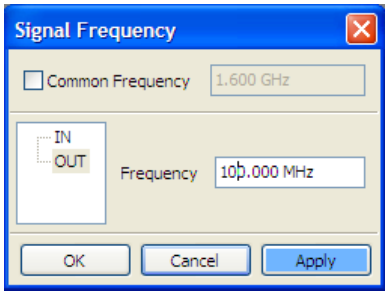


Figure 3-16: Signal frequency dialog

Opens the Signal Frequency dialog to set the signal frequency. The frequency value of the selected channel is indicated.

a. Select the channel intended for measurement.
b. Enter *1.0 GHz* signal frequency.

   Tip: Use a dot as decimal separator.

c. Click "Apply" to assign your entry.
d. Close the dialog with "OK".

3.3.3.2 Measurement Window Configuration

1. Setting up the measurement window

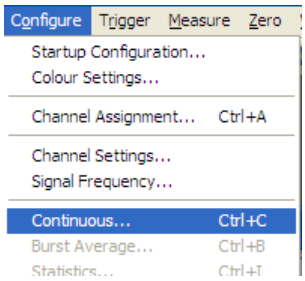


Figure 3-17: Configure > Continuous

► Configure > Continuous

Opens the Continuous Average dialog to enter the aperture time and to activate smoothing.

2. Setting the aperture time

The aperture time defines the size of the measurement window. The aperture time of the selected channel is indicated.

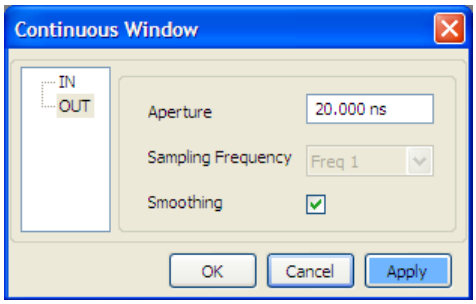


Figure 3-18: Configure Continuous > Aperture time

Measurement window - aperture time

A measurement comprises at least two measurement windows, i.e. 2 x aperture time and a sensor specific dead time of up to 100 µs.

By default an R&S NRP-Z81 wideband power sensor is set to an aperture time of a few microseconds to minimize the inherent noise component in the measurement result.

For an unmodulated signal, as it is in this example, the default setting of 10 µs in conjunction with chopper stabilization provides optimum noise suppression.

a. Select the channel intended for measurement.
b. Enter *10 µs* Aperture time
c. Click "Apply" to confirm your entry.
d. Close with "OK".

3.3.3.3 Execute Measurement

1. Starting the measurement

   a. Turn on the test signal of the signal source.

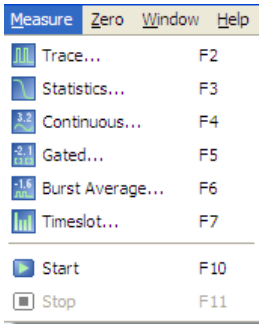


Figure 3-19: Measure menu

   b. Measure > Continuous in the R&S NRPV menu bar.

   Opens the "Continuous" measurement window that is divided into a display area for numerically indicating the measurement results, and a control panel for accessing subdialogs with parameters for measurement, evaluation and display.

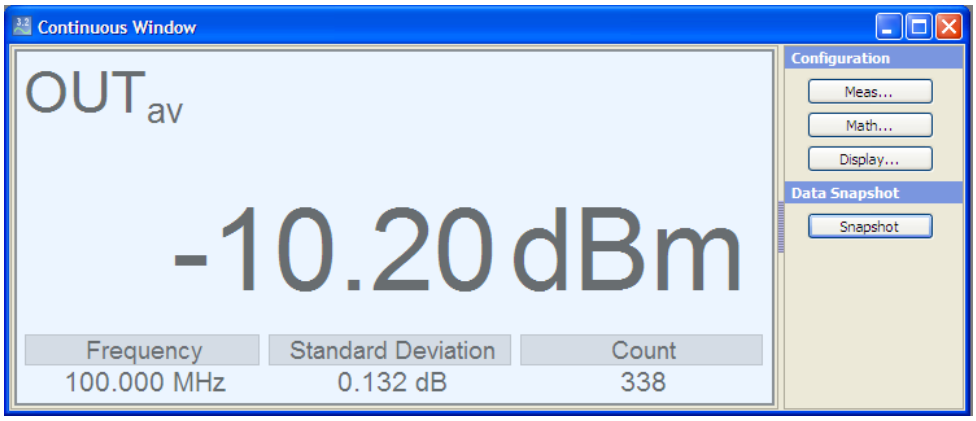


Figure 3-20: Continuous window

   The measurement result is displayed in dBm as the default unit setting for continuous average power measurement.

2. Changing the unit of the measurement result.

   a. Select "Meas..." to open the "Measurement Configuration" dialog.

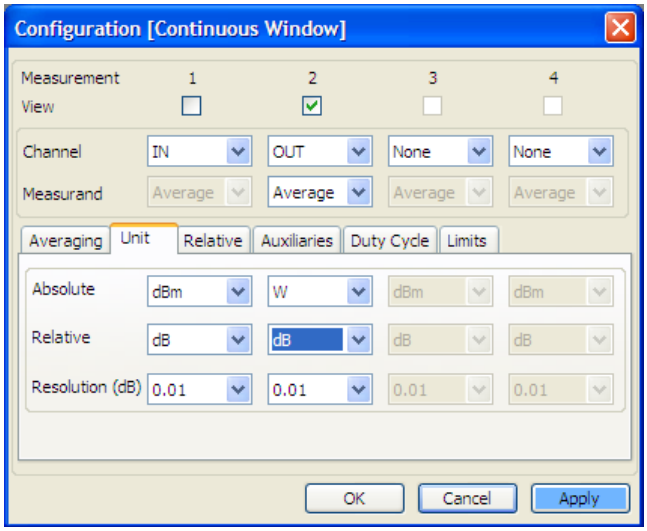


Figure 3-21: Configuration > Continuous window

b. Select the "Unit" tab in the lower area of the dialog.
c. Select "*W* Absolute"
d. Click "Apply" to assign your entry and confirm with "OK".

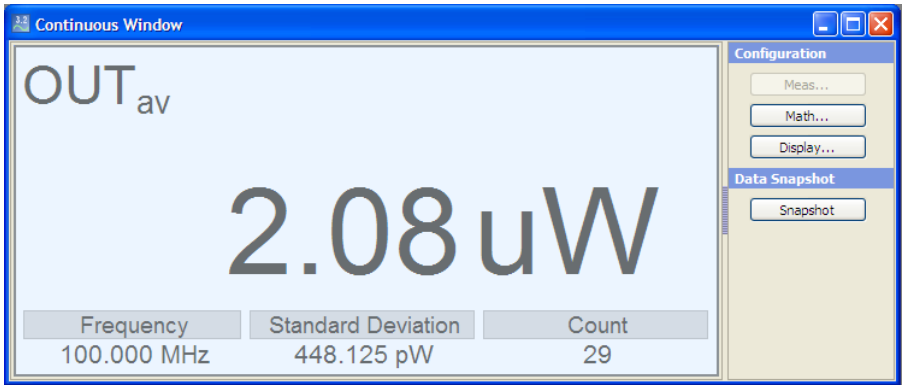


Figure 3-22: Continuos window > results in [Watt]

The measurement result is displayed in [W].

3. Setting a fixed offset correction

   If the signal level is higher than the permissible input level of the sensor, an attenuator is connected between the signal source and the sensor, so that the sensor is not destroyed by the high signal power. In order to adjust the attenuation, an offset correction value must be set. This value compensates the difference between the real signal level and the level at the sensor´s input. Then the indicated measuring value corresponds to the real signal level.

   Sensor related settings are made in the "Channel Settings" dialog.

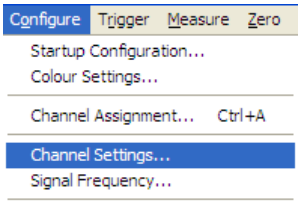


Figure 3-23: Configure > Channel settings

a. "Configure > Channel Settings" in the R&S NRPV menu bar to open the dialog.

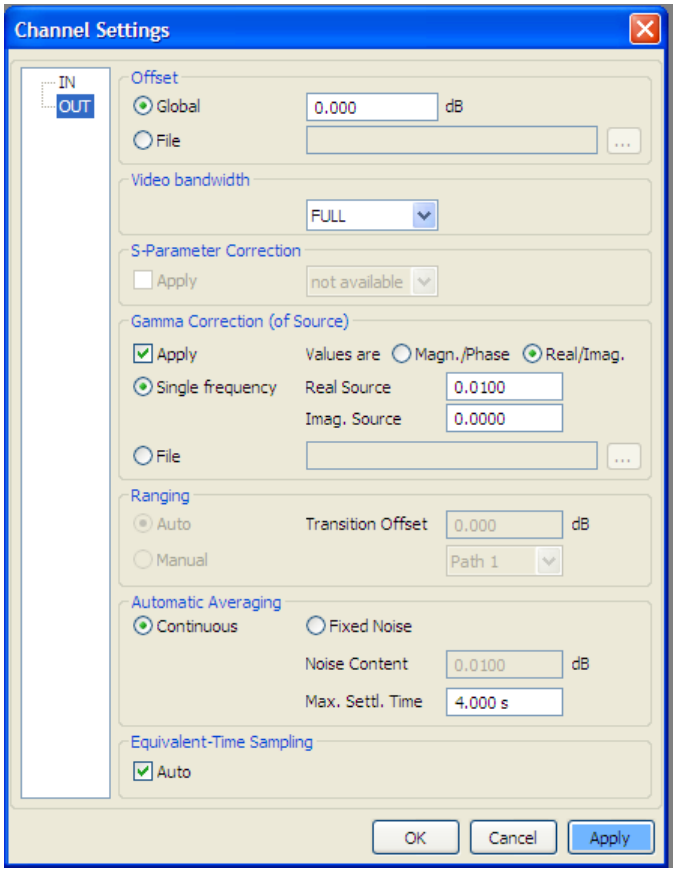


Figure 3-24: Channel settings dialog

b. Activate "Global Offset" and enter the required value, which corresponds to the attenuation value.
c. Select "Apply" to assign your entry and confirm with "OK".

R&S Attenuators

In order to provide that all devices work correctly it is recommended that you use only R&S attenuators. For information on the available R&S attenuators refer to http://rohde-schwarz/Measurement Accessories - Attenuators.

4. Measuring power relative to a reference value

R&S NRPV calculates and displays relative differences between a measured value and a reference value. Reference values can be previously stored values which are recalled, or the reference values can be entered directly.

a. Open the "Measurement Configuration" dialog.

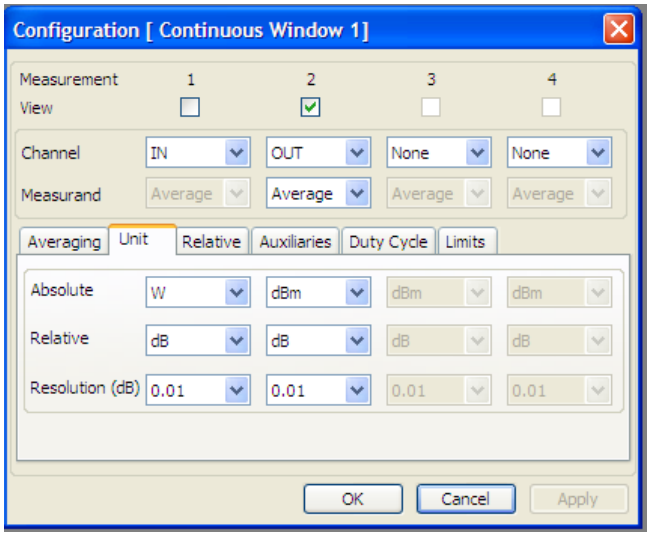


Figure 3-25: Configuration > Continuous > Unit

b. Set the unit to dBm

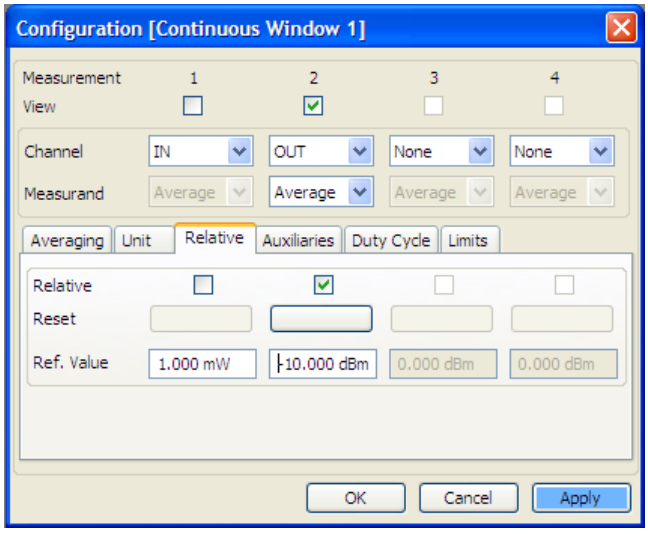


Figure 3-26: Configuration > Continuous > Relative

c. Select the Relative tab.
d. Activate Relative.
e. Enter *-10 dBm* Ref. Value.
f. Click "Apply" to assign your entry and confirm wit "OK".

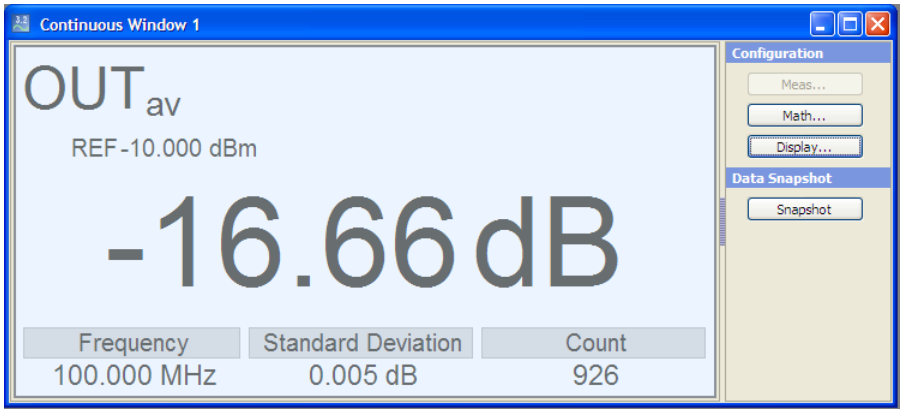


Figure 3-27: Continuos window > reference value indication

The diagram indicates the set reference value and the measuring value relative to this reference, in this example -10 dBm. I.e. the level of the applied signal is -26 dBm. The relative difference between the measured value and the -10 dBm reference value is -16 dBm.

5. Configuring the display

   a. Click "Display..." to open the Display Configuration dialog.

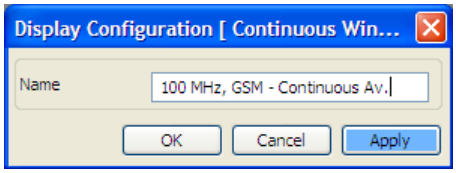


Figure 3-28: Display Configuration > continuos window name

   The "Display Configuration (Continuous Window)" dialog enables you to assign a name to the window.

   b. Assign a suitable name to the measurement window, e.g. enter *1 GHz, GSM - Continuous Av.*

   c. Apply and confirm.

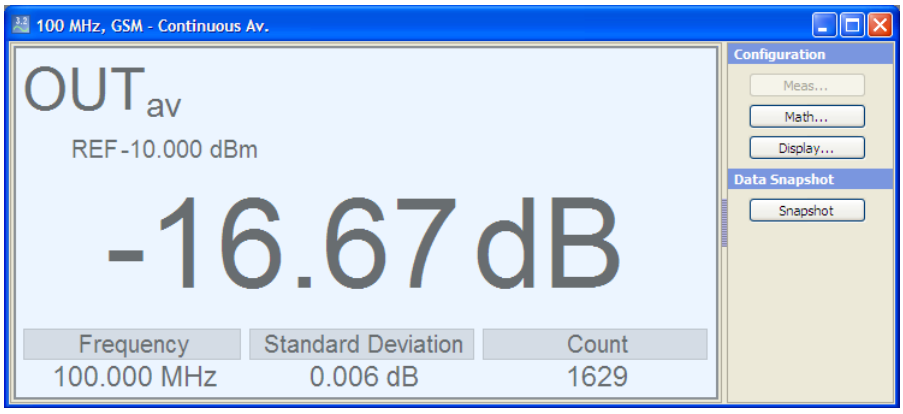


Figure 3-29: Continuos window > window renamed

Tip: Change font colour in the "Configure Colour Settings" dialog, accessed via "Configure > Colour Settings" in the menu bar.

3.3.3.4 Graphically representing power versus time

1. Setting the trace mode

Trace and statistics modes represent graphically the measured power versus time. Displaying the signal graphically as with an oscilloscope, trace mode is particularly suitable for recognizing stable triggering of modulated signals during measurement.

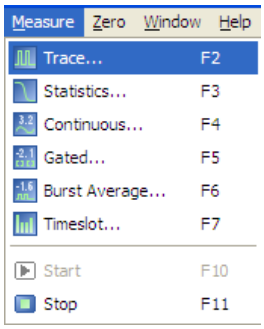


Figure 3-30: Select trace mode

a. Apply an amplitude-modulated or pulsed signal having a modulation or pulse frequency of 1 kHz and 0 dBm signal level.
b. Measure > Trace in the R&S NRPV menu bar.

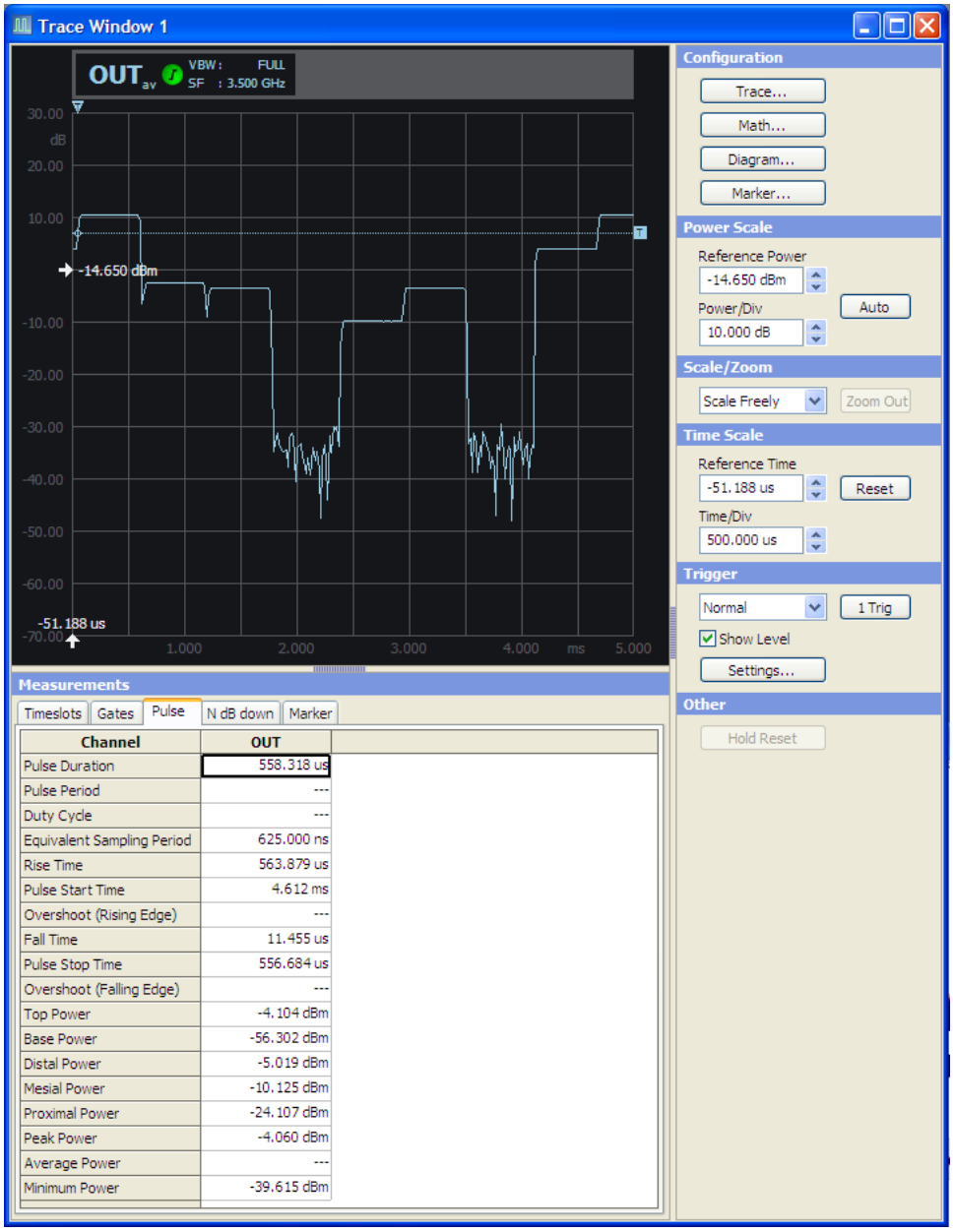


Figure 3-31: Trace window

Opens the "Trace" window that is divided into a display area for graphically indicating the measurement results, and a control panel for accessing subdialogs with parameters for trace, maths, diagram and marker. Entry fields configure scale and display settings for parameters like power, time and trigger. In the lower area of the window, the measurement panel indicates numerical measurement results. For detailed description of trace measurement and functions see "Trace" on page 97.

3.3.3.5 Math Configuration

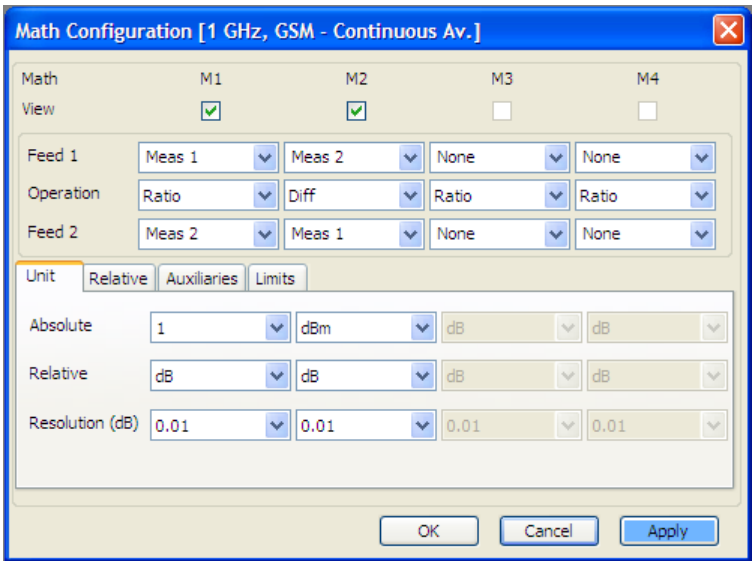


Figure 3-32: Math configuration dialog

"Math Configuration" includes operands selection for math measurement of maximum of four math channels, math operation selection, math channel selection for view, relative measurement option and reference value, Selection of units and resolution, and the parameters that shall be displayed as auxiliary.

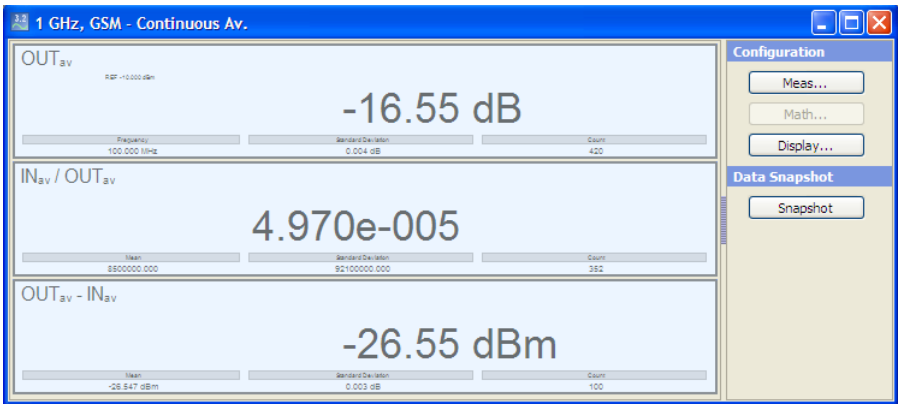


Figure 3-33: Continuos window > math results indication

The R&S NRPV automatically tiles the window and shows the math results.

3.3.3.6 Numerical Burst Average Measurement

The burst average mode is used to measure the average power of pulsed signals. Therefore a pulsed RF signal with a pulse repetition frequency not exceeding 10 kHz is required. The sensor automatically detects start and end of a burst and the trigger point from the measured signal. An external trigger is not required.

1. Setting the measurement window

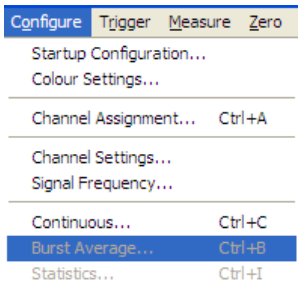


Figure 3-34: Configure > Burst Average

► Configure > Burst Average... in the R&S NRPV menu bar.

Opens the burst average dialog for entering the burst mode parameters. **Exclude from start** and **Exclude from end** exclude pulse build-up and decay phases of a pulse. Dropout helps to ensure the reliability of the end of the modulated signal bursts.

The values of the selected channel are indicated.

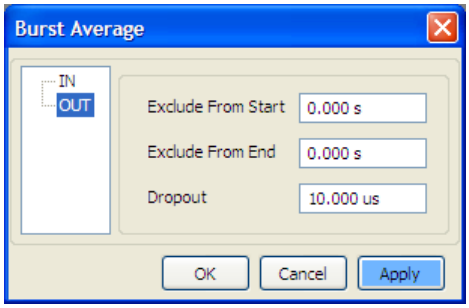


Figure 3-35: Configure > Burst Average dialog

a. Select the channel intended for measurement.
b. Enter *0.001 s* in order to exclude initial peaks of the signal from the measurement. Exclude from start defines the exclusion time at the beginning of the measurement window.
c. Enter *0.002 s* in order to exclude fluctuations at the falling edge of the burst from the measurement. Exclude from end defines the exclusion time at the end of the measurement window.
d. Apply and confirm.
e. Close the dialog.

2. Starting measurement

The burst average mode is used to measure the average power of pulsed signals. The sensor detects start and end of the burst.

► Measure > Burst Average in the R&S NRPV menu bar.

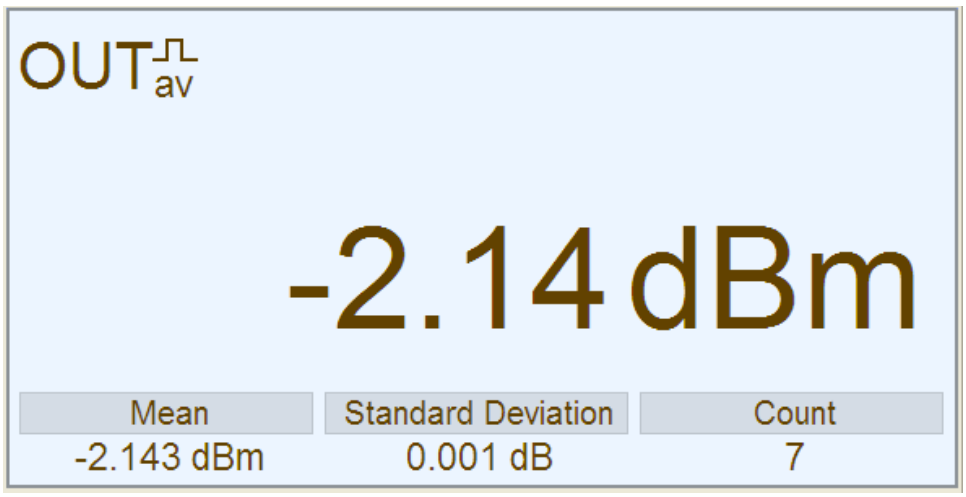


Figure 3-36: Continuos window > Burst Av results indication

4 Operating Concept

Operating concept describes the layout of the application windows, display, controls and how to operate R&S NRPV.

4.1 Graphical User Interface (GUI)

Starting the R&S NRPV software opens the main application window. The appearance is based on the Microsoft®Windows layout. At the top the window covers a menu bar with several pull-down menus and a toolbar with icons of the significant functions. Similar to Microsoft®Office functionality, the icon buttons are the alternative possibility for starting a function. A status bar at the bottom covers information on the connected power sensors and the currently active tasks.

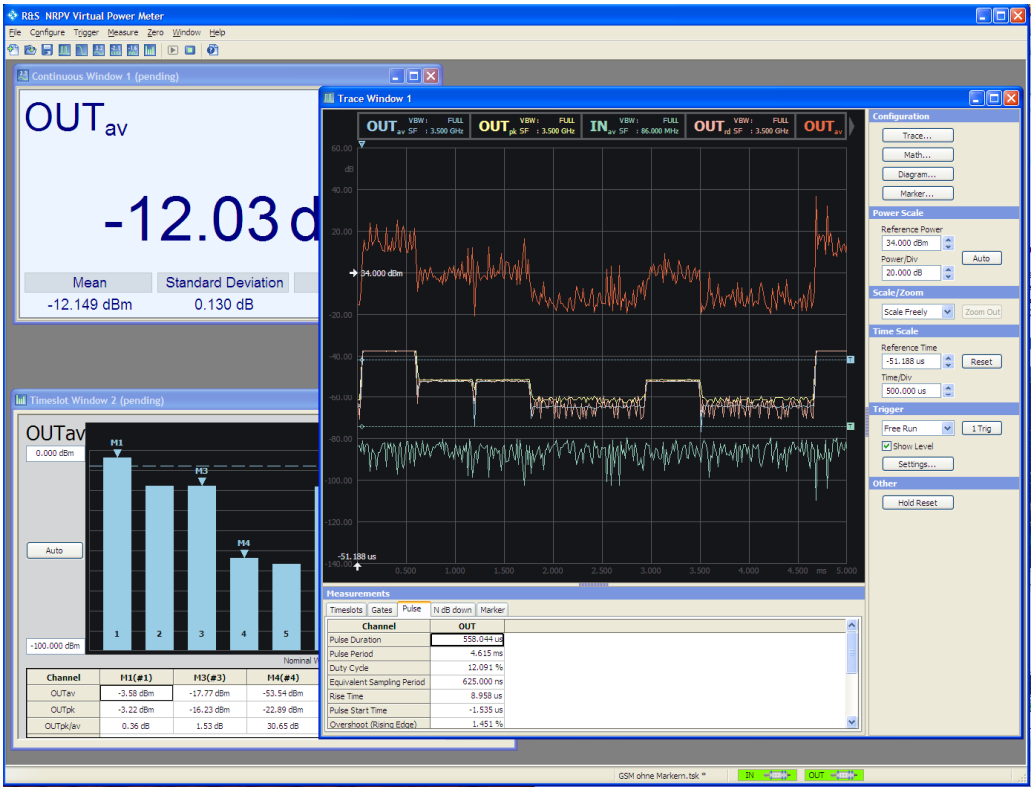


Figure 4-1: Operating concept > Graphical User Interface

Operation corresponds to windows user interfaces, i.e. all menus, dialogs and tables are made up of known elements, such as selection lists, check boxes and entry fields. A frame indicates an active item. Highlighted elements are in edit mode.

4.1.1 Particular Features

4.1.1.1 Zoomed out results display

Convenient monitoring of individual readings

By double-clicking a value in a measurement panel, you can zoom out the value and leave it permanently indicated on the display.

Figure 4-2: Operating concept >values zoomed out

Measured values can be zoomed out arbitrarily and be placed somewhere in the R&S NRPV window. The panes of these readings are transparent, so that the overlapping area remains visible.

4.1.1.2 Sensor Info

Quick and convenient reading of sensor info

- Move the cursor on a sensor image in the status bar to get quick information on the sensor type and its serial number, as shown in the figure below.

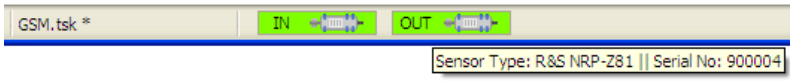


Figure 4-3: Operating concept > Status bar

- Double-click the sensor icon to open a separate window containing detailed information on the sensor.

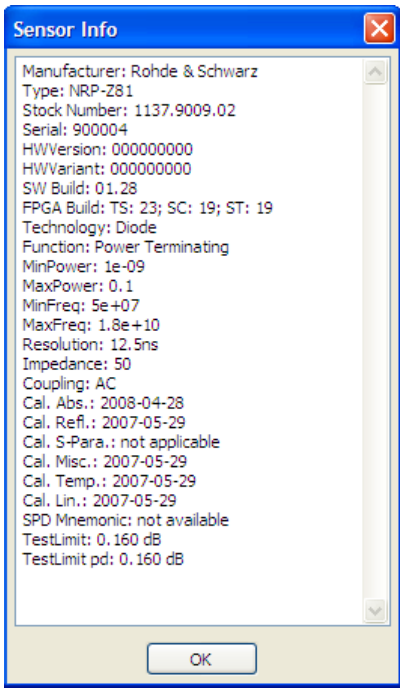


Figure 4-4: Operating concept > Sensor Info

You can readout or even copy this info, for example to have it at hand for service purposes.

4.1.1.3 Print or Copy to Clipboard

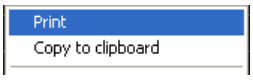
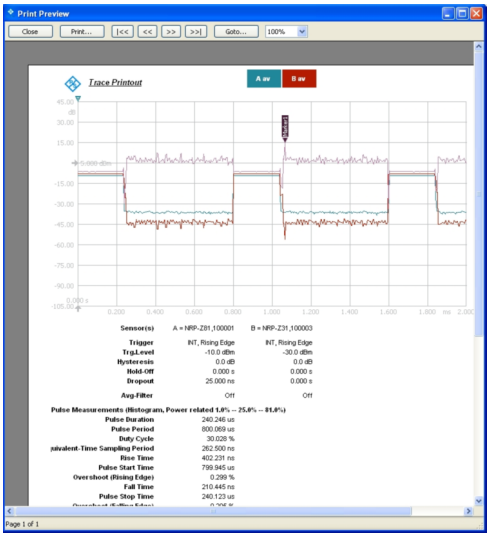


Figure 4-5: Operating Concept - Copy or Print Results

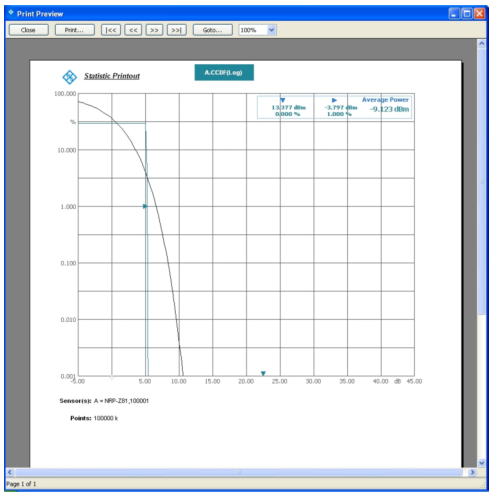
Using the right mouse button, you can open a context-sensitive menu within each measurement window. Apart from the main functions, you can print out the current readings or measurement curves, or store them in the clipboard, e.g. to copy it to an external program for further documentation.

Print

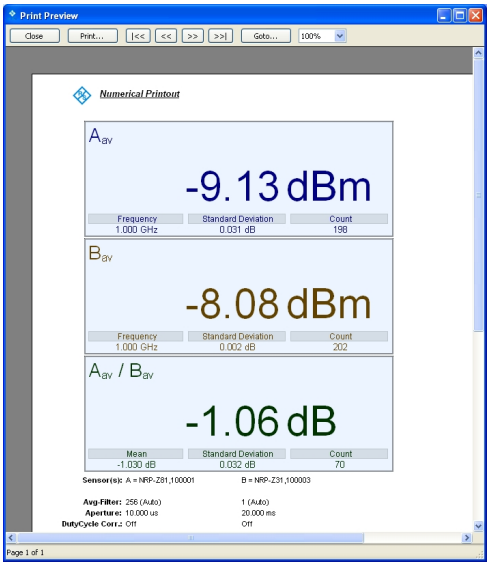
Displays a print preview of the corresponding measurement result.



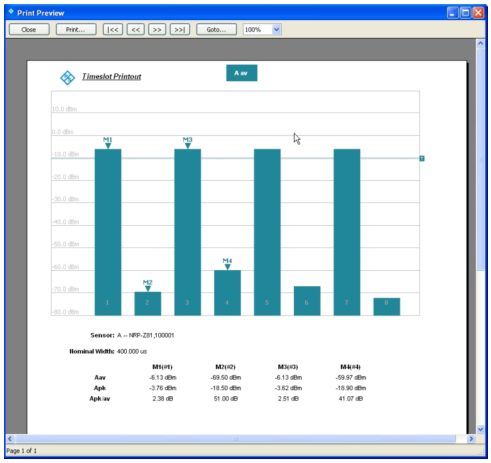
Trace measurement



Statistics measurement



Numerical measurement

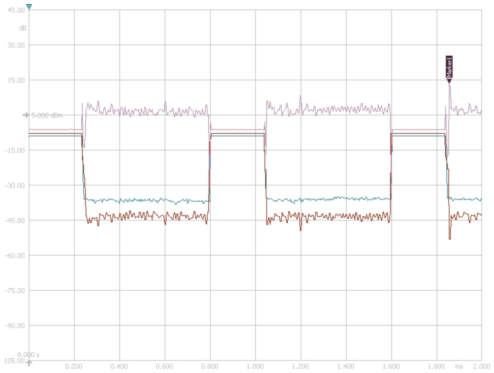


Timeslot measurement

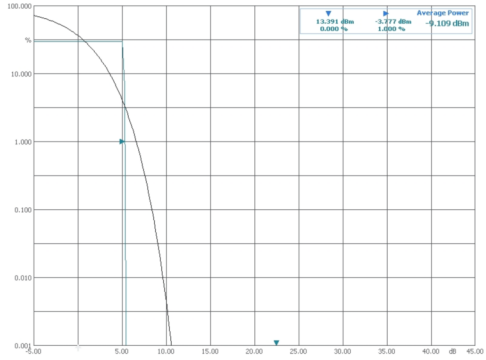
Figure 4-6: Operating Concept - Printout examples

Copy to Clipboard

Takes a screenshot of the current result window and stores it temporarily in the clipboard, i.e. until the next copying. Now you can paste this hardcopy in any document.

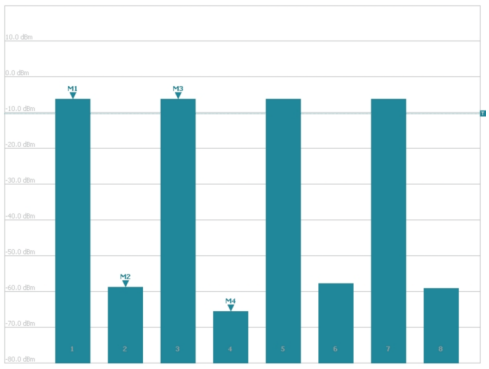


Trace measurement



Statistics measurement

Numerical measurement



Timeslot measurement

Figure 4-7: Operating Concept - Copy to Clipboard examples

4.1.2 Application Windows

This section describes the specific R&S NRPV window components. Besides the main application window additional windows are opened acdcording to the selected measurement.

In general the application differentiates between “Graphical measuring mode” and “Numerical measuring mode”, represented in results windows. Results are displayed digitally and graphically. A results window contains several areas, for example a display area, a control panel on the right, and, depending on the measuring mode, a results table (measurement panel) which contains specific parameters. In the numeric measuring modes R&S NRPV displays the results of measurement digitally. In the graphic measuring mode the results are graphically displayed, including important information within the upper range of the measurement window. The right panel serves for the configuration of the respective measurement windows. A graphical measurement window additionally possesses a measurements panel in the lower range. This panel represents the numeric values in a table.

Menu bar

The menu bar provides the menus of the application.

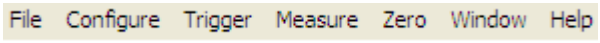


Figure 4-8: Operating concept > Menu bar

Menu

A menu displays a list of functions, with some of them visualized by icons. Find an overview of functions with associated icons in "Icons, Toolbar and Shortcuts" on page 59.

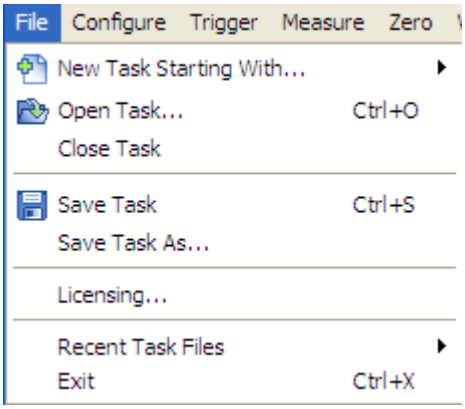


Figure 4-9: Operating concept > Menu

Toolbar

Contains buttons and options to execute the functions. Most of the toolbars' functions are also listed in a menu.

Figure 4-10: Operating concept > Toolbar

Status bar

The status bar displays the connected sensors, their assigned channel, or short name, and currently active task files.

The background colour of the sensor symbol represents the operating mode of the sensor:

Indicates the active channel.

The measurement in this channel is currently not active.

4.1.2.1 Numerical Measurement Window

Numerical measurement windows are divided in two sections. A display area indicates the measuring results in numerical form. On the right side a control panel provides buttons for calling further subdialogs, entry fields for measurement related settings, and the "Snapshot" button for storing current settings.

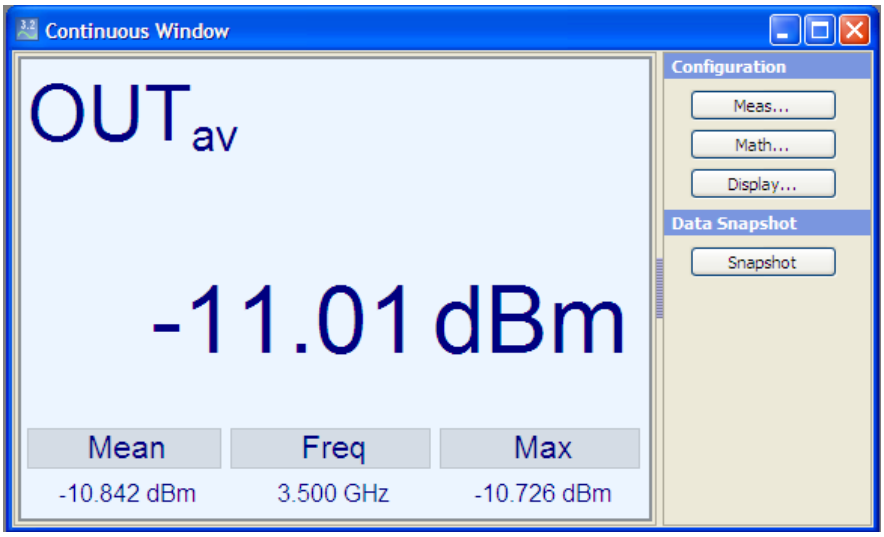


Figure 4-11: Operating concept > Numerical measurement window

4.1.2.2 Graphical Measurement Window

Graphical measurement windows, as e.g. in trace or timeslot mode, are divided into three sections:

- the display area, containing the graph and a diagram description bar
- the control panel on the right side with softkeys and entry fields
- the measurements panel underneath the graph

Figure 4-12: Operating concept > Numerical measurement window

Several parameters as grid, reference arrows, scale labels, trigger, marker and level information are provided to configure the diagram, depending on the selected measurement mode. Refer to the respective descriptions to the results windows:

- "Graph in Trace Mode" on page 100, in trace measurement mode
- "Graph in Statistics Mode" on page 129, in statistics measurement mode
- "Results in Numerical Mode" on page 144 and "Graph in Timeslot Mode" on page 145, in numerical measurement modes

4.1.2.3 Measurement Panels

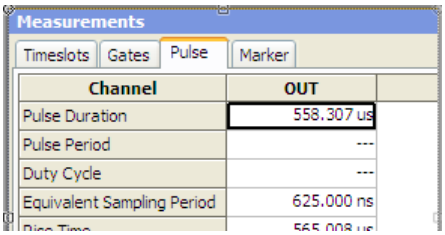


Figure 4-13: Operating concept > Mesurement panels

A measurement panel is arranged underneath the diagram. It consists of several tabs which contain the significant parameters of the measurement. R&S NRPV displays the current readings.

Convenient adjusting of the measurement panel size

The width of the panel is fixed. However, you can change the height of the measurement panel individually by dragging the frame accordingly.

4.1.3 Configuration Dialogs

This section describes the structure of the application dialogs. The dialogs are also designed in window format, covering the same main elements, as e.g. entry fields, checkboxes or buttons. Some entry fields are partially structured in tabs. Each dialog provides buttons to apply, confirm or cancel the entered settings.

The application mainly distinguishes between the measurement, math and display or diagram configuration dialogs. Some measurement modes additionally contain sub menus and dialogs for setting special parameters, as e.g. markers.

4.1.3.1 Measurement Configuration Dialogs

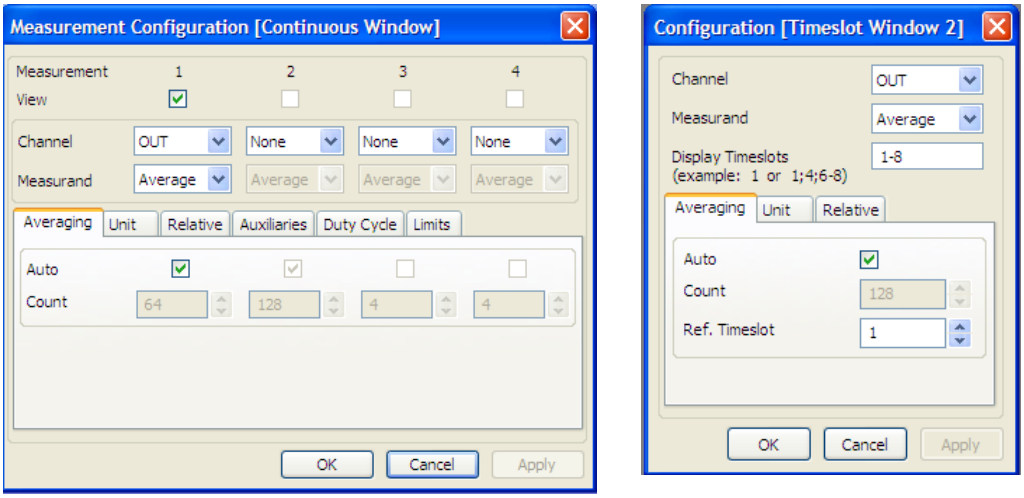


Figure 4-14: Operating concept > Measurement configuration dialogs

Measurement configuration dialogs contain the entry fields for setting the parameters of the currently selected measurement mode.

4.1.3.2 Math Configuration Dialogs

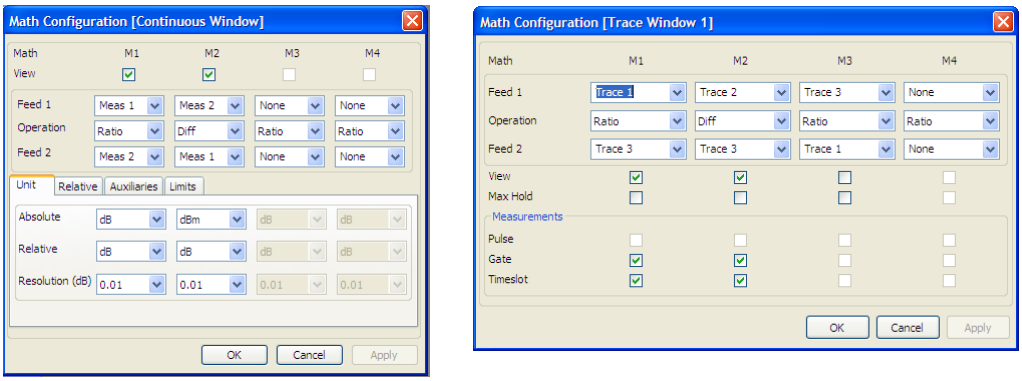


Figure 4-15: Operating concept > Math configuration dialogs

Math configuration dialogs contain math parameters and operands.

Note: Depending on the selected measurement, the math configuration dialogs differ.

4.1.3.3 Display Configuration Dialogs

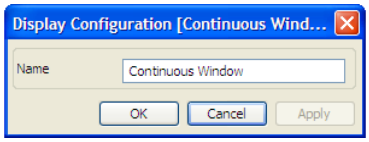


Figure 4-16: Operating concept > Display configuration dialog

A display dialog covers entry fields for configuring diagram parameters in numerical measurement modes.

4.1.3.4 Diagram Configuration Dialogs

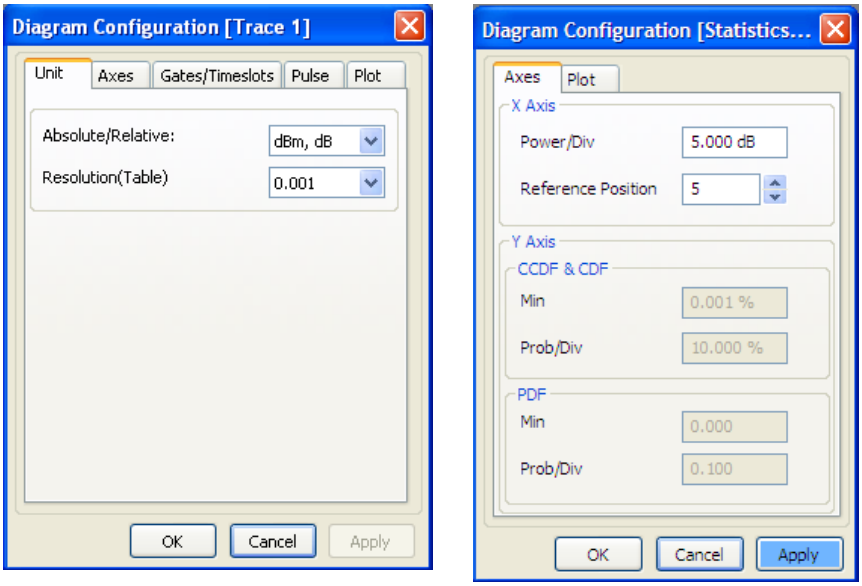


Figure 4-17: Operating concept > Diagram configuration dialog

A diagram dialog covers entry fields for configuring diagram parameters in graphical measurement modes.

Note: Depending on the selected measuring mode, the diagram configuration dialogs differ.

4.1.4 Menus

This section describes the menu structure of the application. Menus are designed in window format and display a list of functions. Menus are opened with the aid of the mouse or by using the ALT+key combination on the keyboard.

The following figure shows the available main menus of the application. For detailed description of the several menu items refer to "Settings - GUI Reference" on page 67.

4.1.4.1 Main Menus and Submenus

The main menus are located in the menu bar at the top of the screen.

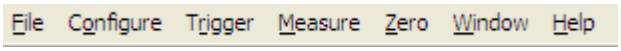


Figure 4-18: Operating concept > Menu bar

A list item of a menu marked with an arrow, represents a general term and covers a submenu.

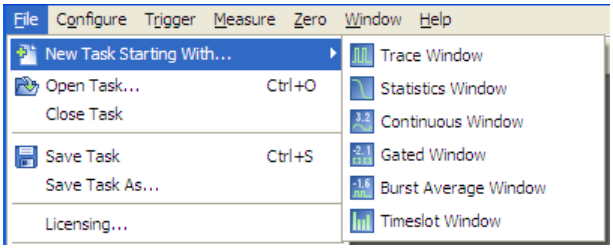


Figure 4-19: Operating concept >Submenus

R&S NRPV comprises the following menus:

File

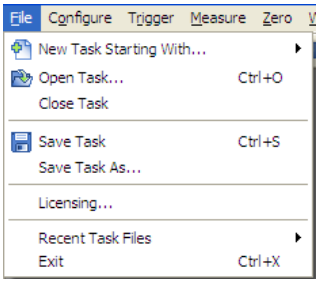


Figure 4-20: Operating concept > File menu

Contains all functions that belong to task management. Create, save or recall measuring data or print the measuring results.

Configure

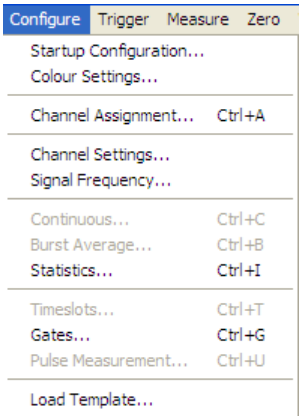


Figure 4-21: Operating concept > Configure menu

This menu contains functions for setting the startup configuration, channel configuration and signal frequency. Additionally, the menu provides dialogs to specify basic parameters for all measurement modes and dialogs for loading settings of digital standard communication signals.

Trigger

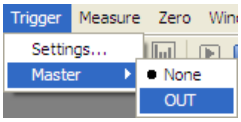


Figure 4-22: Operating concept > Trigger menu

This menu is used for setting the parameters of an external connected trigger source.

Measure

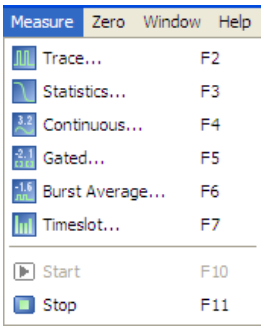


Figure 4-23: Operating concept >File menu

Menu for selecting the measurement mode.

Zero

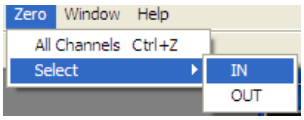


Figure 4-24: Operating concept > Zero menu

Menu for zero error correction.

Window

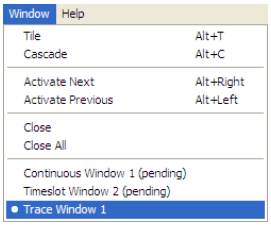


Figure 4-25: Operating concept > Window menu

Menu containing functions for window handling.

Help

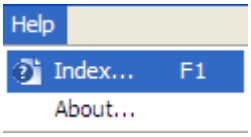


Figure 4-26: Operating concept > Help menu

The help menu with access to the online help and information about the R&S NRPV software version.

4.1.4.2 Context-sensitive Menus

R&S NRPV provides special context-sensitive menus for each area of a measurement window, with the exception of measurement panels. Open a context menu by pressing the right mouse button.

A context-sensitive menu within the graphic range mainly contains the functions of the control panel.

The following figures give an example of context-sensitive menus.

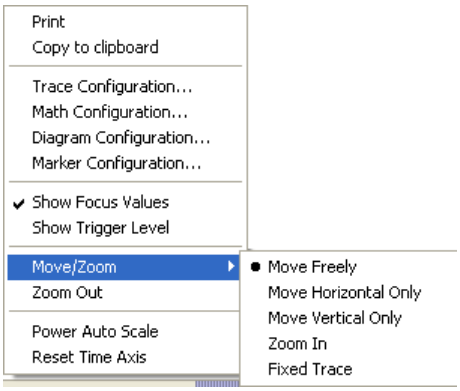


Figure 4-27: Operating concept > Context-sensitive menus

For detailed description of the available menus refer to

- "Context-sensitive Menu" > Trace on page 101
- "Context-sensitive Menu" > Statistics on page 130
- "Context-sensitive Menu > Continuous/ Gate / Burst" on page 146
- "Context-sensitive Menu > Timeslot" on page 147.

4.1.5 Icons, Toolbar and Shortcuts

4.1.5.1 Toolbar

The toolbar of the main application window contains icons for quickly starting the main functions.

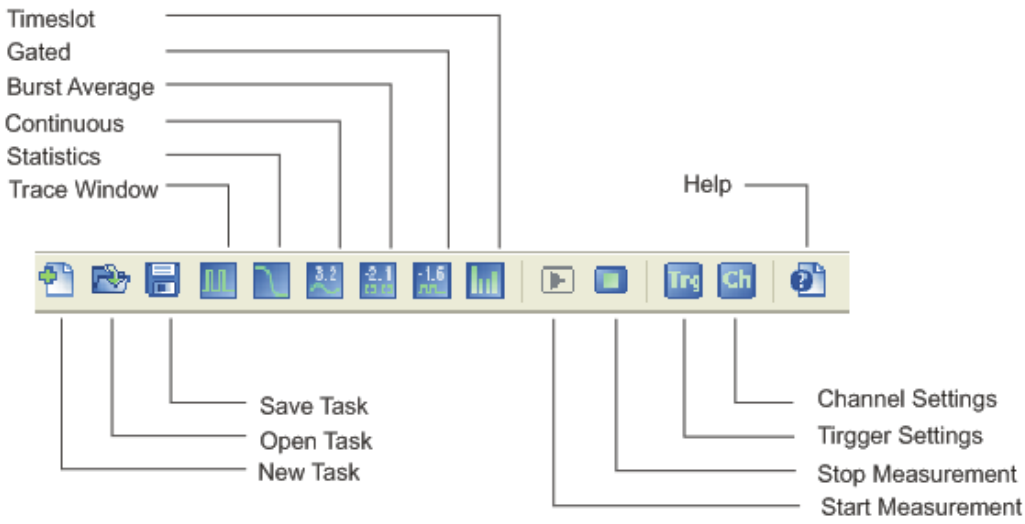


Figure 4-28: Operating concept > Toolbar

The functions are started by clicking the icon buttons with the left mouse button. Each icon features a corresponding item in the menu lists. For assignment on the icons to the corresponding functions see "Icons" on page 59.

4.1.5.2 Icons

To execute a task the application provides icons for main and frequently used functions.

For example, clicking  starts the continuous measurement, just as clicking Measure > Continuous in the menu bar. Alternatively, pressing the function key F4 quickly starts the measurement mode also.

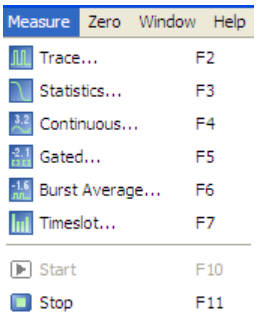


Figure 4-29: Operating concept > Icons

The following table lists the functions that can be started quickly by an icon, function key or a specified keyboard sequence, i.e. shortcuts:

Table 4-1: Icons and the corresponding functions

Icon	Function	Corresponding Menu item	Shortcut
	New Task	File > New Task Starting With	-
	Load Task	File > Open Task	CTRL+O
	Save Task	File > Save Task	CTRL+S
	Trace	Measure > Trace	F2
	Statistics	Measure > Statistics	F3
	Continuous	Measure > Continuous	F4
	Gated	Measure > Gated	F5
	Burst Average	Measure > Burst	F6
	Timeslot	Measure > Timeslot	F7
	Start Measurement	Measure > Start All	F10
	Stop Measurement	Measure > Stop All	F11
	Trigger Settings	Trigger > Settings …	---
	Channel Settings	Configure > Channel Settings …	---
	Index	Help > Index	F1

4.1.5.3 Shortcuts

Using Shortcut keys means pressing one or more keys on the keyboard which are specified for performing a task.

Similar to the icons in the toolbar, the application provides quickly executing particular functions by such predefined keyboard sequences.

For example, pressing CTRL+C opens the configure dialog of the continuous average configuration, just as clicking Configure > Continuous Average.

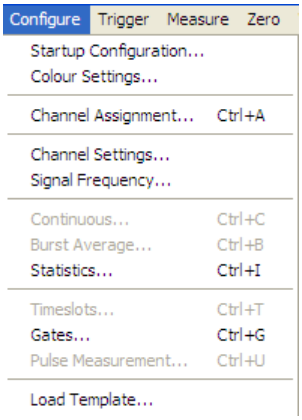


Figure 4-30: Operating concept > Shortcuts in menus

The following table lists the functions that can be started quickly by a shortcut:

Table 4-2: Shortcuts and the corresponding functions

Shortcut	Function	Corresponding Menu item
ALT+C	Cascade	Window > Cascade
ALT+Left	Active Previous	Window > Active Previous
ALT+Right	Active Next	Window > Active Next
ALT+T	Tile	Window > Tile
CTRL+A	Channel Assignment	Configure > Channel Assignment
CTRL+B	Burst Average	Configure > Burst Average
CTRL+C	Continuous	Configure > Continuous Average
CTRL+G	Gates	Configure > Gates
CTRL+I	Statistics	Configure > Statistics
CTRL+O	Open Task	File > Open Task
CTRL+S	Save Task	File > Save Task
CTRL+T	Timeslots	Configure > Timeslots
CTRL+U	Pulse Measurement	Configure > Pulse Measurement
CTRL+X	Exit	File > Exit
CTRL+Z	All Channels	Zero > All Channels

4.1.6 Diagrams

Several parameters as grid, reference arrows, scale labels, trigger, marker and level information are provided to configure the diagram, depending on the selected measurement mode. Refer to the respective descriptions to the graphs:

- "Graph in Trace Mode" on page 100, in trace measurement mode
- "Graph in Statistics Mode" on page 129, in statistics measurement mode
- "Results in Numerical Mode" on page 144 and "Graph in Timeslot Mode" on page 145, in numerical measurement modes

4.1.6.1 Infos and Symbols

According to channel, measurement and math operation the diagram description bar, or the result fields in numerical measuring modes may contain various information, some shown as symbols. The indicated parameters, and values and symbols, representing, for example, measurement mode, numeric and auxiliary values, trigger, marker or filter values or even warnings are activated for display in the respective configuration dialogs of the measurement. They are each identified by their assigned colours, i.e. the colour of a value in a description box corresponds to the colour of the measurement and the graph.

Refer to the following table to get an overview on some individual symbols:

Table 4-3: Special symbols

	Duty cycle correction active
	Offset correction active
	S-Parameter correction active
	Trigger on rising slope
	Trigger on falling slope
	Waiting for trigger event
	Info
	Error occurred
	Warning, for example out of range

4.2 Operating

R&S NRPV operating is similar to the operation of the Microsoft®Windows user interface. All menus and dialogs are in the form of windows and can be operated in the same way. Mouse or, in some cases alternatively keys allow direct access to entries and settings. Selected items are blue highlighted, a yellow frame indicates that a selected button or tab is active.

4.2.1.1 Enter and Confirm Settings

Enter values, units and text by activating the entry field with the mouse and then use the keyboard.

Numerous help functions, called by F1 function key support the user in measurement configuration.

Apply
Apply the settings to the current measurement without closing the active window.

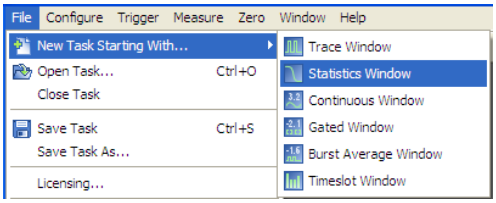
Ok
Apply the settings and close the active window

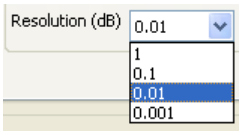
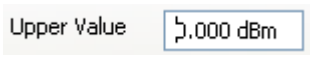
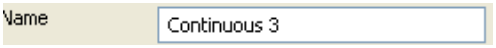
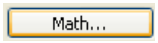
Cancel
Aborts the active window without applying the settings or saving the changes.

4.2.1.2 Elements

All menus, dialogs and diagrams are made up of known elements, e.g.

Table 4-4: GUI Elements

User interface element	Description
	**Menu items** In a menu a selection can be made from a list. The selection list folds down by clicking the menu name.
	**Dialog header** The header line contains the name of the menu and a button closing the menu. The button can be operated with the mouse.
	**Dialog area** Several fields of associated but separately set parameters are organized in an area. The dialog areas are separated from each other with a frame.
	**Tab** Settings fields structured in separate tabs within a dialog.

User interface element	Description
	**Selection field** The button indicates that a selection can be made from a list. The fold-down selection list is displayed below the selection field. One entry at a time can be selected from the list. If an item is not available for selection, it is grayed out and cannot be accessed.
	**Check box** If the check box is ticked, the associated parameter setting is active (i.e. switched on).
	**Tool tip** Help function indicating an explanation to the currently selected element.
	**Numerical entry field** A numeric value (e.g. Ref. value) can be entered.
	**Alphanumerical entry field** An alpha-numeric value (e.g. file name) can be entered.
	**Colour selection field** Opens a dialog for selecting a colour.
 	**Buttons** A button either triggers a single action (e.g. Apply), or calls the next menu.
	**Selecting field** Area for selecting the channel and the sensor, respectively.
 	**Status field** Indicates the state of either the currently running task or the state of a connected sensor.
	**Scroll bars** When a window cannot be shown completely then the window will get scroll arrows on the right side and bottom for scrolling.
	
	**Hide/Show control in the splitter bar** Shows / hides a control panel or measurement panel by mouse click on the striped bar.

4.2.1.3 Mouse Operation

Basically the mouse as pointing device is similar to every computing system. This section only touches information on some special features of the application.

Clicking the right mouse button performs context-sensitive menus for the following controls:

- Channel traces
- Math traces
- Marker symbols
- Limit lines
- Trigger levels and symbols
- Vertical reference position symbol
- Residual screen area
- Trace window

4.2.1.4 Splitter bar

The control and measurement panels are separated from the diagram by splitter bars. Each splitter bar contains a button to hide or show each panel.

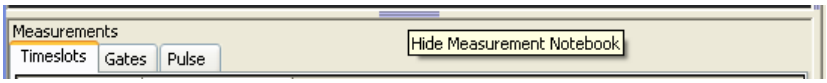


Figure 4-31: Operating concept > Splitter bar

The width of the control panel is fixed, whereas the height of the measurement panel is flexible. Therefore the space between the diagram and the measurement table can be shared by moving the splitter bar with the mouse.

4.3 Data Management

R&S NRPV provides basic measurement settings, which are already stored in the application. It also supports saving user-defined settings and measurement data. Usually drive C:\ is intended to save user-defined data, but any directory structure can be selected. Some default directories are predefined, as e.g. Task file, recommended by the application. Filename and directories are user-selectable and can be changed.

User data is divided into four data types:

- Signal template

  This file contains samples with basic measurement parameters predefined in the application. See "Load" on page 91 to call predefined settings.

  Note: Templates refer to the default application settings and cannot be changed.

- Tasks

  Task files contain settings of a measurement. See "File" on page 67 for handling with task files. For tasks files the directory `%APPDATA%\Rohde-Schwarz\NRPV\TaskFiles\*.tsk` is selected by default.

- Diagram

  For storing diagrams the application creates separate directories for the various measurement modes.

  Table 4-5: Measuement mode directories

Measurement settings	**...are stored in:**
	`%APPDATA%\Rohde-Schwarz\NRPV..`
Continuous average Time gate Burst average	`..\Continuous Images *.jpg`
Timeslot	`..\Timeslot Images, *.jpg`
Trace images	`..\Trace Images, *.jpg`
Statistics	`..\Statistic Images, *.jpg`

5 Settings - GUI Reference

Settings describes all menus and functions of the application in detail.

5.1 File

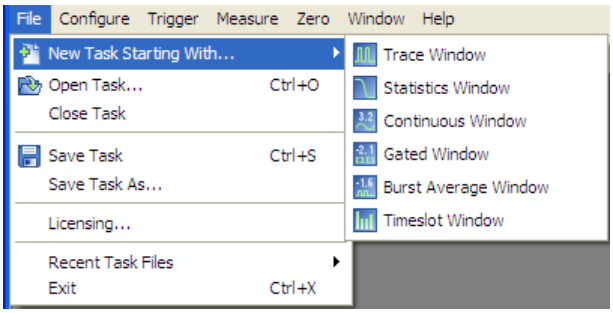


Figure 5-1: File menu > New task

The **Task** menu contains all functions that belong to file management, e.g. creating, saving or recalling measurement data or printing the measurement results.

New Task Starting With...

Pop up the submenu for creating a new measurement task. The submenu covers items for selecting either trace or statistics measurement mode, or the numerical measurement modes continuous, gates, timeslots and burst.

New Task Starting With > Trace Window

Create a new task for measurement mode "Trace" on page 97.

New Task Starting With > Statistics Window

Create a new task for measurement mode "Statistics" on page 127.

New Task Starting With > Continuous, Gated, Burst Average or Timeslot Window

Pop up the submenu for creating a new measurement task. The submenu covers items for selecting one of the measurement tasks continuous, gated, timeslot and burst average. For these measuring modes the measurement windows are almost similar, why the description under "Numerical" on page 141 applies to all modes. Special features are described explicitly.

Open Task

Open a measurement task file previously stored with Save Task or Save Task as.

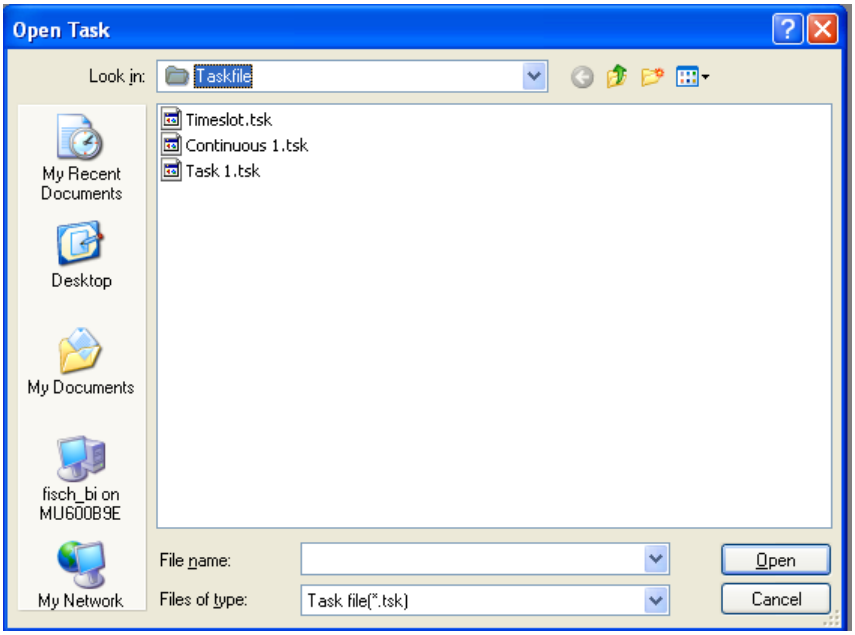


Figure 5-2: File menu > Open task

The "Open Task" dialog covers functions similar to a Microsoft® Windows file dialog. Use this dialog in the same way to select a previously stored measurement task.

1. Click the pop-up button of the selection List **Look in:**

   The available drives and directories are listed.

2. Mark the drive where the task file is stored.

   The available task files are displayed in the area below. Therefore only files with file extension *.tsk are listed. This suffix is preset in the field **Files of type**.

3. Select the file.

4. The file name is entered automatically in the entry field **File name**.

5. Click the *Open* button to load the task.

   The window is closed automatically.

Close Task

Close the currently activated measurement task. A dialog pops up for saving the changes or discarding, respectively. Prompt to save the changes in the task file.

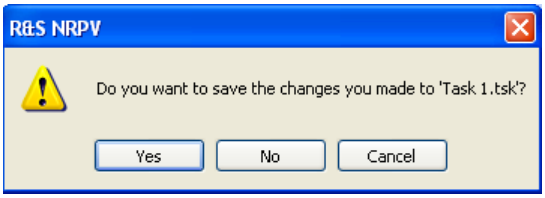


Figure 5-3: File menu > Close task

Prompt to save the changes in the task file.

Save Task

Store the current measurement values into the previously selected file in the same directory.

Save Task As...

Store the current measurement task into a selected file. Assign a file name and choose the directory to save the task file.

> **Note:** The extension of a measurement task is *.tsk and cannot be changed. By default task files are stored in your home directory on drive **C:**.

Licensing

Open the "Licensing NRP-Z Power Sensors for NRPV" dialog for enabling an R&S NRP-Zxx Power Sensor with the license key.

> **Note:** For information on how to proceed refer to “Activate an R&S NRP-Zxx Power Sensor in ” on page 17.

Recent Task Files

Shows a list of recently used task files. For recalling a task select one from the list.

Exit

R&S NRPV requires a prompt for storing modified tasks and then quits the application. When the R&S NRPV is shut down, the current measurement settings can be saved in a task. The tasks are stored in the directory

`%APPDATA%\Rohde-Schwarz\NRPV\Taskfile\<taskname.tsk>`.

and can be recalled.

5.2 Configure

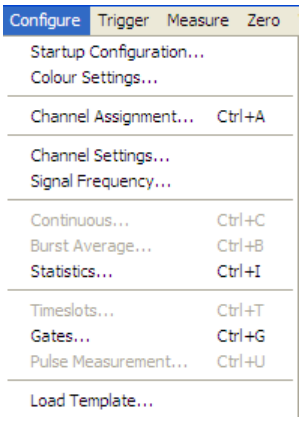


Figure 5-4: Configure menu

The **Configure** menu contains functions for setting the startup configuration and functions to configure channel assignment, channel settings and signal frequency settings. Additionally, the menu provides dialogs to specify basic parameters for all measurement modes, as well as defined R&S values and settings of digital standard communication signals.

Startup Configuration

Open the dialog for selecting the "Startup Configuration", on page 72. Except of default settings either user-defined settings or settings of the last measurement can be selected for starting up the application.

Colour Settings

Opens a dialog for setting the colours “Colour Settings” on page 72. In this dialog you can design your measurements, i.e. you can assign all sort of colours to the traces, curves and markers, as well as to background and grid lines of diagrams.

Channel Assignment

Open the dialog for selecting the channel and for "Channel Assignment" on page 73. Each connected sensor is listed with information on sensor type, serial number and connectivity.

Channel Settings

Open the dialog for configuring specific "Channel Settings" on page 74. Channel settings include offset, video bandwidth, gamma and S-Parameter correction, ranging, and averaging.

Signal Frequency

Open the "Signal Frequency" dialog, on page 83 for setting the carrier frequencies of applied signals.

The following topics provide dialogs to specify basic signal parameters that are independent of the sensor type. These parameters represent the global settings and are needed in principle with the respective measuring modes. Changes of these settings are saved in task files.

Note: See also "Load" on page 91 to call up predefined settings based on a measurement mode or based on a digital standard communication signal.

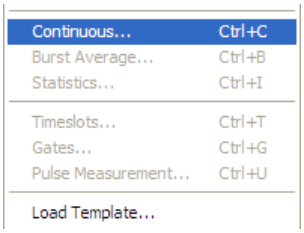


Figure 5-5: Configure menu > load template

Continuous...

"Continuous" on page 84 opens the dialog for configuring the measurement window settings as aperture time, sampling frequency and smoothing.

For trace and statistics measurement mode, signal frequency is displayed in the "Diagram Description Bar" on page 101.

Burst Average...

The "Burst Average" dialog(, on page 85) contains excluding times from start/ end and dropout.

Statistics...

Open the "Statistics" dialog, (on page 85) for setting the aperture time.

Timeslots...

Open the dialog "Timeslots" on page 86 for configuring timeslot and fence parameters.

Gates...

"Gates" on page 88 opens the dialog for configuring gate and fence parameters.

Pulse Measurement...

Select the algorithm for evaluating pulse signals and set the threshold parameters in the dialog "Pulse Measurement" on page 89.

Load Template...

Open the dialog "Load" on page 91 for loading predefined settings of digital standard communication signals as GSM or CW.

5.2.1 Startup Configuration

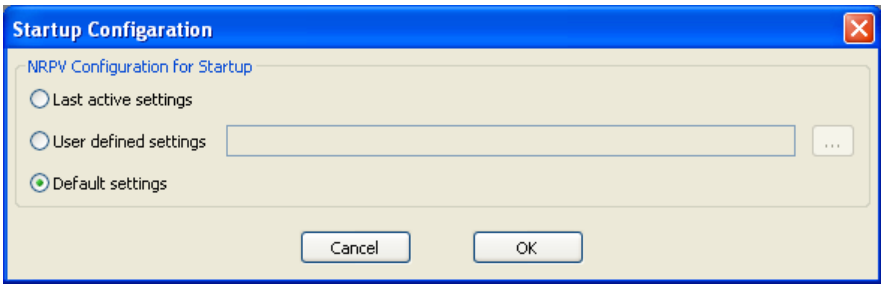


Figure 5-6: Configure > startup configuration dialog

Select how R&S NRPV shall start. The startup configuration can be set to:

Last active	R&S NRPV starts in the same mode, which was active during the last measurement.
User defined	R&S NRPV starts in a user defined mode, which was previously specified and saved in a task file.
Default	R&S NRPV starts with preset values.

5.2.2 Colour Settings

In "Colour Settings" select individual colours for your measurements, or set all colours to default.

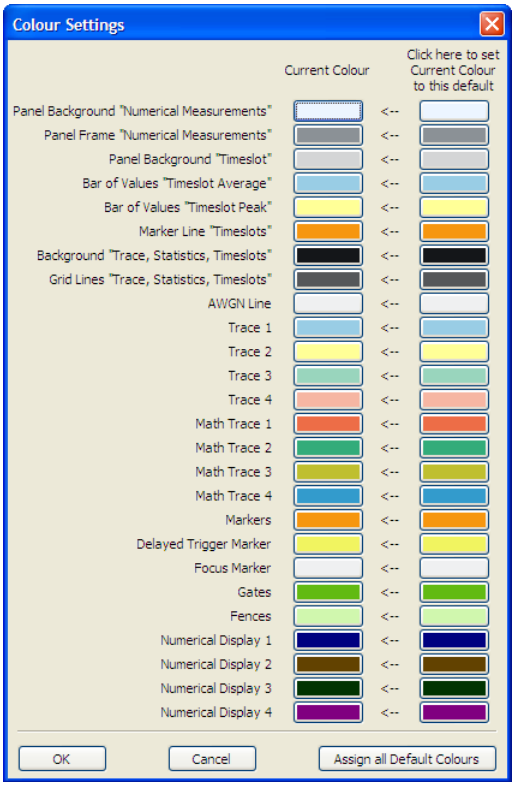


Figure 5-7: Configure > Colour settings dialog

In this dialog you can assign individual colours either to traces and curves, including the associated markers, or to background and grid lines of diagrams. Design your measurements in your own style.

5.2.3 Channel Assignment

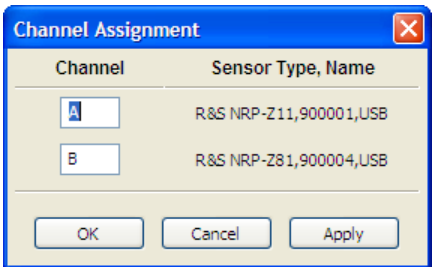


Figure 5-8: Configure > Channel assignment dialog

The **Channel Assignment** dialog displays all connected sensors with information on sensor type, serial number and connectivity.

Note: With one power sensor connected the R&S NRPV program automatically assigns the power sensor to channel A.

Channel Name

Lists the connected channels. R&S NRPV detects all connected sensors automatically and applies capitals to each channel in alphabetical order. It is possible to assign a short name to a channel, i.e. a sensor. The maximum length is three characters in capital letters, as for example "IN" or "OUT".

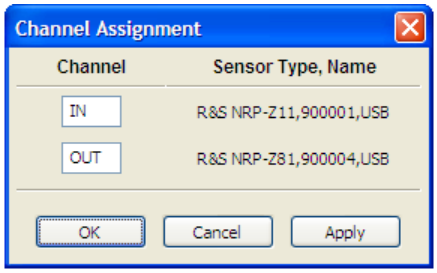


Figure 5-9: Configure > Channel assignment > rename

Sensor Type, Serial Number & Name

Displays identifying data of the connected sensors in the appropriate channels.

5.2.4 Channel Settings

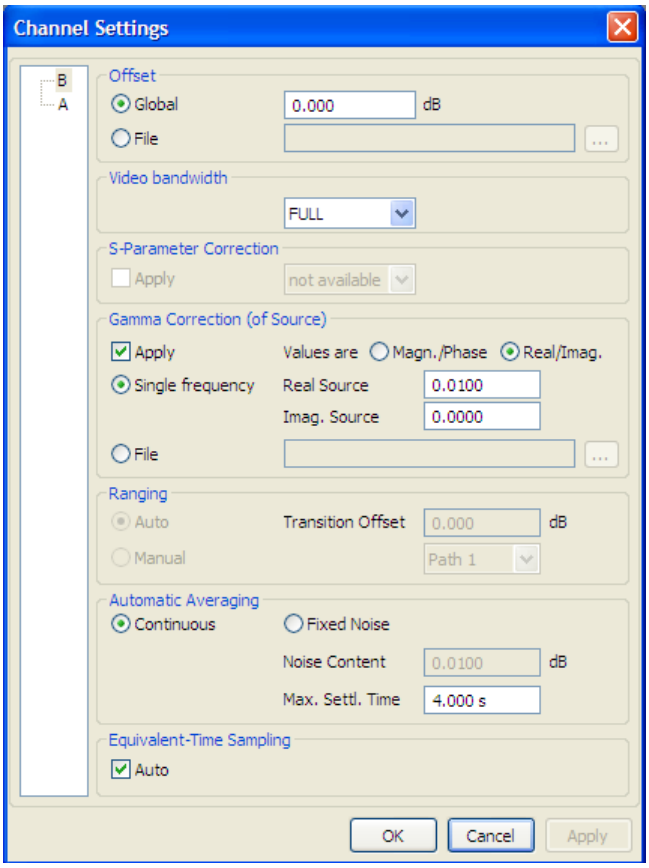


Figure 5-10: Configure > Channel settings dialog

The **Channel Settings** dialog covers entry fields for setting sensor related channel parameters. The parameters are grouped by functionality, such as Offset, Video bandwidth, S-Parameter and Gamma correction, Ranging and Averaging.

By default, the parameters are set according to the sensor. Changes made to the channel settings are partially stored in the task file.

Channel

Select the channel and the sensor, respectively.

Offset

Offset Correction

If the signal level is higher than the permissible input level of the sensor, an attenuator must be connected between the signal source and the sensor, so that the sensor is not destroyed by the high signal power. The offset correction compensates the difference between the real signal level and the level at the sensor´s input. Then the indicated measuring value corresponds to the real signal level.

Enter and activate correction factors to effect an increase or decrease in the measurement result. Correct only factors, which do not or minimally depend on frequency or level. E.g. use this function to adjust any attenuators, directional couplers or amplifiers that are connected between the signal source and the sensor.

Note: Positive offset values correspond to external losses, negative values to external gains.

Global (state)

On — Activate the global offset correction. The displayed value is increased or decreased depending on the sign of the offset.

In the Info line of the measurement window the symbol indicates that global offset correction has been activated.

Off — Switch off global offset correction.

Global (value)

Enter the global offset value.

Note: R&S NRPV automatically adjusts the trigger level, if the offset correction values vary. An info window pops up in which the adaptation must be confirmed.

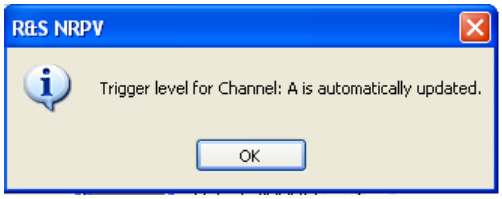


Figure 5-11: Configure > Channel settings > automatic trigger level update

File

On — Activate the offset correction with data loaded from a file.

... — Open the "Offset Parameters" dialog for loading a correction file.

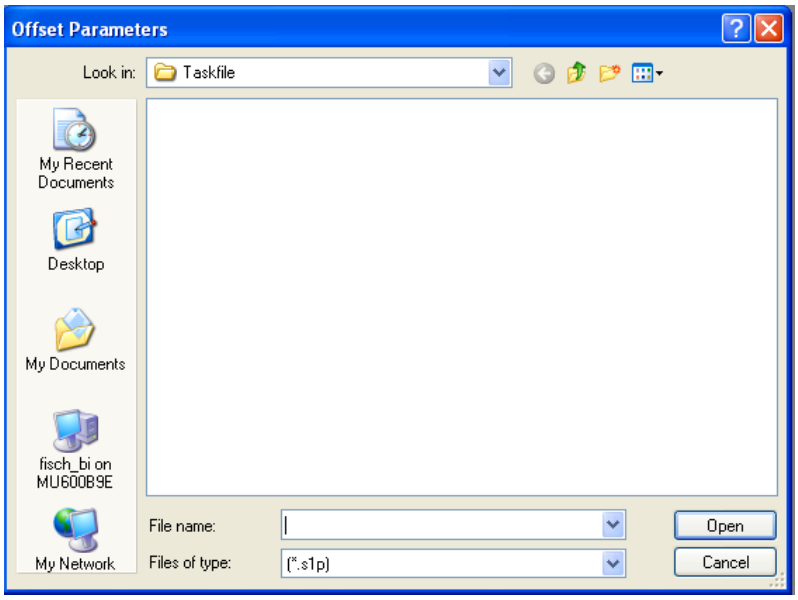


Figure 5-12: Configure > Channel assignment > load offset parameters

Correction values are stored in files. A file contains a table with frequency/offset pairs.

Look in

Select the folder where the correction files are stored. Available files are listed.

> **Note:** The extension of a correction file is *.s1p and cannot be changed.
>
> By default correction files are stored in your home directory on drive **C:**.

Open

Open the selected file.

Off — Switch off global offset correction.

Video Bandwidth

Set the video filter bandwidth.

Availability of video bandwidth adjustment

Video bandwidth is available in the R&S NRP-Z8x wideband power sensors only.

Use the parameter to reduce video bandwidth for trace and statistics measurement modes. As a result, trigger sensitivity is increased and the display noise reduced. To prevent signals from being corrupted do not set the selected video bandwidth to value less than the RF bandwidth of the measurement signal.

FULL... Choose from drop down list. FULL corresponds to a video bandwidth of at least 30 MHz, if the associated frequency of the measurement signal is not less than 500 MHz. For frequencies below 500 MHz, the video bandwidth is automatically reduced to approx. 7.5 MHz.

Note: A limited video bandwidth also reduces the sampling rate.
I.e. in trace mode, the effective time resolution is reduced accordingly.
In Statistics mode, the measurement time must be increased appropriately to keep up the required sample size. The following table presents the video bandwidth and the resulting sampling rate and interval by means of the R&S NRP-Z81 power sensor:

Table 5-1: Video bandwidth and sampling rate

Video Bandwidth	Sampling rate	Sampling interval
FULL	$8 \times 10^7\ s^{-1}$	12.5 ns
5 MHz	$4 \times 10^7\ s^{-1}$	25 ns
1.5 MHz	$1 \times 10^7\ s^{-1}$	100 ns
300 kHz	$2.5 \times 10^7\ s^{-1}$	100 ns

S-Parameter Correction

Availability of S-Parameter correction

S-Parameter correction is possible in the R&S NRP-Z8x wideband power sensors only.

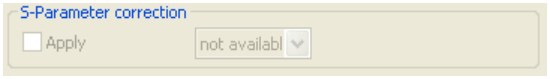


Figure 5-13: Configure > Channel settings > S-parameter

Select and apply a data set of S-Parameters for correcting measurement results, influenced by a two-port connection. Provided that a complete set of S-Parameters is available in the R&S power sensor, the measurement can be corrected by way of calculation. Note that a reference impedance of 50 Ohms must be used for the S-Parameters.

Loading an S-Parameter data set

For loading an S-Parameter table into the sensor use the program module Update S-Parameters, included in the R&S NRP Toolkit.

Several S-Parameter data sets can be loaded onto the R&S NRP-Z8x sensor. A data set is accessed by means of a consecutive number, starting with 1 for the first data set. If an invalid data set consecutive number is entered, an error message is output.

For information on how to use the S-Parameters table refer to the operating manual of your R&S NRP-Z8x power sensor.

Apply < S-Parameter Correction

On	Activate the S-Parameter correction of the connected power sensor by setting the selected S-Parameter data set. In the Info line of the measurement window the symbol indicates that S-Parameter correction has been activated.
Off	Deactivate S-Parameter correction.

Gamma Correction (of Source)

Increase the measurement accuracy by either setting the magnitude and phase of the source's reflection coefficient, or alternatively, the real and imaginary source.

The gamma correction value sets the complex reflection coefficient of the source. A magnitude value of 0 is equivalent to an ideally matched source, and 1 corresponds to total reflection. The phase angle can be set between -360.0 and +360.0 degrees.

Apply < Gamma Correction

Activate gamma correction in order to achieve higher measurement accuracy.

Values are < Gamma Correction

Determine the parameters of gamma correction. Either magnitude and phase or real and imaginary sources are available.

Magn./Phase	Use magnitude and phase angle of the gamma correction coefficient.
Real/Imag.	Operate with real and imaginary values of the gamma correction coefficient.

Single frequency < Gamma Correction

On	Apply the set values for correction.
Off	Switch off gamma correction.

Re. source < Gamma Correction

Set the real part, i.e. the magnitude of the source reflection coefficient.

Imag. source < Gamma Correction

Set the imaginary part, i.e. the phase of the source reflection coefficient.

Magn. source < Gamma Correction

Set the magnitude of the source reflection coefficient directly.

Phase source < Gamma Correction

Set the phase of the source reflection coefficient.

File < Gamma Correction

Set the parameters of the source reflection coefficient loaded from a file.

On — Activate the gamma correction with data loaded from a file.

 — Open the Gamma Correction Parameters dialog for loading a correction file.

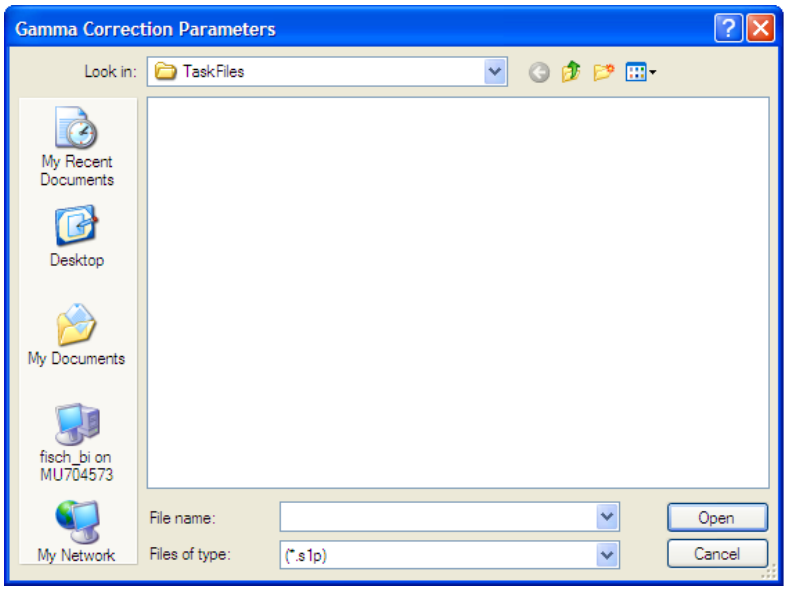


Figure 5-14: Configure > Channel settings > load gamma correction parameter

Correction values are stored in files. A file contains a table with magnitude/phase pairs.

Look in

Select the folder where the correction files are stored. Available files are listed.

> **Note:** The extension of a correction file is *.s1p and cannot be changed.
>
> By default correction files are stored in your home directory on drive **C:**.

Open

Open the selected file.

Off — Switch off offset correction with file data.

Ranging

Availability of ranging

Auto ranging is only possible with R&S NRP-Z11, R&S NRP-Z21/22/23/24/28 and R&S NRP-Z91/98 multipath power sensors.

Select the measurement path for multipath power sensors.
The various power sensors of the R&S NRP series feature different measurement ranges, e.g. thermal power sensors, or wideband power sensors provide only one measurement range. Multipath power sensors are equipped with several paths, providing different sensitivities and therefore different measurement ranges. The measurement paths are simultaneously active.

Auto < Ranging

Activate automatically selecting the most suitable path, i.e. paths that are neither overdriven nor underdriven. The measurement result of two partially overlapping measurement paths is derived from the measured values of both paths.

Note: For some particular applications, e.g. test signals with a large peak-to-average ratio measuring with Auto Ranging does not lead to accurate measurement results. Use the crossover function, which lowers the level in the crossover, to avoid that an overdriven measurement path distorts the evaluation.

Transition Offset < Ranging

Reduce crossover range. To prevent measurement paths which have been overdriven by signal peaks from being included in the evaluation, levels can be reduced in the measurement path crossover.

0.000 dB < Ranging

Enter a negative crossover value as a measure for reducing the crossover levels. For example, setting the level to -6 dB, the crossover is reduced by 6 dB. Drive range increases of the same magnitude, which reduces measurement deviations due to modulation to 25% of the original value.

Note: While large signal characteristics improve as the crossover level drops, the effects of zero deviations and intrinsic noise on the result increase, caused by the less sensitive measurement path being under driven. Therefore changing the crossover level by more than 10 dB might deteriorate the measurement result.

Manual < Ranging

Activate manual selection of the measurement range.

path n < Ranging

Define one of three paths as the measurement range, e.g. for testing the drive range of a path.

Note: The "Transition Offset" entry disables manual functionality and vice versa.

Automatic Averaging

Use an averaging filter to reduce fluctuations in the measurement result. Either choose automatic mode or set the averaging factor to a fixed value manually.

Note: Check if the auto filter mode is giving satisfactory results. If the power is not constant, adjust a manual optimal filter length setting always manually.

Continuous	Activate continuous mode. This mode finds a balance between measurement time and display noise.
Fixed Noise	Activate fixed noise mode. Choose an averaging factor that the sensors intrinsic noise (2 standard deviations) does not exceed the specified Noise Content. Having low power, limit the averaging factor by the duration of the Max. Settling Time in order to avoid long settling times. In the Info line of the measurement window S/N indicates when the display noise exceeds the preset value. **Note:** Automatic averaging mode Continuous disables Fixed Noise mode and vice versa.

Noise Content < Automatic Averaging

Select the portion of intrinsic noise in the measured result. Specifically, this value gives the permitted relative variation of the result which may not be exceeded for 95% of the observation time.

Max. Settl. Time < Automatic Averaging

Enter time value and unit to specify the upper limit for the settling time. If the limit is exceeded, S/N is displayed in the measurement window.

5.2.5 Signal Frequency

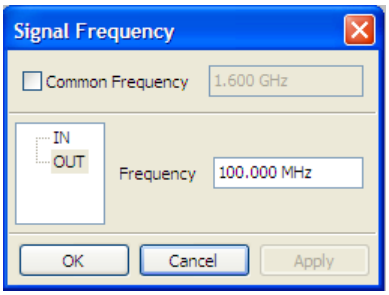


Figure 5-15: Configure > Signal frequency dialog

The **Frequency** dialog covers entry fields for setting the carrier frequencies of the applied signals. Either select each channel separately to individually enter the frequency value or set a frequency for all channels at once.

Note: The carrier frequency of the applied signal must be entered for reaching the specified measurement accuracy.

Common Frequency

Apply the entered frequency value to all channels.

Channel

Select a channel.

Frequency

Enter the frequency value and unit of the signal applied to the selected channel.

Note: Valid for all channels disables single frequency settings and vice versa.

For trace and statistics mode, signal frequency is displayed in the "Diagram Description Bar" on page 101.

5.2.6 Continuous

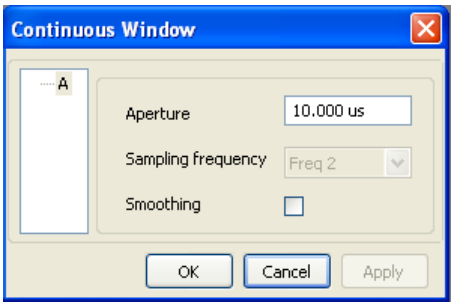


Figure 5-16: Configure > Continuous ...

The **Continuous** dialog contains entry fields for setting measurement window parameters.

Channel

Select a channel.

Aperture

Width of the sampling window. Defines the length of the unsynchronized time interval used to measure the average signal power.

- For an unmodulated signal the default setting of 10µs in conjunction with chopper stabilization provides optimum noise suppression.
- Wider sampling windows are required when the measurement result exhibits fluctuations due to modulation. With very low frequency modulation in particular a display with optimum stability is provided by setting the sampling window length exactly equal to the modulation period.
- If the modulation period varies or is not exactly known, smoothing should also be activated. Approximately five periods within one sampling window are sufficient
- The overall window length is calculated from the sampling frequency and the number of samples. The number of samples determines the length of the evaluation window.
- Additionally this parameter sets the length of the unsynchronized time interval for statistical analysis of the signal, see "Statistics" on page 85.

Sampling frequency

Defines the number of samples taken over the duration of a measurement window. The sampling frequency is defined in Hertz.

- If a sensor contains a sampling A/D converter, the sampling rate can be adjusted to prevent aliasing effects for particular types of modulation signal. Aliasing can occur with some sensors because the sampling frequency is located within the video bandwidth, which means that spectral components of the modulation signal can fall in this frequency range. Changing the sampling frequency will make the aliasing effects disappear.

Smoothing

Enables a smoothing filter. The filter reduces result fluctuations caused by modulation, if the aperture time cannot be exactly adjusted to the modulation period.

- Smoothing creates an approximating function to capture important trends in repeat. Relatively slow changes of value result in a close matching of curve fitting.

5.2.7 Burst Average

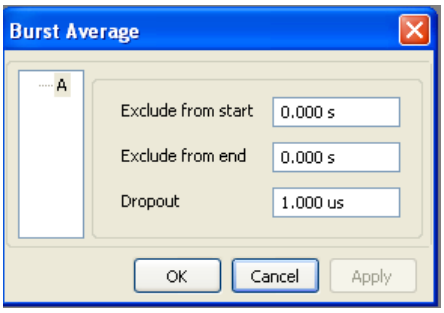


Figure 5-17: Configure > Burst average ...

The Burst Average dialog contains entry fields for excluding the pulse build up and decay phases and Dropout to reliably recognize the end of a burst.

Channel
Select a channel.

Exclude from start
Defines the time gap to be excluded from measurement at the beginning of the burst.

Exclude from end
Defines the time gap to be excluded from measurement at the end of the burst.

Dropout
Define the end of the burst by setting a dropout time in microseconds. Modulation specific power drops that are shorter than the set value are ignored.

Notes:
During the dropout time unwanted trigger signals are rejected.
The set dropout time only affects the internal trigger source.

5.2.8 Statistics

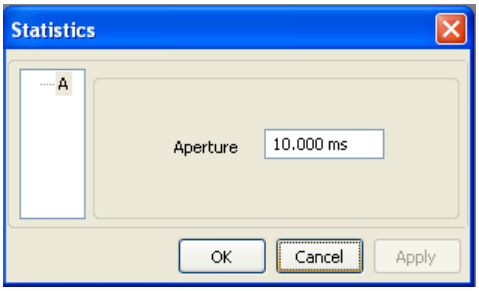


Figure 5-18: Configure > Statistics...

The **Statistics** dialog contains an entry field for setting the aperture time.

Channel
Select a channel.

Aperture
Width of the sampling window. Defines the length of the unsynchronized time interval for statistical analysis of the signal.

5.2.9 Timeslots

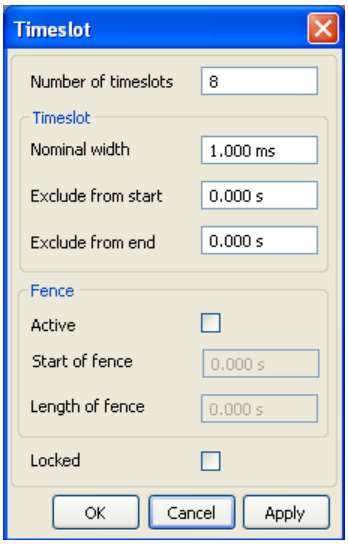


Figure 5-19: Configure > Timeslots...

The **Timeslot** dialog contains entry fields for setting the timeslot, number of timeslots and fence parameters. Validation of parameters entered in this dialog is done automatically for the appropriate channel.

> **Note:** The time resolution is determined by the sampling rate of the sensor. Timeslot mode is available in the R&S NRP-Z1x and R&S NRP-Z2x multipath power sensors and in the R&S NRP-Z8x wideband power sensors, which additionally provide defining a time interval within a window.
> For synchronization signal triggering is required.

Number of timeslots

Define the number of subsequent timeslots that belong to one single frame.

Nominal width < Timeslot

Define the timeslot length by setting time value and unit.

> **Note:** For TDMA signals the nominal timeslot length must be entered here, i.e. the frame length is divided by the number of timeslots.

Exclude from start < Timeslot

Define the time gap to be excluded from measurement at the beginning of the timeslot. Enter time value and unit.

Exclude from end < Timeslot

Set time value and unit for the time gap to be excluded from measurement at the end of the timeslot.

Exclude

Exclude from Start and Exclude from End can also be set interactively in the Scope display in the timeslot measurement window.

Load

For various common mobile radio standards the specified parameters can be loaded in the load dialog under "Load" on page 91.

The timeslots can be set interactively in trace measurement mode.

Active < Fence

Activate the fence function. Fence is a time interval within the measurement period to be excluded from measurement.

Start of fence < Fence

Set the start of fence referring to the timeslot and its length. Enter time value and unit.

Length of fence < Fence

Define time value and unit for the length of period to be excluded from measurement.

Locked

Block the entry fields. Defines if the timeslot parameters are editable directly or graphically. Protect the settings agains accidental changes.

5.2.10 Gates

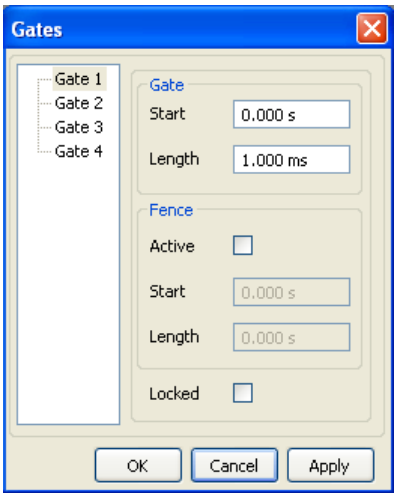


Figure 5-20: Configure > Gates...

The **Gates** dialog contains entry fields for setting gate and fence parameters for four gates to measure average power in time windows. On selecting a channel, validation of parameters for that channel is done automatically.

The time resolution is determined by the sampling rate of the sensor.

Gates

Select a gate. Up to four different gates can be configured. Measurement is performed only in one gate at a time.

Start < Gate

Set the start time of the selected gate. Enter time value and unit.

Length < Gate

Define the length of gate for measurement, by setting time value and unit.

Active < Fence

Activate fence function. Fence is a time interval within the measurement period to be excluded from measurement.

Start < Fence

Define the start of gate fence to exclude from measurement. Enter time value and unit.

Length < Fence

Define time value and unit for the length of period to be excluded from measurement.

Locked

Block the entry fields. Define if the gate parameters are editable directly or by graphical means. Protect the settings against being changed by mistake.

5.2.11 Pulse Measurement

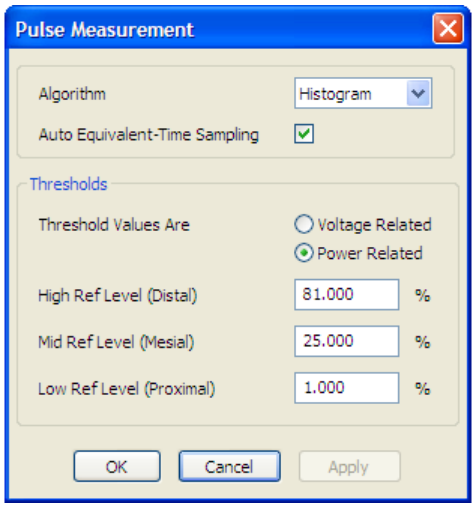


Figure 5-21: Configure > Pulse measurement...

The **Pulse Measurement** dialog contains entry fields for setting the pulse measurement method and threshold parameters used for pulse data analysis.

Pulse Data NRP-Z Analysis

R&S NRPV supports pulse data analysis in cooperation with a power sensors R&S NRP-Z81, NRP-Z85 or NRP-Z86 which are working in time measuring mode.

Power sensors R&S NRP-Z81, NRP-Z85 or NRP-Z86 enable pulse data analysis in measurement mode time. All important pulse parameters are measured after setting the threshold levels. The following graph shows most of these parameters:

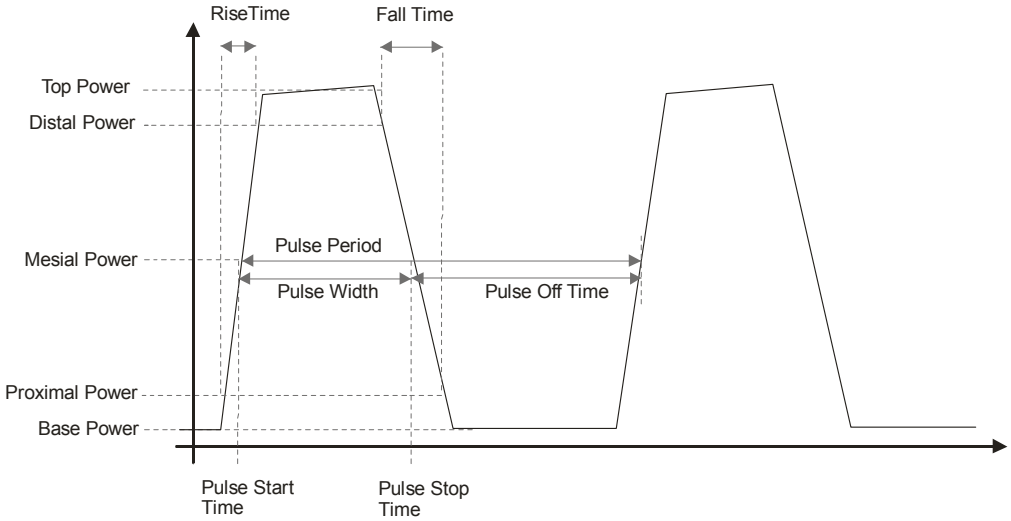
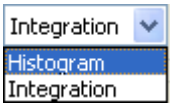


Figure 5-22: Pulse data analysis diagram

The sensor calculates the pulse parameters from each measurement and delivers the results to R&S NRPV.

Algorithm



Select the analysis algorithm for detecting the pulse top and the pulse base power of a pulsed signal. These two power levels are fundamental for all further signal analysis.

Histogram — Computes the pulse levels by analyzing the histogram of the trace data.

By evaluating the probability density of the values of one recorded trace, histogram defines the pulse top and pulse base power level - due to fact that these bars contain the maximum number of hits in upper and lower half of the histogram. If the signal has too much noise that there is no maximum bar, the algorithm returns the min and max peak sample values as base level and top level.

Note: This algorithm is recommended for analyzing most of the pulse signals.

Integration — Detects the pulse top power by fitting a reference rectangle pulse into the pulse signal. The algorithm approximates the signal by an ideal signal with the same energy content, pulse duration and pulse period by calculating the integral of the pulse power and the according voltages.

Note: Use this algorithms for pulse signals with fast rise- and fall-times as well as pulses with amplitude variations, e.g. modulated signals. I.e. use the integration algorithm if the energy content of the complete pulse, including rising and falling edges, is needed and not only the most probable top level.

R&S NRP-Z81/Z85/Z86 power sensors provide pulse data analysis.

Auto Equivalent-Time Sampling

Activate auto equivalent sampling.

Thresholds

The threshold parameters Distal, Mesial and Proximal define the high, mid and low reference level that are used to determine the pulse timing. All values are specified in percent of the pulse amplitude, i.e. the difference between top and base power. Levels are related to power readings in [Watt].

Voltage/Power related < Thresholds

Select how the threshold parameters are calculated, either voltage related or power related. The voltage related parameters represent the normal case, as the usual representation when defining the pulse parameters (rise/fall time, pulse width) is U(t). To achieve a display with equivalent power related values, the voltage-related threshold values must be converted (squared).

The following table compares levels related to Volts, [Watt] and dBW.

Table 5-2: Voltage / power related reference level

Reference Level	Voltage related(%V)	Power related (%W)	Log. scale (dB)
Distal	90	81	-0.9
Mesial	50	25	-6
Proximal	10	1	-20

High Ref Level (Distal) < Thresholds

Set the high reference level in terms of percentage of the overall pulse level. The distal power defines the end of the rising edge and the start of the falling edge of the pulse.

Mid Ref Level (Mesial) < Thresholds

Set the medial reference level in terms of percentage of the overall pulse level. This level is used to define the pulse width (τ) and pulse period.

Low Ref Level (Proximal) < Thresholds

Set the low reference level in terms of percentage of the overall pulse level.

The proximal power defines the start of the rising edge and the end of the falling edge of the pulse.

5.2.12 Load Template

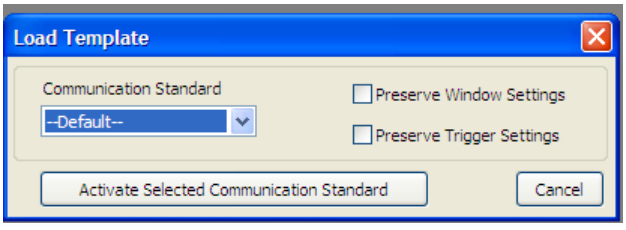


Figure 5-23: Configure > Load template

The **Load Template** dialog enables you to load predefined settings. Get default settings that are based on a measurement mode or settings of a digital standard communication signal. Additionally, the preserve function for window and trigger settings enables to protect customized settings, which have been previously optimized.

For example, a template loaded in trace measurement mode adjusts the scales' start/stop values of the diagram in order to optimize the graph. Customized settings, which have been figured out already can be fixed by activating the preserve checkboxes.

Communication and standards

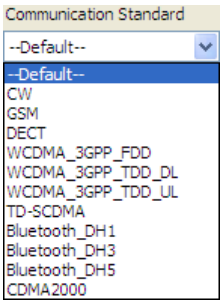


Figure 5-24: Configure > Load template > Select standard

Currently the program provides the settings of several communication standards, plus a CW (continuous wave) signal with set frequency and level.

--Default-- Default values.

<standard> Select the preferred from standard communication signal.

CW Settings from the stored CW signal.

Preserve window settings

Determine whether the window settings are to be reconfigured.

OFF Use the window parameters from the template in order to optimize the diagram.

ON Use already determined parameters.

Preserve trigger settings

Determine whether trigger settings are to be reconfigured.

OFF Use the already optimized trigger parameters from the template.

ON Use the individually determined trigger parameters.

Activate Selected Communication Standard

Assumes the settings of the selected standard.

5.3 Trigger

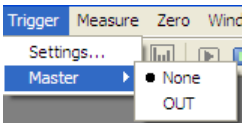


Figure 5-25: Trigger menu

Trigger signals are used to configure the timing conditions for the start of a measurement. The trigger system is required for the average measurement modes timeslot, gate and burst, as well as for trace and statistics.

The **Trigger** menu contains the items **Settings...**, used for opening a dialog to configure trigger parameters, and **Master**, covering a submenu for selecting a device intended for synchronizing trigger signals of several devices or triggering a service request.

Settings

"Settings" on page 93 opens the trigger configuration dialog to apply a trigger source and to set the appropriate parameters.

Master

Assign a sensor as the trigger "Master" on page 95.

5.3.1 Settings

The trigger settings dialog contains all trigger functions.

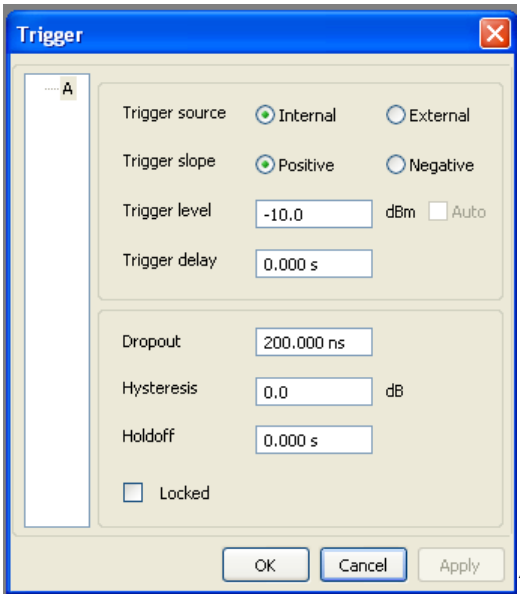


Figure 5-26: Trigger settings dialog

Channel

Select the channel.

Trigger source

Activate the trigger source.

Internal — Select internal trigger source. The trigger event is generated by the sensor.

External — Select external trigger source. The trigger event is executed with the aid of the active edge of the sensor's incoming trigger signal. The active edge is selected under **Slope**.

Trigger slope

Activate the trigger slope.

Positive — Set the rising edge of the trigger signal as active slope. The R&S NRPV shows the  symbol in the display.

Negative — Set the falling edge of the signal as active slope, indicated by  .

Trigger level

Determine the high/low threshold a trigger signal must exceed or fall short before a trigger event is detected.

Manual — Enter the power value of the high / low threshold in dBm. For a positive slope, the measurement is triggered when the signal level rises above the threshold. The threshold determines the power level, at which the signal is high (active) or low (inactive).
In case a negative slope is set, the trigger event is initiated when the signal level falls below the threshold.

> **Tip:** Defining the trigger level manually.
> Setting the trigger level manually is only possible for internal trigger sources. The setting is irrelevant to all other trigger sources. In order to achieve stable trigger conditions, a trigger level above -20 dBm is advisable. If an S-Parameter device has been activated, the trigger level setting is always referenced to the input of this device. When switching the S-Parameter device on or off, the set trigger level and the entry limits are automatically adjusted.

Auto — Enable triggering automatically.

> **Note:** Trigger level Auto disables editing manually and vice versa.
> **Tip:** Automatically triggered internal source
> In the Trace mode, Auto activates the automatic setting of the trigger threshold for internal triggering. The smallest and the largest sample value within the trace length are determined. The trigger threshold is then set exactly to the midpoint of these two values.
> If no trigger events are initiated for more than 0.3 seconds, an automatic search phase lasting 1 second is activated and then the trigger threshold is reset.

Trigger delay

Enter the delay value and unit. Setting a positive value delays the effect of the trigger event until the set time has elapsed. Entering negative values provides pretriggering, which is, depending on the sensor type, limited to a few ms.

Dropout

Set the dropout time in seconds. Enter value and the corresponding unit.

This parameter prevents the trigger system from being activated too early if the signal briefly falls below or exceeds the trigger threshold. The parameter is set to a value that is slightly higher than the maximum duration of power fluctuations that are not supposed to execute triggering.

Hysteresis

Set a hysteresis value of the internal threshold. Use this function to eliminate the noise effects on the edge detector of the trigger system.

Hysteresis is a magnitude added to the threshold. The signal level must pass the sum of threshold and hysteresis before the next trigger event can be initiated. Trigger hysteresis prevents the trigger system from being activated too fast while the trigger threshold is just slightly fallen short or exceeded. With hysteresis a trigger event is only initiated if the signal level drops down the trigger level minus hysteresis for positive slopes. For negative slopes, the level must be higher than the trigger level plus hysteresis value.

Trigger hysteresis setting only applies to the internal trigger source.

Hold off

Set a time value in seconds. Hold off suppresses trigger events within the set hold off time, starting from the last successful triggering. Use this function to exclude unwanted trigger events.

Locked

Block the entry fields. Determine if the trigger parameters are editable directly or protect the settings against being changed by mistake.

5.3.2 Master

Assign a sensor as the trigger master, whose signal is intended to synchronize all other trigger signals. When the trigger master detects a trigger event, it generates an external clock signal for triggering the other sensors. Therefore the trigger master must not be set to external triggering. The master's trigger signal is routed via the connecting cable to the PC and from there distributed to the other sensors.

5.4 Measure

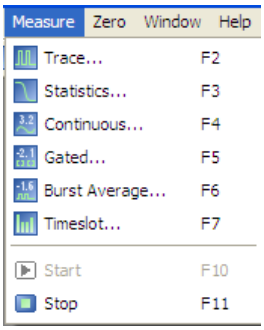


Figure 5-27: Measure menu

The **Measure** menu covers all measurement modes that are provided by R&S NRPV. Perform mode specific numerical measurements, trace measurement for pulse analysis and statistically evaluate power density and distribution. Several measurement tasks can be operated simultaneously with data acquisition and evaluation visualized in the graphical areas of the measurement windows.

> **Note:** A measurement starts immediately by selecting a measurement mode. Set measurement parameters, mathematical operands, display settings and view the results during measurement. Assign modifications with the "Apply" button provided in each dialog.

Select one of the listed measurement modes:

Trace

"Trace" on page 97 opens the trace measurement window for pulse analysis.

Statistics

"Statistics" on page 127 opens a measurement window for evaluating the ratio of the signal density and distribution versus power. Determine the density and distribution with the aid of markers.

Continuous, Gated, Timeslot or Burst Average

Select a numerical measuring mode as e.g continuous, gated, burst or timeslot.

Continuous	Select the measurement configuration dialog to set the parameters for continuous power measurement.
Gated	Open the configuration dialog for gated power measurement. Measure the power with periodic envelope over defined time gates. Specify time intervals to be excluded from measurement.
Timeslot	Enter the configuration dialog covering parameters for timeslot measurement. Use this mode to measure the power of any complex signal in defined time segments simultaneously.
Burst Average	Pop up a measurement window to measure the burst power of a modulated pulsed signal.

For these measuring modes the measurement windows are almost similar, why the description under "Numerical" on page 141 applies to all modes. Special features are described explicitly.

Start /Stop

Starts or stops measurement, see “Start / Stop Measurement” on page 164.

5.4.1 Trace

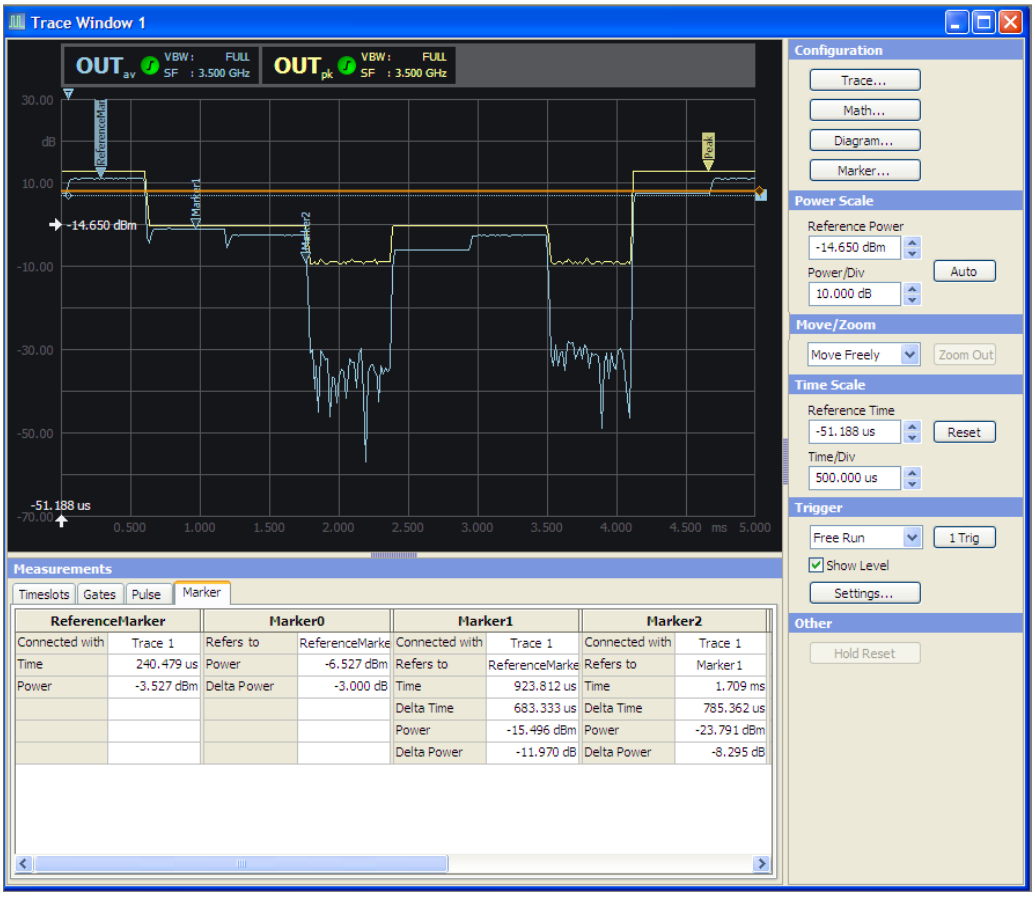


Figure 5-28: Measure > Trace window

In the Trace mode, the R&S NRPV analyzes the power envelope of the test signal and displays the power envelope as a function of time. Displaying the signal graphically as with an oscilloscope, trace mode is particularly suitable for recognizing stable triggering of modulated signals during measurement.

> **Note:** Trace measurement is available in many R&S power sensors, e.g. the multipath power sensors NRP-Z1x and R&S NRP-Z2x, except of R&S NRP-Z27 and in the R&S NRP-Z8x wideband power sensors. These sensors provide to graphically display envelope power versus time.

The trace dialog covers the following panels:

Display panel

Indicates the measurement result in power versus time. The display is divided into the “Graph in Trace Mode” on page 100, showing the diagram with grid, markers trigger delay and level information, and the "Diagram Description Bar" on page 101 with information on the configured traces.

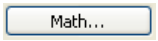
Control panel

The control panel shows all parameters that are relevant for the display. It contains buttons to call sub dialogs for Trace, Maths, Diagram and Marker configuration as well as entry fields for setting power and time scaling, trigger and some miscellaneous parameters.

Trace...

Opens the dialog for configuring trace parameters, see "Measurement Configuration" on page 102. Select trace, colour, view, channel and measurand, and apply max hold, averaging and measurement type to the appropriate channels.

Math...



Open the dialog for configuring math parameters and operands, as described in "Math Configuration" on page 105. Select channel, colour, view and mathematical operation and apply max hold and measurement type to the appropriate channels.

Diagram...

Open the dialog for "Diagram Configuration" on page 107. The configuration dialog is divided in several tabs, which are described in "Diagram Config. > Axes" on page 109, "Diagram Config. > Gates/Timeslots" on page 111, "Diagram Config. > Pulse" on page 112 and "Diagram Config. > Plot" on page 115.

Marker...

"Marker" on page 116 opens the dialog for setting the position of a marker and its value in the display and show or hide delta values.

Power, Move/Zoom, Time, Trigger, Other

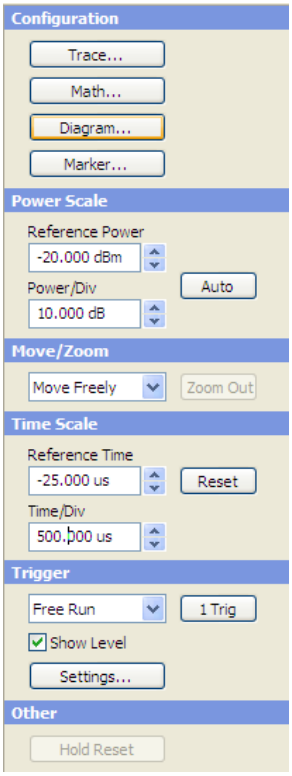


Figure 5-29: Measure > Trace > Control panel

Directly enter the values or select settings in the control panel.

- "Power Scale", on page 121
- "Move/Zoom", on page 122
- "Time Scale", on page 124
- "Trigger", on page 125
- "Other Section", on page 126

Measurements panel

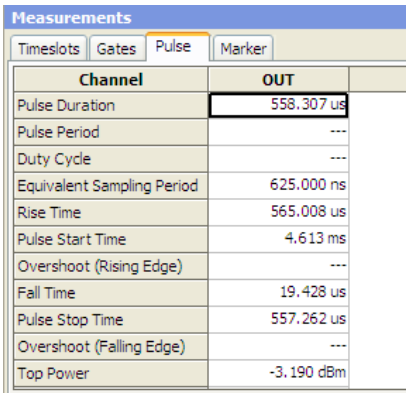


Figure 5-30: Measure > Trace > Measurements panel

"Measurements Panel > Trace Measurement " on page 126 includes tabs with parameters listed for timeslot, gates and pulse measurements. View the values of the currently shown measurement.

5.4.1.1 Graph in Trace Mode

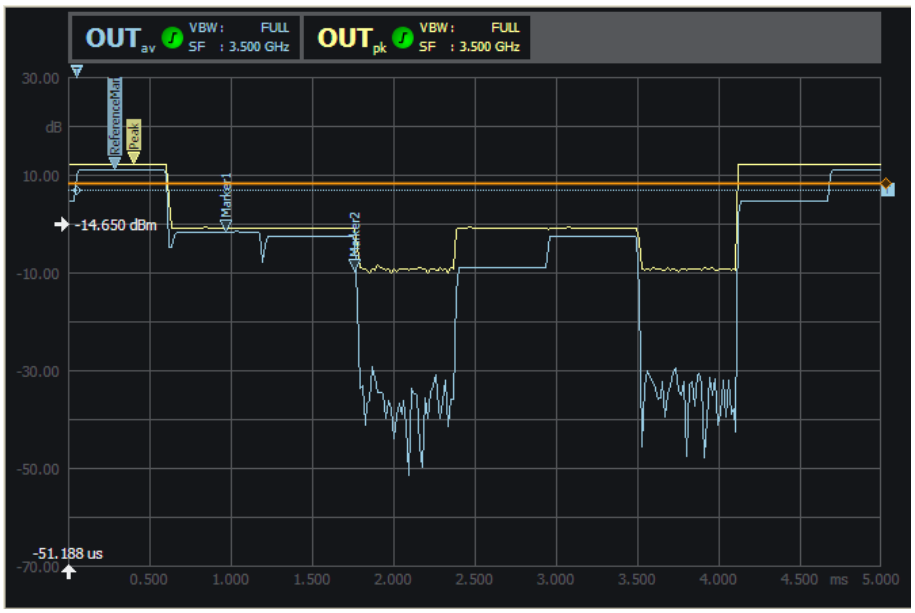
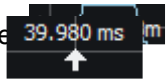
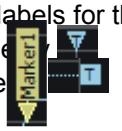


Figure 5-31: Measure > Trace > Graph

The results window graphically represents the envelope power versus time. Shaped as an oscilloscope display, the results window indicates:

- diagram description bar
- Y axis, indicating power in dB or W
- X axis with times scale in s
- dotted gridlines
- a white arrow showing the reference powe 

- a white arrow showing the reference time
- relative labels for the scale
- trigger de 

- trigger le
- markers
- graph, indicating the result
- gates and timeslot lines

For detailed information on the symbols refer to “Infos and Symbols” on page 62.

5.4.1.2 Diagram Description Bar

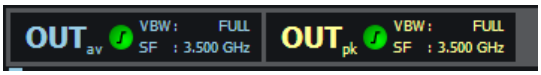


Figure 5-32: Measure > Trace > graph description bar

The diagram description bar indicates various information on trace configuration. For example, a selected channel or a math operation. The displayed symbols, values and additional information are each identified by their assigned colours. E.g. the colour of a value in a description box corresponds to the set colour for measurement and graph. The arrow at the beginning or at the end of the diagram description bar indicates that not all infos on the screen can be displayed. Click the respective arrow to scroll through the description bar. For detailed information on the symbols of the description bar refer to “Infos and Symbols” on page 62.

5.4.1.3 Context-sensitive Menu

R&S NRPV provides a context-sensitive menu in the results window of the trace measurement window. Right-click to open the menu.

Note: The context-sensitive menu of the trace measurement window mainly covers configuration functions which alternatively are accessed via the control panel, the menu bar or the toolbar.

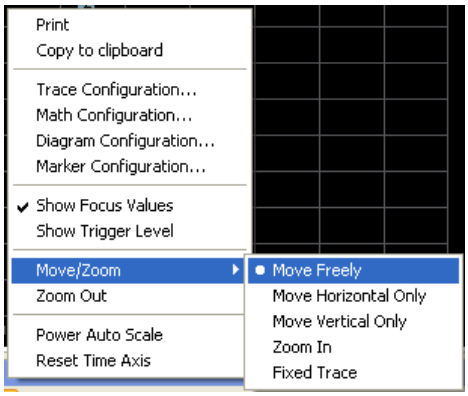


Figure 5-33: Measure > Trace > Context sensitive menu

The dialogs and parameters are described in the appropriate chapters of this operating manual. The following table lists the context-sensitive menu items and refers to the according descriptions.

Menu item	**Described in section ...**
Print / Copy to Clipboard	“Print or Copy to Clipboard” on page 49
Trace Configuration...	"Measurement Configuration", on page 102
Math Configuration...	"Math Configuration", on page 105
Diagram Configuration...	"Diagram Configuration", on page 107
Marker Configuration...	“Marker” on page 116
Show Focus Values	"Diagram Config. > Axes", on page 109

Show Trigger Level	"Trigger", on page 125
Move/Zoom	"Move/Zoom", on page 122
– Move Freely	
– Move Horizontal only	
– Move Vertical only	
– Zoom In	
– Fixed Trace	
Zoom Out	
Power Auto Scale	"Power Scale", on page 121
Reset Time Axis	"Time Scale", on page 124

5.4.1.4 Measurement Configuration

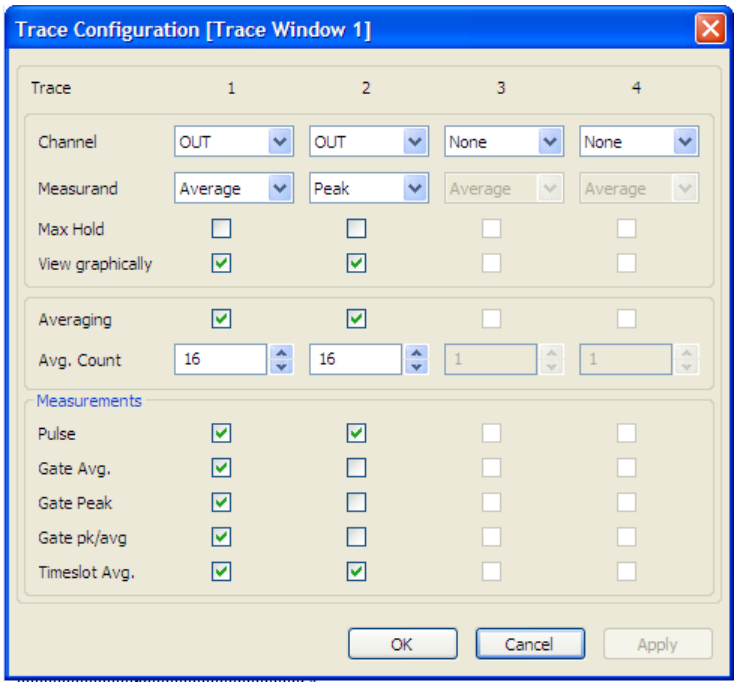


Figure 5-34: Measure > Trace > Meas configuration

The trace configuration dialog provides configuration of up to four channels for sensors that support trace measurement. View selection boxes activate displaying the measurement results of each channel separately. Also, independently of each other, the following parameters are provided for each channel:

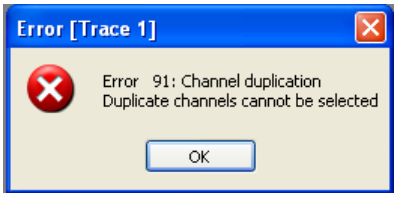
- Measurand selection
- Max. Hold measurement
- Averaging settings
- Selection of the measurement modes Pulse, Marker, Gate and Timeslot.

Trace 1 - 4

Indicates 4 available trace measurements.

Channel Duplication

In case the same trace measurement is assigned to a second trace, an error message pops up.



It is possible to perform e.g. an average measurement on one trace and a peak measurement on a second trace within the same channel.

Channel

Select a particular channel of the signal to be measured and displayed in trace mode. Select one of at maximum 4 channels from the list, containing only channels that provide trace measurements.

Note: The view checkbox is enabled automatically, if a channel is selected.

Measurand

Select a channel specific measurand. Since each point represents a time interval usually comprising many samples, the R&S NRP-Z8x wideband power sensors provide selecting what is to be displayed.

Average	Select the average power for display. Average power features flicker free display and a smooth trace.
Peak	Select the highest power measured.
Random	Select the power of a randomly selected sample. Random power provides a realistic display with signal details.

Max Hold

Set Max hold functionality. Max hold records the highest value measured for each point, independent from Average, Random or Peak measurement. The maximum measured value is displayed.

Note: Click "Hold Reset" button in the control panel to reset the stored values, see also "Other Section" on page 126. Alternatively disable max hold checkbox and enable again to restart maximum value recording.

View graphically

Activate the trace for indication in the graph.

Averaging

Enable manually setting of the averaging count. The averaging count sets the number of traces to be evaluated to form the measurement result. In manual mode the sensor uses the averaging factor set in the averaging count entry field. In auto mode the sensor determines the optimum average filter count internally based on the given resolution (0.01 dB).

Note: The following averaging count entry field is enabled only, if averaging is activated.

Avg. Count

Enter the number of values that have to be averaged to form the measurement result. The greater this averaging factor, the less the measured values fluctuate and the longer the measurement time. The entered averaging count value is rounded off to the nearest power of 2. Use the Up & Down arrow buttons to increment / decrement the averaging count, also rounded to the next higher / lower power of 2 values. Increasing averaging count reduces signal variations and noise.

The changed averaging count is transferred to the corresponding sensor, featuring the following configurations:

- **Avg. count < Min.:** Averaging count is set to minimum and the decrement button is disabled.
- **Avg. count > Max.:** Averaging count is set to maximum and the increment button is disabled.

Note: In case of Min or Max count set automatically, no error messages are reported.^

Measurements

Select the modes to be displayed.

Pulse < Measurements

Enable the pulse measurement mode, described in "Diagram Config. > Pulse" on page 112. The corresponding pulse parameters are displayed in the trace measurement window.

Gate Avg. < Measurements

Enable the gate average measurement.

Gate Peak < Measurements

Enable the gated peak measurement mode, see "Diagram Config. > Gates/Timeslots" on page 111. The corresponding measurement configuration is displayed in the measurement window.

Gate pk/avg. < Measurements

Enable the gated peak average measurement mode. The corresponding measurement configuration is displayed in the measurement window. Refer to "Diagram Config. > Gates/Timeslots" on page 111.

Timeslot Avg. < Measurements

Enable the timeslot measurement mode, described in "Diagram Config. > Gates/Timeslots" on page 111. The corresponding measurement configuration is displayed in the measurement window.

5.4.1.5 Math Configuration

Figure 5-35: Measure > Trace > Math configuration

R&S NRPV can combine measured values from several sensors, using mathematical functions. The math configuration dialog provides configuration of up to four math channels for multichannel measurement. Each of the four channels can be assigned to the same or to different sensors. If multiple channels use the same sensor, the measurement is performed only once. The result is reused for the other channels. View selection boxes activate displaying the measured and computed results of each math channels. Additionally, the following parameters are provided for each channel:

- Feed 1 and Feed 2 selection of the available channel traces
- Selection of math operation
- Max. Hold function
- Selection of the measurement modes Pulse, Gate and Timeslot.

  Note: Math operands can be an absolute channel or a constant that is always interpreted in Watt.

Math 1 - 4

Indicates 4 math measurement channels.

Feed 1, 2

Select an available trace, a trace memory or a constant channel for the first and for the second operand.

Feed 1	Select the channel to be used to calculate the displayed value.
Feed 2	Select the second channel which is to be used for calculation.

Note: Both operands can neither be the same channel nor constant values.

Operation

Select a mathematical function to operate the measurement results of feed 1 and feed 2.

SWR — Compute the standing wave ratio from the first and the second measurement by using the following equation:

$$SWR=(1+RC)/(1-RC)$$

The measurement is performed in logarithmic scale.

Note: The forward power must be measured in the first channel and the reverse power must be assigned to the second channel.

RC is the reflection coefficient, internally calculated from the measured power values P1 in channel 1 and P2 in channel 2.

$$RC=10^{(P1-P2)/20}$$

Diff — Subtract the measured power in the second channel from the power of the first channel. The calculation, performed in linear scale is converted to logarithmic scale. Displayed unit is dB.

Ratio — Build the ratio of the power in the first channel to the power in the second channel. Internally the ratio is performed by subtracting the measured power values in logarithmic scale. Displayed unit is dB.

View

Select the math channels to be viewed on trace display. On selecting a math channel, Math trace plot is displayed in the measurement window.

Max Hold

Set Max hold functionality. Max hold records the highest value measured for each point, independent from the selected operation. The maximum measured value is displayed.

Note: Enable max hold to reset the stored values. Activating again restarts maximum value recording.

In the measurement section of the dialog trace measurements are activated. Then the measurement can be indicated in the diagram.

In the measurement section of the math configuration dialog measurements are activated. Then the results can be indicated in the diagram.

Measurements

Assign the math funtion to the measurement modes.

Pulse < Measurements

Enable the pulse measurement mode. The corresponding pulse parameters are displayed in the trace measurement window, as described in "Diagram Config. > Pulse" on page 112.

Gate < Measurements

Enable the gate measurement mode. The corresponding parameters are displayed in the trace measurement window, as described in "Diagram Config. > Gates/Timeslots" on page 111.

Timeslot < Measurements

Enable the timeslot measurement mode under "Diagram Config. > Gates/Timeslots" on page 111. The corresponding measurement configuration is displayed in the measurement window.

5.4.1.6 Diagram Configuration

The diagram configuration dialog provides configuration of the trace measurement result window. All functions directly relate to the graphical data representation and do not affect sensor settings.

The dialog covers tabs for parameter settings to

- select the unit the results shall be displayed in "Diagram Config. > Unit" on page 108
- define scale and resolution of the axes under "Diagram Config. > Axes" on page 109
- set gates or timeslots to be viewed on the trace window in "Diagram Config. > Gates/Timeslots" on page 111
- select the pulse parameters to be indicated "Diagram Config. > Pulse" on page 112
- design the trace display window in "Diagram Config. > Plot" on page 115

5.4.1.7 Diagram Config. > Unit

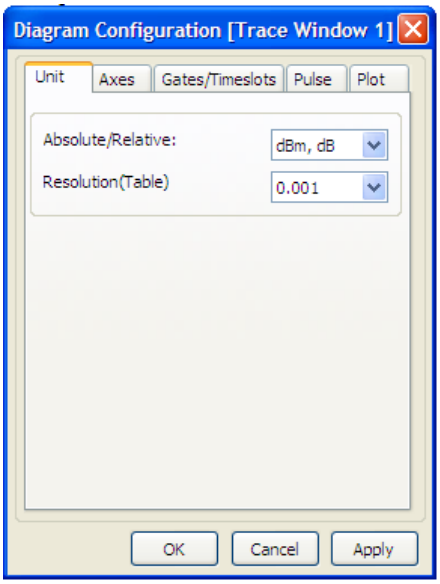


Figure 5-36: Measure > Trace > Diagram configuration

The unit tab of the diagram configuration dialog contains the entry fields for assigning unit and resolution to the y-axis. Trace data can be viewed in linear scale [Watt] or logarithmic scale (dBm).

Absolute/Relative

Set the unit for the y-axis the result is to be displayed. Electrical power is measured in W and usually converted to logarithmic scale. For a **relative** power level the measured value is related to a reference power. The ratio is expressed in terms of the log of that ratio. The unit of the power ratio is dB. An absolute power level is referred to **1 mW** and expressed in dBm.

dB, dBm	Assign a logarithmic scale to the y-axis to display power ratio.
Watt, 1	Assign a linear scale to the y-axis for displaying absolute power values.
dBµV, dB	Assign a logarithmic scale to the y-axis to display voltage ratio.

The units of the displayed parameters of the y-axis change according to the selected unit, i.e. Min power, Max power, Rev power and power/Div are adjusted.

Resolution (Table)

Set a resolution for the unit of the y-axis. The precision of the displayed result depends on the selected unit.

5.4.1.8 Diagram Config. > Axes

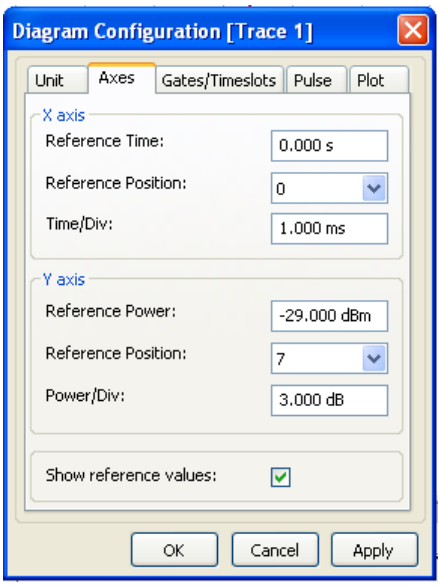


Figure 5-37: Measure > Trace > Diagram > Axes

The Axes tab of the diagram configuration dialog provides setting scale, resolution and position of the axes. Set the absolute values, position and grid of the reference markers, and switch on or off their display. The X axis time scale is divided into 10 equal divisions. The same applies to the power scale of the Y axis.

Set value and scale directly in the control panel

Change Reference Time and Time/Div for the X axis directly by using the entry fields and the plus and minus buttons in the control panel of the trace measurement dialog and, the same way, change Reference power and Power/Div for the Y axis.

For additional description refer to "Power Scale" on page 121 and "Time Scale" on page 124.

X axis

Set Reference time, position and grid of the time axis. In trace measurement X axis represents the measuring time. The X axis features delayed and physical trigger markers, ruler and focus line. Delayed trigger marker always represents the 0 seconds in the X axis, and it is common to all the channels within the trace display. The number of physical trigger markers is equivalent to the number channels within the trace display. The reference time as focus is attached to the grid, graphically depicted as an arrow. The value does not move with trace nor does it move relative to markers, and it is independent of the number of channels. The total length of axis is determined by the Reference time and Time/ div. The scale minimum depends on the trace offset ranges, and the scale maximum depends on the trace measurement time ranges of all sensors that are selected for the measurement.

Reference Time < X axis

Specify the reference time of the trace results window. The reference time represents the absolute center of the scale. This setting affects the graphical data representation in the application and also the measurement and sensor configuration.

Reference Position < X axis

Set the position of the reference time within the trace results window.

Time/Div < X axis

Define the time value of one X axis division. Enter value and unit. R&S NRPV uses a fixed grid of 10 divisions for the X axis. The time resolution is set per division with the lowest possible value of 5 ns/div. Decimal precision more than 3 decimal places is truncated in the display.

Note: Not all sensors support the same time resolution. Additional information can be found in the sensor data sheets. R&S NRPV automatically corrects invalid ranges for the current sensor.

Based on the X scale range, Time/Div is validated featuring the following configuration:

- **Time/Div < Min.**: Minimum value is set per division.
- **Time/Div > Max.**: Maximum value is set per division.

Note: In case of start value set automatically, no error messages are reported.

Y Axis

Set Reference power, position and grid of the level axis. The Y scale is defined by the two parameters reference level and level step per division. The Y-axis shows the unit of measurement selected in the unit tab. Both values can be entered manually in logarithmic or linear scale.

Reference Level < Y axis

Specify the upper limit of the trace results window. This setting only affects the graphical data representation in the application and has no influence on the measurement or sensor configuration.

Reference Position < Y axis

Set the reference position.

Power/div < Y axis

Define the power value of one Y axes division. Enter value and unit. Unit depends on the setting selected in the unit tab. Decimal precision more than 3 decimal places is truncated in the display. Based on the Y scale range, Power/Div is validated featuring the following configuration:

- **Pow/Div < Min.**: Minimum value is set per division.
- **Pow/Div > Max.**: Maximum value is set per division.

Note: In case of start value set automatically, no error messages are reported.

Show reference values

Show the numerical values of the reference parameters. The values are displayed right next to the arrows of the reference markers.

5.4.1.9 Diagram Config. > Gates/Timeslots

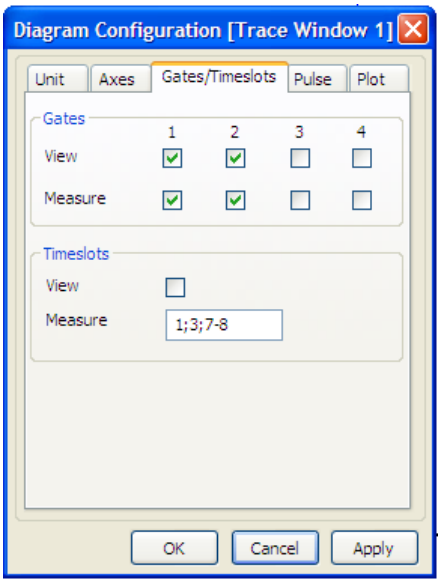


Figure 5-38: Measure > Trace > Diagram > Gates/Timeslots

The Gates/Timeslots tab of the trace diagram configuration dialog provides selecting gates and timeslots for measurement and view. For display in trace mode gates and timeslots parameters are configured at the same time.

Gates

View and measurement checkboxes activate measuring and displaying the measurement results in the trace measurement window. Provides 4 available trace measurements.

View < Gates

Enable to view the gate on the trace measurement window. R&S NRPV displays the active gate in the diagram as dashed lines. Gate parameters as start time, length and fence settings are defined in "Gates" on page 88.

Measure < Gates

Activate the gates for measurement. R&S NRPV lists the measured values for each selected gate in the Gates tab of the measurements panel.

Timeslots

A view checkbox activates the display of timeslots in the trace measurement window. Select a particular timeslot for indicating the measured value.

View < Timeslots

Enable to view the timeslot on the trace window. R&S NRPV displays the active timeslots in the diagram as dashed lines. The number of timeslots is defined in "Timeslots" on page 86.

Measure < Timeslots

Select a timeslot for indicating the measured value in this particular time interval. R&S NRPV indicates the measured values of the appropriate channels in the timeslot tab of the measurements panel.

5.4.1.10 Diagram Config. > Pulse

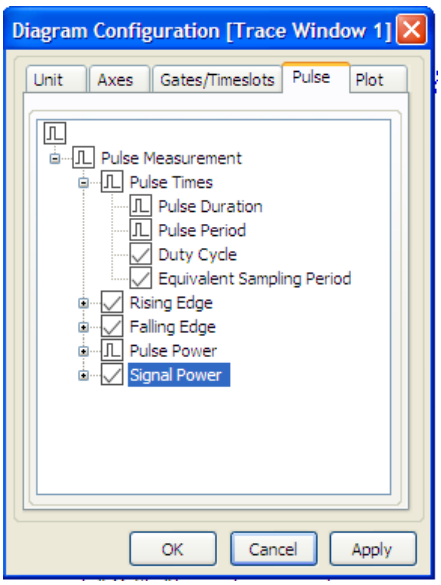


Figure 5-39: Measure > Trace > Diagram > Pulse

The Pulse tab in the trace diagram configuration dialog provides specific pulse measurement values to be displayed. View checkboxes activate the display of the measurement parameters, which are subdivided into the following groups:

- Pulse Times, covering duration, period and duty cycle
- Rising Edge, including rise time, pulse start time and overshoot
- Falling Edge, including fall time, pulse stop time and overshoot
- Pulse Power with top, base, distal, mesial and proximal power parameters
- Signal Power, covering peak, average and minimum power

Select the checkbox to enter one of three possible states:

Check Show the value in the table of the measurement panel.

Show Graphically represent the value in the diagram and show the value in the table.

Note: Clicking a parameter's checkbox, which cannot be graphically displayed, applies only check or uncheck.

Uncheck Do not show the value.

Pulse Times

Contains parameters for information on characteristic times of a pulse.

Pulse Duration — (Mesial power) Displays the pulse width.

Note: Usually the interval between the 50% points of the final amplitude is used too define pulse duration.

Pulse Period — Displays the time the pulse signal needs to complete one cycle.

Duty Cycle — Indicates the duty cycle of the measured power. If a duty cycle of a pulsed signal is measured, the R&S NRPV displays the average power in the pulse.

Equivalent Sampling Period — Indicates the duty cycle of the equivalent sampling period.

Rising Edge

Contains falling edge signal parameter to be displayed.

Rise Time — Indicates the time required for the signal to change from low value to high value.

Pulse Start Time — Displays the start point of the current pulse, i.e. the time when the signal crosses the medial reference level.

Overshoot — Indicates when the final value is exceeded.

Falling Edge

Contains falling edge signal parameter to be displayed.

Fall Time — Indicates the time required for the amplitude of a pulse signal to change from high value to low value..

Pulse Stop Time — Displays the end point of the current pulse, i.e. the time when the signal crosses the medial reference level.

Overshoot — Indicates when the final value is exceeded.

Pulse Power

Contains pulse power parameters to be displayed.

Top Power — Indicates the power of a complete pulse, including rising and falling edges.

Note: This function is provided by R&S NRP-Z81/Z85/Z86 power sensors only.

Base Power — Indicates the base power, computed in the pulse level analysis histogram of the trace data.

Distal Power — Indicates the absolute power value of the high reference level.

Mesial Power — Indicates the absolute power value of the mid reference level.

Proximal Power — Indicates the absolute power value of the high reference level.

Signal Power

Contains parameters for continuous signals to be indicated.

Peak Power — Indicate the measured peak power.

Average Power — Indicate the measured average power.

Minimum Power — Minimum power value of the signal.

5.4.1.11 Diagram Config. > Plot

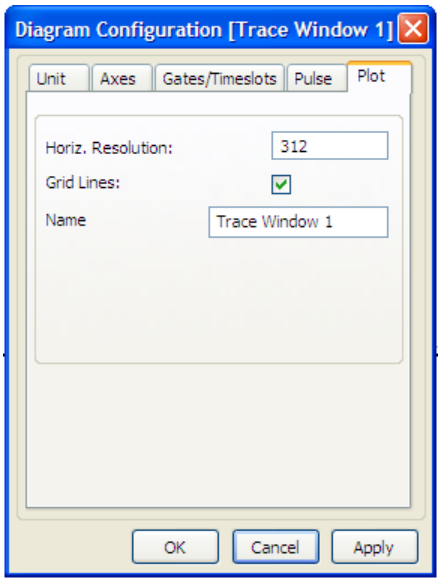


Figure 5-40: Measure > Trace > Diagram > Plot

The "Plot" tab in the trace diagram configuration dialog covers parameters for designing the trace measurement display. Set screen resolution and grid lines and assign the label to the measurement window in this dialog.

Horiz. Resolution

Set a number of trace points for the horizontal resolution. This setting is valid for all traces. R&S NRPV synchronizes an updated resolution with the sensor. Based on the minimum trace points, resolution is validated featuring the following configuration:

- **Horiz. Resolution < Min.**: Minimum resolution is set.
- **Horiz. Resolution > Max.**: Maximum resolution is set.

Note: In case of resolution value set automatically, no error messages are reported.

Grid lines

Set grid lines to be displayed or hidden.

Name

Apply a designated name to the trace measurement window.

5.4.1.12 Marker

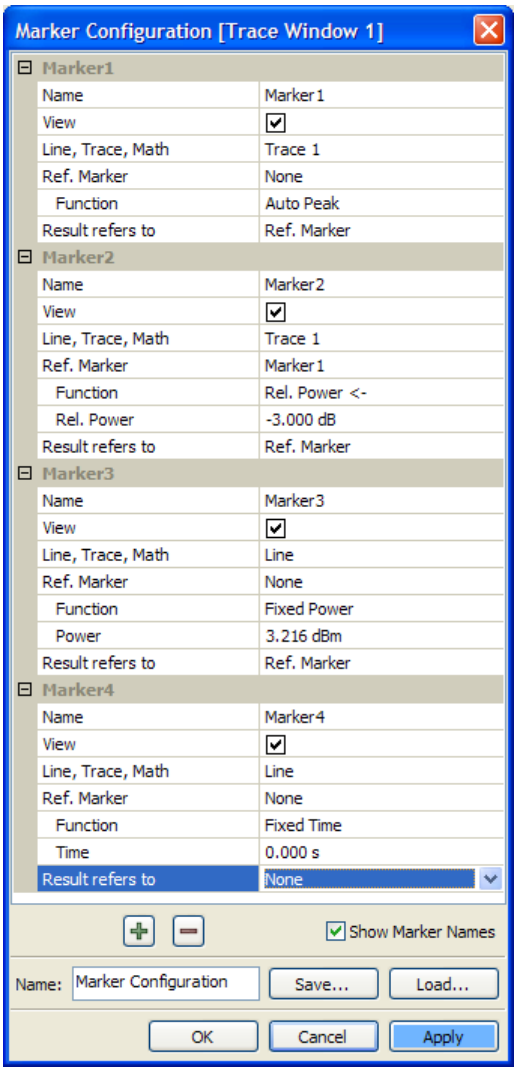
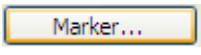


Figure 5-41: Measure > Trace > Marker dialog

In trace mode, any number of markers can be defined. Markers can be assigned to trace points for performing automated measurements.

You can use markers quite different, e.g. to define a delta to a level or a frequency value, to refer to a reference value, or to determine the peak. The settings in the marker dialog provide therefore countless variations.

Markers can be defined in the "Marker Configuration" dialog, which can be started by pressing 

in the configuration panel.

Initially no markers are defined. Press  to add a new marker.

(Marker) Name	Assign a marker name.
View	Indicate the marker in the graph.
Line, Trace, Math	Refer to a marker line, a trace related marker or a math trace related marker.
Ref. Marker	Determine an additional reference to e.g. an already defined marker, or a function. This reference is used to position the current marker.
Function	Determine the task of the marker. The possible values depend on the settings of Line, Trace and Math. A table with available combinations can be found below.
Result refers to	Determine an additional reference to e.g. an already defined marker, or a function. This reference is used to calculate marker results of the current marker relative to. By default, the marker results refer to the reference marker. It is rarely helpful to define separate reference markers for positioning and result evaluation.
	Add or remove a marker
	Display the marker's names in the graph that are activated in the "View" checkbox.
Name:	Assign an individual name to the marker dialog.
Save/Load	Save or Restore a marker configuration.

All values and parameter of the markers are shown in the marker panel underneath the diagram. Additionally, you can change the function values directly in the graph by selecting and dragging with the mouse pointer.

Marker functions in detail

Line, Trace, Math	Ref. Marker	Function	Application
Line	None	Fixed Time	Vertical Marker Line
		Fixed Power	Horizontal Marker Line
	<Any Marker>	Rel. Time. and/or Rel. Power depending on reference marker type	Marker line relative to another marker value
< Any Trace>	None	Fixed Time	Marker showing the power at a dedicated point of time
		Auto Peak	Marker "riding" on the current peak of a trace
	<Any Marker>	Rel. Time	Marker time shifted to the Ref. marker
		Rel. Power <-	Marker at the next position left to reference marker where relative power is reached
		Rel. Power ->	Marker at the next position right to reference marker where relative power is reached
		Next Peak <-	Marker at the next peak left to reference marker
		Next Peak ->	Marker at the next peak right to reference marker

Table 5-3: Marker functions

The math traces are handled the same way.

5.4.1.13 Example how to use markers

Application: measure distance of two pulses on two traces
Let's assume, we have to traces carrying pulses:

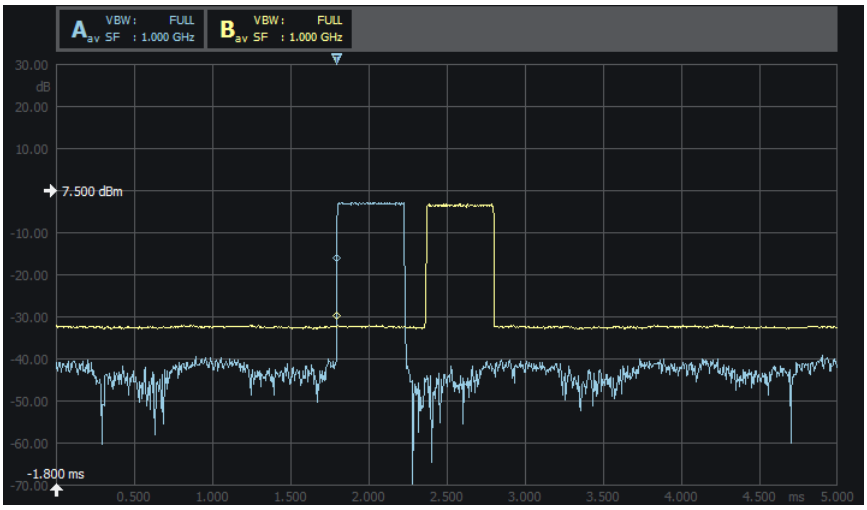


Figure 5-42: Marker example > two traces carrying pulses

► Now define the markers:
The first marker indicates the peak of Trace 1 (the blue trace):

Blue Marker	
Name	Blue Marker
View	☑
Line, Trace, Math	Trace 1
Ref. Marker	None
Function	Auto Peak
Result refers to	Ref. Marker

Figure 5-43: Marker example > 1st marker

The second marker does the same for Trace 2 (the yellow trace with the delayed pulse):

Yellow Marker	
Name	Yellow Marker
View	☑
Line, Trace, Math	Trace 2
Ref. Marker	None
Function	Auto Peak
Result refers to	Ref. Marker

Figure 5-44: Marker example > 2nd marker

Marker number three detects the pulse start by searching the -3dB point left to the peak:

Start of Blue	
Name	Start of Blue
View	☑
Line, Trace, Math	Trace 1
Ref. Marker	Blue Marker
Function	Rel. Power <-
Rel. Power	-3.000 dB
Result refers to	Ref. Marker

Figure 5-45: Marker example > 3rd marker

The last marker does the same for the yellow trace:

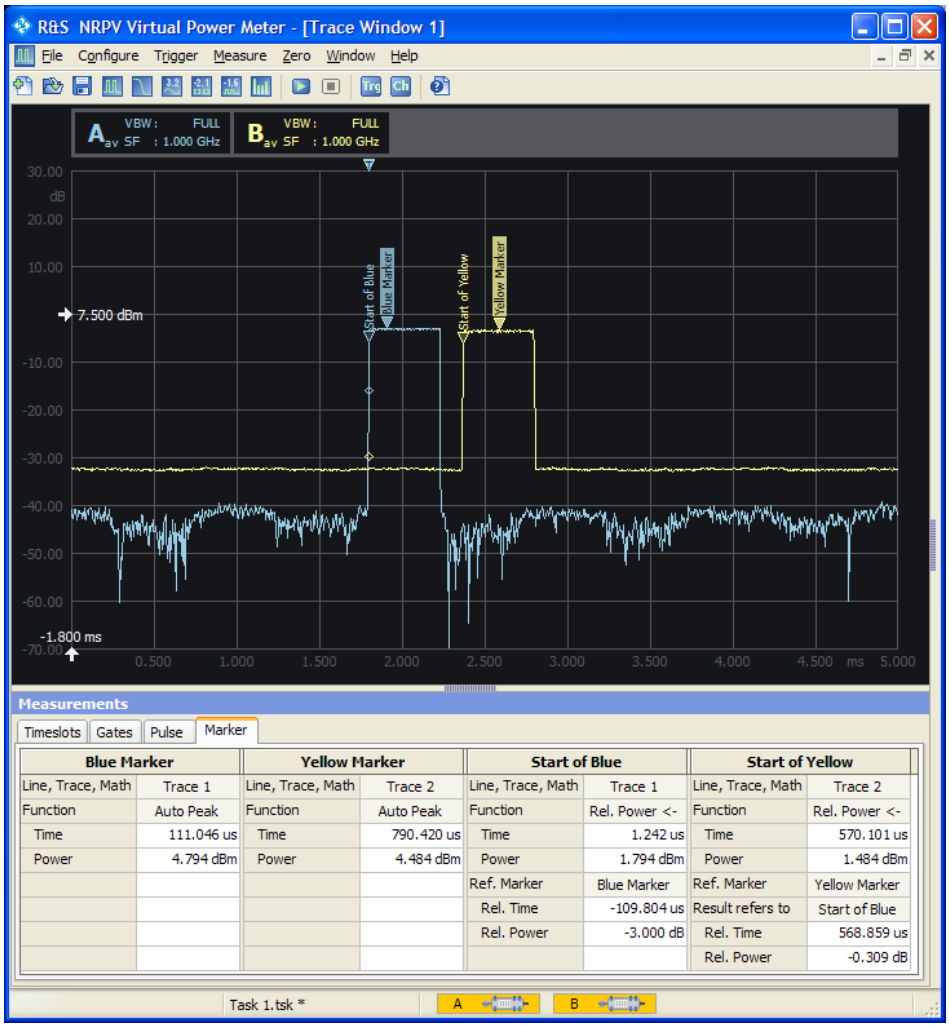
Start of Yellow	
Name	Start of Yellow
View	☑
Line, Trace, Math	Trace 2
Ref. Marker	Yellow Marker
Function	Rel. Power <-
Rel. Power	-3.000 dB
Result refers to	Start of Blue

Figure 5-46: Marker example > 4th marker

Note: The reference marker for result evaluation is not the same used for positioning!

In this case we want to know the distance to the third marker "Start of Blue".

The marker results including the pulse distance are shown below the trace display:



Blue Marker		Yellow Marker		Start of Blue		Start of Yellow	
Line, Trace, Math	Trace 1	Line, Trace, Math	Trace 2	Line, Trace, Math	Trace 1	Line, Trace, Math	Trace 2
Function	Auto Peak	Function	Auto Peak	Function	Rel. Power <-	Function	Rel. Power <-
Time	111.046 us	Time	790.420 us	Time	1.242 us	Time	570.101 us
Power	4.794 dBm	Power	4.484 dBm	Power	1.794 dBm	Power	1.484 dBm
				Ref. Marker	Blue Marker	Ref. Marker	Yellow Marker
				Rel. Time	-109.804 us	Result refers to	Start of Blue
				Rel. Power	-3.000 dB	Rel. Time	568.859 us
						Rel. Power	-0.309 dB

Figure 5-47: Marker example > traces with defined markers

The pulse distance is shown in the section of "Start of Yellow" > "Result refers to" > "Rel. Time": it is 568.859 µs.

5.4.1.14 Power Scale

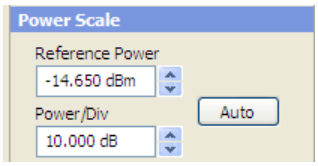


Figure 5-48: Measure > Trace > Power scale

This section provides to directly set the reference power level and the Y axis power scale division. The Y scale can be represented logarithmic or linear, defined in "Diagram Config. > Unit", on page 108.

Reference Power < Power Scale

Adjust reference power as the upper limit by either directly entering the value or incrementally shift the level using the plus minus buttons. Alternatively, set the reference power level under "Diagram Config. > Axes", on page 109.

> **Note:** This setting only affects the graphical data representation and has no influence on the measurement.

Auto

Initiate Auto scaling for the Y axis. The lower and upper limit values are computed according to a special algorithm. Considering all viewed traces the algorithm determines the minimum and maximum values of all the signals.

R&S NRPV updates the parameters, listed below:

- Y start, Y spread and Y stop
- Reference position marker, based on Y start change
- Trigger bar
- Y min power, Y max power and Y power/ div
- Reference position (grid value) fields in the diagram configuration
- Trace plots

Depending on the defined unit and the connected sensors, different routines are computed to determine the scaling automatically.

Power / Div

Set the power range of one Y axis division. Either directly enter a value or increment / decrement the size in fixed steps using the up and down arrow buttons. Alternatively, set the Y axis division in "Diagram Config. > Axes", on page 109.

5.4.1.15 Move/Zoom

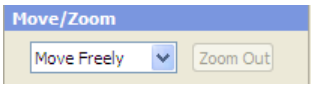


Figure 5-49: Measure > Trace > Move/Zoom

Covers a drop down list for configuration the mouse movement and zoom functionality in the trace results window. .

Note: Power/Div sets the scaling of the Y axis. Changing this value is always done by keeping the reference power constant and adjusting the visible power limits accordingly.

Figure 5-50: Measure > Trace > Move/Zoom list

Move Freely — Freely change the position of traces within the results window. R&S NRPV adjusts affected values automatically, and even provides moving the graphs.

How to proceed:

a. Position the cursor.

b. Capture a trace by pressing the left-hand mouse button and then keeping it pressed.

c. Move the trace to the requested position.

d. Release the mouse button to drop the trace at its new position.

Move Horiz. only — Change the position of traces within the results window in horizontal direction. Proceed the same way as described above.

Move Vert. only — Change the position of traces within the results window in vertical direction. Proceed the same way as described above.

Zoom In — Freely select any section to be zoomed in the results window.

How to proceed:

a. Position the cursor to set the zoom start point.

b. Press the left-hand mouse button and keep it pressed.

c. Drag a rectangular shape around the area to be zoomed in.

d. Release the mouse button to execute zooming.

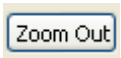
Note: In this way the display can be zoomed in several steps.
The zoom is cancelled by clicking the Zoom out button, see description below.

Fixed Trace — Fix the trace configuration of the currently performed measurement. Moving or zooming the trace with the mouse is disabled.

Additional adjustments during Zoom In

R&S NRPV does not just graphically perform zoom in operation but reconfigures the sensors and trace parameters to provide more detailed information on the measurement results.

Zoom Out < Move/Zoom



Return the scaling to the size before zooming in. If zooming in has been performed in several steps, zooming out operates the same way reversely.

5.4.1.16 Time Scale

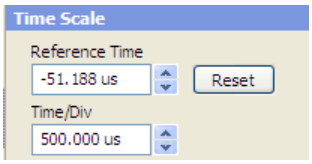


Figure 5-51: Measure > Trace > Time Scale

This section provides to directly set the reference time and the X axis time scale division.

Modification of time scale parameters is only possible for linear scale.

Reference Time

Set reference time by either directly entering the value or by using the up and down arrow buttons. The two buttons increase or decrease the time in fixed steps. The appropriate unit is added automatically to the value. Alternatively, set the reference time under “Diagram Config. > Axes”, on page 109.

Reset

Set reference time and reference position to default values. .

Time/ Div

Set the time span of one X axis division. Either directly enter the value or increment/ decrement the size in fixed steps using the up and down arrow buttons. Alternatively set the X axis division in “Diagram Config. > Axes”, on page 109.

5.4.1.17 Trigger

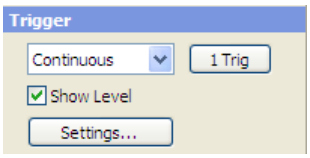
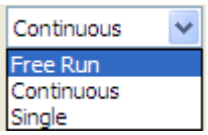


Figure 5-52: Measure > Trace > Trigger

Contains a drop down list to select the trigger mode.



Free Run	Automatically starts a measurement if no trigger event has occurred after 300 ms.
Continuous	Continuous triggering with regular trigger events.
Single	This setting disables continuous triggering so that only one trigger event at time is executed. To enable triggering, press the `1Trig` key. The symbol Trigger sequence control appears in the display. The trigger sequence control is used to manually control the trigger sequence.

1Trig

Initiate a single trigger event manually. `1Trig` captures the signal irrespective of the trigger level and applies the trigger event to all channels in the trace window. .

Depending on the state of the Trigger mode `1Trig` initiates different events:

- **Single deactivated** Stop a running measurement, or a start again a stopped measurement.
- **Single active** First selection of Trig1 enables triggering and starts measurement. A second stroke initiates one trigger event. The next stroke switches to manual triggering.

Show Level

Show the trigger level line in the display.

Note: Show level only concerns indicating the trigger level line. Trigger level symbols are permanently displayed, even if show trigger level is deactivated.

Settings

"Settings" on page 93 opens the trigger configuration dialog to set the appropriate trigger parameters.

5.4.1.18 Other Section

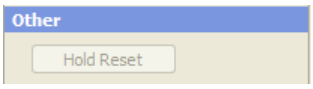


Figure 5-53: Measure > Trace > Other

Contains a reset button for restarting max hold function.

Hold Reset < Other

Resets the recorded max hold values and then restart Max Hold operation. For information on max hold function see "Measurement Configuration", on page 102.

5.4.1.19 Measurements Panel > Trace Measurement

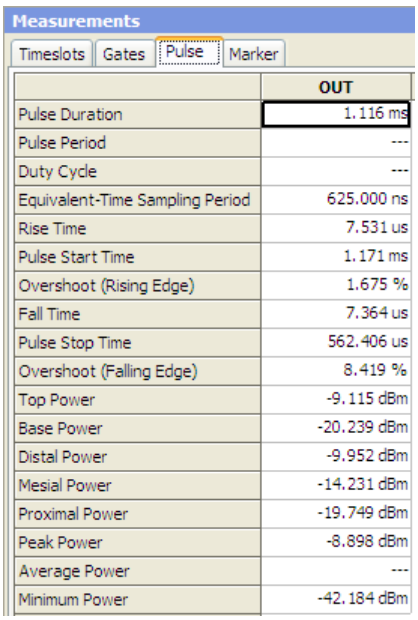


Figure 5-54: Measure > Trace > Measurements

The measurements panel consists of separate tabs which contain the significant parameters for timeslot, gates and pulse power measurement, and NdB down and marker parameters. R&S NRPV displays the currently measured values.

Timeslots < Measurements

Display the currently measured power level of a selected timeslot. Select the timeslot for indicating in "Diagram Config. > Gates/Timeslots", on page 111.

Gates < Measurements

Show the currently measured values of the selected gates. Display the values of av (average power), pk (peak power) and the ratio of pk/av. Select the timeslot for indicating in "Diagram Config. > Gates/Timeslots", on page 111.

Pulse < Measurements

Display the currently measured values of the incoming pulse signal. Display the parameters selected in "Diagram Config. > Pulse", on page 112.

Marker < Measurements

Display the settings of the markers selected for view in "Marker" on page 116.

5.4.2 Statistics

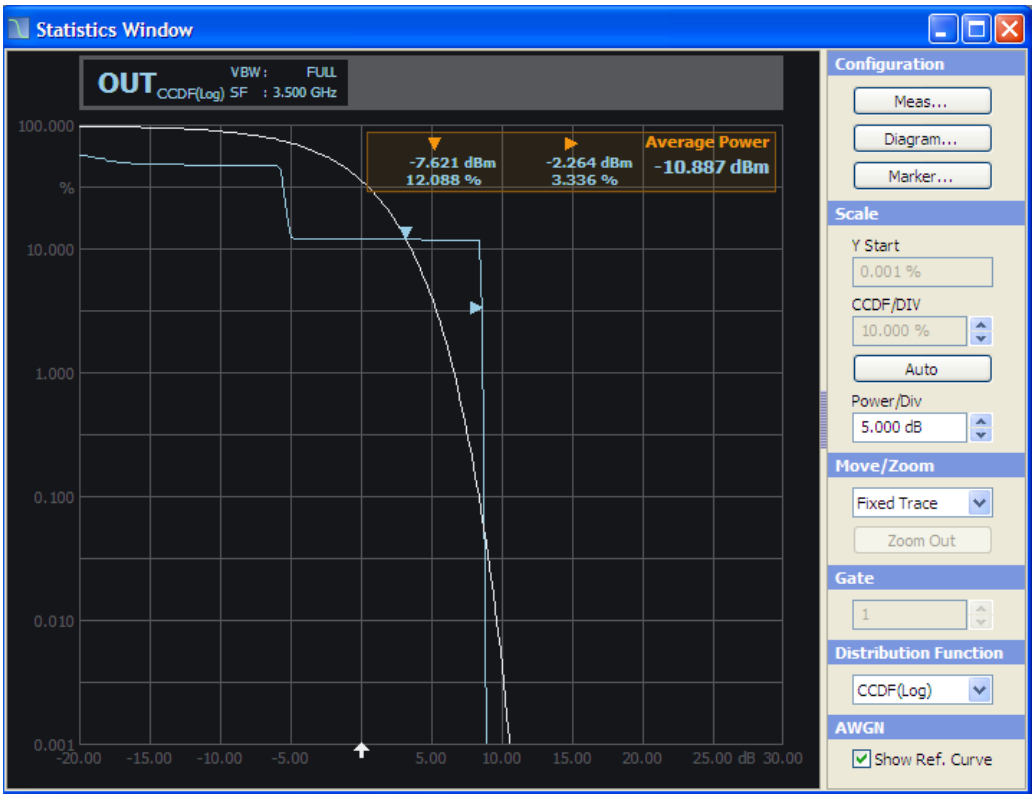


Figure 5-55: Measure > Statistics window

In the **Statistics** mode, R&S NRPV analyzes the power envelope of the test signal and returns an array of statistic values. Power envelope in its distribution and distribution density function is displayed. Statistically analyzing the envelope power requires trace measurement of the signal. The measurement covers one time interval and is repeated until the desired number of samples is attained. Multiple statistic measurements can be performed simultaneously.

> **Note:** The R&S NRP-Z8x wideband power sensors provide to graphically display the amplitude distribution as CCDF, CDF or PDF.

The Statistics dialog covers the following panels:

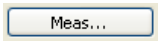
Display panel

Displays the results of power measurement statistically, i.e. the distribution or the distribution density. The display is divided into the “Graph in Statistics Mode” on page 129, showing the diagram with grid, markers and measurement graph, and the "Diagram Description Bar" on page 130 with information on the configured measurements.

Control panel

The control panel shows all parameters that are relevant for the display. It contains buttons to call sub dialogs for measurement, diagram and marker configuration as well as entry fields for directly setting power and distribution scaling, distribution function and some miscellaneous parameters.

Meas...

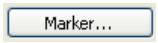


Open the dialog for "Measurement Configuration" on page 131. Select colour, view and channel of up to 4 configurable measurements. Set markers and AWGN distribution to be displayed and select acquisition and distribution functions.

Diagram...

Open the dialog to configure statistics display. Define the settings of the axes in "Diagram Config. > Axes" on page 134 and apply plot settings in "Diagram Config. > Plot" on page 136 to design the display and output of the measurement results.

Marker...



Open the dialog to set the position of the X and Y markers and their values in the display. For detailed description refer to "Marker" on page 137.

Scale, Move/Zoom, Gate, Distribution Function and AWGN

Directly enter the values or select settings in the control panel.For description refer to "Scale" on page 138, "Move/Zoom" on page 139 and "Gate, Distribution Function and AWGN" on page 140.

5.4.2.1 Graph in Statistics Mode

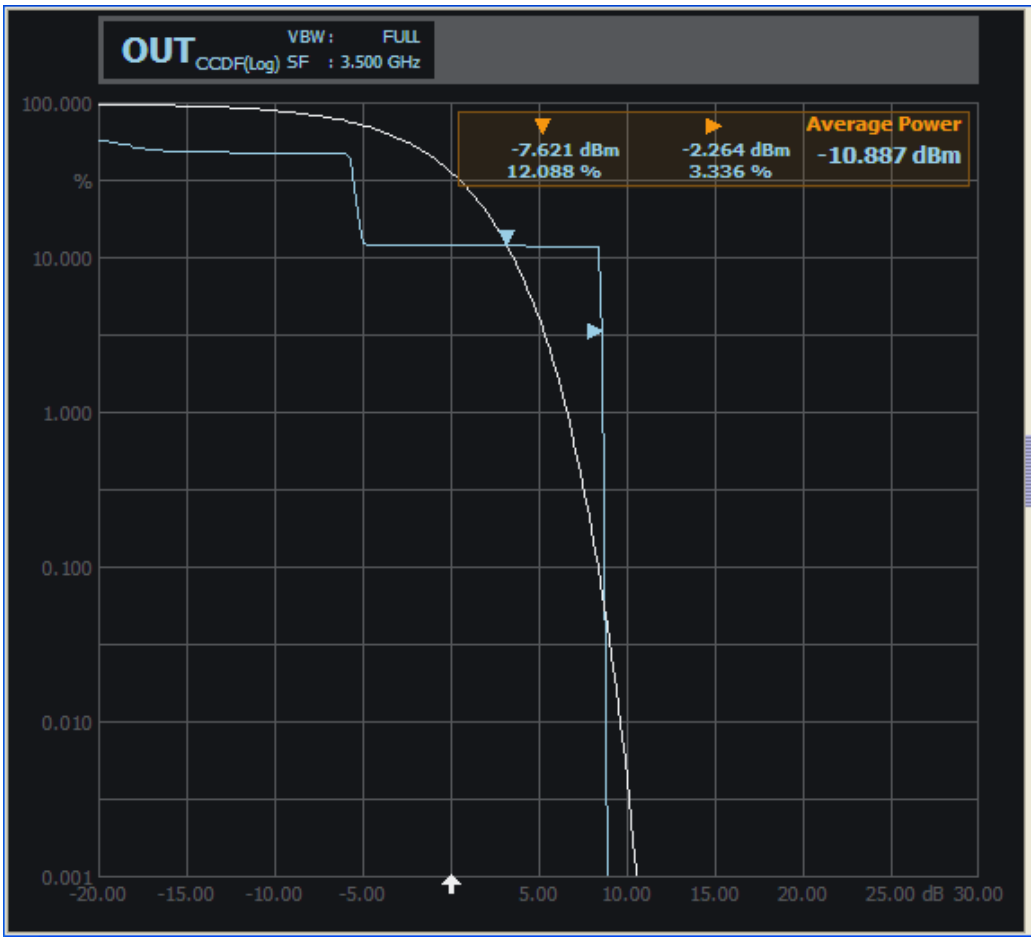


Figure 5-56: Measure > Statistics > Graph

The diagram area graphically represents the distribution or distribution density of the envelope power. The results window indicates:

- diagram description bar
- X axis, indicating power in dB or W
- Y axis scaled in %
- dotted gridlines
- a white arrow showing the average power 

- relative labels for the scale
- markers 
- graph, indicating the result and the additive white gaussian noise distribution

For detailed information on the symbols refer to “Infos and Symbols” on page 62.

5.4.2.2 Diagram Description Bar

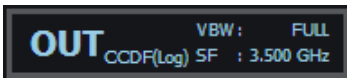


Figure 5-57: Measure > Statistics > graph description bar

The diagram description bar indicates various information on statistics configuration, e.g. a selected channel or a distribution function. The displayed values and additional information are each identified by their assigned colours, i.e. the colour of a value in a description box corresponds to colour assigned to the measurement and graph. An arrow at the beginning or at the end of the diagram description bar indicates that not all infos on the screen can be displayed. Click the respective arrow to scroll through the description bar.

For detailed information on the symbols of the results window refer to "Infos and Symbols" on page 62.

5.4.2.3 Context-sensitive Menu

R&S NRPV provides a context-sensitive menu in the results window of the statistics measurement window. Right-click to open the menu.

Note: The context-sensitive menu of the statistics measurement window mainly covers configuration functions which alternatively are accessed via the control panel, the menu bar or the toolbar. The menu also consists of functions as e.g. Show Hide Markers, Move/Zoom or Auto Scale. Show/Hide Markers and Move/Zoom provide submenus for selecting further parameters.

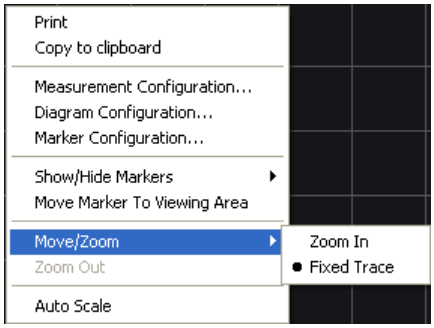


Figure 5-58: Measure > Trace > Context sensitive menu

The dialogs and parameters are described in the appropriate chapters of this operating manual. The following table lists the context-sensitive menu items and refers to the according descriptions.

Menu item	Described in section ...
Print / Copy to Clipboard	"Print or Copy to Clipboard" on page 49
Measurement Configuration...	"Measurement Configuration", on page 131
Diagram Configuration...	"Diagram Config. > Axes", on page 134 and "Diagram Config. > Plot", on page 136

Menu item	Described in section ...
Marker Configuration	"Marker", on page 137
Move Marker to Viewing Area	
Move/Zoom	"Move/Zoom", on page 139
Zoom Out	
Auto Scale	"Scale", on page 138

5.4.2.4 Measurement Configuration

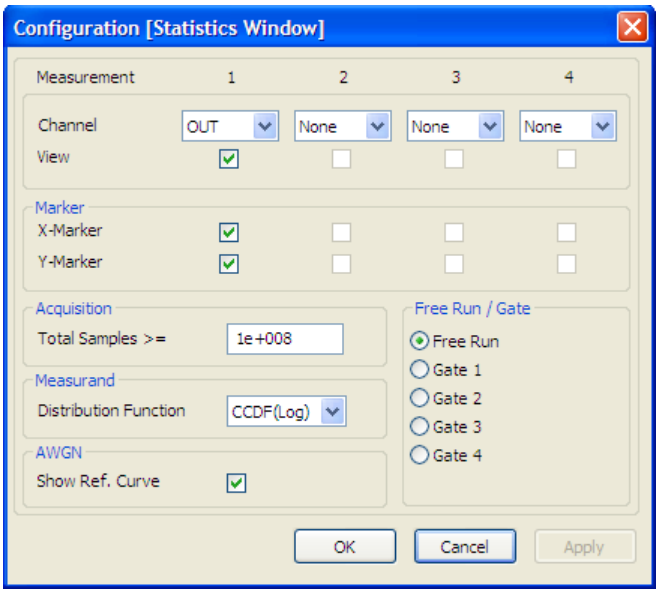


Figure 5-59: Measure > Statistics > Meas configuration

The statistics configuration dialog provides configuration of up to four measurements for sensors that support statistics measurement. View selection boxes activate displaying the measurement results. Set channel and marker for each measurement separately as well as general parameters for acquisition, distribution and display of the measurement results.

Measurement 1 - 4

Indicates 4 channels for statistics measurements.

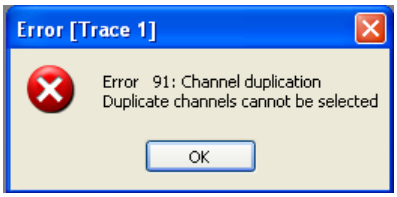
Channel

Select a particular channel of the signal to be measured and displayed in statistics mode. Select one of at maximum 4 channels from the list, containing only channels that provide statistics measurement. .

Note: The View checkbox is enabled automatically, if a channel is selected.

Channel Duplication

In case the same statistics measurement is assigned twice, an error message pops up.



It is possible to assign one channel to a measurement only.

View

Select the measurement result to be viewed on display.

Marker

Define a marker for either power or for density/distribution and set the positions. With the aid of markers you can calculate scalar values at the marker positions.

X Marker < Marker

View the marker, positioned to a power value in the measurement window. The value of the distribution or the distribution density is measured and displayed.

Y Marker < Marker

Display the marker, positioned to a value of distribution or distribution density. The power is measured and displayed.

Acquisition

Configure data acquisition parameters to be performed by the R&S power sensor.

Total Samples < Acquisition

Enter a minimum number of samples for statistics measurement. The parameter is used to calculate the measurement time considering the minimum and maximum values of the connected sensors.

Measurand < Acquisition

Select the distribution function for signal measurement and display. R&S NRPV supports the distribution functions CDF, the CCDF and PDF.

Distribution Function < Measurand

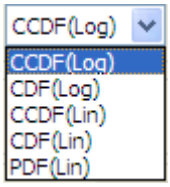


Figure 5-60: Distribution Function > Function list

The distribution function updates the sensor and the measurement configuration value. The sensor can be set to deliver CCDF statistics data directly. CCDF shows the probability that the mean signal power will be exceeded. The probability is represented as % in the diagram, performed either in logarithmic or linear scale.

CCDF (Log) Select CCDF (complementary cumulative distribution function) function with the results displayed in logarithmic scale.

CDF (Log) Set CDF (cumulative distribution function) in logarithmic scale. R&S NRPV updates the sensor using the CCDF function and calculates the measurement results internally, by means of:

CDF=1-CCDF

CCDF (Lin) Select CCDF function displayed in linear scale.

CDF (Lin) Select CDF function, shown in linear scale.

PDF (Lin) Select the PDF (probability density statistics) function. The graph represents the power histogram in linear scale.

AWGN

Add an ideal AWGN curve as reference to the statistics data display. The reference curve relates to the average power and can be used with all statistics modes.

Free Run /Gate

Free Run Activate measurement with an immediately executed trigger event.

- Active
  Free run performs continuous measurement during the selected time interval, asynchronously to the waveform. If a measurement is completed, the sensor is immediately set to initiated, waiting for the next trigger event.
- Deactivated
  A measurement is performed only once. Use free running for the first measurement of signals with unknown timing and level.

Gate 1 ...4 — Select a particular gate to acquire measurement values. The measurement is performed synchronously over the selected gate. R&S NRPV provides up to four gates for measurement. Statistic gate parameters as statistics start time, length and fence settings are defined in "Gates", on page 88.

Note: Free run mode disables "Gate" mode and vice versa.

5.4.2.5 Diagram Config. > Axes

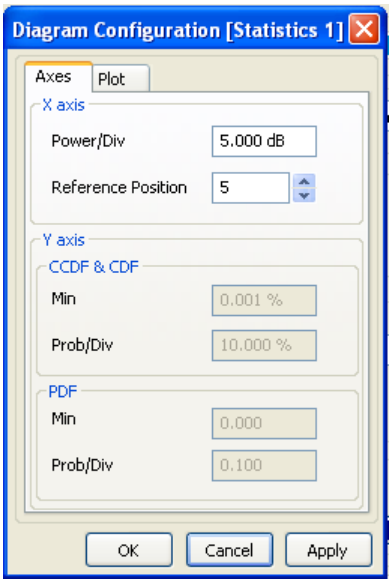


Figure 5-61: Measure > Statistics > Diagram > Axes

The Axes tab of the diagram configuration dialog covers entry fields for defining scale and reference position for the X axis, and scale in dependency of the distribution function for the Y axis, respectively. In statistics measurement X axis represents the power values, and the Y axis indicates the effective frequency of the values. The scales of both axes are divided into 10 equal divisions.

X axis

Set a reference position and grid of the power axis and thereby determine the start value of the power scale.

Power/Div < X axis

Define the power value of one division. Enter value and unit.

Reference Position < X axis

The scale of the X axis is focussed on the reference power, i.e. the average power applied from the sensor of the appropriate channel. Minimum and maximum values of the grid cannot be entered directly. Relating to the reference position and power/Div R&S NRPV calculates the start and end value of the scale, by means of:

Start = Reference Power – (Reference position * Power/Div.)

The scale values shown in power grid lines are relative values with respect to reference power.

Y axis

Enter start value and grid of the probability axis referring to the distribution function. For CCDF/CDF function scale unit is % in each case, for PDF function is dimensionless.

CCDF & CDF < Y axis

Min < CCDF & CDF < Y axis

Set the start value of the probability axis for CCDF/CDF evaluation. Enter value and unit.

Prob/Div < CCDF & CDF < Y axis

Define the value of one Y axis division.

PDF < Y axis

Min < PDF < Y axis

Set the start value of the probability axis for PDF evaluation. Enter value and unit.

Prob/Div < PDF < Y axis

Define the value of one Y axis division.

Modify Y axis parameters in linear scale only

Displaying the results in logarithmic scale, i.e. CCDF or CDF function, the start and <Function>/Div values are fixed. Modification is only possible for linear scale.

5.4.2.6 Diagram Config. > Plot

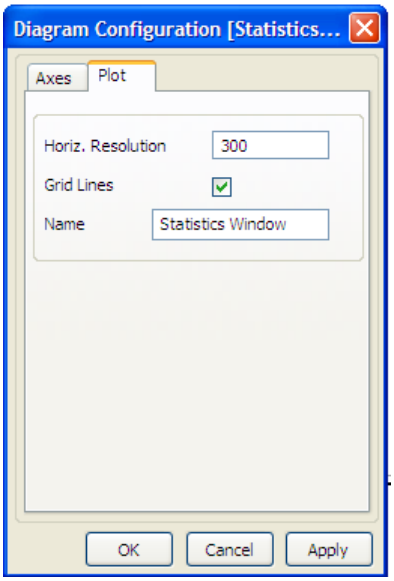


Figure 5-62: Measure > Statistics > Diagram > Plot

The Plot tab in the statistics diagram configuration dialog covers parameters for designing the statistics measurement display. Set screen resolution and grid lines assign a name to the measurement window in this dialog.

Horiz. Resolution

Set the number of pixels to specify the horizontal resolution. This setting is valid for all statistics measurements. R&S NRPV synchronizes an updated resolution with the sensor.

Grid lines

Set grid lines to be displayed or hidden.

Name

Apply a designated name to the statistics measurement window.

5.4.2.7 Marker

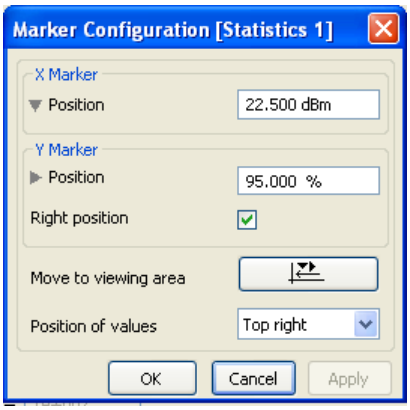


Figure 5-63: Measure > Statistics > Marker

In statistics mode, markers can be tied to points for performing automated measurements. The marker configuration dialog covers entry fields for setting markers of the x and y axis and to determine the position of marker information in the display.

Position < X Marker

Enter the X marker position in dBm.

Position < Y Marker

Enter the Y marker position in %.

Right Position < Y Marker

Place the probability marker on the right position, otherwise the marker is positioned on left hand side.

Move to viewing area

Place the X and Y markers within the results window if they are beyond the statistics window boundaries.

Position of values

Place the marker values inside the grid. Choose a position from the list:

Top left	Display the marker value list in the top left corner of the display.
Top right	Display the marker value list in the top right corner.
Bottom left	Display the marker value list in the bottom left corner.
Bottom right	Display the marker value list in the bottom right corner.

5.4.2.8 Scale

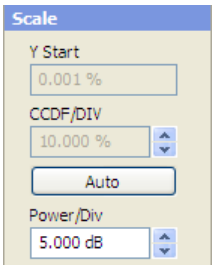


Figure 5-64: Measure > Statistics > Scale

This section provides to directly set the start value and the scale division of the probability axis as well as the X axis power value of a division.

Note: Modification of Y axis parameters is only possible in linear scale.

Y Start

Enter the start value for indicating the probability. Alternatively, set the start of the Y axis under “Diagram”, on page 134.

CCDF/Div

Define the value of one Y axis division. Either directly enter a value or increment / decrement the size in fixed steps using the up and down arrow buttons.

Auto

Initiate Auto scaling for both of the axis. The parameters defining the axes are computed according to the following settings:

- Default start and stop values for the Y axis CCDF/CDF function, and best fit values for the PDF function
- Default grid and spread values for X axis

Power/Div

Set the power range of one X axis division. Either directly enter a value or increment / decrement the size in fixed steps using the up and down arrow buttons. Alternatively, set the X axis division in “Diagram”, on page 134.

5.4.2.9 Move/Zoom

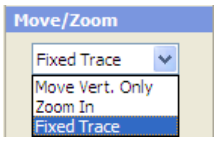


Figure 5-65: Measure > Statistics > Move/Zoom

Covers a drop down list for configuration the mouse movement and zoom functionality in the statistics results window.

Note: Power/Div sets the scaling of the X axis. Changing this value is always done by keeping the average power constant and adjusting the visible power limits accordingly.

Zoom In

Freely select any section to be zoomed in the results window. Recalculates the start, stop and spread values to start the measurement for the zoomed area. The reference marker remains and the scale is updated.

How to proceed:

a. Position the cursor to set the zoom start point.

b. Press the left-hand mouse button and keep it pressed.

c. Drag a rectangular shape around the area to be zoomed in.

d. Release the mouse button to execute zooming.

Note: In this way the display can be zoomed in several steps.
The zoom is cancelled by clicking the Zoom out button, see description below.

Fixed trace

Freeze the trace display/configuration of the currently performed measurement. The plot neither can be zoomed nor moved vertically.

Zoom Out < Move/Zoom

Return the scaling to the size before zooming in. If zooming in has been performed in several steps, zooming out operates the same way reversely.

5.4.2.10 Gate, Distribution Function and AWGN

Select the parametres for time gates and the distribution function, and activate the AWGN graph in the display.

Note: Alternatively, define the parameters in the dialog "Measurement Configuration", on page 131.

Gate

Figure 5-66: Measure > Statistics > Gate

Select one of four gates. R&S NRPV transmits information to the sensor and updates the measurement configuration. Statistic gate parameters as statistics start time, length and fence settings are defined in "Gates", on page 88.

Note: Gate is available only if free run mode is disabled.

Distribution Function

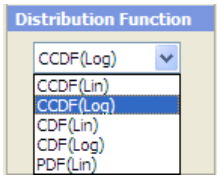


Figure 5-67: Measure > Statistics > Distribution function

Select the distribution function. R&S NRPV updates the sensor and the measurement configuration. Set to CDF the application transmits CCDF to the sensor and computes the CDF results internally.

Show Ref. Curve < AWGN

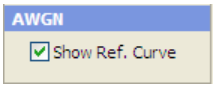


Figure 5-68: Measure > Statistics > Show Ref

Activate AWGN reference curve to be displayed.

5.4.3 Numerical

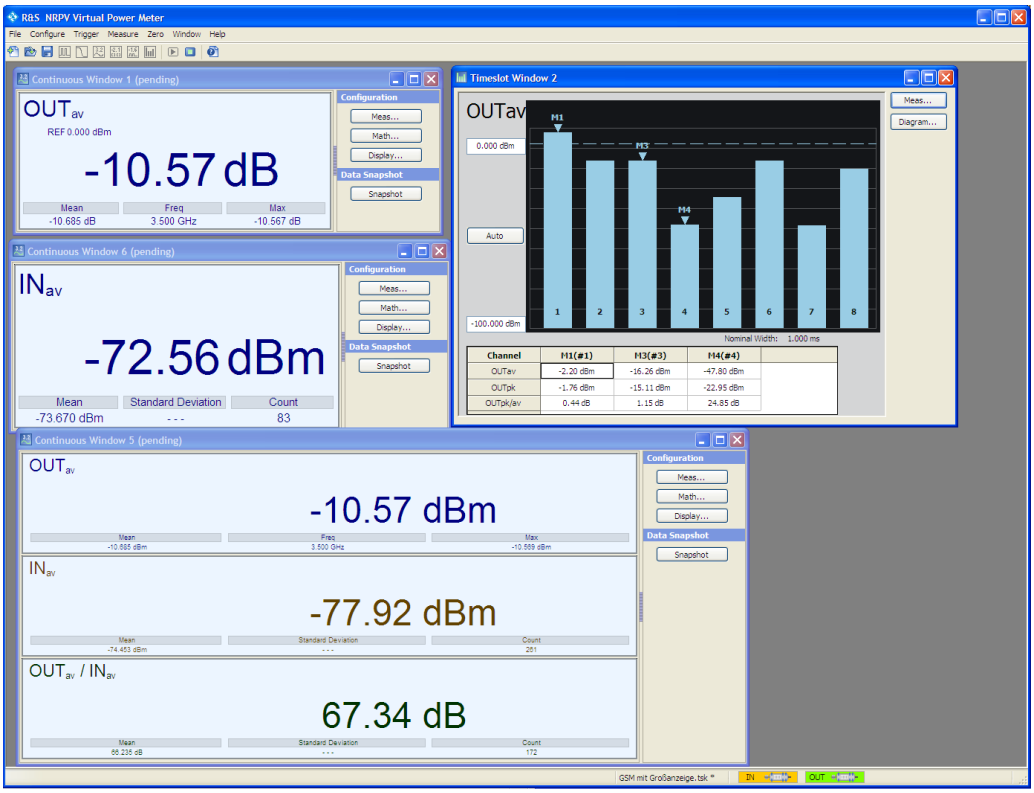


Figure 5-69: Measure > Numerical window

Numerical power measurement comprises continuous, gated, timeslot and burst measurement. R&S NRPV provides for all modes separate measurement windows, which are almost similar, except of the presentation of timeslot measurement. Every result window has its respective tabs for relative, reset and auxiliary reset functions

About the following description

In the following description the information is mainly valid for all numerical measurement modes covered. If there are special features for one specific mode, information is given and stated clearly.

Timeslot mode settings are described separately.

The numeric windows for continuous, gated or burst power measurement contain the following sections:

Results windows

Results windows point the results numerically in the "Results " on page 144.

Timeslot mode features special display, described in "Graph in Timeslot" on page 145.

Configuration controls

The control panel contains buttons to call subdialogs for measurement, math and diagram configuration.

Meas...

Open the dialog for configuring measurement parameters. Select measurements, channel and view, and determine the measurand for display. For description refer to "Measurement Configuration > Continuous / Gate / Burst" on page 148.

Timeslot mode features special measurement parameters, described in "Measurement Configuration > Timeslot" on page 150.

Math...

"Math" on page 157 opens the dialog to configure math parameters and to determine operands for related measurements. Define unit, set relative measurement and auxiliaries settings and apply styles to the results for display.

Display.../ Diagram...

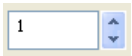
Open the dialog for configuring display settings, as described in "Display Configuration" on page 162. Rename the measurement window, define background colour and font settings. In case of timeslot measurement specify axes and plot settings in the according diagram dialog.

> **Note:** Timeslot mode features special display. The characterizing values are described in "Diagram Config. > Timeslot > Axes" on page 163, and "Diagram Config. > Timeslot > Plot" on page 164.

Gate Selection

> **Note:** Gate selection refers to time gate measurement.

For time gate average mode the control panel also includes an entry file for gate selection.



Select one of four gates. R&S NRPV transmits information to the sensor and updates the measurement configuration. Gate parameters as start time, length and fence settings are defined in “Gates”, on page 88.

> **Note:** Gate is available only if free run mode is disabled.

Snapshot

Stores the current measurement value in a *.csv file. R&S NRPV automatically creates a new file, assigns the file name, composed of the date, time and an abbreviation for the measurement, and stores it in the application path under `%APPDATA%\Rohde-Schwarz\NRPV\Snapshots`.

`%APPDATA%` is a system variable, representing drive and path of the application data on your PC.

All further snapshots of the same date and measurement are continuously stored in this file.

► Move the pointer over the button to find a ToolTip with information on directory, path and file name.

Measurement abbreviations:

CA	**C**ontinuous **A**verage
TG	**T**ime **G**ate
BA	**B**urst **A**verage

Measurements Panel

Note: Measurments panel refers to timeslot measurement.

Display power values available in a selected timeslot. For detailed description refer to "Measurements Panel > Timeslot" on page 164.

5.4.3.1 Results in Numerical Mode

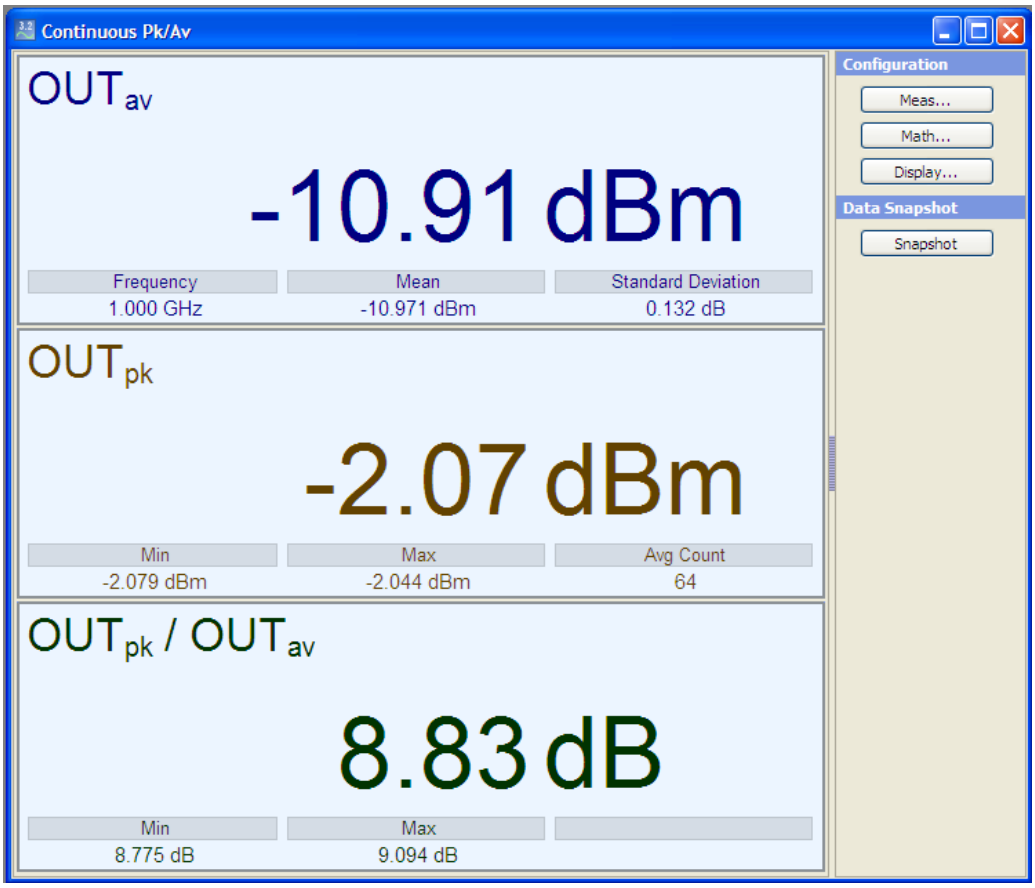


Figure 5-70: Measure > Numerical > Results window

The results field represents a digital meter indicating the main numeric value of measurement and auxiliary values, selected for view under "Measurement Config. > Auxiliaries", on page 154. An analog meter graphically represents the results. One measurement window covers a maximum of 4 result fields, including both, absolute and math measurements.

The main numeric result displays either the measurement value or the values resulting from math operations. Based on unit, the result formats depend on absolute or relative measurement. The auxiliary result displays up to three further values of absolute channel or math measurement results. The result formats depend on measurement mode. Resolution is always 0.001 for auxiliary results.

According to channel, measurement and math operation the result designation may contain various information. For detailed information on the symbols of the result field refer to

For detailed information on the symbols refer to "Infos and Symbols" on page 62.

5.4.3.2 Graph in Timeslot Mode

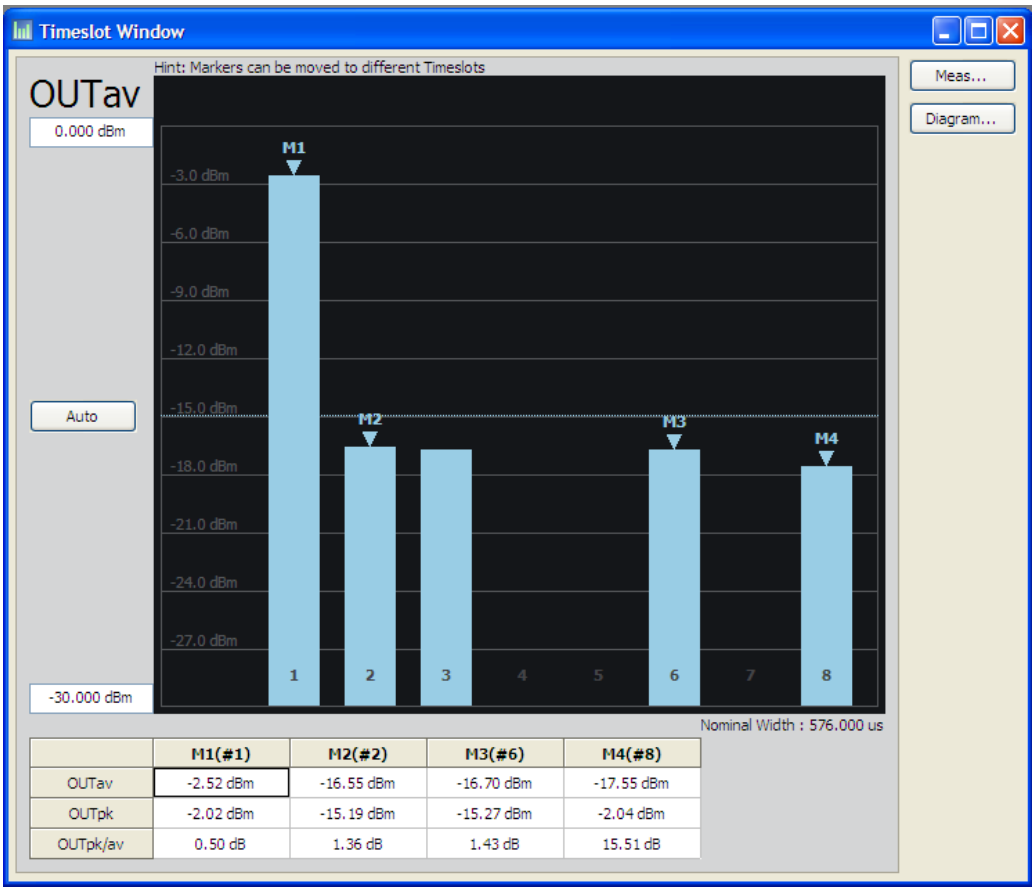


Figure 5-71: Measure > Numerical > Graph

The graphical timeslot average power view contains information listed below:

- Bar chart with up to 8 active slots
- Nominal width
- Trigger level
- Averaging filter count
- Reference level
- Marker measurement

All bars are continuously updated. The update rate depends mainly on the set average filter count. The higher the filter count, the lower the update rate and the noise level. To the left of the timeslot results window a control panel provides entry fields for directly setting the power levels of the scale.

If the readings in a bar exceed the upper value of the diagram, R&S NRPV graphically indicates the overshoot by darkening the color of the respective bar.

Max power/ Min power

30.000 dBm / -70.000 dBm

Set minimum and maximum power value for display. Both entry fields provide the unit of measurement selected in the unit tab.
The control panel shows all parameters that are relevant for the display. It contains buttons to call sub dialogs for measurement, diagram and marker configuration as well as entry fields for directly setting power and distribution scaling, distribution function and some miscellaneous parameters.

Auto

Auto

Initiate Auto scaling for the power axis. The lower and upper limit values are computed according to a special algorithm. Considering all viewed timeslots the algorithm determines the minimum and maximum values of all the results.
R&S NRPV updates the parameters, listed below:

- Y min power, Y max power and Y power/ div
- Reference position marker, based on Y start change
- Trigger bar
- Reference position (grid value) fields in the diagram configuration

Depending on the defined unit and the connected sensors, different routines are computed to determine the scaling automatically.

5.4.3.3 Context-sensitive Menu > Continuous/ Gate / Burst

R&S NRPV provides a context-sensitive menu in the result field of a numerical measurement window. Right-click to open the menu.

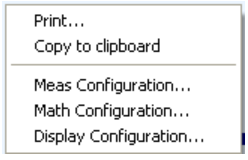


Figure 5-72: Measure > Numerical > Context sensitive menu

Note: The context-sensitive menu of the numerical measurement window covers configuration functions, which alternatively can be accessed via the control panel, the menu bar or the toolbar. Additionally the Save Diagram function is included in this menu.

The dialogs and parameters are described in the appropriate chapters of this operating manual. The following table lists the context-sensitive menu items and refers to the according descriptions.

Menu item	Described in section ...
Print / Copy to Clipboard	“Print or Copy to Clipboard” on page 49
Meas Configuration...	“Measurement Configuration > Continuous / Gate / Burst”, on page 148
Math Configuration...	“Math Configuration”, on page 157
Display Configuration...	“Display Configuration”, on page 162

5.4.3.4 Context-sensitive Menu > Timeslot

R&S NRPV provides a context-sensitive menu in the result field of a timeslot measurement window. Right-click to open the menu.

Note: The context-sensitive menu of the timeslot measurement window mainly covers configuration functions which alternatively can be accessed via the control panel, the menu bar or the toolbar. The menu also consists of functions as e.g. Show Hide Markers and Save Diagram. Show/Hide Markers provides a submenu to individually set markers for display.

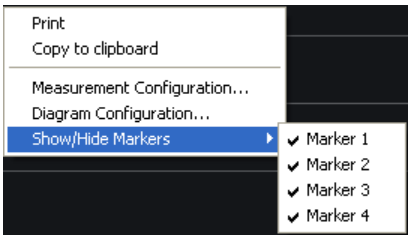


Figure 5-73: Measure > Numerical > Context sensitive menu Tslot

The dialogs and parameters are described in the appropriate chapters of this operating manual. The following table lists the context-sensitive menu items and refers to the according descriptions.

Menu item	Described in section ...
Print / Copy to Clipboard	"Print or Copy to Clipboard" on page 49
Measurement Configuration...	"Measurement Configuration > Timeslot", on page 150.
Diagram Configuration...	"Diagram Config. > Timeslot > Axes", on page 163 and "Diagram Config. > Timeslot > Plot", on page 164
Show/Hide Markers, e.g. – Marker 1 – Marker 2 – Marker 3 – Marker 4	Right mouse click shows or hides markers.

5.4.3.5 Measurement Configuration > Continuous / Gate / Burst

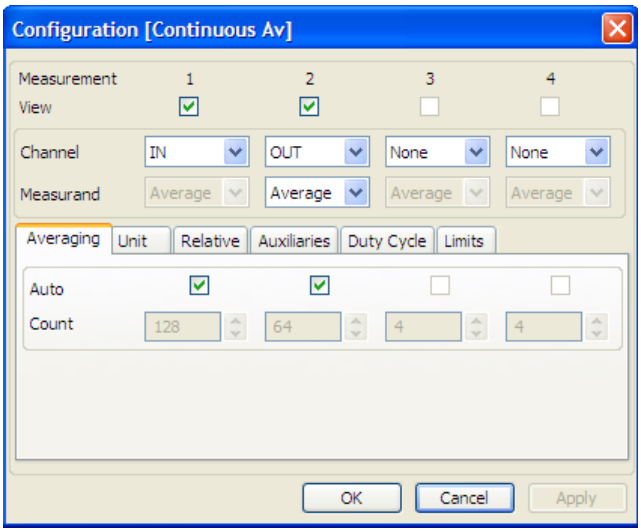


Figure 5-74: Measure > Numerical > Meas configuration > Continuous / Burst / Gate

Note: The Duty Cycle" tab only applies to "Continuous Av" measurement mode.

The numerical measurement configuration dialog provides configuration of up to four measurements. View selection boxes activate displaying the measurement results of each measurement separately. Select channel and measurand and define additional parameters, as e.g. averaging, unit or style which are covered in separate tabs.

Measurement

Indicates the measurement number.

View

Select the measurement to be viewed on the main numeric measurement window. R&S NRPV views up to four measurements, including the absolute channel and maths measurement.

Note: It is not possible, to check more than 4 views.

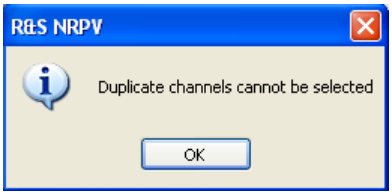
Channel

Select a channel for numerical measurement. The drop down menu indicates all assigned channels supporting numeric measurement.

Note: If the connected sensor provides time gate measurement with the specified global parameters, the application evaluates all selected channels.

Channel Duplication

In case the same measurement is assigned twice, an error message pops up.



It is possible to perform e.g. an average measurement and a peak measurement within the same channel.

Measurand

Select the measurement parameter to be displayed.

Average	Select the average power for display.
Peak	Select the highest power measured. Peak is only available, if the sensor supports this feature.

Note: In case the same measurand is assigned to a second measurement in the same channel, an error message pops up.

Tabs

Besides the settings described above the measurement configuration dialog covers several tabs for setting further parameters, i.e.:

- average parameters, see also "Measurement Config. > Averaging" on page 151.
- units, see also "Measurement Config. > Unit" on page 152
- relative measurement options and reference value, see also “Measurement Config. > Relative”, on page 153
- Auxiliaries, containing particular measurement values for display, see also "Measurement Config. > Auxiliaries" on page 154
- Duty cycle settings for calculating the pulse power of pulse modulated signals, see also “Measurement Config. > Duty Cycle”, on page 155
- limit values, see also “Measurement Config. > Limits”, on page 156

5.4.3.6 Measurement Configuration > Timeslot

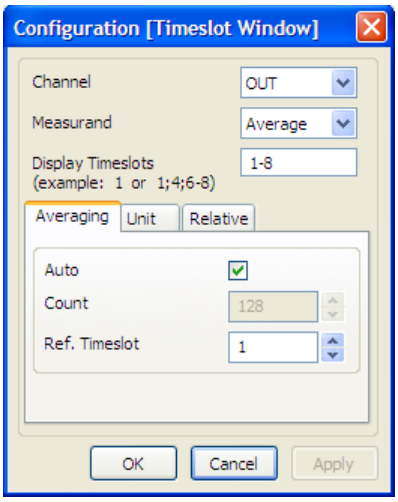


Figure 5-75: Measure > Numerical > Meas configuration > Tslot

Select channel, measurand and timeslot, and define additional parameters, as e.g. averaging, unit or style which are covered in separate tabs.

Channel

Select a channel for measurement. The drop down menu lists all assigned channels supporting timeslot measurement.

Note: If the connected sensor provides timeslot measurement with the specified global parameters, the application evaluates all selected channels.

Measurand

Select the measurement parameter to be displayed.

Average	Select the average power for display.
Peak	Select the highest power measured. Peak is only available, if the sensor supports this feature.

Note: In case the same measurand is assigned to a second measurement in the same channel, an error message pops up.

Display Timeslots

Select the timeslots that are to be displayed in the diagram.

Tabs

Besides the settings described above the application provides several tabs for setting further parameters, i.e.:

- averaging parameters are set in "Measurement Config. > Averaging" on page 151
- set units in "Measurement Config. > Unit" on page 152
- define relative measurement options and reference values under "Measurement Config. > Relative" on page 153

5.4.3.7 Measurement Config. > Averaging

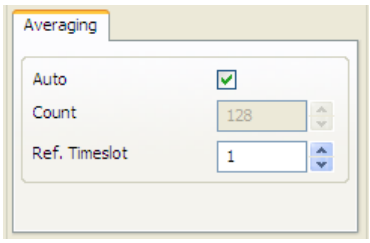


Figure 5-76: Measure > Numerical > Meas configuration > Averaging

Note: The "Ref. Timeslot" selection field applies to "Timeslot" measurement mode.

The averaging tab enables you to activate automatically averaging mode and to set the average filter count.

Auto

On	The sensor determines the optimum average filter count internally based on the given resolution.
Off	The sensor uses an averaging factor manually set by the user.

Count

Enter the number of measured values that have to be averaged to form the measurement result. Directly entered, the value is rounded off to the nearest power of two. Use the Up & Down arrow buttons to increment / decrement the averaging count. Count is rounded to the next higher / lower power of 2^x value. The greater this averaging factor, the less the measured values fluctuate and the longer the measurement time is.

R&S NRPV transmits the changes to the corresponding sensor, featuring the following configuration:

- **Avg. count < Min.:** Averaging count is set to minimum and the decrement button is disabled.
- **Avg. count > Max.:** Averaging count is set to maximum and the increment button is disabled.

  Note: In case of Min or Max count set automatically, no error messages are reported.

Ref. Timeslot

Define the timeslot whose power is to be used as reference for automatically calculating the average count (auto averaging).

Reference timeslot selection applies to timeslot mode.

5.4.3.8 Measurement Config. > Unit

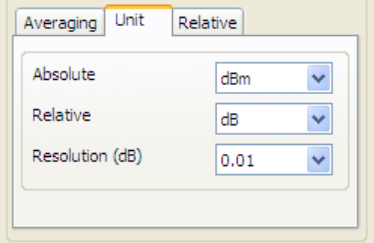


Figure 5-77: Measure > Numerical > Meas configuration > Unit

The unit tab of either the numerical configuration dialog contains the entry fields for assigning unit and resolution. Measurement and math results can be viewed in linear scale [Watt] or logarithmic scale [dBm].

Absolute

Set the unit to display the absolute values of measurement.

dBm	Display the absolute value as logarithmic power ratio.
W	Display the absolute power value in Watt.
dBµV	Display the absolute value of logarithmic power ratio, expressed as a voltage.

Relative

Set the unit to display the results of relative power measurement.

1	Display the measured level related to a reference power.
dB	Display the relative value as logarithmic power ratio.
Δ%	Display the power ratio of result and reference power, expressed %.

Note: When using percentages, differentiate between voltage or power quantities, and consider the x% of a quantity, or x% more or less of a quantity.

Resolution (dB)

Select a resolution to display the results according to that value. R&S NRPV transmits the changed resolution value to the sensor.

5.4.3.9 Measurement Config. > Relative

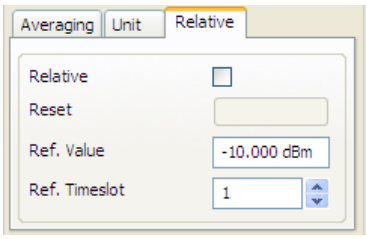


Figure 5-78: Measure > Numerical > Meas configuration > Relative

Note: The "Ref. Timeslot" selection field applies to "Timeslot" measurement mode.

The "Relative" tab provides setting parameters for relative power measurement. Using relative function to relate a power or a power ratio to a reference value, e.g. a measured or a directly entered power. Use this mode for analyzing the stability or drift during power measurement.

Note: If you perform a measurement with the math operation "SWR" (**S**tanding **W**ave **R**atio), relative measurement is disabled, see "Math Configuration" on page 105.

Relative

On — Activate relative measurement. Based on the measured values R&S NRPV computes the relative values according to the reference value. Relative measurement results as ratio in linear scale.

Note: SWR measurement mode disables relative measurement.

Off — Select absolute measurement or measurement of the power ratio of two measurements.

Reset

Accept the currently measured value as reference value. This Reset button is enabled when relative measurement is on.

Note: If the measurement result is invalid during reset function, an error message pops up.

Ref. Value

Directly enter a new reference value or modify a previously set value.

Ref. Timeslot

Select a particular timeslot for indicating.

Reference timeslot selection only affects the settings in timeslot mode.

5.4.3.10 Measurement Config. > Auxiliaries

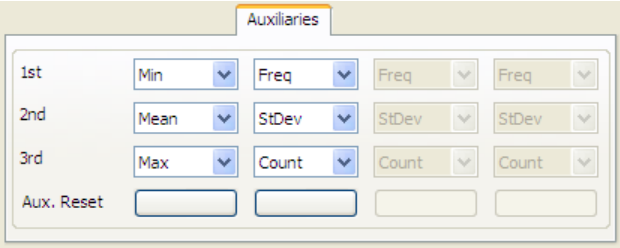


Figure 5-79: Measure > Numerical > Meas configuration > Auxiliaries

Note: The "Auxiliaries" tab field applies to "Continuous, Gated and Burst Average" measurement modes. "Timeslot" mode features a special display with settings defined separately. The characterizing values in timeslot mode are described in "Graph in Timeslot" on page 145.

The "Auxiliaries" tab enables you to select particular measurement values for display. Besides the main reading up to three values are displayed in the result field.

1st. / 2nd. / 3rd.

Select up to 3 parameters for display. R&S NRPV computes the following values during measurement:

Min	The minimum value resulting from the measured samples.
Max	The maximum value resulting from the measured samples.
Mean	The mean value calculated from the measured samples.
StDev	The standard deviation calculated from the samples.
Freq	The frequency of the measured signal.
Count	The counted the number of samples.
Av Count	The number of readings to be averaged for one measured value.
None	none

Aux. Reset

Assign the currently measured Min, Max, Mean, Num and StDev values. This Reset button is enabled if any of the auxiliaries entry fields is selected.

5.4.3.11 Measurement Config. > Duty Cycle

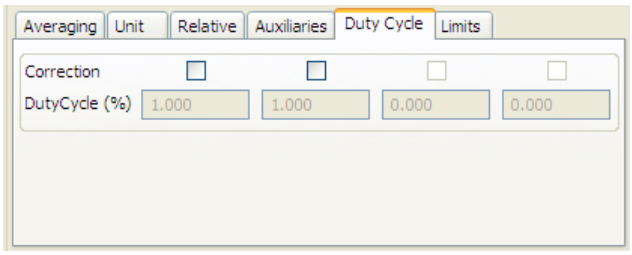


Figure 5-80: Measure > Numerical > Meas configuration > Duty cycle

Note: This dialog only affects continuous average power measurement of pulse modulated signals.

Activate duty cycle correction in this tab. Using duty cycle correction the duty cycle can be set as a percentage for pulse modulated signals. The sensor calculates the pulse power from the duty cycle and the average power.

Correction

On — Activate duty cycle correction for the corresponding sensor. If the duty cycle is measured, R&S NRPV displays the average power in the pulse.

In the Info line of the measurement window the symbol indicates that global offset correction has been activated.

Note: Duty cycle on enables the entry field Duty Cycle (%) (described below) and vice versa.

Off — Switch off duty cycle correction.

Duty Cycle (%)

Enter the value in percent. This entry field is enabled if duty cycle correction is activated.

5.4.3.12 Measurement Config. > Limits

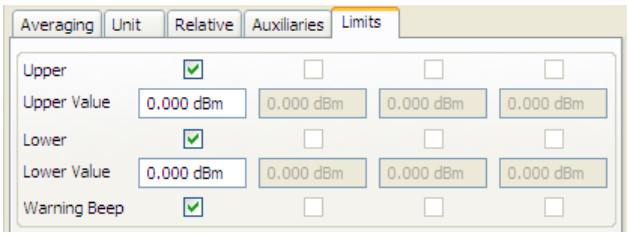


Figure 5-81: Measure > Numerical > Meas configuration > Limits

Note: The "Auxiliaries" tab field applies to "Continuous, Gated and Burst Average" measurement modes.

The limits tab provides setting an upper and a lower limit for each measurement result. If either limit is exceeded, a warning is issued.

Upper / Lower

On — Switch on the monitoring function for the upper limit or lower limit, respectively.

Off — Switch off upper/ lower limit check.

Upper/ Lower Value

Specify an upper/lower limit for the measured values. If a limit is exceeded, the warning message "Limit fail" is displayed.

Warning Beep

On — Activate an acoustic alarm for output if a limit is exceeded.

Off — Turn off the acoustic alarm.

5.4.3.13 Math Configuration

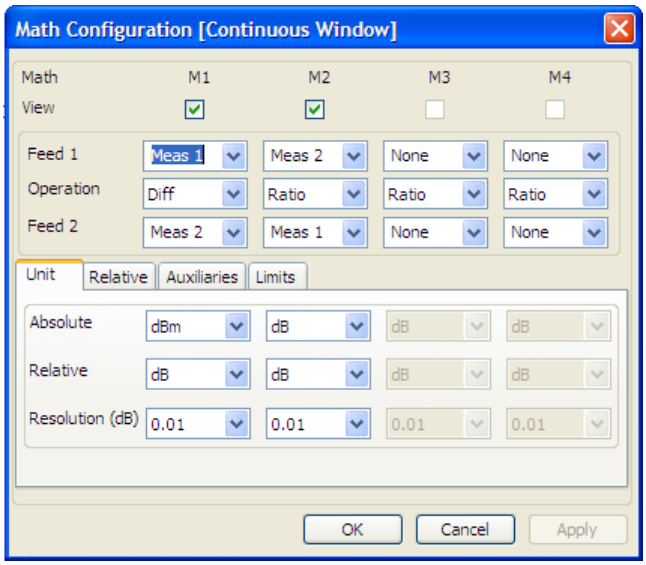


Figure 5-82: Measure > Numerical > Math configuration dialog

Note: R&S NRPV provides the "Math" functionality in the measurement modes continuous, gate and burst.

R&S NRPV processes the results from several sensors, using mathematical functions. The math configuration dialog provides configuration of up to four math channels for multichannel measurement. Each of the four channels can be assigned to the same or to different sensors. If multiple channels use the same sensor, the measurement is performed only once. The result is reused for the other channels. View selection boxes activate displaying the measured and computed results of each math channels.

Select channel and measurand and define additional parameters, as e.g. unit, relative measurement option or auxiliaries, which are covered in separate tabs.

Math 1 - 4

Indicates 4 available math measurements.

View

Select the math channels to be viewed in the result field. R&S provides to display up to four measurements, including absolute channel and math measurements.

Feed 1, 2

Select a measurement for the first and for the second operand. The available absolute channel measurements are listed for selection.

Feed 1	Select the channel to be used to calculate the displayed value.
Feed 2	Select the second channel which is to be used for calculation.

Operation

Select a calculation function to operate the measurement results of feed 1 and feed 2. If view is set, the corresponding math measurement results are displayed on the result field.

Ratio — Build the ratio of the power in the first channel to the power in the second channel. Internally the ratio is performed by subtracting the measured power values in logarithmic scale. Displayed unit is dB.

Diff — Subtract the measured power in the second channel from the power of the first channel. The calculation, performed in linear scale is converted to logarithmic scale. Displayed unit is dB.

SWR — Compute the standing wave ratio from the first and the second measurement by using the following equation:

$$SWR=(1+RC)/(1-RC)$$

The measurement is performed in logarithmic scale.

Note: The forward power must be measured in the first channel and the reverse power must be assigned to the second channel.

RC is the reflection coefficient, internally calculated from the measured power values P1 in channel 1 and P2 in channel 2.

$$RC=10^{(P1-P2)/20}$$

Tabs

Besides the settings described above the math configuration dialog contains several tabs ,to set further parameters. The following chapters inform about these settings:

- "Math Config. > Unit", on page 159
- "Math Config. > Relative", on page 160
- "Math Config. > Auxiliaries", on page 161
- "Math Config. > Limits", on page 162

5.4.3.14 Math Config. > Unit

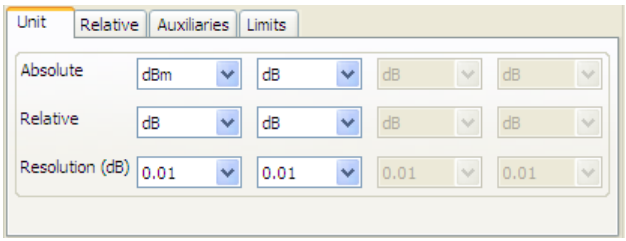


Figure 5-83: Measure > Numerical > Math configuration > Unit

The unit tab of the math configuration dialog contains the entry fields for assigning unit and resolution to the results. Math results can be viewed in linear scale [Watt] or logarithmic scale [dBm].

Absolute

Set the unit to display the absolute values of measurement.

Units for absolute measurement

According to relative measurement, selected with math function ratio, the unit list changes to the appropriate relative units, described in section **Relative** (see below).

dBm	Display the absolute value as logarithmic power ratio.
W	Display the absolute power value in Watt.
dBµV	Display the absolute value of logarithmic power ratio, expressed as a voltage.

Relative

Set the unit to display the results of relative power measurement.

1	Display the measured level related to a reference power.
dB	Display the relative value as logarithmic power ratio.
Δ%	Display the power ratio of result and reference power, expressed %.

Note: When using percentages differentiate between voltage or power quantities, and consider the x% of a quantity or x% more or less of a quantity.

Note: SWR measurement mode disables relative measurement.

Resolution (dB)

Select a resolution to display the results according to that value. R&S NRPV transmits the changed resolution value to the sensor.

5.4.3.15 Math Config. > Relative

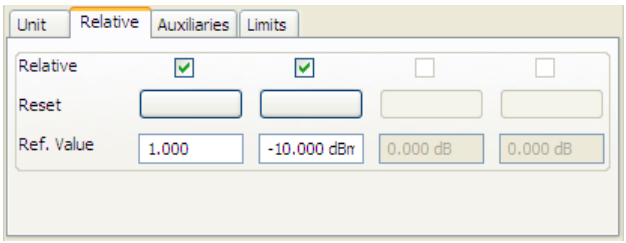


Figure 5-84: Measure > Numerical > Math configuration > Relative

The Relative tab provides settings for relative power measurement. Data, resulting from math operation can be related to a reference value.

Relative

On — Activate relating function. Based on the calculated values R&S NRPV computes the relative values according to the reference value. Relative results are output as ratio in linear scale.

Note: SWR measurement mode disables relative measurement.

Off — Select absolute output of math results.

Reset

Accept the currently calculated value as reference value. This Reset button is enabled when relative function is on.

Note: If the measurement result is invalid during reset function, an error message pops up.

Ref. Value

Directly enter a new reference value or modify a previously set value.

5.4.3.16 Math Config. > Auxiliaries

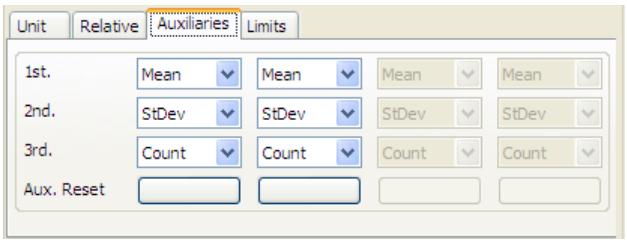


Figure 5-85: Measure > Numerical > Math configuration > Auxiliaries

The Auxiliaries tab enables you to select particular math results for display. Along with the main numeric value up to three values are displayed in the result field.

1st. / 2nd. / 3rd.

Select up to 3 parameters for display. R&S NRPV computes the following values during calculation:

Min	The minimum value resulting from the calculated samples.
Max	The maximum value resulting from the calculated samples.
Mean	The mean value calculated from the calculated samples.
StDev	The caluculated standard deviation.
Feed 1 / Feed 2	The values of feed 1 or feed 2 are used for calculating.
Count	The counted the number of samples.
None	none

Aux. Reset

Assign the currently measured Min, Max, Mean, Feed, Num and StDev values. This Reset button is enabled if any of the auxiliaries entry fields is selected.

5.4.3.17 Math Config. > Limits

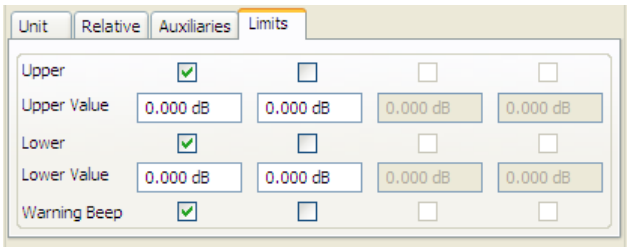


Figure 5-86: Measure > Numerical > Math configuration > Limits

The limits tab provides setting an upper and a lower limit for each calculated result. If either limit is exceeded, a warning is issued.

Upper / Lower

On — Switch on the monitoring function for the upper limit or lower limit, respectively.

Off — Switch off upper/ lower limit check.

Upper/ Lower Value

Specify an upper/lower limit for the computed values. If a limit is exceeded, the warning message "Limit fail" is displayed.

Warning Beep

On — Activate an acoustic alarm for output if a limit is exceeded.

Off — Turn off the acoustic alarm.

5.4.3.18 Display Configuration

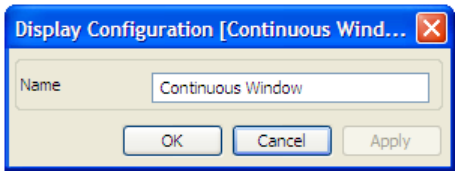


Figure 5-87: Measure > Numerical > Display configuration dialog

Name

Assign a designated name to the appropriate measurement window.

5.4.3.19 Diagram Config. > Timeslot > Axes

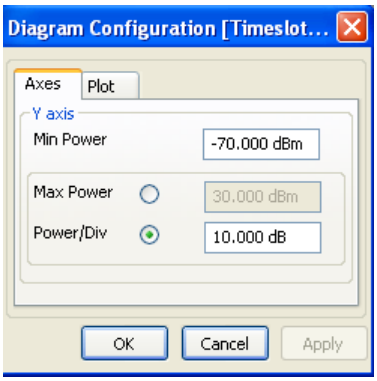


Figure 5-88: Measure > Numerical > Diagram configuration > Tslot > Axes

Set the axis division, minimum and maximum power values for the Y axis in the Axes tab of the timeslot diagram configuration dialog. The Y axis power scale is divided into 10 equal divisions. The y scale is defined by two parameters, either by minimum and by maximum power or by minimum power and power step per division. The entry fields provide the unit of measurement selected in the unit tab. Alternatively, both values can be entered directly in the results window of the timeslot measurement window. These settings only affect the graphical data representation in the application and have no influence on the measurement or sensor configuration.

Min Power < Y axis

Set minimum level of the display.

Max Power < Y axis

Enable the entry field to directly enter the maximum power value of the display. The value defines the upper limit of the timeslot results window.

Power/Div < Y axis

Enable the entry field to enter the power value of one division. The value, multiplied by 10, the predefined number of divisions, defines the upper limit of the timeslot results window.

Based on the power range of the sensor, Power/Div is validated featuring the following configuration:

- **Pow/Div < Min.**: Minimum value is set per division.
- **Pow/Div > Max.**: Maximum value is set per division.

  Note: In case of start value set automatically, no error messages are reported.

5.4.3.20 Diagram Config. > Timeslot > Plot

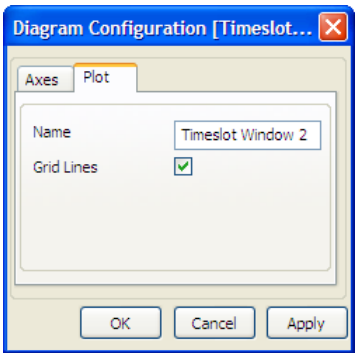


Figure 5-89: Measure > Numerical > Diagram configuration > Tslot > Plot

Activate the view of gridlines in the diagram and assign a name to the measurement window in this dialog.

Name
Apply a designated name to the timeslot measurement window.

Grid lines
Set grid lines to be displayed or hidden.

5.4.3.21 Measurements Panel > Timeslot

	M1(#1)	M2(#2)	M3(#6)	M4(#8)
OUTav	-2.44 dBm	-16.57 dBm	-16.63 dBm	-22.52 dBm
OUTpk	-2.03 dBm	-15.22 dBm	-15.24 dBm	-2.04 dBm
OUTpk/av	0.41 dB	1.35 dB	1.39 dB	20.48 dB

Figure 5-90: Measure > Timeslot

The measurements panel shows power values measured in timeslots. Activate the timeslot for display in the measurement configuration dialog, as described under ""Measurement Configuration > Timeslot" on page 150".

<channel>
Displays the parameters average, peak and the ratio of average to peak of the corresponding channel.

M1 (#1)
Displays the values of the appropriate channel measured in the selected timeslot.

5.5 Start / Stop Measurement

Start
Starts the measurement in the currently active window. This button is disabled if measurement is running.

Note: The start command causes that all open measurements are activated, but only the measurement in the active window is executed. If you activate another measurement window, R&S NRPV automatically executes this measurement and switches off the previous one.

Stop
Stops the running and all active measurements.

5.6 Zero

Initializing the power sensor

To prevent any previous settings from causing incorrect results always run a new measurement with reset of the sensor.

Zeroing

Turn off the test signal before zeroing. An active test signal during zeroing causes an error because the power measured is too high.

► Zero > Select > Channels > OUT in the R&S NRPV menu bar.

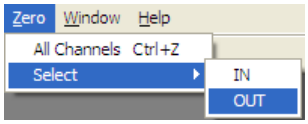


Figure 5-91: Zero menu

Starts zeroing in channel OUT. The function checks the confidence level of the sensor results.
Zeroing takes several seconds. At run time a "Zeroing in progress..." message pops up. When completed the message terminates zeroing successfully or reports an error (succeeded / failed).

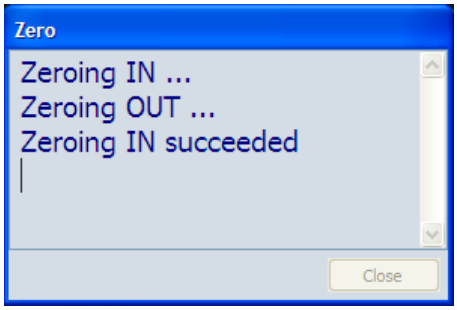


Figure 5-92: Zero in process

Repeat Zeroing

- during warm-up after switching on or connecting the instrument
- after a substantial variation of the ambient temperature
- after several hours of operation
- when very low-power signals are to be measured, e.g. less than 10 dB above the lower measurement limit.

For zeroing switch off the test signal and do not remove the sensor from the signal source. Apart from keeping the thermal balance, this has the advantage that the noise superimposed on the test signal (e.g. from a broadband amplifier) can be detected on zeroing and does not impair the measurement result.

5.7 Window

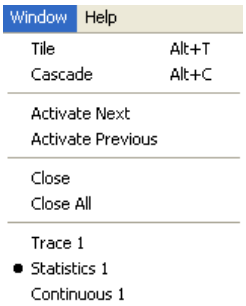


Figure 5-93: Window menu

This menu contains functions for window handling.

Tile

Arrange all currently opened windows on the screen. The window being last active continues to hold focus. Tiling maintains the display aspect ratio of the windows.

> **Note:** When the measurement windows are tiled the trace window only shows the diagram area. The control panel and the measurement panel are hidden.

Cascade

Arrange all currently opened windows successively. The window being actually focused remains in the same state. Cascading maintains the display aspect ratio of the windows.

Activate Next

Sets the following window active.

Activate Previous

Sets the previous window active.

Close

Quits the currently active window.

Close All

Quits all opened windows simultaneously.

5.8 Help

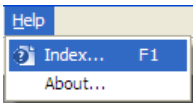


Figure 5-94: Help menu

Index...

Use for help. Search for specific words or phrases, or choose from a list of keywords. Open the HTML document in a browser, e.g. Microsoft®Windows Internet Explorer.

Note: Currently Index is not active. This function is intended for future use.

About...

Retrieve information about software version and licensing of the R&S NRPV.

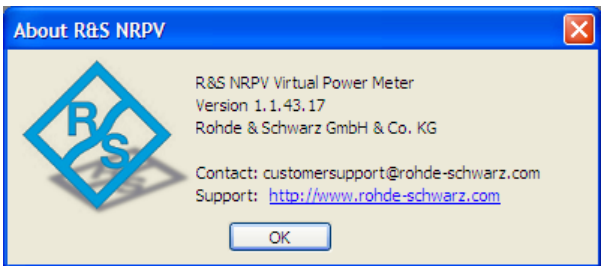


Figure 5-95: About R&S NRPV

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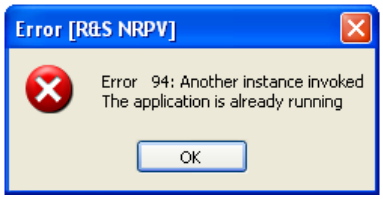
Index of Tables and Figures

Appendix

Appendix provides a list of warning messages and makes familiar with the conventions used in this manual. It also covers information on software licensing and R&S information for customer support and service.

A Warning Messages

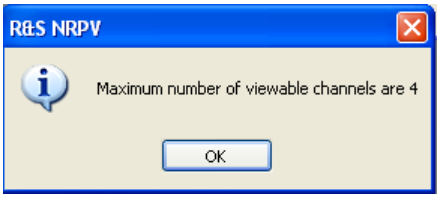
Another instance invoked



Only one instance of R&S NRPV can run at a time. The program cannot be started twice.

Maximum number of viewable channels is 4.

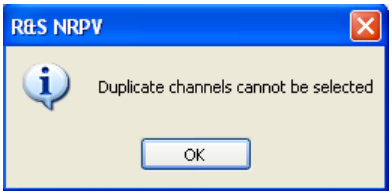
More than 4 measurements were activated.



Up to four measurements, including the absolute channel and maths measurement are possible.

Duplicate channels cannot be selected

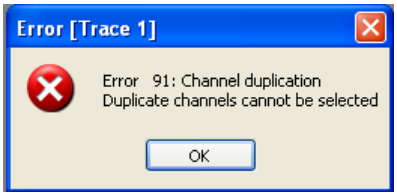
A channel was assigned to a second measurement using the same measurand.



E.g. with one sensor connected, an average measurement cannot be performed parallel on a second channel.

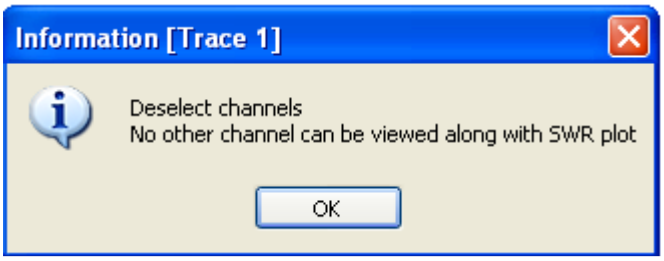
Error 91: Channel duplication. Duplicate channels cannot be selected

The same trace measurement was assigned to a second trace channel. E.g. with one sensor connected, an average trace measurement cannot be performed parallel on a second trace channel.



Reference value cannot be calculated

The current measurement result is invalid. Therefore the derived reference value on pressing reset will also be invalid.



B Conventions Used in this Manual

The following conventions are used throughout the R&S NRPV Software Manual:

Typographical conventions

Convention	Description
“Graphical user interface elements”	All names of graphical user interface elements on the screen, such as dialogs, soft keys, menus, options, buttons etc., are enclosed by quotation marks.
Input	Input to be entered by the user is displayed in italics.
`File names, commands, program code`	File names, commands, coding samples and screen output are distinguished by their font.
"Links"	Links that you can click are enclosed in quotation marks and displayed in blue font.
Hyperlinks	Hyperlinks that you can click are underlined and displayed in blue font.