



**ROHDE & SCHWARZ**

Test and Measurement  
Division

## **Operating Manual**

# **3GPP WCDMA Base Station Test**

**Application Firmware Module R&S<sup>®</sup> FSIQK72**

1126.4746.02

# **3GPP HSDPA Base Station Test**

**Application Firmware Module R&S<sup>®</sup> FSIQK74**

1153.1109.02

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Republic of Germany

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



# Safety Instructions

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

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

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

## Symbols and safety labels

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

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

## Safety Instructions

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

### Tags and their meaning

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

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

### Basic safety instructions

1. The product may be operated only under the operating conditions and in the positions specified by the manufacturer. Its ventilation must not be obstructed during operation. Unless otherwise specified, the following requirements apply to Rohde & Schwarz products:  
prescribed operating position is always with the housing floor facing down, IP protection 2X, pollution severity 2, overvoltage category 2, use only in enclosed spaces, max. operation altitude max. 2000 m. Unless specified otherwise in the data sheet, a tolerance of  $\pm 10\%$  shall apply to the nominal voltage and of  $\pm 5\%$  to the nominal frequency.
2. Applicable local or national safety regulations and rules for the prevention of accidents must be observed in all work performed. The product may be opened only by authorized, specially trained personnel. Prior to performing any work on the product or opening the product, the product must be disconnected from the supply network. Any adjustments, replacements of parts, maintenance or repair must be carried out only by technical personnel authorized by Rohde & Schwarz. Only original parts may be used for replacing parts relevant to safety (e.g. power switches, power transformers, fuses). A safety test must always be performed after parts relevant to safety have been replaced (visual inspection, PE conductor test, insulation resistance measurement, leakage current measurement, functional test).
3. As with all industrially manufactured goods, the use of substances that induce an allergic reaction (allergens, e.g. nickel) such as aluminum cannot be generally excluded. If you develop an allergic reaction (such as a skin rash, frequent sneezing, red eyes or respiratory difficulties), consult a physician immediately to determine the cause.



## Safety Instructions

4. If products/components are mechanically and/or thermally processed in a manner that goes beyond their intended use, hazardous substances (heavy-metal dust such as lead, beryllium, nickel) may be released. For this reason, the product may only be disassembled, e.g. for disposal purposes, by specially trained personnel. Improper disassembly may be hazardous to your health. National waste disposal regulations must be observed.
5. If handling the product yields hazardous substances or fuels that must be disposed of in a special way, e.g. coolants or engine oils that must be replenished regularly, the safety instructions of the manufacturer of the hazardous substances or fuels and the applicable regional waste disposal regulations must be observed. Also observe the relevant safety instructions in the product documentation.
6. Depending on the function, certain products such as RF radio equipment can produce an elevated level of electromagnetic radiation. Considering that unborn life requires increased protection, pregnant women should be protected by appropriate measures. Persons with pacemakers may also be endangered by electromagnetic radiation. The employer is required to assess workplaces where there is a special risk of exposure to radiation and, if necessary, take measures to avert the danger.
7. Operating the products requires special training and intense concentration. Make certain that persons who use the products are physically, mentally and emotionally fit enough to handle operating the products; otherwise injuries or material damage may occur. It is the responsibility of the employer to select suitable personnel for operating the products.
8. Prior to switching on the product, it must be ensured that the nominal voltage setting on the product matches the nominal voltage of the AC supply network. If a different voltage is to be set, the power fuse of the product may have to be changed accordingly.
9. In the case of products of safety class I with movable power cord and connector, operation is permitted only on sockets with earthing contact and protective earth connection.
10. Intentionally breaking the protective earth connection either in the feed line or in the product itself is not permitted. Doing so can result in the danger of an electric shock from the product. If extension cords or connector strips are implemented, they must be checked on a regular basis to ensure that they are safe to use.
11. If the product has no power switch for disconnection from the AC supply, the plug of the connecting cable is regarded as the disconnecting device. In such cases, it must be ensured that the power plug is easily reachable and accessible at all times (length of connecting cable approx. 2 m). Functional or electronic switches are not suitable for providing disconnection from the AC supply. If products without power switches are integrated in racks or systems, a disconnecting device must be provided at the system level.
12. Never use the product if the power cable is damaged. By taking appropriate safety measures and carefully laying the power cable, ensure that the cable cannot be damaged and that no one can be hurt by e.g. tripping over the cable or suffering an electric shock.
13. The product may be operated only from TN/TT supply networks fused with max. 16 A.
14. Do not insert the plug into sockets that are dusty or dirty. Insert the plug firmly and all the way into the socket. Otherwise this can result in sparks, fire and/or injuries.
15. Do not overload any sockets, extension cords or connector strips; doing so can cause fire or electric shocks.
16. For measurements in circuits with voltages  $V_{rms} > 30 V$ , suitable measures (e.g. appropriate measuring equipment, fusing, current limiting, electrical separation, insulation) should be taken to avoid any hazards.
17. Ensure that the connections with information technology equipment comply with IEC 950/EN 60950.
18. Never remove the cover or part of the housing while you are operating the product. This will expose circuits and components and can lead to injuries, fire or damage to the product.

## Safety Instructions

19. If a product is to be permanently installed, the connection between the PE terminal on site and the product's PE conductor must be made first before any other connection is made. The product may be installed and connected only by a skilled electrician.
20. For permanently installed equipment without built-in fuses, circuit breakers or similar protective devices, the supply circuit must be fused in such a way that suitable protection is provided for users and products.
21. Do not insert any objects into the openings in the housing that are not designed for this purpose. Never pour any liquids onto or into the housing. This can cause short circuits inside the product and/or electric shocks, fire or injuries.
22. Use suitable overvoltage protection to ensure that no overvoltage (such as that caused by a thunderstorm) can reach the product. Otherwise the operating personnel will be endangered by electric shocks.
23. Rohde & Schwarz products are not protected against penetration of water, unless otherwise specified (see also safety instruction 1.). If this is not taken into account, there exists the danger of electric shock or damage to the product, which can also lead to personal injury.
24. Never use the product under conditions in which condensation has formed or can form in or on the product, e.g. if the product was moved from a cold to a warm environment.
25. Do not close any slots or openings on the product, since they are necessary for ventilation and prevent the product from overheating. Do not place the product on soft surfaces such as sofas or rugs or inside a closed housing, unless this is well ventilated.
26. Do not place the product on heat-generating devices such as radiators or fan heaters. The temperature of the environment must not exceed the maximum temperature specified in the data sheet.
27. Batteries and storage batteries must not be exposed to high temperatures or fire. Keep batteries and storage batteries away from children. If batteries or storage batteries are improperly replaced, this can cause an explosion (warning: lithium cells). Replace the battery or storage battery only with the matching Rohde & Schwarz type (see spare parts list). Batteries and storage batteries are hazardous waste. Dispose of them only in specially marked containers. Observe local regulations regarding waste disposal. Do not short-circuit batteries or storage batteries.
28. Please be aware that in the event of a fire, toxic substances (gases, liquids etc.) that may be hazardous to your health may escape from the product.
29. Please be aware of the weight of the product. Be careful when moving it; otherwise you may injure your back or other parts of your body.
30. Do not place the product on surfaces, vehicles, cabinets or tables that for reasons of weight or stability are unsuitable for this purpose. Always follow the manufacturer's installation instructions when installing the product and fastening it to objects or structures (e.g. walls and shelves).
31. Handles on the products are designed exclusively for personnel to hold or carry the product. It is therefore not permissible to use handles for fastening the product to or on means of transport such as cranes, fork lifts, wagons, etc. The user is responsible for securely fastening the products to or on the means of transport and for observing the safety regulations of the manufacturer of the means of transport. Noncompliance can result in personal injury or material damage.
32. If you use the product in a vehicle, it is the sole responsibility of the driver to drive the vehicle safely. Adequately secure the product in the vehicle to prevent injuries or other damage in the event of an accident. Never use the product in a moving vehicle if doing so could distract the driver of the vehicle. The driver is always responsible for the safety of the vehicle; the manufacturer assumes no responsibility for accidents or collisions.
33. If a laser product (e.g. a CD/DVD drive) is integrated in a Rohde & Schwarz product, do not use any other settings or functions than those described in the documentation. Otherwise this may be hazardous to your health, since the laser beam can cause irreversible damage to your eyes. Never try to take such products apart, and never look into the laser beam.



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



## Informaciones de seguridad

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

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

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

### Símbolos y definiciones de seguridad

Ver manual de instrucciones del uso	Informaciones para maquinaria con un peso de > 18kg	Peligro de golpe de corriente	¡Advertencia! Superficie caliente	Conexión a conductor protector	Conexión a tierra	Conexión a masa conductora	¡Cuidado! Elementos de construcción con peligro de carga electrostática

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

## Informaciones de seguridad

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

### Palabras de señal y su significado

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

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

### Informaciones de seguridad elementales

1. El producto solamente debe ser utilizado según lo indicado por el fabricante referente a la situación y posición de funcionamiento sin que se obstruya la ventilación. Si no se convino de otra manera, es para los productos R&S válido lo que sigue: como posición de funcionamiento se define principalmente la posición con el suelo de la caja para abajo , modo de protección IP 2X, grado de suciedad 2, categoría de sobrecarga eléctrica 2, utilizar solamente en estancias interiores, utilización hasta 2000 m sobre el nivel del mar.  
A menos que se especifique otra cosa en la hoja de datos, se aplicará una tolerancia de  $\pm 10\%$  sobre el voltaje nominal y de  $\pm 5\%$  sobre la frecuencia nominal.
2. En todos los trabajos deberán ser tenidas en cuenta las normas locales de seguridad de trabajo y de prevención de accidentes. El producto solamente debe de ser abierto por personal périto autorizado. Antes de efectuar trabajos en el producto o abrirlo deberá este ser desconectado de la corriente. El ajuste, el cambio de partes, la manutención y la reparación deberán ser solamente efectuadas por electricistas autorizados por R&S. Si se reponen partes con importancia para los aspectos de seguridad (por ejemplo el enchufe, los transformadores o los fusibles), solamente podrán ser sustituidos por partes originales. Despues de cada recambio de partes elementales para la seguridad deberá ser efectuado un control de

## Informaciones de seguridad

- seguridad (control a primera vista, control de conductor protector, medición de resistencia de aislamiento, medición de medición de la corriente conductora, control de funcionamiento).
3. Como en todo producto de fabricación industrial no puede ser excluido en general de que se produzcan al usarlo elementos que puedan generar alergias, los llamados elementos alergénicos (por ejemplo el níquel). Si se produjeran en el trato con productos R&S reacciones alérgicas, como por ejemplo urticaria, estornudos frecuentes, irritación de la conjuntiva o dificultades al respirar, se deberá consultar inmediatamente a un médico para averiguar los motivos de estas reacciones.
  4. Si productos / elementos de construcción son tratados fuera del funcionamiento definido de forma mecánica o térmica, pueden generarse elementos peligrosos (polvos de sustancia de metales pesados como por ejemplo plomo, berilio, níquel). La partición elemental del producto, como por ejemplo sucede en el tratamiento de materias residuales, debe de ser efectuada solamente por personal especializado para estos tratamientos. La partición elemental efectuada inadecuadamente puede generar daños para la salud. Se deben tener en cuenta las directivas nacionales referentes al tratamiento de materias residuales.
  5. En el caso de que se produjeran agentes de peligro o combustibles en la aplicación del producto que debieran de ser transferidos a un tratamiento de materias residuales, como por ejemplo agentes refrigerantes que deben ser repuestos en periodos definidos, o aceites para motores, deberán ser tenidas en cuenta las prescripciones de seguridad del fabricante de estos agentes de peligro o combustibles y las regulaciones regionales para el tratamiento de materias residuales. Cuiden también de tener en cuenta en caso dado las prescripciones de seguridad especiales en la descripción del producto.
  6. Ciertos productos, como por ejemplo las instalaciones de radiación HF, pueden a causa de su función natural, emitir una radiación electromagnética aumentada. En vista a la protección de la vida en desarrollo deberían ser protegidas personas embarazadas debidamente. También las personas con un bypass pueden correr peligro a causa de la radiación electromagnética. El empresario está comprometido a valorar y señalar áreas de trabajo en las que se corra un riesgo de exposición a radiaciones aumentadas de riesgo aumentado para evitar riesgos.
  7. La utilización de los productos requiere instrucciones especiales y una alta concentración en el manejo. Debe de ponerse por seguro de que las personas que manejen los productos estén a la altura de los requerimientos necesarios referente a sus aptitudes físicas, psíquicas y emocionales, ya que de otra manera no se pueden excluir lesiones o daños de objetos. El empresario lleva la responsabilidad de seleccionar el personal usuario apto para el manejo de los productos.
  8. Antes de la puesta en marcha del producto se deberá tener por seguro de que la tensión preseleccionada en el producto equivalga a la del la red de distribución. Si es necesario cambiar la preselección de la tensión también se deberán en caso dabo cambiar los fusibles correspondientes del producto.
  9. Productos de la clase de seguridad I con alimentación móvil y enchufe individual de producto solamente deberán ser conectados para el funcionamiento a tomas de corriente de contacto de seguridad y con conductor protector conectado.
  10. Queda prohibida toda clase de interrupción intencionada del conductor protector, tanto en la toma de corriente como en el mismo producto ya que puede tener como consecuencia el peligro de golpe de corriente por el producto. Si se utilizaran cables o enchufes de extensión se deberá poner al seguro, que es controlado su estado técnico de seguridad.
  11. Si el producto no está equipado con un interruptor para desconectarlo de la red, se deberá considerar el enchufe del cable de distribución como interruptor. En estos casos deberá asegurar de que el enchufe sea de fácil acceso y nabejo (medida del cable de distribución aproximadamente 2 m). Los interruptores de función o electrónicos no son aptos para el corte de la red eléctrica. Si los productos sin interruptor están integrados en construcciones o instalaciones, se deberá instalar el interruptor al nivel de la instalación.

## Informaciones de seguridad

12. No utilice nunca el producto si está dañado el cable eléctrico. Asegure a través de las medidas de protección y de instalación adecuadas de que el cable de eléctrico no pueda ser dañado o de que nadie pueda ser dañado por él, por ejemplo al tropezar o por un golpe de corriente.
13. Solamente está permitido el funcionamiento en redes de distribución TN/TT aseguradas con fusibles de como máximo 16 A.
14. Nunca conecte el enchufe en tomas de corriente sucias o llenas de polvo. Introduzca el enchufe por completo y fuertemente en la toma de corriente. Si no tiene en consideración estas indicaciones se arriesga a que se originen chispas, fuego y/o heridas.
15. No sobrecargue las tomas de corriente, los cables de extensión o los enchufes de extensión ya que esto pudiera causar fuego o golpes de corriente.
16. En las mediciones en circuitos de corriente con una tensión de entrada de  $U_{eff} > 30 \text{ V}$  se deberá tomar las precauciones debidas para impedir cualquier peligro (por ejemplo medios de medición adecuados, seguros, limitación de tensión, corte protector, aislamiento etc.).
17. En caso de conexión con aparatos de la técnica informática se deberá tener en cuenta que estos cumplan los requisitos de la EC950/EN60950.
18. Nunca abra la tapa o parte de ella si el producto está en funcionamiento. Esto pone a descubierto los cables y componentes eléctricos y puede causar heridas, fuego o daños en el producto.
19. Si un producto es instalado fijamente en un lugar, se deberá primero conectar el conductor protector fijo con el conductor protector del aparato antes de hacer cualquier otra conexión. La instalación y la conexión deberán ser efectuadas por un electricista especializado.
20. En caso de que los productos que son instalados fijamente en un lugar sean sin protector implementado, autointerruptor o similares objetos de protección, deberá la toma de corriente estar protegida de manera que los productos o los usuarios estén suficientemente protegidos.
21. Por favor, no introduzca ningún objeto que no esté destinado a ello en los orificios de la caja del aparato. No vierta nunca ninguna clase de líquidos sobre o en la caja. Esto puede producir corto circuitos en el producto y/o puede causar golpes de corriente, fuego o heridas.
22. Asegúrese con la protección adecuada de que no pueda originarse en el producto una sobrecarga por ejemplo a causa de una tormenta. Si no se verá el personal que lo utilice expuesto al peligro de un golpe de corriente.
23. Los productos R&S no están protegidos contra el agua si no es que exista otra indicación, ver también punto 1. Si no se tiene en cuenta esto se arriesga el peligro de golpe de corriente o de daños en el producto lo cual también puede llevar al peligro de personas.
24. No utilice el producto bajo condiciones en las que pueda producirse y se hayan producido líquidos de condensación en o dentro del producto como por ejemplo cuando se desplaza el producto de un lugar frío a un lugar caliente.
25. Por favor no cierre ninguna ranura u orificio del producto, ya que estas son necesarias para la ventilación e impiden que el producto se caliente demasiado. No pongan el producto encima de materiales blandos como por ejemplo sofás o alfombras o dentro de una caja cerrada, si esta no está suficientemente ventilada.
26. No ponga el producto sobre aparatos que produzcan calor, como por ejemplo radiadores o calentadores. La temperatura ambiental no debe superar la temperatura máxima especificada en la hoja de datos.

## Informaciones de seguridad

27. Baterías y acumuladores no deben de ser expuestos a temperaturas altas o al fuego. Guardar baterías y acumuladores fuera del alcance de los niños. Si las baterías o los acumuladores no son cambiados con la debida atención existirá peligro de explosión (atención celulas de Litio). Cambiar las baterías o los acumuladores solamente por los del tipo R&S correspondiente (ver lista de piezas de recambio). Baterías y acumuladores son deshechos problemáticos. Por favor tirenlos en los recipientes especiales para este fin. Por favor tengan en cuenta las prescripciones nacionales de cada país referente al tratamiento de deshechos. Nunca sometan las baterías o acumuladores a un corto circuito.
28. Tengan en consideración de que en caso de un incendio pueden escaparse gases tóxicos del producto, que pueden causar daños a la salud.
29. Por favor tengan en cuenta que en caso de un incendio pueden desprenderse del producto agentes venenosos (gases, líquidos etc.) que pueden generar daños a la salud.
30. No sitúe el producto encima de superficies, vehículos, estantes o mesas, que por sus características de peso o de estabilidad no sean aptas para él. Siga siempre las instrucciones de instalación del fabricante cuando instale y asegure el producto en objetos o estructuras (por ejemplo paredes y estantes).
31. Las asas instaladas en los productos sirven solamente de ayuda para el manejo que solamente está previsto para personas. Por eso no está permitido utilizar las asas para la sujecion en o sobre medios de transporte como por ejemplo grúas, carretillas elevadoras de horquilla, carros etc. El usuario es responsable de que los productos sean sujetados de forma segura a los medios de transporte y de que las prescripciones de seguridad del fabricante de los medios de transporte sean tenidas en cuenta. En caso de que no se tengan en cuenta pueden causarse daños en personas y objetos.
32. Si llega a utilizar el producto dentro de un vehículo, queda en la responsabilidad absoluta del conductor que conducir el vehículo de manera segura. Asegure el producto dentro del vehículo debidamente para evitar en caso de un accidente las lesiones u otra clase de daños. No utilice nunca el producto dentro de un vehículo en movimiento si esto pudiera distraer al conductor. Siempre queda en la responsabilidad absoluta del conductor la seguridad del vehículo y el fabricante no asumirá ninguna clase de responsabilidad por accidentes o colisiones.
33. Dado el caso de que esté integrado un producto de laser en un producto R&S (por ejemplo CD/DVD-ROM) no utilice otras instalaciones o funciones que las descritas en la documentación. De otra manera pondrá en peligro su salud, ya que el rayo laser puede dañar irreversiblemente sus ojos. Nunca trate de descomponer estos productos. Nunca mire dentro del rayo laser.

## Certified Quality System

**DIN EN ISO 9001 : 2000**  
**DIN EN 9100 : 2003**  
**DIN EN ISO 14001 : 1996**

DQS REG. NO 001954 QM/ST UM

### QUALITÄTSZERTIFIKAT

*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 Managementsystems entwickelt, gefertigt und geprüft.

Das Rohde & Schwarz Managementsystem ist zertifiziert nach:

DIN EN ISO 9001:2000  
DIN EN 9100:2003  
DIN EN ISO 14001:1996

### CERTIFICATE OF QUALITY

*Dear Customer,*

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The Rohde & Schwarz quality management system is certified according to:

DIN EN ISO 9001:2000  
DIN EN 9100:2003  
DIN EN ISO 14001:1996

### CERTIFICAT DE QUALITÉ

*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 conformément aux normes:

DIN EN ISO 9001:2000  
DIN EN 9100:2003  
DIN EN ISO 14001:1996



**ROHDE & SCHWARZ**



# Contents of Manual for Application Firmware R&S® FSIQK72/K74

This manual contains all information on the operation of R&S® FSIQ equipped with Application Firmware R&S® FSIQK72/K74. It includes operation via menus and the remote-control commands for the 3GPP WCDMA base station test.

The manual comprises the data sheet and 10 chapters:

- The data sheet** informs on the guaranteed specifications and the firmware characteristics.
- Chapter 1** describes how to enable the application firmware module.
- Chapter 2** describes typical examples of measurements by means of tests.
- Chapter 3** describes the measurement setup for base station tests.
- Chapter 4** describes the 3GPP WCDMA test models as stipulated in standard FDD (3G TS 25.141 V3.7.0).
- Chapter 5** gives a schematic overview of the WCDMA control menus.
- Chapter 6** contains a detailed description of the possible base station test measurements as a reference for manual operation. The chapter also presents a list of remote-control commands associated with each function.
- Chapter 7** describes all remote-control commands defined for the code domain measurement. An alphabetic list of all remote-control commands and a table of softkeys with the assignment of commands are given at the end of this chapter.
- Chapter 8** contains the performance test.
- Chapter 9** contains an explanation of terms related to measured quantities of the code domain measurement.
- Chapter 10** contains the index of this operating manual.

This manual is a supplement to the R&S® FSIQ operating manual. It includes exclusively functions of Application Firmware R&S® FSIQK72/K74. For all other descriptions, please refer to the R&S® FSIQ operating manual.



# 3GPP WCDMA/HSDPA Base Station Test - Application Firmware R&S® FSIQK72/K74

Signal Analyzer R&S® FSIQ equipped with Application Firmware R&S® FSIQK72/K74 performs code domain power measurements on downlink signals according to standard 3GPP (FDD mode). The application firmware is in line with standard 3GPP (Third Generation Partnership Project) with version release 5. Signals that meet the conditions for channel configuration of test models 1 to 4 according to 3GPP can be measured with FSIQK72. In addition to the code domain measurements prescribed by the standard 3GPP, the application offers measurements with predefined settings in the frequency domain, e.g. power and ACLR measurement. The spectrum analyzer R&S® FSIQ equipped with Application Firmware FSIQK74 additionally allows to perform measurements on test model 5 (HSDPA). Installation of FSIQK72 is a precondition for equipping the FSU with FSIQK74.

The following hardware is required for using R&S® FSIQ in combination with option R&S® FSIQK72/K74:

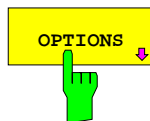
- Option R&S® FSIQ B70 – Extended I/Q memory and DSP module
- Module I/Q Demodulator: model index 05 (Order No.: 1066.2520.05)

- Notes:**
- *The code domain power measurements can be performed for units fitted with IQ demodulators other than model 05. However, the linearity of the R&S® FSIQK72/K74 level values can only be guaranteed with an IQ demodulator of model 05 or higher.*
  - *The model index of the I/Q Demodulator is indicated in table “Installed Components” (SYSTEM-INFO HARDWARE+OPTIONS menu)*

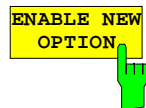
## 1 Enabling the Firmware Option

Firmware Option R&S® FSIQK72/K74 is enabled in the *CONFIGURATION SETUP* menu by entering a keyword. The keyword is delivered with the option (see Key Code Document, 1153.1121). R&S® FSIQK72 and R&S® FSIQK74 have different keywords. An installation of R&S® FSIQK72 is a precondition for installing R&S® FSIQK74. If the options are factory-installed, they are already enabled.

*CONFIGURATION SETUP* menu:



The *OPTIONS* softkey opens a submenu where keywords for new firmware options (application firmware modules) can be entered. Available options are displayed in a table which is opened when entering the submenu.



The *ENABLE NEW OPTION* softkey activates the entry of the keyword for a firmware option.

One or several keywords can be entered in the entry field. On entering a valid keyword, *OPTION KEY OK* is displayed on the message line and the option is entered in the *FIRMWARE OPTIONS* table.

The *FIRMWARE OPTIONS* table can be displayed in the *FIRMWARE OPTIONS* softkey in the *INFO* menu.

In case of invalid keywords, *OPTION KEY INVALID* is displayed on the message line.

## 2 Getting Started

The following chapter explains basic WCDMA base station tests by means of a setup with Signal Generator R&S SMIQ. It describes how operating and measurement errors can be avoided using correct presetting. The measurements are performed with an analyzer equipped with R&S® FSIQK72. An additional installation of R&S® FSIQK74 is not necessary.

The measurement screen is presented in chapter 6 for each measurement.

Key settings are shown as examples to avoid measurement errors. Following the correct setting, the effect of an incorrect setting is shown. The following measurements are performed:

- Measurement 1: Measuring the spectrum
- Measurement 2: Measurement of CPICH (Common Pilot Channel) in vector signal analyzer mode
  - Setting: Synchronization of reference frequencies
- Measurement 3: Measurement of relative code domain power
  - Setting: Setting the analyzer center frequency to the DUT frequency
  - Setting: Scrambling code of signal
- Measurement 4: Triggered measurement of relative code domain power
  - Setting: Trigger offset
- Measurement 5: Measurement of composite EVM
- Measurement 6: Measurement of peak code domain error

The measurements are performed using the following units and accessories:

- Signal Analyzer R&S® FSIQ with Application Firmware R&S® FSIQK72/K74: WCDMA base station test (option R&S® FSIQ B70 required)
- Vector Signal Generator SMIQ with option SMIQB43: digital standard WCDMA (options SMIQB20 and SMIQB11 required)
- 1 coaxial cable, 50 Ω, approx. 1 m, N connector
- 1 coaxial cable, 50 Ω, approx. 1 m, BNC connector

Conventions for displaying settings on R&S® FSIQ:

- |             |  |
|-------------|--|
| [<KEY>]     | Press a key on the front panel, e.g. <b>[SPAN]</b>                     |
| [<SOFTKEY>] | Press a softkey, e.g. <b>[MARKER -&gt; PEAK]</b>                       |
| [<nn unit>] | Enter a value and terminate by entering the unit, e.g. <b>[12 kHz]</b> |

Conventions for displaying settings on SMIQ:

- |           |  |
|-----------|--|
| [<KEY>]   | Press a key on the front panel, e.g. <b>[FREQ]</b>   |
| <MENU>    | Select a menu, parameter or a setting, e.g. <b>DIGITAL STD.</b><br>The menu level is marked by an indentation. |
| <nn unit> | Enter a value and terminate by entering the unit, e.g. <b>12 kHz</b>   |

## Basic Settings in Code Domain Measurement Mode

In the default setting after PRESET, R&S® FSIQ is in the analyzer mode. The following default settings of the code domain measurement are activated, provided the code domain measurement mode is selected.

Table 2-1 Default settings of the code domain measurement

Parameter	Setting
Digital standard	W-CDMA 3GPP FWD
Sweep	CONTINUOUS
CDP mode	CODE CHAN AUTOSEARCH
Trigger settings	FREE RUN
Trigger offset	-266.67µs
Scrambling code	0
Threshold value	-20 dB
Symbol rate	15 ksps
Code number	0
Slot number	0
Display	Screen A: CODE PWR RELATIVE Screen B: RESULT SUMMARY

## Measurement 1: Measuring the Signal Power

The measurement of the spectrum gives an overview of the WCDMA signal and the spurious emissions close to the carrier.

Test setup ➤ Connect the RF output of SMIQ to the RF input of R&S® FSIQ (coaxial cable with N connectors).

Settings on SMIQ:

```

[PRESET]
[LEVEL: 0 dBm]
[FREQ: 2.1175 GHz]
DIGITAL STD
  WCDMA/3GPP
    SET DEFAULT
    SELECT BS/MS
      BS 1 ON
        P-CPICH STATE ON
          STATE: ON
  
```

Settings on R&S® FSIQ:

```

[PRESET]
[CENTER: 2.1175 GHz]
[REF: 0 dBm]
[MODE: 3GPP BTS ANALYZER: POWER]
  
```

Measurement on R&S® FSIQ: The following is displayed:

- The spectrum of the WCDMA signal (CPICH only) on the trace
- The signal channel power within the 3.84 MHz channel bandwidth (in the marker info field)

## Measurement 2: Measurement of CPICH in Vector Signal Analyzer Mode

When the WCDMA signal only contains one channel, the signal can be measured in the vector analyzer mode of the analyzer. Since each channel is QPSK-modulated, the total signal is QPSK-modulated also if only one channel is transmitted.

The measurement of the QPSK signal allows, for instance, to determine the frequency offset between DUT and analyzer.

This may be useful for troubleshooting, e.g. if synchronization is not possible during the code domain power measurement.

Test setup *As for measurement 1*

Settings on SMIQ: *As for measurement 1*

Settings on R&S® FSIQ: **[PRESET]**  
**[CENTER:** *2.1175 GHz]*  
**[REF:** *0 dBm]*  
**[MODE:** *VECTOR ANALYZER*  
*DIGITAL STANDARDS W-CDMA 3GPP FWD]*

Measurement on R&S® FSIQ: The following is displayed:

- Screen A: Constellation diagram of signal (QPSK)
- Screen B: Numeric results of demodulation

Frequency error The frequency error display denotes the frequency offset between the DUT and the analyzer. For a high frequency offset (>1 kHz), the CDP measurements are inaccurate and a synchronization of the analyzer and the measurement signal is no longer possible. The frequency offset can be corrected by tuning the transmitter or center frequency of the analyzer. It is recommended to synchronize the analyzer and the DUT via the reference input of the analyzer.

### Setting: Synchronizing the reference frequencies

The synchronization of the reference oscillators both of the DUT and analyzer strongly reduces the measured frequency error.

Test setup ➤ Connect the reference input (EXT REF IN/OUT) on the rear panel of the analyzer to the reference output (REF) on the rear panel of SMIQ (coaxial cable with BNC connectors).

Settings on SMIQ: *As for measurement 2*

Settings on R&S® FSIQ: *As for measurement 2, plus*  
**[SETUP:** *REFERENCE EXT]*

Measurement on R&S® FSIQ: Frequency error The displayed frequency error should be < 10 Hz.

**The reference frequencies of the analyzer and of the DUT should be synchronized**

### Measurement 3: Measurement of Relative Code Domain Power

A code domain power measurement on one of the test models (model 1 with 32 channels) is shown in the following. To demonstrate the effects the basic parameters of CDP measurements which allow an analysis of the signal are changed one after the other from values adapted to the measurement signal to non-adapted values.

Test setup

- Connect the RF output of SMIQ to the input of FSIQ
- Connect the reference input (EXT REF IN/OUT) on the rear panel of the analyzer to the reference input (REF) on the rear panel of SMIQ (coaxial cable with BNC connectors).

Settings on SMIQ:

```

[PRESET]
[LEVEL:                0 dBm]
[FREQ:                2.1175 GHz]
DIGITAL STD
  WCDMA 3GPP
    TEST MODELS ...
      TEST1_32
    SELECT BS/MS
      BS 1 ON
        PICH STATE: OFF
          STATE: ON
  
```

Settings on R&S® FSIQ:

```

[PRESET]
[CENTER:              2.1175 GHz]
[REF:                 10 dBm]
[MODE:                3GPP BTS ANALYZER: CODE DOM POWER
MEAS SETTINGS          SCRAMBLING CODE 0]
  
```

Measurement on R&S® FSIQ: The following is displayed:

Screen A: Code domain power of signal  
(test model 1 with 32 channels)

Screen B: Numeric results of CDP measurement

## Setting: Behaviour with Deviating Center Frequency Setting

In the following, the behaviour of the DUT and the analyzer with deviating center frequency setting is shown.

Settings on SMIQ: ➤ Tune the center frequency of the signal generator in 1 kHz steps and watch the analyzer screen:

Measurement on R&S® FSIQ:

- A CDP measurement on the analyzer is still possible with a frequency error of up to approx. 1 kHz. Up to 1 kHz, a frequency error causes no apparent difference in measurement accuracy of the code domain power measurement.
- Above a frequency error of 1 kHz, the probability of an impaired synchronization increases. With continuous measurements, at times all channels are displayed in blue with almost the same level.
- Above a frequency error of approx. 3 kHz, a CDP measurement cannot be performed. R&S® FSIQ displays all possible codes in blue with a similar level.

Settings on SMIQ: ➤ Set the signal generator center frequency again to 2.1175 GHz:  
**[FREQ: 2.1175 GHz]**

**The analyzer center frequency should not differ from the DUT frequency by more than 1 kHz.**

## Setting: Behaviour with Incorrect Scrambling Code

A valid CDP measurement can only be carried out if the scrambling code set on the analyzer is identical to the one of the transmitted signal.

Test setup

```

SELECT BS/MS
BS 1: ON
SCRAMBLING CODE: 0001
(the scrambling code is set to 0000 on the analyzer)

```

Settings on SMIQ: The CDP display shows all possible codes with approximately the same level.

Settings on R&S® FSIQ: Set scrambling code to new value:  
**[MODE: 3GPP BTS ANALYZER: CODE DOM POWER**  
**MEAS SETTINGS SCRAMBLING CODE 1]**

Measurement on R&S® FSIQ: The CDP display again shows the test model.

**The scrambling code setting of the analyzer must be identical to that of the measured signal.**



## Measurement 4: Triggered Measurement of Relative Code Domain Power

If the code domain power measurement is performed without external triggering, a section of approximately 20 ms of the test signal is recorded at an arbitrary moment to detect the start of a WCDMA frame in this section. Depending on the position of the frame start, the required computing time can be quite long (up to approx. 3 seconds). The computing time can be reduced by applying an external (frame) trigger.

- Test setup
- Connect the RF output of SMIQ to the input of FSIQ
  - Connect the reference input (EXT REF IN/OUT) on the rear panel of R&S® FSIQ to the reference input (REF) on the rear panel of SMIQ (coaxial cable with BNC connectors).
  - Connect the external trigger input on the rear panel of R&S® FSIQ (EXT TRIG GATE) to the external trigger output on the rear panel of SMIQ (TRIGOUT1 of PAR DATA).

Settings on SMIQ: *As for measurement 3*

Settings on R&S® FSIQ: *As for measurement 3, plus  
[MEAS SETTINGS TRIGGER EXT]*

Measurement on R&S® FSIQ: The following is displayed:  
Screen A: Code domain power of signal  
(test model 1 with 32 channels)  
Screen B: Numeric results of CDP measurement

Trg to Frame: Offset between trigger event and start of WCDMA frame

The repetition rate of the measurement increases considerably compared to the repetition rate of a measurement without external trigger.

### Setting: Trigger offset

A delay of the trigger event referred to the start of the WCDMA frame can be compensated by modifying the trigger offset.

Settings on R&S® FSIQ: **[MODE:** 3GPP BTS ANALYZER: CODE DOM POWER  
MEAS SETTINGS EXT TRIG OFFSET 100  $\mu$ s]

Measurement on R&S® FSIQ: The parameter Trg to Frame in the numeric results table (screen B) changes:  
Trg to Frame -100  $\mu$ s

**Note:** *To enable the start of a CDP measurement at slot 0 of a WCDMA frame, the trigger offset has to be set to -266,67  $\mu$ s. For a detailed description of the relation between trigger offset and CDP analysis see the following chapters*

**A trigger offset compensates analog delays of the trigger event.**

## Measurement 5: Measurement of Composite EVM

The composite EVM measurement represents a measurement of the RMS-averaged deviation of the test signal from the ideal signal.

An ideal reference signal is generated from the demodulated data. The test signal and the reference signal are compared with each other. The square deviation yields the composite EVM.

- Test setup
- Connect the RF output of SMIQ to the input of FSIQ
  - Connect the reference input (EXT REF IN/OUT) on the rear panel of R&S® FSIQ to the reference input (REF) on the rear panel of SMIQ (coaxial cable with BNC connectors).
  - Connect the external trigger input on the rear panel of R&S® FSIQ (EXT TRIG GATE) to the external trigger output on the rear panel of SMIQ (TRIGOUT1 of PAR DATA).

Settings on SMIQ:

```
[PRESET]
[LEVEL:                0 dBm]
[FREQ:                2.1175 GHz]
DIGITAL STD
  WCDMA 3GPP
    TEST MODELS ...
      TEST1_32
    SELECT BS/MS
      BS 1 ON
        PICH STATE OFF
      STATE: ON
```

Settings on R&S® FSIQ:

```
[PRESET]
[CENTER:             2.1175 GHz]
[REF:                10 dBm]
[MODE:              3GPP BTS ANALYZER: CODE DOM POWER
MEAS SETTINGS        SCRAMBLING CODE 0
                    INACT CHAN THRESHOLD -20
                    TRIGGER EXT

[menu change key UP]
RESULT DISPLAY      COMPOSITE EVM]
```

Measurement on R&S® FSIQ: The following is displayed:

- Screen A: Code domain power of signal  
(Test model 1 with 32 channels)
- Screen B: Composite EVM (EVM for total signal)

## Measurement 6: Measurement of Peak Code Domain Errors

The peak code domain error measurement is defined in the 3GPP specification for WCDMA signals. An ideal reference signal is generated from the demodulated data. The test signal and the reference signal are compared with each other. The difference of the two signals is projected onto the classes of the different spreading factors. The peak code domain error measurement is obtained by summing up the symbols of each difference signal slot.

- Test setup
- Connect the RF output of SMIQ to the input of FSIQ
  - Connect the reference input (EXT REF IN/OUT) on the rear panel of R&S® FSIQ to the reference input (REF) on the rear panel of SMIQ (coaxial cable with BNC connectors).
  - Connect the external trigger input on the rear panel of R&S® FSIQ (EXT TRIG GATE) to the external trigger output on the rear panel of SMIQ (TRIGOUT1 of PAR DATA).

Settings on SMIQ:

```
[PRESET]
[LEVEL:                0 dBm]
[FREQ:                2.1175 GHz]
DIGITAL STD
  WCDMA 3GPP
    TEST MODELS ...
      TEST1_32
    SELECT BS/MS
      BS 1 ON
        PICH STATE OFF
      STATE: ON
```

Settings on R&S® FSIQ:

```
[PRESET]
[CENTER:            2.1175 GHz]
[REF:              0 dBm]
[MODE:            3GPP BTS ANALYZER: CODE DOM POWER
MEAS SETTINGS      SCRAMBLING CODE 0
                   INACT CHAN THRESHOLD -20
                   TRIGGER EXT

[menu change key UP]
RESULT DISPLAY    PEAK CODE DOMAIN ERR
                  SELECT PCDE SF 512]
```

Measurement on R&S® FSIQ:

The following is displayed:

Screen A: Code domain power of signal  
(test model 1 with 32 channels)

Screen B: Peak code domain error (projection of the error onto the class  
with spreading factor 512)

### 3 Setup for Base Station Tests



**Caution:**

Before turning the instrument on, the following conditions must be fulfilled:

- Instrument covers are in place and all fasteners are tightened.,
- Fan openings are free from obstructions.
- Signal levels at the input connectors are all below specified maximum values. The level at the R&S® FSIQ RF input of +20 dBm with a 0 dB input attenuator must under no circumstances be exceeded.
- Signal outputs are correctly connected and not overloaded.

**Non-compliance with these instructions may cause damage to the instrument .**

This section describes how to set up the analyzer for WCDMA base station tests. As a prerequisite for starting the test, the instrument must be correctly set up and connected to the AC power supply as described in chapter 1 of the operating manual for the analyzer. Furthermore, the application firmware module R&S® FSIQK72 and for measurements on test model 5 additionally R&S® FSIQK74 must be properly installed following the instructions given in chapter 1 of the present manual.

#### Standard Test Setup

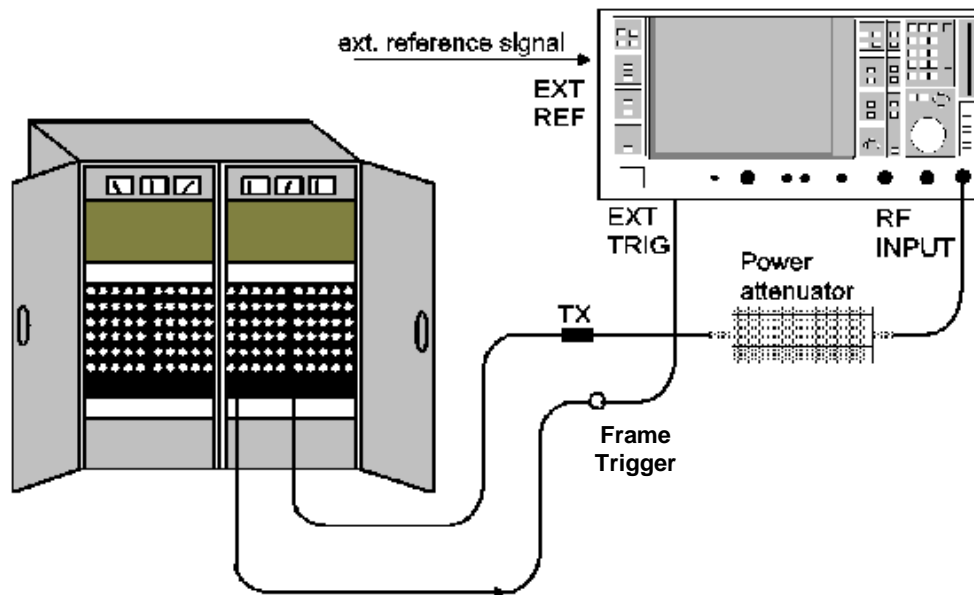


Fig. 3-1 BTS test setup

- Connect antenna output (or TX output) of BTS to RF input of the analyzer via a power attenuator of suitable attenuation.

The following values are recommended for the external attenuator to ensure that the RF input of the analyzer is protected and the sensitivity of the analyzer is not reduced too much.

Max. power	Recommended ext. attenuation
≥ 55 to 60 dBm	35 to 40 dB
≥ 50 to 55 dBm	30 to 35 dB
≥ 45 to 50 dBm	25 to 30 dB
≥ 40 to 45 dBm	20 to 25 dB
≥ 35 to 40 dBm	15 to 20 dB
≥ 30 to 35 dBm	10 to 15 dB
≥ 25 to 30 dBm	5 to 10 dB
≥ 20 to 25 dBm	0 to 5 dB
< 20 dBm	0 dB

- For signal measurements at the output of two-port networks, connect the reference frequency of the signal source to the rear reference input of the analyzer (*EXT REF IN/OUT*).

To ensure that the error limits specified by the 3GPP standard are met, the analyzer should use an external reference frequency for frequency measurements on base stations. A rubidium frequency standard may be used for instance as a reference source.

- If the base station is provided with a trigger output, connect this output to the rear trigger input of the analyzer (*EXT TRIG GATE*).

## Presetting

- Enter external attenuation (reference level offset)
- Enter reference level
- Enter center frequency
- Set the trigger
- Select standard and measurement

## 4 WCDMA Test Models

For measurements on base-station signals in line with 3GPP, test models with different channel configuration are specified in the document "Base station conformance testing (FDD)" (3GPP TS 25.141 V5.7.0). An overview of the test models is given in this chapter.

The channel configurations of test models 1 to 4 can be measured properly if at least R&S® FSIQK72 is installed on the analyzer. In addition to the data channels containing pilot symbols, the special channels SCCPCH and PICH will be detected both in *CODE CHAN AUTOSEARCH* and *CODE CHAN PREDEFINED* mode. In mode *CODE CHAN PREDEFINED* the 3GPP test models 1 to 4 can be used for the measurement at a keystroke (see softkey *CODE CHAN PREDEFINED* for a detailed description).

The channel configuration for test model 5 according to 3GPP contains channels in which the modulation type can vary. Those channels can be measured both in *CODE CHAN AUTOSEARCH* and *CODE CHAN PREDEFINED* mode if the analyzer is equipped with R&S® FSIQK74. In this case test model 5 can be used as well at a keystroke in mode *CODE CHAN PREDEFINED*.

Table 4-1 Test model 1

Channel type	Number of channels	Power (%)	Level (dB)	Spreading code	Timing offset (x256T <sub>chip</sub> )
PCCPCH+SCH	1	10	-10	1	0
Primary CPICH	1	10	-10	0	0
PICH	1	1.6	-18	16	120
SCCPCH (SF=256)	1	1.6	-18	3	150
DPCH (SF=128)	16/32/64	76.8 total	see TS 25.141	see TS 25.141	see TS 25.141

Table 4-2 Test model 2

Channel type	Number of channels	Power(%)	Level (dB)	Spreading code	Timing offset (x256T <sub>chip</sub> )
PCCPCH+SCH	1	10	-10	1	0
Primary CPICH	1	10	-10	0	0
PICH	1	5	-13	16	120
SCCPCH (SF=256)	1	5	-13	3	150
DPCH (SF=128)	3	2 x 10, 1 x 50	2 x -10, 1 x -3	24, 72, 120	1, 7, 2

Table 4-3 Test model 3

Channel type	Number of channels	Power (%) 16/32	Level (dB) 16/32	Spreading code	Timing offset (x256T <sub>chip</sub> )
PCCPCH+SCH	1	12,6/7,9	-9 / -11	1	0
Primary CPICH	1	12,6/7,9	-9 / -11	0	0
PICH	1	5/1.6	-13 / -18	16	120
SCCPCH (SF=256)	1	5/1.6	-13 / -18	3	150
DPCH (SF=256)	16/32	63,7/80,4 total	see TS 25.141	see TS 25.141	see TS 25.141

Table 4-4 Test model 4

Channel type	Number of channels	Power (%) 16/32	Level (dB) 16/32	Spreading code	Timing offset (x256T <sub>chip</sub> )
PCCPCH+SCH	1	50 to 1.6	-3 to -18	1	0
Primary CPICH	1	10	-10	0	0

\* The CPICH is optional.

Table 4-5 Test model 5

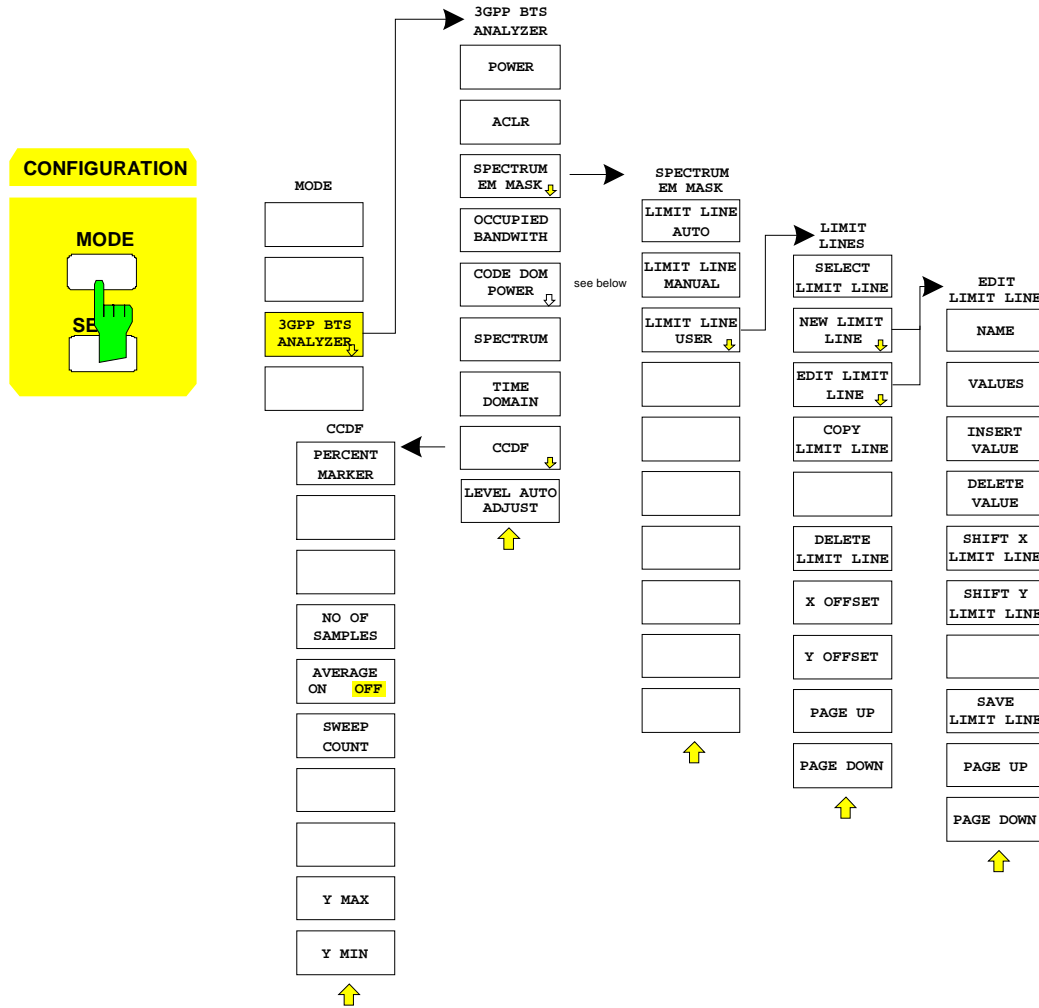
Kanaltyp	Anzahl der Kanäle	Leistung (%)	Level (dB)	Spreading Code	Timing offset (x256T <sub>chip</sub> )
PCCPCH+SCH	1	7,9	-11	1	0
Primary CPICH	1	7,9	-11	0	0
PICH	1	1.3	-19	16	120
SCCPCH (SF=256)	1	1.3	-19	3	0
DPCH (SF=256)	30/14/6(*)	14/14.2/14.4 gesamt	Siehe TS 25.141	Siehe TS 25.141	Siehe TS 25.141
HS_SCCH	2	4 gesamt	Siehe TS 25.141	Siehe TS 25.141	Siehe TS 25.141
HS_PDSCH (16QAM)	8/4/2(*)	63.6/63.4/63.2 gesamt	Siehe TS 25.141	Siehe TS 25.141	Siehe TS 25.141

\* 2 HS\_PDSCH correspond to 6 DPCH, 4 HS\_PDSCH to 14 DPCH und 8 HS\_PDSCH to 30 DPCH

This test model can be measured with an analyzer equipped with R&S® FSIQK74.

## 5 Menu Overview

Application Firmware Module R&S® FSIQK72/K74 (WCDMA base station test) extends the analyzer by the code domain measurement mode for 3GPP WCDMA standard. Additional softkeys are available which allow overview measurements in the analyzer and vector analyzer modes.





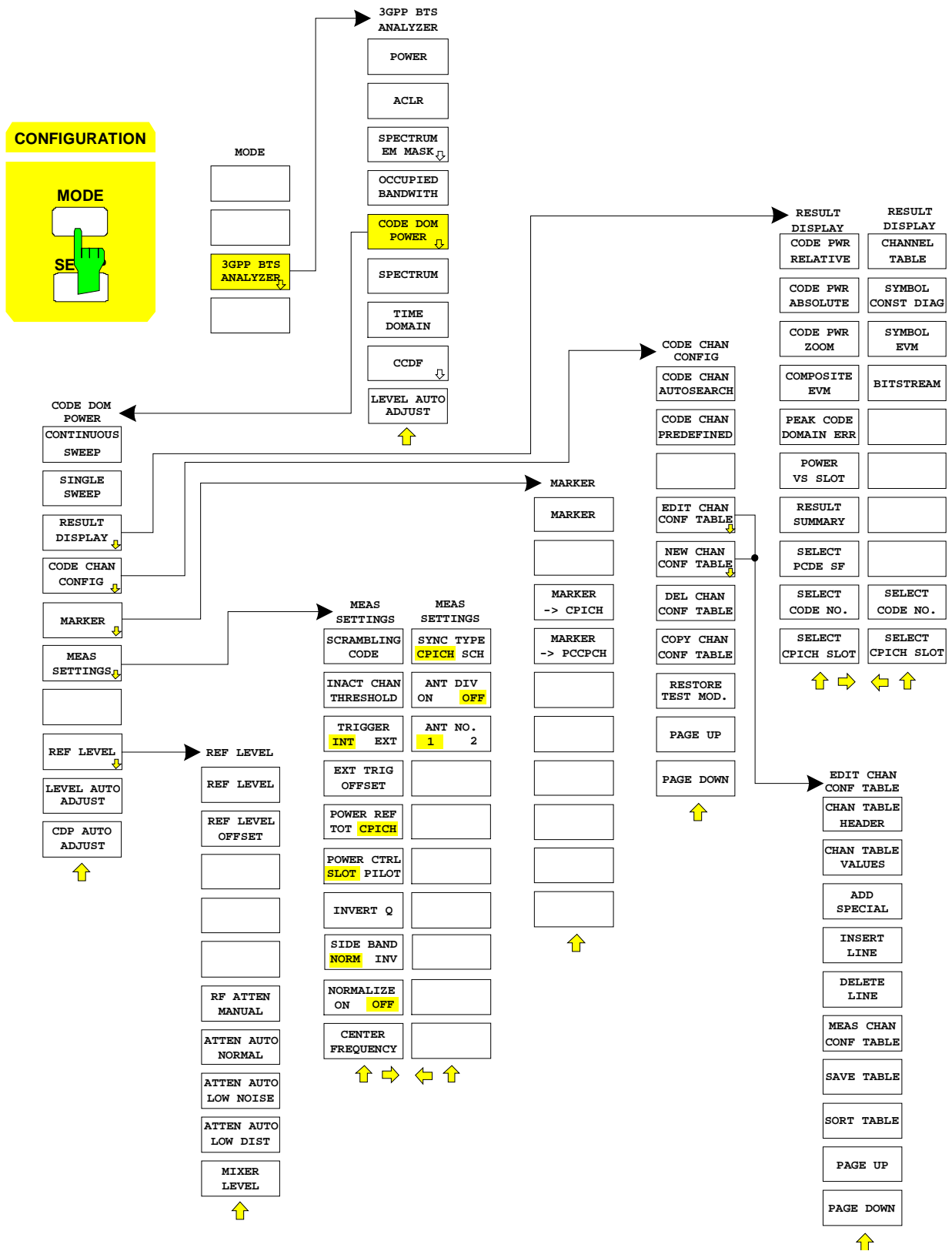


Fig. 5-1 Overview of menus

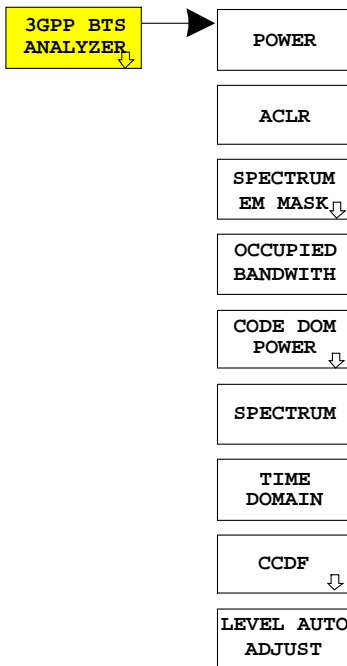
## 6 Configuration of WCDMA Measurements

The most important parameters for the 3GPP WCDMA base station tests are summarized in the menu *cdmaOne BTS* ( *CONFIGURATION* key group, *Mode* key) and are explained below using the softkey functions. The measurements described at the softkeys can be performed both with an analyzer equipped with R&S® FSIQK72 only and with an analyzer with additional R&S® FSIQK74. The description of measurement functions and the graphics it contains refer to R&S® FSIQK72. If a different behaviour of measurement functions or additional information can be reached by equipping the analyzer with R&S® FSIQK72, this will be stated within the text.

The *CDP MEAS* softkey activates the code domain measurement mode and opens the submenus for setting the measurement.

The softkeys *POWER*, *ACLR*, *SPECTRUM EM MASK*, *OCCUPIED BANDWIDTH*, *SPECTRUM*, *TIME DOMAIN* and *CCDF* activate base station tests in the analyzer or vector analyzer mode. The settings required by 3GPP specifications are performed by pressing the associated softkey, a subsequent modification of settings is possible. The other menus of R&S® FSIQ correspond to the menus of these modes and are described in the operating manual of FSIQ.

### CONFIGURATION MODE menu

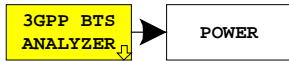


The *3GPP BTS ANALYZER* softkey opens a submenu for setting the various measurement modes of option R&S® FSIQK72/K74:

- *POWER* activates the channel power measurement with defined settings in the analyzer mode.
- *ACLR* activates the adjacent channel power measurement with defined settings in the analyzer mode.
- *SPECTRUM EM MASK* compares the signal power in different carrier offset ranges with the maximum values specified by 3GPP.
- *OCCUPIED BANDWIDTH* activates the measurement of the occupied bandwidth (analyzer mode).
- *CODE DOM POWER* activates the code domain measurement mode and opens another submenu for selecting and configuring the parameters. All other menus of R&S® FSIQ are adapted to the functions of the code domain measurement mode.
- *SPECTRUM* activates an overview measurement with defined settings in the analyzer mode.
- *TIME DOMAIN* activates the measurement of the WCDMA signal CREST factor in the time domain display mode (analyzer mode).
- *CCDF* evaluates the signal with regard to its statistical characteristics (distribution function of the signal amplitudes).

### Measurement of Channel Power

Submenu: CONFIGURATION- MODE – 3GPP BTS ANALYZER – POWER



The *POWER* softkey activates the measurement of the WCDMA signal channel power.

FSIQ measures the RF signal power in the 3.84 MHz bandwidth. The power is calculated by summing up the values at the trace points. The individual trace points are weighted with the root raised cosine function as specified by the 3GPP standard. The bandwidth is displayed numerically in the marker info field at the top right edge of the screen.

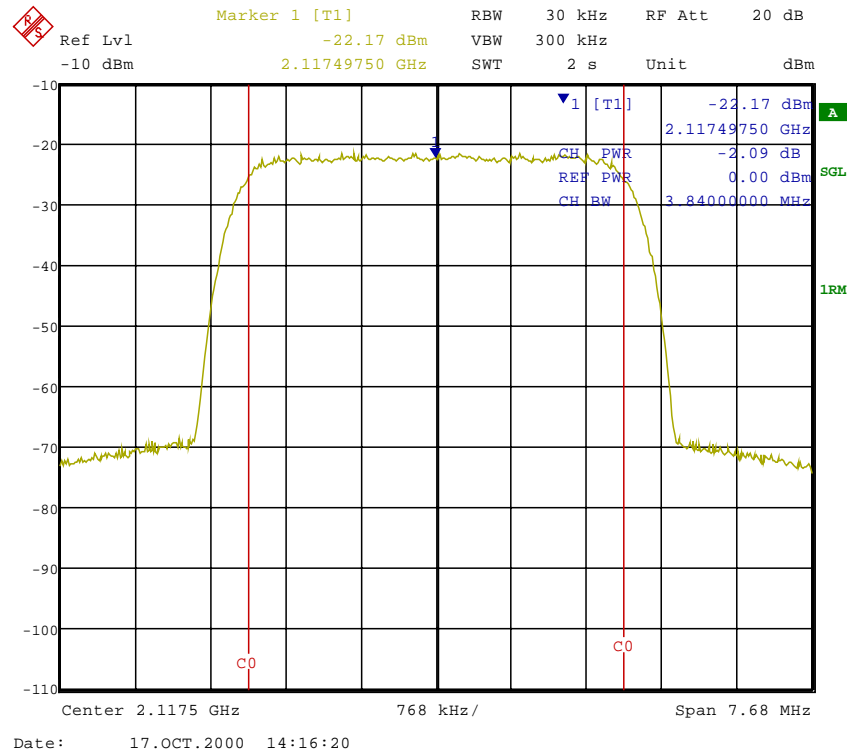


Fig. 6-1 Power measurement in the 3.84 MHz transmission channel

Pressing the softkey activates the analyzer mode with defined settings:

SYSTEM PRESET		
After Preset the following user-specific settings are restored and so the adaptation to the DUT is maintained:	Reference Level , Reference Level Offset Center Frequency, Frequency Offset Input Attenuation, Mixer Level All trigger settings	
MARKER NORMAL	CHANNEL POWER	
MARKER NORMAL	POWER MEAS SETTINGS - ACP STANDARD	W-CDMA 3GPP FWD

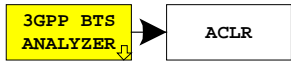
Starting from these settings, R&S® FSIQ can be operated in all functions available in the analyzer mode, i.e. all test parameters can be adapted to the requirements of the specific measurement.

IEC/IEEE-bus command: :CONFigure:WCDPower:MEASurement POWER

Query of results: :CALCulate:MARKer:FUNCTion:POWer:RESult? CPOWER

Measurement of Adjacent-Channel Power - ACLR

Submenu: CONFIGURATION - MODE - 3GPP BTS ANALYZER



The ACLR softkey activates the adjacent-channel power measurement in the default setting according to 3GPP specifications (Adjacent Channel Leakage Power Ratio).

FSIQ measures the channel power and the relative power of adjacent channels and of the next channels. The results are displayed in the marker info field at the top right edge of the screen.

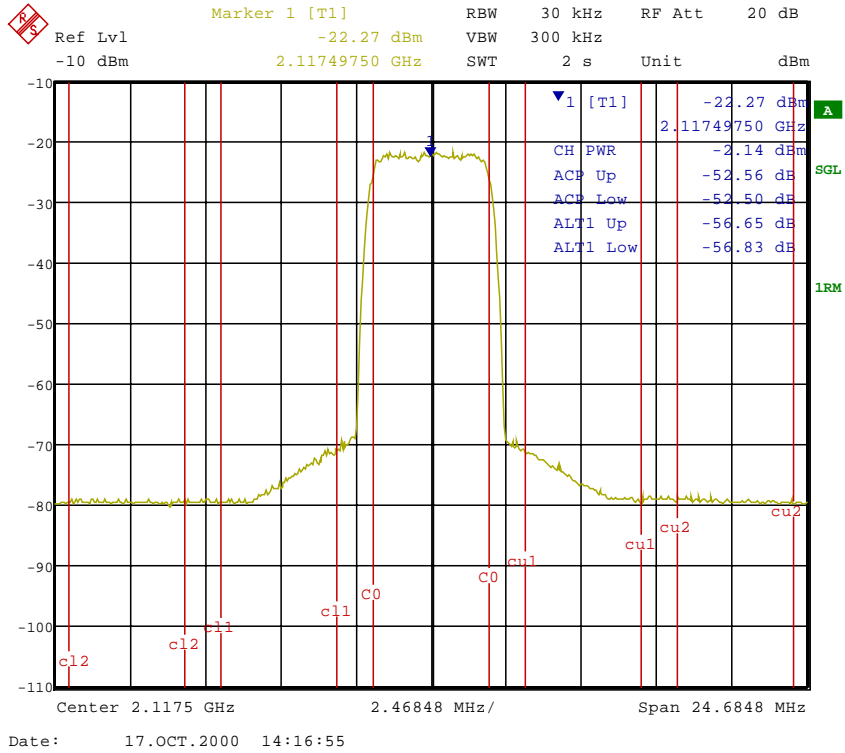


Fig. 6-2 Adjacent-channel power measurement of a WCDMA base station.

Pressing the softkey activates the analyzer mode with defined settings:

SYSTEM PRESET		
After Preset the following user-specific settings are restored and so the adaptation to the DUT is maintained:	Reference Level , Reference Level Offset Center Frequency, Frequency Offset Input Attenuation, Mixer Level All trigger settings	
MARKER NORMAL	ADJACENT CHAN POWER	
MARKER NORMAL	POWER MEAS SETTINGS - ACP STANDARD	W-CDMA 3GPP FWD
	SET NO OF ADJ CHAN'S	2

Starting from these settings, R&S® FSIQ can be operated in all functions available in the analyzer mode, i.e. all test parameters can be adapted to the requirements of the specific measurement.

IEC/IEEE-bus command: :CONFigure:WCDPower:MEASurement ACLR

Query of results: :CALCulate:MARKer:FUNction:POWER:RESult? ACPower

Signal Power Check – SPECTRUM EM MASK

CONFIGURATION - MODE - 3GPP BTS ANALYZER submenu

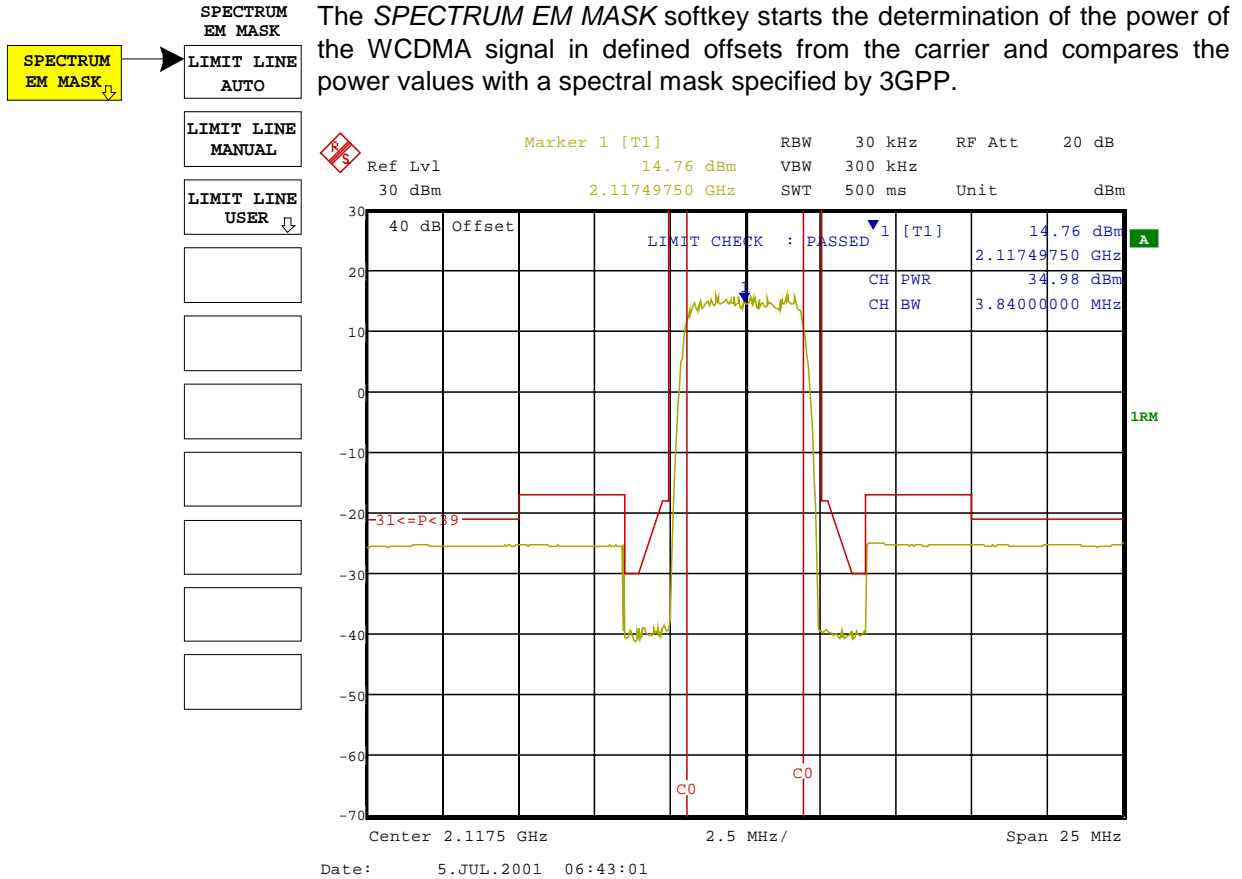


Fig. 6-3 Measurement of Spectrum Emission Mask.

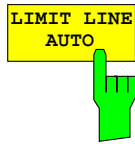
Pressing the softkey activates the analyzer mode with defined settings:

SYSTEM PRESET		
After Preset the following user-specific settings are restored and so the adaptation to the DUT is maintained:	Reference Level , Reference Level Offset Center Frequency, Frequency Offset Input Attenuation, Mixer Level All trigger settings	
MARKER NORMAL	CHANNEL POWER	
MARKER NORMAL	POWER MEAS SETTINGS - ACP STANDARD	W-CDMA 3GPP FWD
	SET NO OF ADJ CHAN'S	0
MARKER NORMAL	CP / ACP ABS / REL	ABS
FREQUENCY SPAN		25 MHz
	CENTER FIXED	
SWEEP SWEEP	SWEEP TIME MANUAL	0.5 sec
TRACE 2/3/4	DETECTOR	RMS

Starting from these settings, R&S® FSIQ can be operated in all functions available in the analyzer mode, i.e. all test parameters can be adapted to the requirements of the specific measurement.

IEC/IEEE-bus command: :CONFigure:WCDPower:MEASurement ESpectrum

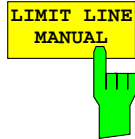
Query of results: :CALCulate:LIMit:FAIL? and visual evaluation



The *LIMIT LINE AUTO* softkey automatically selects the limit line to be checked according to power determined in the useful channel. If the measurement is carried out in *CONTINUOUS SWEEP* and the channel power changes from sweep to sweep, this can result in the limit line being continuously redrawn.

The softkey is activated when the spectrum emission mask measurement is entered.

IEC/IEEE-bus command:           : CALC:LIM:ESP:MODE AUTO



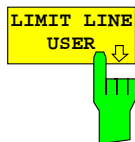
The *LIMIT LINE MANUAL* softkey activates the manual selection of a predefined limit line. If this softkey is selected, the channel power measurement is not used to select the limit line, but only to determine its relative components. The power at the different frequency offsets is compared with the user-defined limit line.

The softkey opens a table with all the limit lines predefined in the device:

P >= 43 dBm  
 39 dBm <= P < 43 dBm  
 31 dBm <= P < 39 dBm  
 P < 31 dBm

The name of the limit line indicates the expected power range, for which the limit line has been defined.

IEC/IEEE-bus command:           : CALC:LIM:ESP:MODE MANuAl  
   : CALC:LIM:ESP:VALue 39



The *LIMIT LINE USER* softkey activates the input of user-defined limit lines. The softkey opens the menus of the limit line editor that are known from the basic unit. The limit lines created by the user are included in the table for *LIMIT LINE MANUAL*.

The following limit line settings are useful for base station tests:

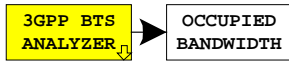
Trace 1, Domain Frequency, X-Scaling relative, Y-Scaling absolute, Spacing linear, Unit dBm

In contrast to the predefined limit lines supplied with the R&S® FSIQ which correspond to the standard specifications, the user-defined limit line can be specified for the entire frequency range ( $\pm 12.5$  MHz from carrier) either relatively (referred to the channel power) or absolutely.

IEC/IEEE-bus command:       see Table of Softkeys with Assignment of IEC/IEEE Commands

### Measurement of Occupied Bandwidth - OCCUPIED BANDWIDTH

Submenu: CONFIGURATION - MODE - 3GPP BTS ANALYZER



The *OCCUPIED BANDWIDTH* activates the measurement of the bandwidth which the signal occupies.

The occupied bandwidth is defined as the bandwidth in which 99% of the total transmitter power is contained.

The occupied bandwidth and the frequency markers are output in the marker info field at the top right edge of the screen.

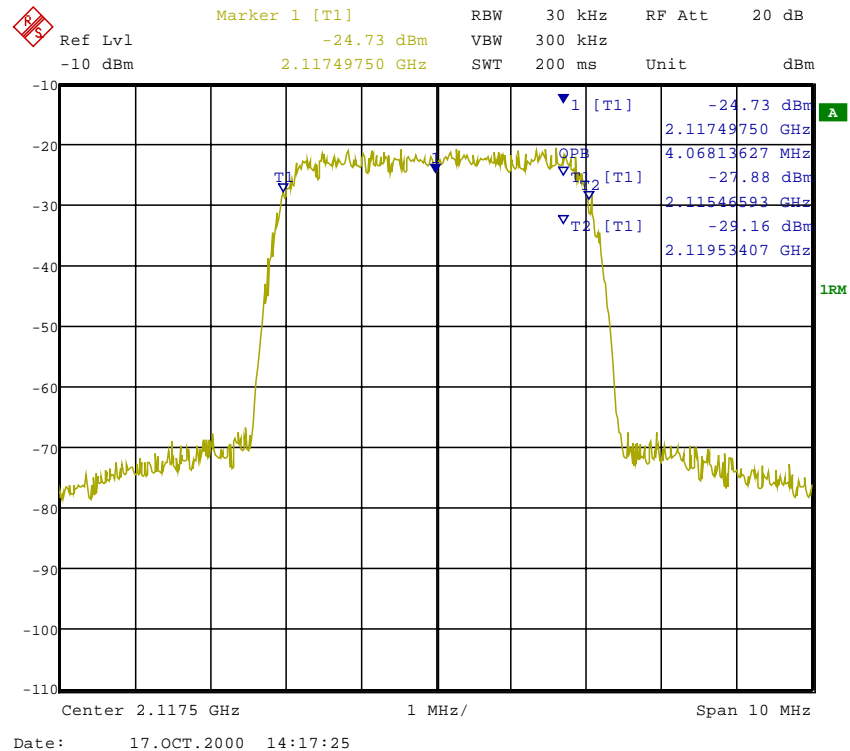


Fig. 6-4 Measurement of occupied bandwidth.

Pressing the softkey activates the analyzer mode with defined settings:

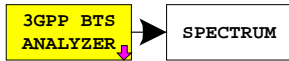
SYSTEM PRESET		
After Preset the following user-specific settings are restored and so the adaptation to the DUT is maintained:		
		Reference Level , Reference Level Offset
		Center Frequency, Frequency Offset
		Input Attenuation, Mixer Level
		All trigger settings
MARKER NORMAL	OCCUPIED PWR BANDW	
FREQUENCY SPAN		10 MHz
SWEEP SWEEP	SWEEP TIME MANUAL	0.2 sec
SWEEP COUPLING	RBW MANUAL	30 kHz
TRACE 1	DETECTOR	RMS

IEC/IEEE-bus command: :CONFigure:WCDPower:MEASurement OBANdwidth

Query of results: :CALCulate:MARKer:FUNCTion:POWER:RESult? OBANdwidth

Spectrum Measurement - SPECTRUM

Submenu: CONFIGURATION- MODE - 3GPP BTS ANALYZER



The *SPECTRUM* softkey displays the spectrum of the WCDMA BTS signal with a span of 25 MHz in the analyzer mode.

This measurement gives an overview of the W-CDMA signal spectrum so that interfering signals in the immediate vicinity can be identified. Measurement settings, e.g. the span, can be modified as required for further signal measurements.

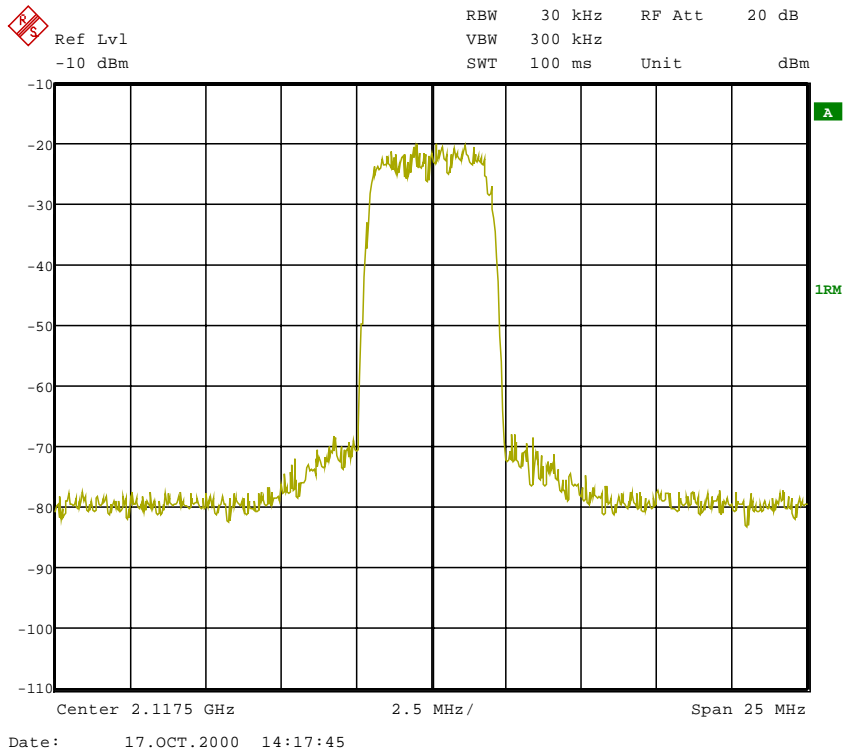


Fig. 6-5 Spectrum display of WCDMA signal at a 25 MHz span.

Pressing the softkey activates the analyzer mode with defined settings:

SYSTEM PRESET		
After Preset the following user-specific settings are restored and so the adaptation to the DUT is maintained: Reference Level , Reference Level Offset Center Frequency, Frequency Offset Input Attenuation, Mixer Level All trigger settings		
FREQUENCY SPAN		25 MHz
SWEEP SWEEP	SWEEP TIME MANUAL	0.1 sec
SWEEP COUPLING	RES BW MANUAL	30 kHz
TRACE 1	DETECTOR	RMS

Starting from these settings, R&S® FSIQ can be operated in all functions available in the analyzer mode, i.e. all test parameters can be adapted to the requirements of the specific measurement.

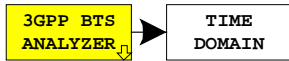
IEC/IEEE-bus command: :CONFigure:WCDPower:MEASurement FDOMain

Query of results: -- (visual evaluation)



### Measurement of Crest Factor - TIME DOMAIN

Submenu: CONFIGURATION - MODE - 3GPP BTS ANALYZER



The *TIME DOMAIN* softkey displays the CREST factor of the WCDMA BTS signal in the analyzer mode.

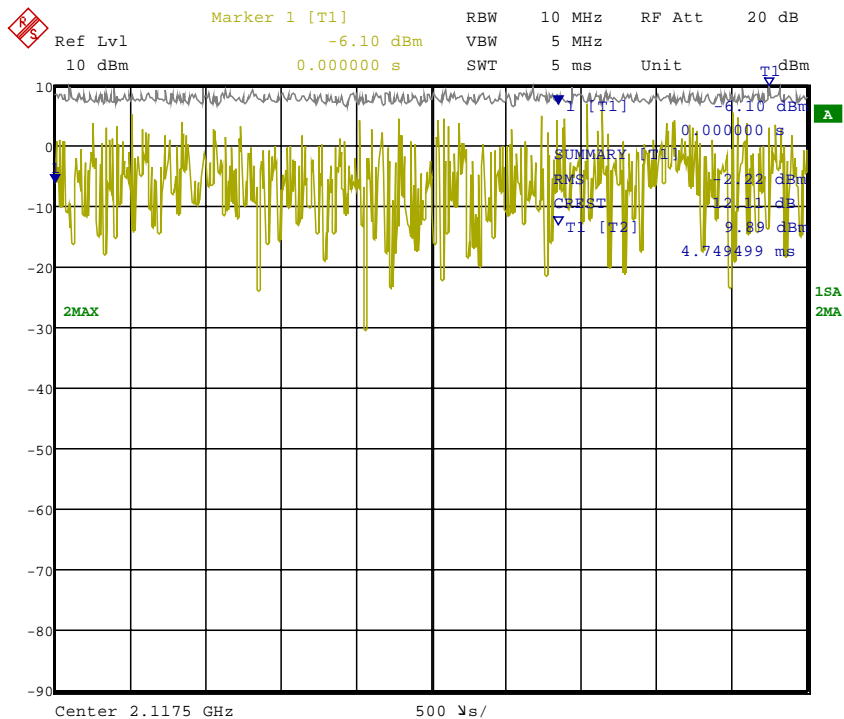
For this measurement, a signal section is continuously recorded.

The W-CDMA signal is measured in the zero span in the time domain. The result is displayed in two traces.

Trace 1 is measured with the sample detector. The analyzer calculates the average power from the displayed trace points.

Trace 2 is measured with the peak detector in the max. hold mode, i.e. the peak value of the signal is displayed.

The analyzer calculates the crest factor from the difference between the peak and the average power and displays it in the Marker Info field.



Date: 17.OCT.2000 14:18:36

Fig. 6-6 Time domain display of WCDMA signal.

Pressing the softkey activates the analyzer mode with defined settings:

SYSTEM PRESET		
After Preset the following user-specific settings are restored and so the adaptation to the DUT is maintained: Reference Level , Reference Level Offset Center Frequency, Frequency Offset Input Attenuation, Mixer Level All trigger settings		
FREQUENCY SPAN		ZERO SPAN
SWEEP SWEEP	SWEEP TIME MANUAL	0.1 sec
SWEEP COUPLING	RES BW MANUAL	10 MHz
	VIDEO BW MANUAL	5 MHz
TRACE 1	DETECTOR	SAMPLE
MARKER NORMAL		MARKER 1
TRACE 2		MAX HOLD
TRACE 2	DETECTOR	MAX PEAK
MARKER SEARCH	SUMMARY MARKER	ON
MARKER SEARCH	SUMMARY MARKER	RMS
MARKER NORMAL	MARKER INFO	ON

Starting from these settings, R&S® FSIQ can be operated in all functions available in the analyzer mode, i.e. all test parameters can be adapted to the requirements of the specific measurement.

IEC/IEEE-bus command: :CONFigure:WCDPower:MEASurement TDOMain

Query of results: :CALCulate:MARKer:FUNCTion:CRESt?  
 :CALCulate:MARKer:FUNCTion:SUMMary:RMS:RESult?  
 :CALCulate:MARKer:FUNCTion:SUMMary:STATe ON

### Signal Statistics - CCDF

CONFIGURATION - MODE - 3GPP BTS ANALYZER sub menu

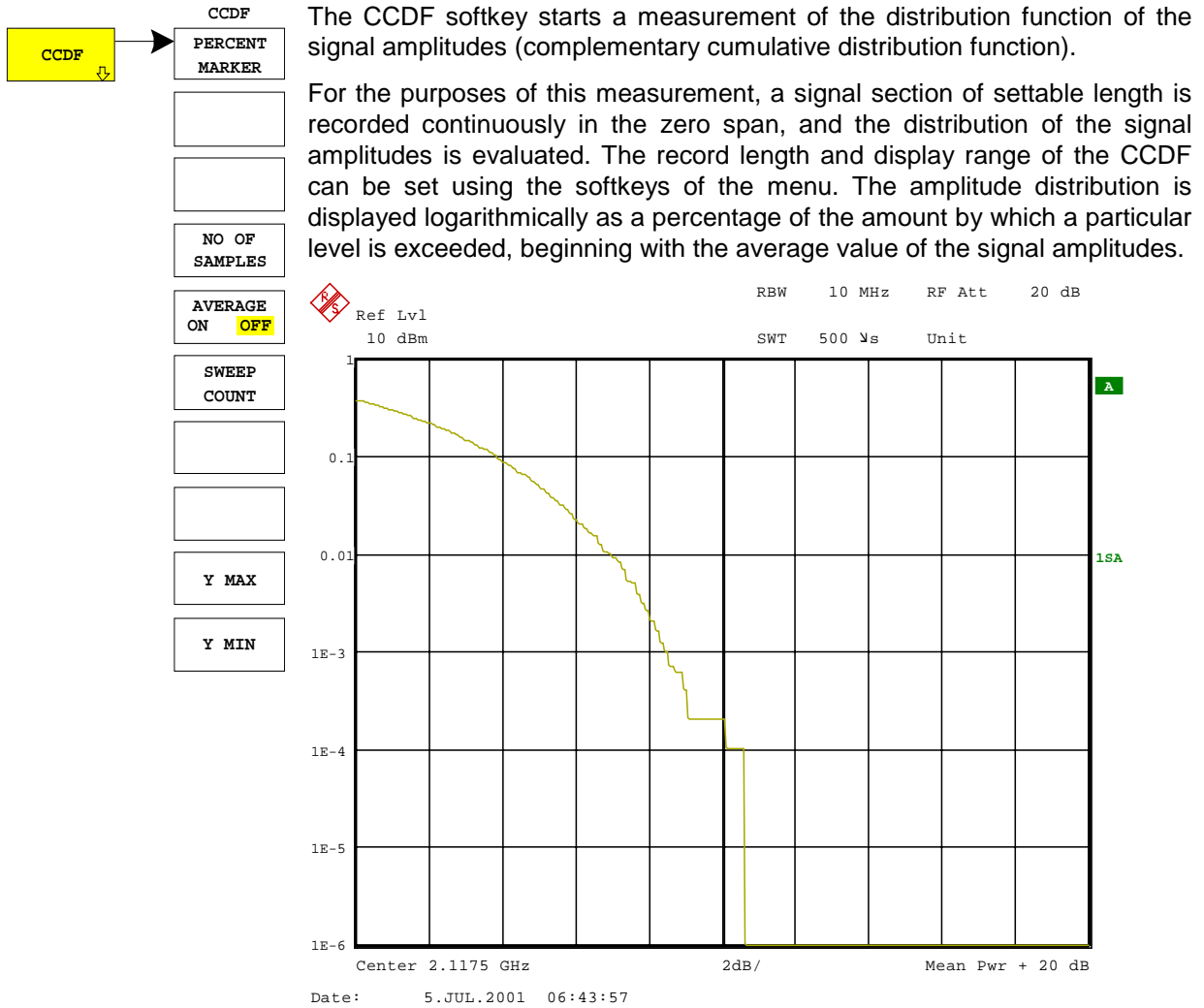


Fig. 6-7 CCDF of WCDMA signal.

Pressing the softkey activates the analyzer mode with defined settings:

SYSTEM PRESET	After Preset the following user-specific settings are restored and so the adaptation to the DUT is maintained: Reference Level, Reference Level Offset Center Frequency, Frequency Offset Input Attenuation, Mixer Level All trigger settings	
FREQUENCY SPAN		ZERO SPAN
TRACE1	DETECTOR	SAMPLE
SWEEP COUPLING	RES BW MANUAL	10 MHz
	VIDEO BW MANUAL	5 MHz

Starting from these settings, R&S® FSIQ can be operated in all functions available in the analyzer mode, i.e. all test parameters can be adapted to the requirements of the specific measurement.

IEC/IEEE-bus command:       :CONFigure:WCDPower:MEASurement CCDF  
 or  
                               :CALCulate:STATistics:CCDF ON

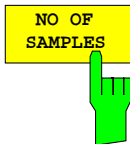
Query of results:             :CALCulate:MARKer:X?



The *PERCENT MARKER* softkey sets the marker to the specified percentage of the Y axis. The step width of the marker movement depends on the current marker value.

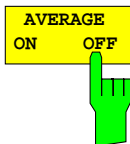
In addition to this marker, the normal markers of the analyzer can be activated for the display mode.

IEC/IEEE-bus command:       :CALC:MARK:Y:PERC 5



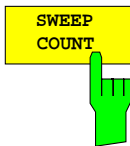
The *NO OF SAMPLES* softkey specifies the number of samples used to create the CCDF.

IEC/IEEE-bus command:       CALC:STAT:NSAM 5000



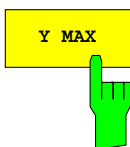
The *AVERAGE ON / OFF* softkey specifies whether or not the results of continuous measurements (in conjunction with *SWEEP COUNT*) are averaged. The default setting of the softkey is *OFF*.

IEC/IEEE-bus command:       :DISP:TRAC1:MODE AVER | VIEW



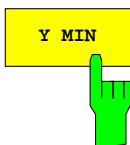
The *SWEEP COUNT* softkey determines the number of signal sections across which averaging is carried out (in the case of *AVERAGE ON*). Using *SWEEP COUNT* >1 and *AVERAGE ON*, the number of samples used to evaluate the statistical characteristics of the signal can be increased.

IEC/IEEE-bus command:       :SWE:COUN 6



The *Y MAX* softkey specifies the upper limit of the display range of the CCDF. Since probabilities are specified on the Y axis, the entered numerical values are dimensionless. The maximum value of the softkey is 1.

IEC/IEEE-bus command:       CALC:STAT:SCAL:Y:UPP 0.01



The *Y MIN* softkey specifies the lower limit of the display range of the CCDF. The minimum value of the softkey is 1E-6.

IEC/IEEE-bus command:       CALC:STAT:SCAL:Y:LOW 0.001

## Code Domain Measurements on WCDMA Signals

Application Firmware R&S® FSIQK72/K74 provides the peak code domain error measurement and composite EVM measurement, prescribed by the 3GPP standard, as well as the code domain power measurement of assigned and unassigned codes. In addition, the symbols demodulated in a slot, the decided bits or the EVM symbol can be displayed for an active channel.

A signal section of approx. 20 ms is recorded for analysis and searched for the start of a WCDMA frame. If a frame start is found in the signal, the CDP analysis is performed for a complete frame starting from slot 0.

Because of the power control over one power group prescribed by the 3GPP specification, permitting the channel power for a specific slot to be controlled at the beginning of the pilot symbol of the preceding slot, the signal has to be shifted in the memory in such a way that the WCDMA frame start is preceded by at least 1024 chips (longest sequence of pilot symbols).

Because of this shift and without triggering it may happen, however, that the recorded signal does not allow the analysis of a complete frame to start from slot 0. In this case, R&S® FSIQK72/K74 will start the CDP analysis from the first complete slot in the memory instead from slot 0. The 15 slots following the first complete one will be analyzed.

With triggering (frame trigger) and a trigger offset of 0 the CDP analysis for a complete WCDMA frame cannot start from slot 0 because of the shifting of the signal in the memory. In this case, R&S® FSIQK72/K74 will typically start CDP analysis from slot 1. With a trigger offset of  $-266,67 \mu\text{s}$  ( $= 1024$  chips) the start of the analysis can be shifted to slot 0.

The start slot of the CDP analysis can be seen in all graphs where the x axis is referenced to the slot. A detailed description is given with the respective display modes.

Application firmware R&S® FSIQK72/K74 offers two different ways of representing the code domain power measurement:

- Representation of all code channels

Option R&S® FSIQK72/K74 displays the power of all occupied code channels in a bargraph. The x axis is scaled for the highest code class or the highest spreading factor (512). Code channels with a lower spreading factor occupy correspondingly more channels of the highest code class. The power of the code channel is always correctly measured in accordance with the actual power of the code channel. Unused code channels are assumed to belong to the highest code class and displayed accordingly. The displayed power of an unused code channel therefore corresponds to the power of a channel with the spreading factor 512 at the respective code position.

To simplify identification, used and unused channels are displayed in different colours. Used channels are yellow, unused channels are blue.

The measured power always refers to one slot. The time reference for the start of a slot is the CPICH slot. When a timing offset is used this means that the power measurement period does not have to be identical for the various code channels as the beginning of the channel slot depends on the timing offset.

- Representation of channel power versus slots of a WCDMA signal frame

In this case the power of a selectable code channel is indicated versus a frame. The power is always measured within one slot of the selected channel. If code channels contain a timing offset, a specific slot of each channel is started at a different time. The offset to the beginning of the CPICH slot may be as long as one frame. The time reference for the display (x axis) is the CPICH. The power displayed for the measured code channel is however referred to the physical time at which it actually occurs. The timing offset of all power-controlled code channels can thus be directly read in the measured trace.

For all measurements performed in a slot of a selected channel (bits, symbols, EVM), the actual slot spacing of the channel is taken as a basis.

The composite EVM and peak code domain error measurements are always referred to the total signal. For code domain power (CDP) measurements, the display is operated in the SPLIT SCREEN mode. Only the display modes for the codes of the class with the highest spreading factor are permitted in the upper part of the screen, all other display modes are assigned to the lower part of the screen.

FSIQK72/K74 expects the following synchronization channels for the code domain power measurements.

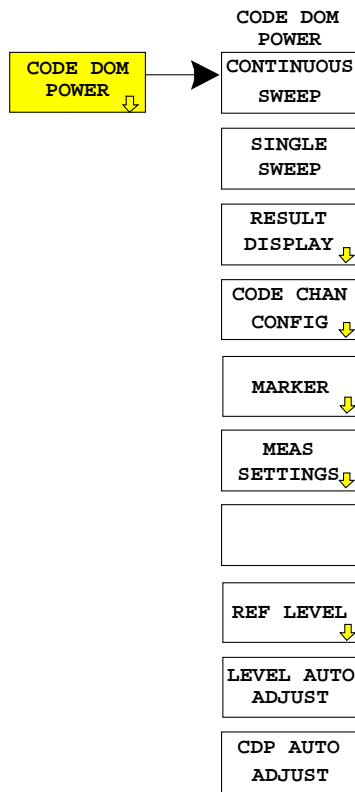
- Primary common control physical channel (PCCPCH). This channel shall be active within each channel configuration
- Primary synchronization channel (PSCH).
- Secondary synchronization channel (SSCH).
- Common pilot channel (CPICH). This channel is optional. If the signal does not contain CPICH, the firmware application shall be switched to *SYNC TYPE SCH* (see softkey *SYNC TYPE CPICH/SCH*).

There are two modes for the CDP analysis, mode *CODE CHAN AUTOSEARCH* and mode *CODE CHAN PREDEFINED*. R&S® FSIQK72 and R&S® FSIQK74 differ in both modes:

When operated in *CODE CHAN AUTOSEARCH* mode, R&S® FSIQK72 performs an automatic search for active channels (DPCH's) in the whole code domain. The search is based on the presence of known symbol sequences (pilot sequences) in the despread symbols of a channel. Channels without pilot sequences can therefore not be detected as being active in this mode. However, special channels SCCPCH and PICH will be detected even though they do not contain any pilot symbols. In the *CODE CHAN PREDEFINED* mode, the user can define the active channels contained in the signal via tables that can be selected and edited. For these channels a channel search by comparison with pilot sequences is no longer performed. In this mode, special channels without pilot sequences (which should be in the code domain however) can therefore be taken into account by R&S® FSIQK72 for the CDP analysis.

When operated in *CODE CHAN AUTOSEARCH* mode, FS-K74 performs an automatic search for channels in the whole code domain which is not based on the presence of any known symbol sequences. With FS-K74 therefore channels of High Speed Data Packet Access (HSDPA) that do not contain pilot sequences can be detected as well. Additionally the possibility of changing modulation type within the channels is taken into account. Thus, channels with a modulation type differing from the usual QPSK of DPCH are properly measured as well. In mode *CODE CHAN PREDEFINED*, the channels contained in the signal are considered as predefined analogous to FS-K72. Only the modulation type of each channel will be measured by the firmware application.

Submenu: CONFIGURATION - MODE - 3GPP BTS ANALYZER



The *CODE DOM POWER* softkey activates the code domain measurement mode and opens a submenu for configuring the measurements. All settings can be performed in these submenus.

IEC/IEEE-bus command:

```
:CONFigure:WCDPower:MEASurement WCDPower
or:
:INSTrument:SElect WCDPower
```

Query of results:

```
:TRACe:DATA? TRACE1|TRACE2|ABITstream|PWCDp|CTable
```

or

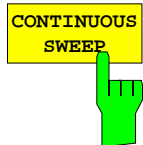
```
:CALCulate<1|2>:MARKer<1>:FUNctioN:WCDPower:RESult?
PTOTal | FERRor | TFRame | TOFFset | MACCuracy |
PCDError | EVMRms | EVMPeak | CERRor | CSLot |
SRATe | CHANnel | CDPabsolute | CDPRelative |
IQOffset | IQIMbalance
```

or

Marker functions (see *MARKER* submenu)

### Continuous Measurement - Continuous Sweep

Submenu: CONFIGURATION - MODE - 3GPP BTS ANALYZER - CODE DOM POWER

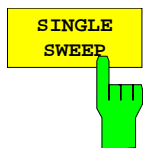


The *CONTINUOUS SWEEP* softkey sets a continuous measurement mode. The start of the actual measurement, however, may depend on an external trigger. (see section Trigger Settings - *TRIGGER* Menu)

```
IEC/IEEE-bus command: :INITiate:CONTinuous ON;
:INITiate:IMMediate
```

### Single Measurement - Single Sweep

Submenu: CONFIGURATION - MODE - 3GPP BTS ANALYZER - CODE DOM POWER

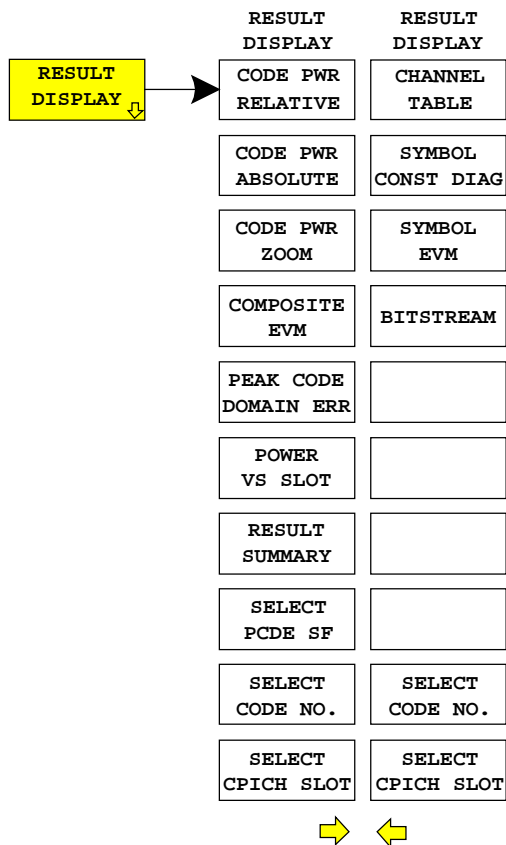


The *SINGLE SWEEP* softkey sets the single measurement mode. A single sweep is performed upon pressing the softkey. The start of the actual measurement, however, may depend on an external trigger (see section Key group *SWEEP*).

```
IEC/IEEE-bus command: :INITiate:CONTinuous OFF;
:INITiate:IMMediate
```

## Display Mode - RESULT DISPLAY

Submenu: CONFIGURATION - MODE - 3GPP BTS ANALYZER - CODE DOM POWER



The *RESULT DISPLAY* softkey opens a submenu for setting the display mode. The main menu contains the most important display modes as well as the measurements specified by the 3GPP standard for a fast access, whereas the side menu contains more detailed display modes.

The following display modes are available:

## CODE PWR RELATIVE

Code domain power with relative scaling

## CODE PWR ABSOLUTE

Code domain power with absolute scaling

## CODE PWR ZOOM

Selection of 64 codes out of the 512 possible codes

## COMPOSITE EVM

Square difference between test signal and ideal reference signal

## PEAK CODE DOMAIN ERR

Projection of the error between the test signal and the ideal reference signal onto the various spreading factors and subsequent summation using the symbols of each difference signal slot

## POWER VS SLOT

Power of the selected channel versus all slots of a WCDMA signal frame

## RESULT SUMMARY

Tabular result display

## CHANNEL TABLE

Display of channel occupation table

## SYMBOL CONST DIAG

Display of constellation diagram

## SYMBOL EVM

Display of error vector magnitude diagram

## BITSTREAM

Display of decided bits

By entering a code number (*SELCT CODE NO:* softkey) in the modes *CODE PWR RELATIVE / ABSOLUTE / ZOOM, POWER VS SLOT, SYMBOL CONST DIAG / EVM* it is possible to mark a channel for more detailed display modes.



The desired spreading factor can be selected with the *SELECT PCDE SF* softkey in the *PEAK CODE DOMAIN* display mode.

In the *POWER VS SLOT*, *SYMBOL CONST DIAG* and *SYMBOL EVM* display modes a slot can be marked by entering a slot number using the *SELECT CPICH SLOT* softkey.

Above the diagram, the most important measurement settings which form the basis if the display modes are summarized:

CF	2.1175 GHz	SR	30 ksp/s
Code Pwr Relative		Chan Code	27
CPICH Slot	10	Chan Slot	1

Fig. 6-8 Indication of measurement parameters

The different elements are:

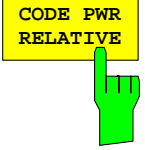
1st column:

CF 2.1175 GHz:	Center frequency of signal
Code Pwr Relative:	Name of selected display mode
CPICH Slot 10:	CPICH slot number (value of <i>SELECT CPICH SLOT</i> softkey)

2nd column:

SR 30 ksp/s:	Symbol rate of selected channel
Chan Code 27:	Spreading code of selected channel
Chan Slot 1:	Slot number of selected channel

**Note:** For the peak code domain error display mode, the indication of the symbol rate is replaced by the indication of the spreading factor onto which the error is projected (see *PEAK CODE DOMAIN ERR* softkey)



CODE PWR  
RELATIVE

The *CODE PWR RELATIVE* softkey selects the code domain power display mode with relative scaling.

In default mode, the power of the channels is referred to the CPICH power (code No. 0). This power reference was selected since the total power may vary depending on the slot due to the possibility of controlling the power in the different code channels. In contrast to the variable total power, the power of the CPICH is the same in all slots so that it can form the constant reference for the display. The reference can be switched to total power selecting setting *TOT* for the *POWER REF* softkey.

The measurement interval for determining the power of the channels is a slot in the CPICH (corresponding to a timing offset of 0 chip referred to the beginning of the signal frame).

The powers of the active channels and of the unassigned codes are shown in different colours:

- yellow: active channels
- blue: unassigned codes

If the analyzer is equipped with R&S® FSIQK72, a data channel in *CODE CHAN AUTOSEARCH* mode is considered to be active if the pilot symbols as specified by 3GPP standard are to be found at the end of each slot. Channels without or with incorrect pilot symbols are therefore not recognized by R&S® FSIQK72 in this mode. An exception to this rule are the special channels SCCPCH and PICH which can be recognized as active in the automatic search mode although they do not contain pilot symbols. In addition, the channel must exceed a minimum power (see *INACT CHAN THRESHOLD* softkey).

In *CODE CHAN PREDEFINED* mode, each data channel that is included in the user defined channel table is considered to be active.

If the analyzer is equipped additionally with R&S® FSIQK74, all channels that meet special quality criteria are recognized as active. The detection of channels does not depend on pilot sequences or other pre-known symbol sequences in R&S® FSIQK74. An active channel has only to exceed a minimum power (see *INACT CHAN THRESHOLD* softkey).

By entering a code channel number (see *SELECT CODE NO* softkey) it is possible to mark a channel for more detailed display modes. The marked channel is shown in red. The whole channel is marked if it is an assigned channels, and only the entered code is marked in the case of an unassigned code.

Selecting other display modes (e.g. *SYMBOL CONSTELLATION*) for unassigned codes is possible but not useful since the results are not valid.

At an analyzer equipped with R&S® FSIQK72 only, in the CDP diagram, the effect of missing or incomplete pilot symbols in a data channel can be shown in analyzer mode *CODE CHANNEL AUTOSEARCH*. At the points of the CDP diagram where the channel should appear due to its spreading code, there is a power value higher than the noise. The associated bars, however, are displayed in blue colour (black in the figures). In such a case, the channel should be checked for its pilot symbols. In *CODE CHANNEL PREDEFINED* mode, the channel should be included in the user defined channel table.

If the analyzer is equipped additionally with R&S® FSIQK74, channels without pilot sequences are recognized as active as well if they meet special quality criteria.

The following figures show how the CDP is displayed when all active channels contained in the signal have been found and when one of the channels has been recognized as inactive, eg because of missing pilot symbols (analyzer equipped with R&S® FSIQK72).

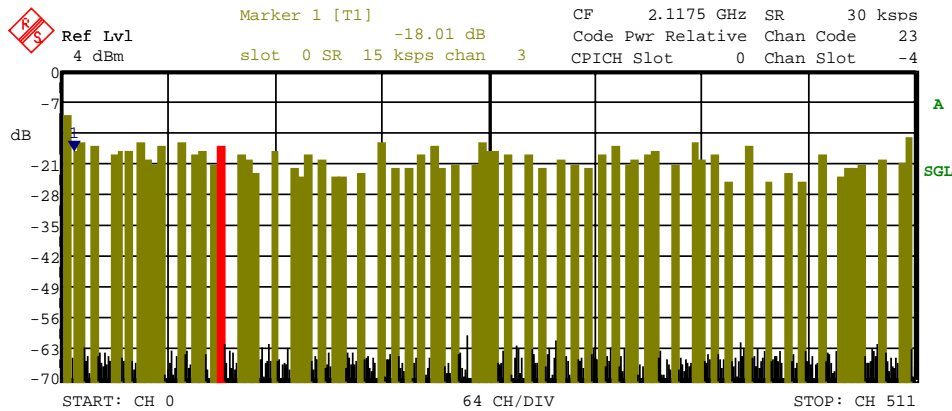


Fig. 6-9 CDP diagram with all channels recognized as active

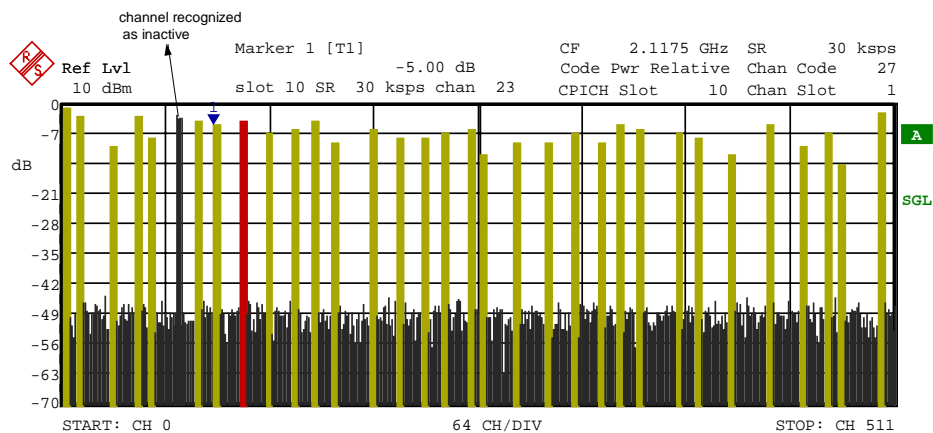


Fig. 6-10 CDP diagram with one of the channels recognized as inactive

At an analyzer equipped with additional R&S® FSIQK74, channels without pilot symbols, e.g. channels of type HS-PDSCH, are recognized as active. The following figure shows test model 5 with 8 HS-PDSCH channels and 30 DPCH channels.

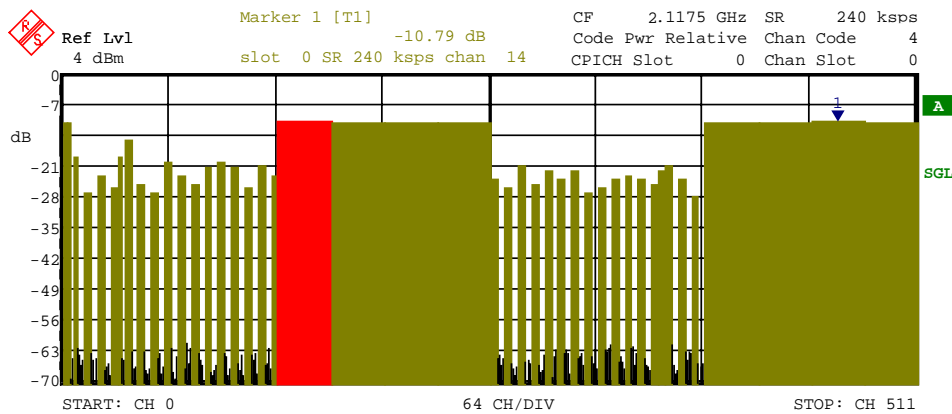
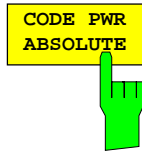


Fig. 6-11 CDP diagram (test model 5)

IEC/IEEE-bus command: :CALCulate<l>:FEED "XPOW:CDP:RAT"



The *CODE PWR ABSOLUTE* softkey selects the code domain power display mode with absolute scaling.

The powers of the active channels and of the unassigned codes are shown in different colours:

- yellow: active channels
- blue: unassigned codes

After entering a code number (*SELECT CODE NO* softkey) it is possible to mark a channel for other display modes. The marked channel is shown in red.

The measurement interval for determining the power of the channels is a slot in the CPICH (corresponding to a timing offset of 0 chip referred to the beginning of the signal frame).

For the recognition of the active code channels, the conditions are the same as those described for *CODE PWR RELATIVE*.

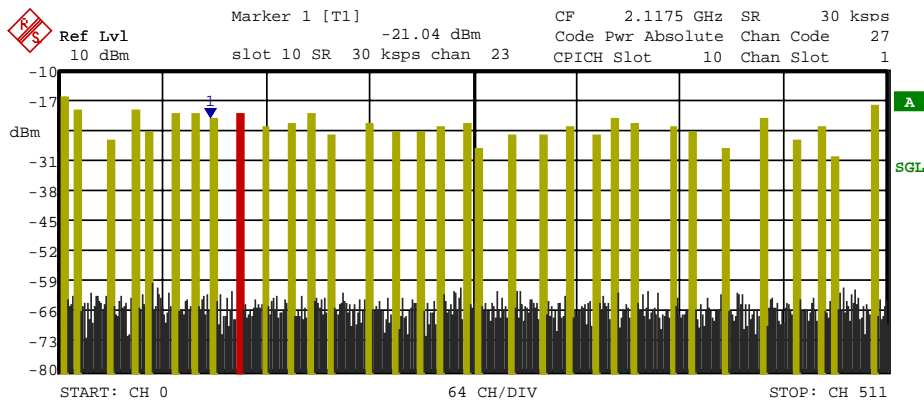
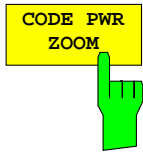


Fig. 6-12 Code domain power display mode with absolute scaling

IEC/IEEE-bus command: :CALCulate<1>:FEED "XPOW:CDP"



The *CODE PWR ZOOM* softkey zooms the x- axis of the code domain power display. The analyzer displays a window of 64 codes out of the 512 possible codes.

The representation is referred to the position of an activated marker. If no marker is active, the zoomed representation starts from code 0.

The powers of the active channels and of the unassigned codes are shown in different colours:

- yellow: active channels
- blue: unassigned codes

By entering a code channel number (see *SELECT CODE NO* softkey) it is possible to mark a channel for more detailed display modes. The marked channel is shown in red.

In the zoomed representation, the marked channel need not be contained in the displayed picture section. The display does not scroll depending on the marked channel.

The measurement interval for determining the power of the channels is a slot in the CPICH (corresponding to a timing offset of 0 chip referred to the beginning of the signal frame).

For the recognition of the active code channels, the conditions are the same as those described for *CODE PWR RELATIVE*.

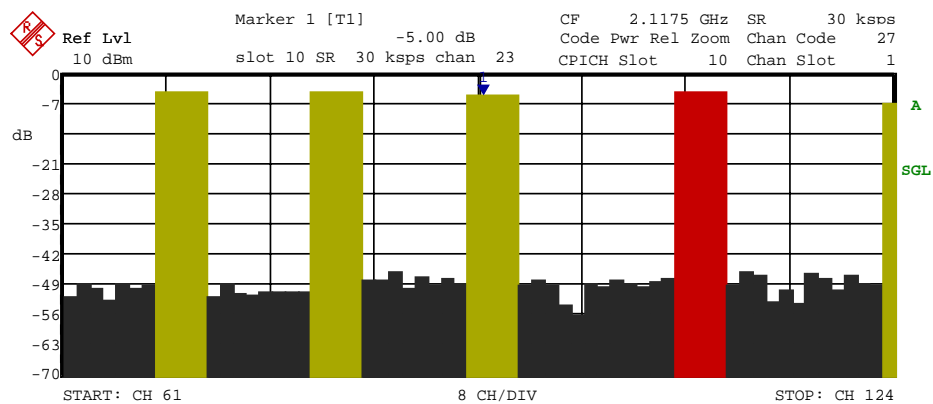


Fig. 6-13 Zoomed representation of the CDP diagram

IEC/IEEE-bus command: --



The *COMPOSITE EVM* softkey selects the composite EVM display mode.

During the composite EVM measurement, the square root of the squared errors between the real and imaginary parts of the test signal and an ideal reference signal (EVM referred to the total signal) is determined

The measurement result consists of one composite EVM measurement value per slot. In this case, the measurement interval is the slot spacing of the CPICH (timing offset of 0 chip referred to the beginning of the frame).

Only the channels recognized as active are used to generate the ideal reference signal. If an assigned channel is not recognized as active since pilot symbols are missing or incomplete, the difference between the measurement and reference signal, and the composite EVM is very high (see figures).

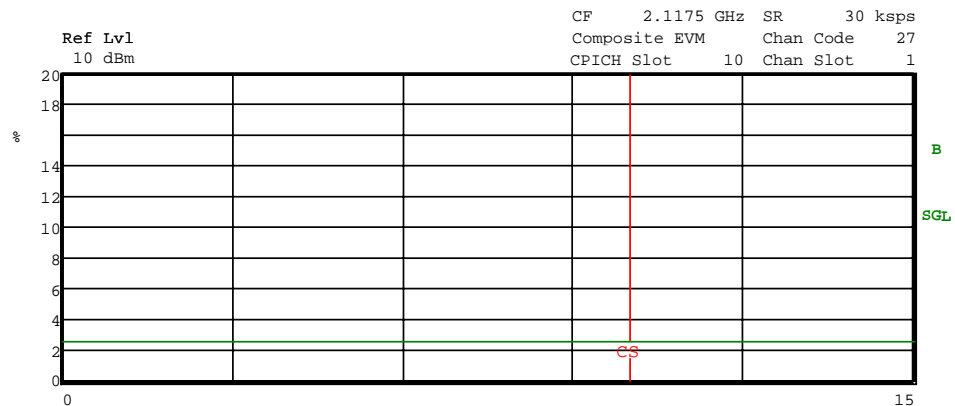


Fig. 6-14 Composite EVM - all channels are recognized as active

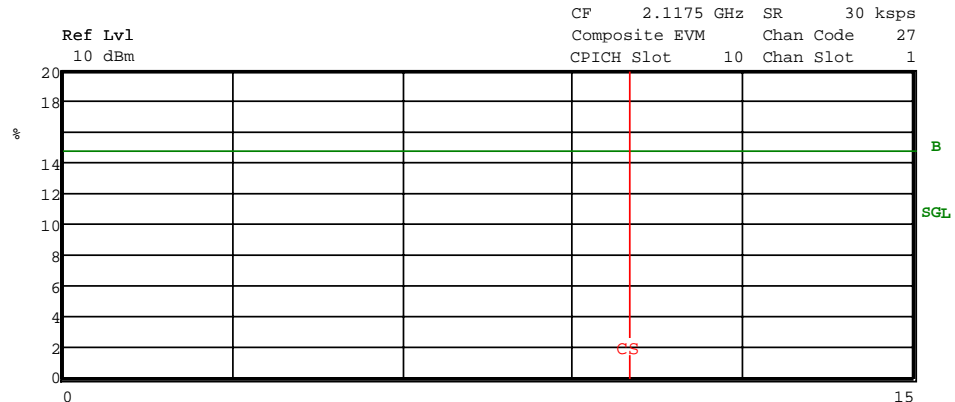
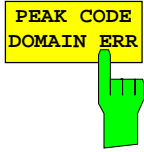


Fig. 6-15 Composite EVM - one channel is recognized as inactive

IEC/IEEE-bus command: :CALCulate2:FEED "XTIM:CDP:MACCuracy"



The *PEAK CODE DOM ERR* softkey selects the peak code domain error display mode.

In line with the 3GPP specifications, the error between the measurement signal and the ideal reference signal is projected onto the various spreading factors. The desired spreading factor is selected by means of the *SELECT PCDE SF* softkey.

The result consists of a numerical value per slot for the peak code domain error value. The measurement interval is the slot spacing of the CPICH (timing offset of 0 chip referred to the beginning of the frame).

Only the channels recognized as active are used to generate the ideal reference signal for the peak code domain error. If an assigned channel is not recognized as active since pilot symbols are missing or incomplete, the difference between the measurement and reference signal is very high. R&S® FSIQK72/K74 consequently indicates a peak code domain error that is too high (see figures).

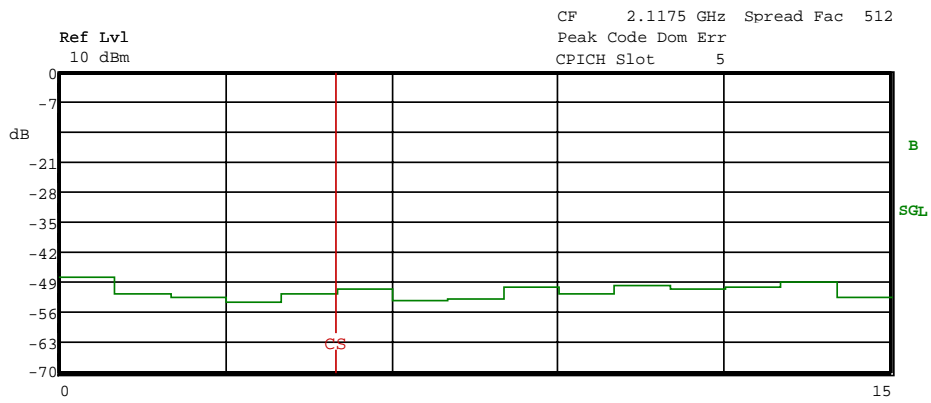


Fig. 6-16 Peak Domain Error - all channels are recognized as active

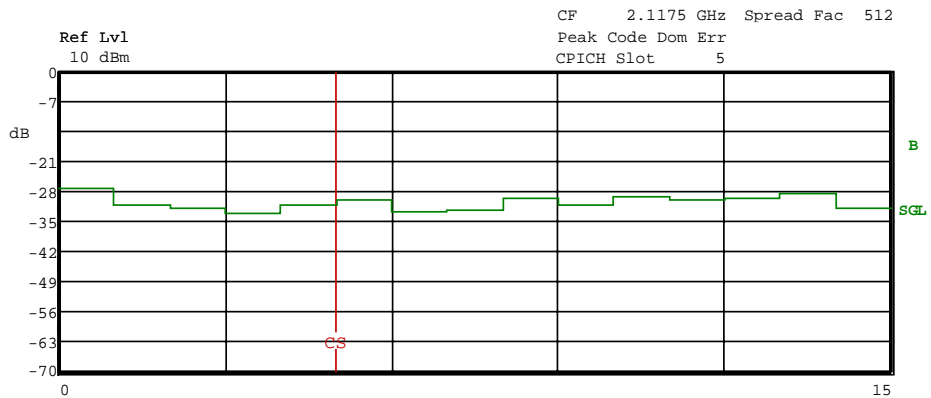
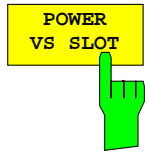


Fig. 6-17 Peak Domain Error - one channel is recognized as inactive

IEC/IEEE-bus command: :CALCulate2:FEED "XTIM:CDP:ERR:PCDomain"



The *POWER VS SLOT* softkey selects the indication of the power of the selected code channel depending on the slot number. The power of the selected channel (marked red in the CDP diagram) is displayed versus all slots of a frame of the WCDMA signal.

The 16 slots of the selected channel which follow the slot from which analysis starts are displayed. The following has to be taken into account: Due to the timing offset (up to one frame) admissible for the channels, the beginning of slot 0 of the selected channel is shifted with reference to the start of the frame (reference: CPICH slot 0). The timing offset therefore has also to be applied to the power-versus-slot display. To show the connection between timing offset and CDP analysis in the diagram, the x axis reflects the slot spacing of the channel as well as of the CPICH.

- The grid of the power-versus-slot display reflects the spacing of the CPICH slots. The slots are always labelled at the grid line where the slot in question begins (top labelling of x axis in diagram). The first CPICH slot displayed is the one from which the CDP analysis was started.
- The trace showing the powers versus the channel slots is displayed with a timing offset. The labelling of the channel slot numbers is displayed below the x axis at the beginning of the slot concerned (power group).

The following figures show an example of different results:

- Channel with a timing offset of 24832 chips referred to the CPICH (beginning of frame) with power control.

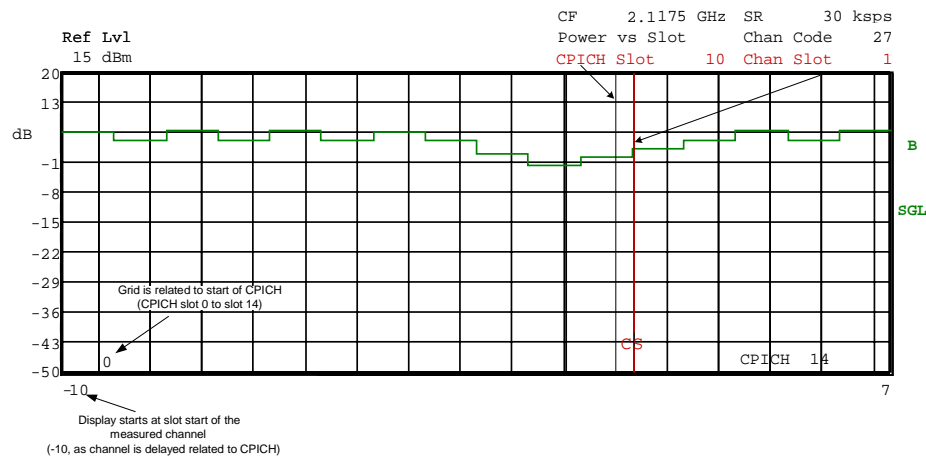


Fig. 6-18 Power versus Slot measurement for a channel with power control (timing offset 23 808)



- Channel with a timing offset of 2304 chips referred to the CPICH (beginning of frame) without power control.

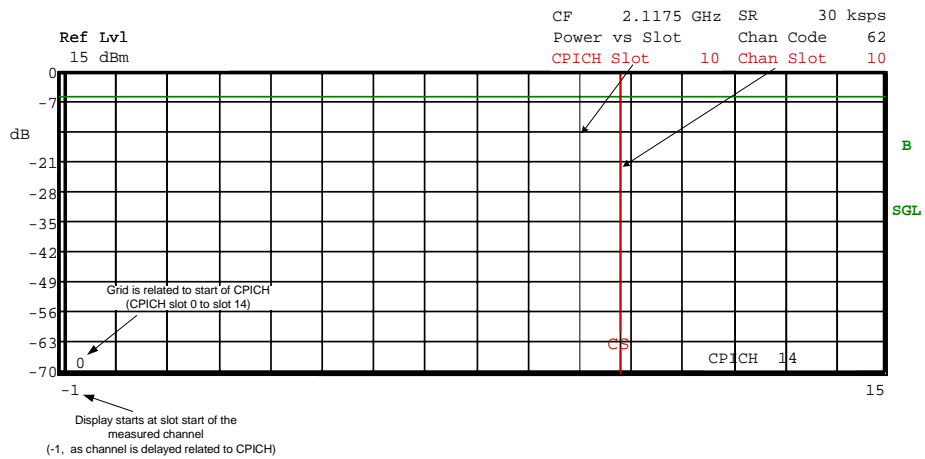


Fig. 6-19 Power versus Slot measurement for a channel without power control (timing offset 2304)

- Channel without timing offset from the CPICH (unassigned codes have a timing offset of 0 chip referred to beginning of the frame)

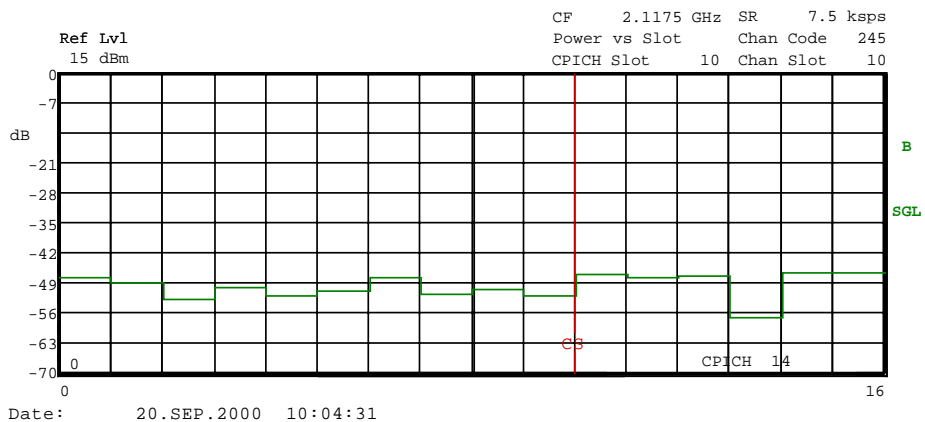


Fig. 6-20 Power versus Slot measurement for a channel without timing offset (unassigned code)

It is not only possible to select a code channel in the CDP diagram, but also to mark a slot in the power-versus-slot diagram. Marking is done by entering the CPICH slot number (see *SELECT CPICH SLOT* softkey) and the selected slot is marked in red. The red marking is always on the starting point of a slot and can be varied only with the slot spacing (see vertical line CS in the figures above).

Modifying a slot number has the following effects:

- The CDP diagram in the upper half of the display is updated referred to the entered CPICH slot number.
- Starting from the CPICH slot, all dependent results are calculated for the actual slot of the selected channel. The relevant graphics are updated.

IEC/IEEE-bus command: :CALCulate2:FEED "XTIM:CDP:PVSlot "



The *RESULT SUMMARY* softkey selects the numerical display of all results. The display is subdivided as follows:

RESULT SUMMARY			
GLOBAL RESULTS		Carr Freq Err 14.81 Hz	
Total PWR	-8.63 dBm	Trg to Frame	4.46 ms
Chip Rate Err	-0.89 ppm	IQ Imbalance	0.03 %
IQ Offset	0.06 %	Pk Code Dom Err	-59.16 dB rms
Composite EVM	1.20 % rms		( 15 ksps)
CPICH Slot Number	0		
CHANNEL RESULTS		Timing Offset	0 Chips
Symb Rate	240 ksps	Chan Slot Number	0
Channel Code	4	No. of Pilot Bits	0
Modulation Type	16QAM	Chan Pow abs.	-19.47 dBm
Chan Pow rel.	-10.84 dB	Symbol EVM	5.52 % Pk
Symbol EVM	1.41 % rms		

Fig. 6-21 Result Summary

The upper part contains the results relating to the total signal:

- Total PWR:** Outputs the total signal power (average power of total evaluated WCDMA frame).
- Carr Freq Err:** Outputs the frequency error referred to the center frequency of the analyzer. The absolute frequency error is the sum of the analyzer and DUT frequency error. Differences of more than 1 kHz between transmitter and receiver frequency impair the synchronization of the CDP measurement. For this reason, the transmitter and receiver should be synchronized (see chapter Getting Started).
- Chip Rate Err:** Outputs the chip rate error (3.84 Mcps) in ppm. As a result of a high chip rate error symbol errors arise and the CDP measurement is possibly not synchronized to the WCDMA signal. The result is valid even if the synchronization of analyzer and W-CDMA signal failed.
- Trg to Frame:** This result outputs the timing offset from the beginning of the recorded signal section to the start of the analyzed WCDMA frame. In the case of triggered data collection, this timing offset is identical with the timing offset of frame trigger (+ trigger offset) – frame start. In the case of failure of the synchronization of analyzer and W-CDMA signal, the value of Trg to Frame is not significant.
- IQ Offset:** DC offset of signals in %
- IQ Imbalance:** IQ imbalance of signal in %
- Composite EVM:** The composite EVM is the difference between the test signal and the ideal reference signal (see *COMPOSITE EVM* softkey). The rms average (of the analyzed frame) of the measurement results for each slot is given in the *RESULT SUMMARY*.

## Peak Code Dom Err:

The *PEAK CODE DOMAIN ERROR* measurement specifies a projection of the difference between the test signal and the ideal reference signal onto the selected spreading factor (see *PEAK CODE DOMAIN ERR* and *SELECT PCODE SF* softkeys). The average (of the analyzed frame) of the measurement results for each slot is indicated in the *RESULT SUMMARY* as an overview. The spreading factor onto which projection is made is shown below the measurement result.

**CPICH Slot:** Outputs the number of the CPICH slot at which the measurement is performed (see *SELECT CPICH SLOT* softkey).

The results of measurements on the selected channel (red in the diagram) are displayed in the lower part of the *RESULT SUMMARY*.

**Symb Rate:** Symbol rate at which the channel is transmitted.

**Timing Offset:** Offset between the start of the first slot in the channel and the start of the analyzed WCDMA frame.

**Channel Code:** Number of the spreading code of the selected channel .

## Chan Slot Number:

The *CHAN SLOT NUMBER* is obtained by combining the value of the *SELECT CPICH SLOT* softkey and the channel's timing offset.

**Modulation Type :** Modulation type. This parameter is only measured if the analyzer is equipped with R&S® FSIQK74. At an analyzer equipped with R&S® FSIQK74, modulation type of data channels of HSDPA (HS-PDSCH) can be QPSK or 16QAM. If the analyzer is not equipped with R&S® FSIQK74 modulation type of each channel is QPSK.

**No of Pilot Bits:** Number of pilot bits of the selected channel.

## Chan Pow rel. / abs.:

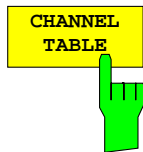
Channel relative (referred to CPICH) and absolute.

## Error Vector Mag Pk / rms:

Peak or average of the results of the error vector magnitude measurement (see *SYMBOL EVM* softkey).

## IEC/IEEE-bus command:

```
:CALCulate2:FEED "XTIM:CDP:ERR:SUMM"
:CALCulate<1|2>:MARKer<1>:FUNction:WCDPower:RES?
  PTOTal| FERRor| TFRame| TOFFset| MACCuracy|
  PCDerror| EVMRms| EVMPeak| CERRor| CSLot| SR
```



The *CHANNEL TABLE* softkey selects the display of the channel assignment table. The channel assignment table can contain a maximum of 512 entries, corresponding to the 512 assignable codes of the class with spreading factor 512.

The upper part of the table indicates the control channels of the signal. The power of the CPICH and PCCPCH is specified. The power of the PSCH and SSCH channels is not determined and therefore the associated fields are empty. If the channel table contains SCCPCH and PICH these channels are also listed in the upper part of the table.

The lower part of the table indicates the data channels (DPCH) contained in the signal. The channels are in descending order according to symbol rates and within a symbol rate in ascending order according to the channel numbers. Therefore, the unassigned codes are always at the end of the table.

The lower part of the table indicates the data channels contained in the signal. Data channels are all channels that do not have predefined channel numbers and symbol rates. That means that for example a channel like SCCPCH, whose channel number and symbol rate can vary, will be found among the data channels in *CODE CHAN AUTOSEARCH* mode if its symbol rate or channel number differs from that prescribed in 3GPP standard. If the analyzer is equipped with R&S® FSIQK72 only, the pilot symbols prescribed in 3GPP standard have to be found at the end of each slot of data channels. If the analyzer is equipped with R&S® FSIQK74, the channels of HSDPA will be found among the data channels. If the type of a channel can be fully recognized, as for example at a DPCH (based on pilot sequences) or at a HS-PDSCH (based on modulation type), the type will be entered into the field *TYPE*. All channels with channel type not fully recognized are of type CHAN.

The channels are to be found in descending order according to symbol rates and within a symbol rate in ascending order according to the channel numbers. Therefore, the unassigned codes are always to be found at the end of the table. If the modulation type for a channel can vary, the measured value of modulation type will be appended to the type of the channel (see figure).

The following figure shows *CHANNEL TABLE* for an analyzer equipped with R&S® FSIQK72 and R&S® FSIQK74 and measuring test model 5.

CHANNEL TABLE								
Type	SR(ksp/s)	Ch#	Status	TFCI	PilL	PWR ABS	PWR REL	Toffs
CPICH	15.0	0	active	---	--	-19.63	-11.00	---
PCCPCH	15.0	1	active	---	--	-19.62	-10.99	---
SCCPCH	15.0	3	active	OFF	0	-27.64	-19.01	0
PICH	15.0	16	active	---	--	-27.60	-18.97	30720
HSPDSCH_16QAM	240.0	4	active	OFF	0	-19.47	-10.84	0
HSPDSCH_16QAM	240.0	5	active	OFF	0	-19.71	-11.07	0
HSPDSCH_16QAM	240.0	6	active	OFF	0	-19.76	-11.13	0
HSPDSCH_16QAM	240.0	7	active	OFF	0	-19.69	-11.06	0
HSPDSCH_16QAM	240.0	12	active	OFF	0	-19.79	-11.16	0
HSPDSCH_16QAM	240.0	13	active	OFF	0	-19.79	-11.16	0
HSPDSCH_16QAM	240.0	14	active	OFF	0	-19.42	-10.79	0

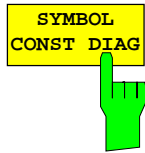
Fig. 6-22 Channel Table

The following parameters of these channels are determined by the CDP measurement:

Type:	Type of a channel (active channels only). If the modulation type of a channel can vary (HS-PDSCH, at an analyzer equipped with R&S® FSIQK74), the value of modulation type measured by the firmware application will be appended to the channel type. Data channels that do not have a type which can be fully recognized are of type CHAN (at an analyzer equipped with R&S® FSIQK74).
SR:	Symbol rate at which the channel is transmitted (7.5 ksps to 960 ksps).
Ch #:	Number of channel spreading code (0 to [spreading factor 1])
Status:	Status display. Since the active data channels are automatically searched for by the CDP measurement, each channel is in the active state.
TFCI:	Indication of whether or not the data channel uses TFCI symbols.
PiIL:	Number of pilot bits of a channel.
PWR ABS / PWR REL:	Indication of the absolute and relative channel power (referred to the CPICH or the total power of the signal).
T Offs:	Timing offset. Offset between the start of the first slot of the channel and the start of the analyzed WCDMA frame.

In *CODE CHAN AUTOSEARCH MODE*, a data channel is considered to be active if the required pilot symbols (see 3GPP specification) are at the end of each slot. In addition, the channel should have a minimum power (see *INACT CHAN THRESHOLD* softkey). At an analyzer equipped with R&S® FSIQK74, channels do not necessarily have to contain pilot symbols. Instead, channels have to fulfill special quality criteria to be recognized active. In *CODE CHAN PREDEFINED* mode, all channels that are included in the user defined channel table are marked as active.

IEC/IEEE-bus command: :CALCulate<1>:FEED "XTIM:CDP:ERR:CTable"



The *SYMBOL CONST DIAG* softkey selects the display of symbol constellation diagram.

The symbols are displayed for the selected channel (red marking in the CDP diagram) and the selected slot (red marking in the power-versus-slot diagram).

It is possible to display the constellation diagram for unassigned codes (red marking in the CDP diagram on a code represented in blue), but the results are not meaningful, as the unassigned code channel does not contain data.

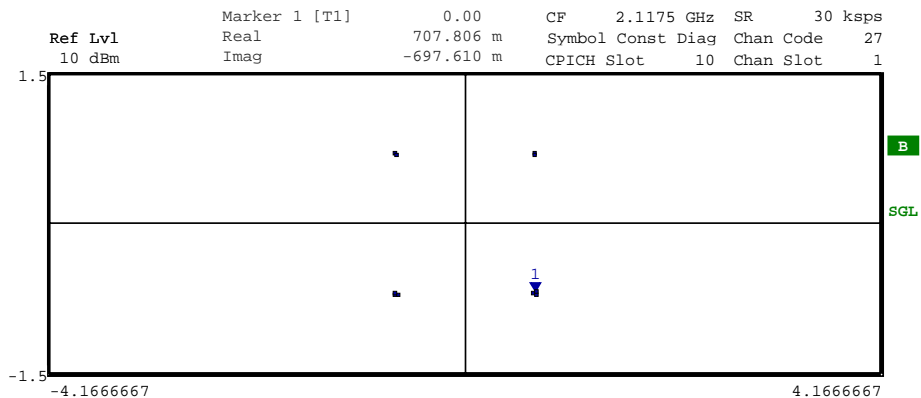


Fig. 6-23 Symbol Constellation Diagram

For data channels of HSDPA the modulation type can vary according to 3GPP. If the analyzer is equipped with R&S® FSIQK74, this will be considered by switching the diagram according to modulation type of the channel.

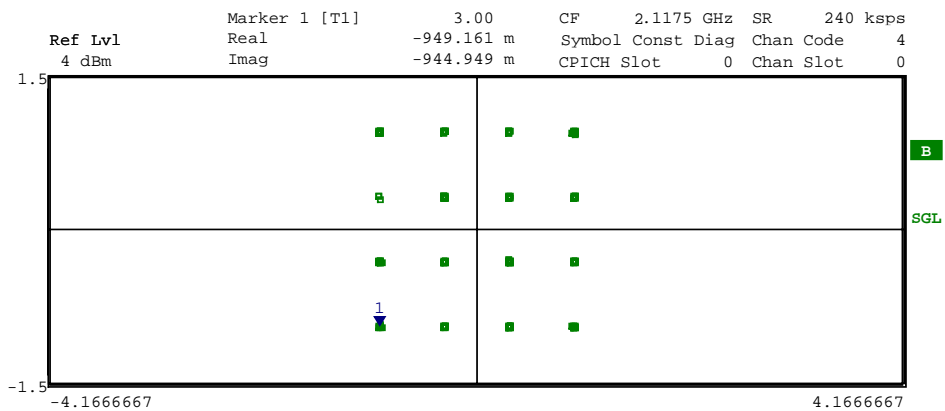
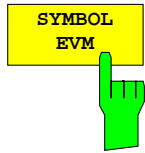


Fig. 6-24 Symbol Constellation Diagram (16QAM)

IEC/IEEE-bus command: :CALCulate2:FEED "XTIM:CDP:SYMB:CONS"



The *SYMBOL EVM* softkey activates the symbol error vector magnitude display. The EVM is displayed for the selected channel (red marking in the CDP diagram) and the selected slot (red marking in the power-versus-slot diagram).

It is possible to display the symbol error vector magnitude for unassigned codes (red marking in the CDP diagram on a code represented in blue), but the results are not valid.

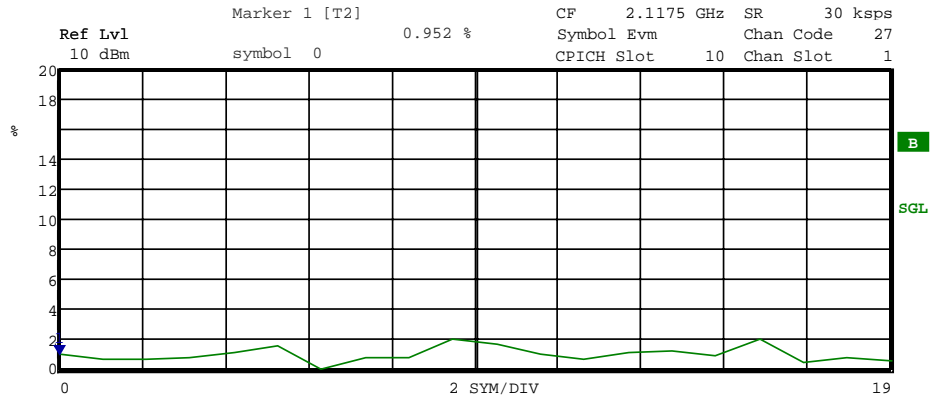


Fig. 6-25 Error Vector Magnitude for the selected slot of the selected channel

IEC/IEEE-bus command: :CALCulate2:FEED "XTIM:CDP:SYMB:EVM"



The *BITSTREAM* softkey activates the bitstream display.

The decided bits are displayed for the selected channel (red marking in the CDP diagram) and the selected slot (red marking in the power-versus-slot diagram).

Depending on the channel type and the symbol rate at which the channel is transmitted, specific symbols can be "switched off" in a slot, i.e. power 0 is transmitted instead of these symbols. The results of the bit decision are invalid for such symbols. Such invalid bits are marked by "x" in the diagram.

While it is possible to display the bitstream for unused codes (red marking in the CDP diagram at a code displayed in blue), the missing data means that the results are not very informative. In this case, "-" is used to indicate that all the bits are invalid.

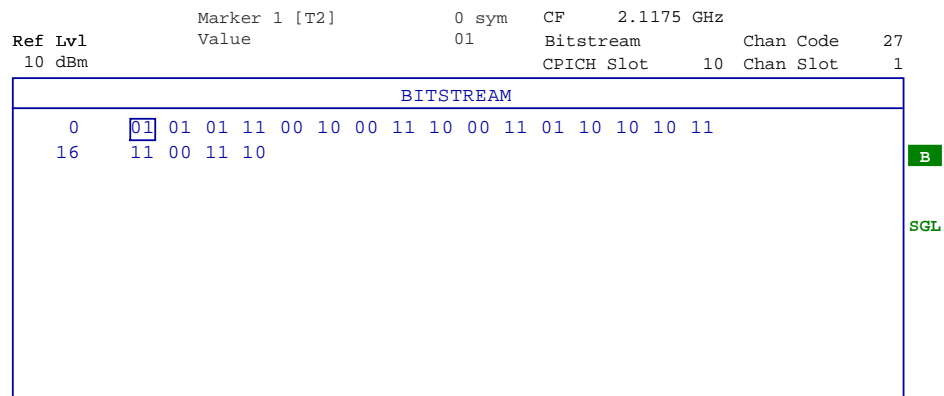


Fig. 6-26 Demodulated bits for the selected slot of the selected channel

For data channels of HSDPA, the modulation type can vary. Depending on the modulation type the number of bits that belong to one symbol will change. At an analyzer equipped with R&S® FSIQK74 the diagram will be switched according to the modulation type of the channel.

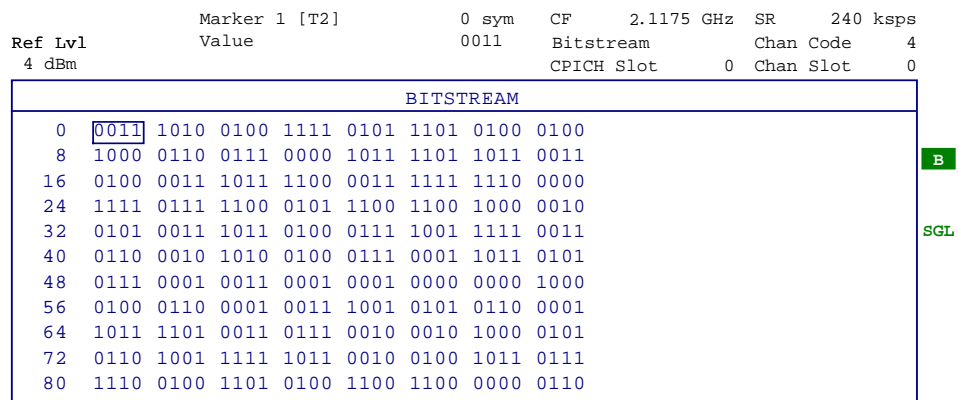
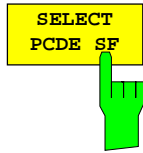


Fig. 6-27 Demodulated bits for the selected slot of the selected channel (16QAM)

IEC/IEEE-bus command: :CALCulate2:FEED "XTIM:CDP:BSTream"

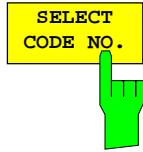




The *SELECT PCDE SF* softkey activates the entry of the class of codes onto which the error vector is to be projected for the *PEAK CODE DOMAIN ERROR* display. The entry of the spreading factor is only possible for this display mode, it has no effect on any other display mode.

IEC/IEEE-bus command:

```
: [SENSe:]CDPower:SFActor 4|8|16|32|64|128|256|512
```



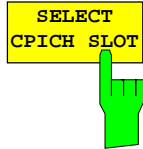
The *SELECT CODE NO* softkey activates the selection of a channel for the display modes *CDP PWR RELATIVE/ABSOLUTE*, *CODE PWR ZOOM*, *POWER VS SLOT*, *SYMBOL CONST DIAG*, *SYMBOL EVM*.

The entry is made on the basis of the code class with spreading factor 512. The number of the spreading code which the required channel has at its actual transmission rate has to be converted into spreading factor 512. The entered code correlates with the channel marked in red in the CDP diagram.

If the entered code corresponds to an active channel, the whole associated channel is marked. If it corresponds to a gap between the channels, only the entered code is marked.

If the code number is modified using the rollkey, the red marking changes its position in the diagram only if the code number no longer belongs to the marked channel.

IEC/IEEE-bus command: `: [SENSe:]CDPower:CODE 0 to 511`



The *SELECT CPICH SLOT* softkey activates the selection of the slot number for the display modes *POWER VS SLOT*, *SYMBOL CONST DIAG*, *SYMBOL EVM*.

To avoid ambiguities that may occur due to the permissible timing offsets, the slot number is defined on the basis of the CPICH (i.e. calculated in steps of 2560 chips starting from the beginning of the frame). The desired slot of the selected channel has to be converted according to its timing offset.

**Example:**

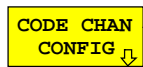
Slot 0 of the CPICH is set. The selected channel (red marker in the CDP diagram) has a timing offset of 2816 chips, i.e. slot 0 of the channel is delayed by 2816 chips against the frame start. Slot 0 of the CPICH therefore corresponds to slot 1 of the channel.

When the slot number is entered, the red marking in the power-versus-slot diagram changes its position in steps of 2560 chips.

IEC/IEEE-bus command: `: [SENSe:]CDPower:SLOT 0 to 14`

## Measurement Configuration

CONFIGURATION - MODE - 3GPP BTS ANALYZER - CODE CHAN CONFIG sub menu



CODE CHAN  
CONFIG

CODE CHAN  
AUTOSEARCH

CODE CHAN  
PREDEFINED



EDIT CHAN  
CONF TABLE

NEW CHAN  
CONF TABLE

DEL CHAN  
CONF TABLE

COPY CHAN  
CONF TABLE

RESTORE  
TEST MOD.

PAGE UP

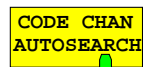
PAGE DOWN

The *CODE CHAN CONFIG* softkey opens a submenu with different configurations for measurements. In this submenu, predefined channel tables can be selected and edited as a basis for code domain measurements.

When the softkey is selected, a table including the channel tables stored on the measuring instrument's hard disk is opened. The table provides just an overview and a table for the measurement can only be selected after actuating the *CODE CHAN PREDEFINED* softkey.

IEC/IEEE-bus command:

```
:CONFigure:WCDPower[:BTS]:CTable:CATalog?
```



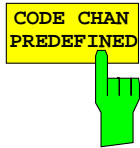
The *CODE CHAN AUTOSEARCH* softkey allows code domain power measurements in the automatic search mode. In this mode, the whole code domain (all permissible symbol rates and channel numbers) is searched for active channels. If the analyzer is equipped with R&S® FSIQK72 only, detecting an active channel is performed by a comparison with the pilot symbols to be expected after despreading. Only channels with pilot symbols can be detected as active channels. An exception to this rule are control channels SCCPCH and PICH, which can be recognized as active even though they do not contain pilot symbols. If the analyzer is additionally equipped with R&S® FSIQK74 channels without pilot symbols can also be recognized as active if they fulfill special quality criteria. If a channel without pilot symbols can be fully recognized (e.g. a HS-PDSCH, if it has modulation type 16QAM) its channel type will be determined. All other channels without pilot symbols are of channel type CHAN.

Synchronization channels CPICH, PCCPCH, PSCH and SSCH are assumed to be present by the CDP analysis and added to the channel table for each measurement.

The *CODE CHAN AUTOSEARCH* mode is the preset search mode starting the CDP analysis. It is mainly intended for giving the user an overview of the channels contained in the signal. If the signal contains channels that are not detected as being active in the automatic search mode, the CDP analysis can be performed with the channel configurations predefined by the user by switching to the *CODE CHAN PREDEFINED* mode.

IEC/IEEE-bus command:

```
CONFigure:WCDPower[:BTS]:CTABLE[:STATe] OFF
```



The *CODE CHAN PREDEFINED* softkey activates the predefined channel table mode. No search for active channels in the code domain is performed in this mode, but the channels contained in a channel table defined prior to the measurement are assumed to be active. The code domain power measurement and all further evaluations are carried out for these channels.

On selecting the softkey, a table containing all channel tables stored in the measuring instrument is opened. The CDP analysis is switched to the predefined channel table. When the next measurement is started, the power is measured according to this mode. The last table of the automatic search mode is first taken as a basis for the measurement. This table is available under the *RECENT* entry.

Switching to one of the predefined channel tables is done by selecting the corresponding table entry and pressing one of the unit keys. From the next measurement onwards, the selected channel table is taken as a basis for the sweep. The selected channel table is marked by a tick.

FSIQK72/K74 comes ready with the following channel tables stored on the measuring instrument:

Channel model 1 to 3GPP with 16/32/64 channels

Channel model 2 to 3GPP

Channel model 3 to 3GPP with 16/32 channels

Channel model 4 with CPICH

Channel model 4 to 3GPP without CPICH

If the analyzer is equipped with R&S® FSIQK74 the following channel tables will be offered additionally:

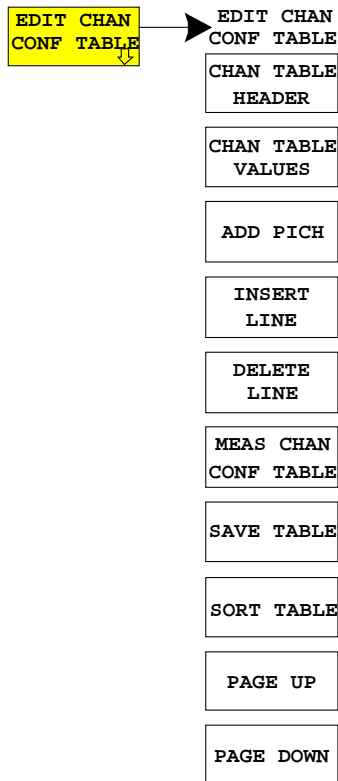
Channel model 5 to 3GPP with 2/4/8 HS-PDSCH and 6/14/30 DPCH

The predefined channel tables can be restored in case they have been accidentally overwritten (see softkey *RESTORE TEST MOD.*).

IEC/IEEE-bus command:

```
CONFigure:WCDPower[:BTS]:CTABLE[:STATe] ON
```

```
CONFigure:WCDPower[:BTS]:CTABLE:SElect "3GB_1_32"
```



The *EDIT CHAN CONF TABLE* softkey opens a submenu giving access to the softkeys required for editing the channel table. The channel table is opened simultaneously for editing. The user can modify the channel configuration in the selected channel table

EDIT CHANNEL TABLE							
NAME:	3GB_1_16						
COMMENT:	3GPP Base Station Test Model 1 16 Channels						
CHANNEL TYPE	SYMBOL RATE[kbps]	CHAN #	USE TFCI	TIMING OFFS. [CHIPS]	PILOT BITS	CDP REL. [dB]	STATUS
CPICH	15.0	0			---	0.0	ACTIVE
PCCPCH	15.0	1			---	0.0	ACTIVE
SCCPCH	15.0	3	NO	0	8	0.0	ACTIVE
DPCH	30.0	2	NO	22016	8	0.0	ACTIVE
DPCH	30.0	11	NO	34304	8	0.0	ACTIVE
DPCH	30.0	17	NO	13312	8	0.0	ACTIVE
DPCH	30.0	23	NO	11520	8	0.0	ACTIVE
DPCH	30.0	31	NO	36608	8	0.0	ACTIVE
DPCH	30.0	38	NO	28672	8	0.0	ACTIVE
DPCH	30.0	47	NO	15104	8	0.0	ACTIVE
DPCH	30.0	55	NO	5888	8	0.0	ACTIVE
DPCH	30.0	62	NO	256	8	0.0	ACTIVE
DPCH	30.0	69	NO	22528	8	0.0	ACTIVE
DPCH	30.0	78	NO	7680	8	0.0	ACTIVE
DPCH	30.0	85	NO	4608	8	0.0	ACTIVE
DPCH	30.0	94	NO	7680	8	0.0	ACTIVE
DPCH	30.0	102	NO	15616	8	0.0	ACTIVE
DPCH	30.0	113	NO	32768	8	0.0	ACTIVE
DPCH	30.0	119	NO	36608	8	0.0	ACTIVE

Date: 15.APR.2004 05:57:14

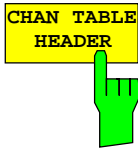
Fig. 6-28 Table for editing a channel configuration

The user has the possibility of modifying any of the channel tables stored in the instrument. The edited table is not stored automatically on the instrument hard disk but only after the user has activated the *SAVE TABLE* softkey. This prevents inadvertent overwriting of a table (e.g. one of the channel models).

If the user edits the table that is currently taken as a basis for the CDP analysis, the edited table is used for the next measurement immediately after storage. The effects of modifications in the table are therefore visible at once. The edited table is stored on the instrument hard disk only after the user has activated the *SAVE TABLE* softkey.

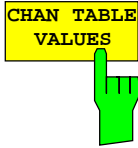
If the user edits a table that is stored on the instrument hard disk but currently not activated, the modifications are visible after storage (*SAVE TABLE* softkey) and subsequent activation.

If the *SYMBOL RATE* or *CHAN NO* of a channel is modified, a check for code domain conflicts is performed after the entry has been confirmed (unit hardkeys). If a code domain conflict is detected, the associated channels are marked by an asterisk. The user has the possibility of eliminating the code domain conflicts. When a table containing code domain conflicts is used for a CDP analysis, the results are invalid.



The *CHAN TABLE HEADER* softkey enables the user to edit the table header. The table name can be changed to prevent overwriting stored tables. The name of a table may not contain more than 8 characters.

IEC/IEEE command: :CONFigure:WCDPower[:BTS]:CTABLE:NAME  
"NEW\_TAB"



The *CHAN TABLE VALUES* softkey enables the user to edit the entries in the channel table. The following entries are available for each channel contained in the table (entry is confirmed using the unit hardkeys):

**SYMBOL RATE:**

symbol rate at which the channel is transmitted. This entry cannot be edited for channels whose symbol rate is defined in the standard (e.g. synchronization channels). In the case of special channels, the channel type is entered instead of the symbol rate.

**CHAN NO:**

number of the channel in the associated transmission class. The validity of the entered channel number in the selected transmission rate is checked on entry, invalid entries are not permitted.

**USE TFCI:**

indicates whether the channel contains TCFI symbols. This information is required for determining the slot format of the channel. This entry cannot be edited for channels that contain no TFCI information.

**TIMING OFFSET:**

timing offset of the channel. The expected timing offset is the channel offset referred to the CPICH, specified in chips. This entry cannot be edited for channels that have no timing offset.

**PILOT BITS:**

number of pilot bits of the channel. This information is required for determining the slot format. This entry cannot be edited for channels that contain no pilot symbols.

**CDP REL.:**

information about the relative channel power. This entry cannot be edited and is only available for the *RECENT* table, it is used for detecting low-power channels.

**STATUS:**

channel status (active/inactive). Modifying the channel status blanks out a channel entered in the table from the CDP analysis without the user having to clear the associated entry from the table. Only channels with an active channel status are used for the CDP analysis.

**IEC/IEEE commands:**

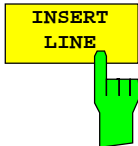
```
:CONFigure:WCDPower[:BTS]:CTABLE:DATA
      8,0,0,0,0,0,1,0.00,8,1,0,0,0,0,1,0.00,7,1,0,256,8,0,
      1,0.00

:CONFigure:WCDPower[:BTS]:CTABLE:COMMENT "Comment for new
table"
```



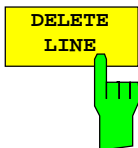
The *ADD SPECIAL* softkey opens a table where the available special channels can be selected. PICH and SCCPCH are available as special channels in the R&S® FSIQK72. They are included in the channel tables of the test models. Each of the two channels can be added once to the channel tables. If the analyzer is equipped with R&S® FSIQK74, the channel types of HSDPA (HSSCCH and HSPDSCH) can be selected and added to the channel table as well.

IEC/IEEE command: included in command :CONF:WCDP:CTAB:DATA



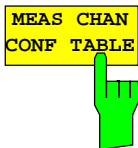
The *INSERT LINE* softkey inserts a new entry into the table. The entries can be made in any order. A channel is taken into account in the CDP analysis only if all required entries are available in the list.

IEC/IEEE command: --



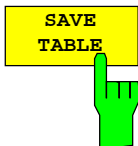
The *DELETE LINE* softkey deletes the marked line from the table. The *MEAS CHAN CONF TABLE* softkey starts a measurement in the *CODE CHAN AUTOSEARCH* mode. The measurement results are entered in the opened channel table.

IEC/IEEE command: --



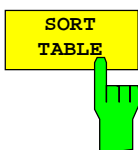
The *MEAS CHAN CONF TABLE* softkey starts a measurement in the *CODE CHAN AUTOSEARCH* mode. The measurement results are entered in the opened channel table. The softkey is only available in *CODE CHANNEL AUTOSEARCH* mode.

IEC/IEEE command: --



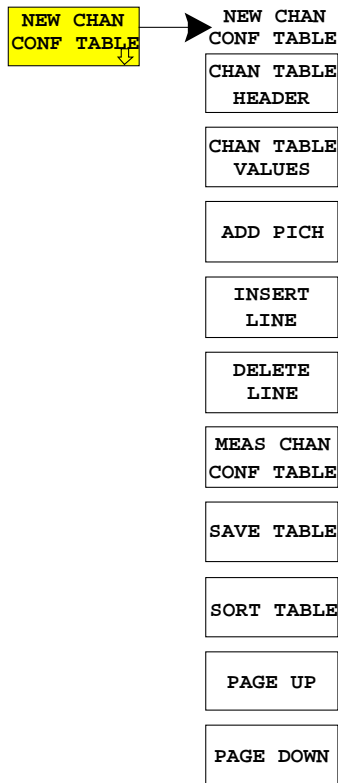
The *SAVE TABLE* softkey saves the table under the specified name. Caution: Editing the channel models and storing them under the initial name overwrites the models.

IEC/IEEE command: -- (automatically executed in remote control)



The *SORT TABLE* softkey sorts the table according to symbol rates in descending order and within a symbol rate according to channel numbers in ascending order.

IEC/IEEE command: --



The *NEW CHAN CONF TABLE* softkey opens a submenu, which is identical to the submenu described for the *EDIT CHAN CONF TABLE* softkey. In contrast to *EDIT CHAN CONF TABLE*, *NEW CHAN CONF TABLE* only adds the synchronization channels to the table for, the table name is still not defined:

EDIT CHANNEL TABLE								
NAME:		NEW						
COMMENT:								
CHANNEL TYPE	SYMBOL RATE[kps]	CHAN #	USE TFCI	TIMING OFFS. [CHIPS]	PILOT BITS	CDP REL. [dB]	STATUS	
CPICH	15.0	0			---		ACTIVE	
PCCPCH	15.0	1			---		ACTIVE	

Date: 15.APR.2004 05:58:17

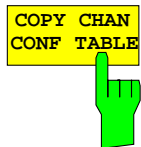
Fig. 6-29 Table for creating a new channel configuration



The *DEL CHAN CONF TABLE* softkey deletes the selected table stored in the measuring instrument. The active table cannot be deleted in the *CODE CHAN PREDEFINED* mode.

IEC/IEEE command:

```
:CONFigure:WCDPower[:BTS]:CTABLE:DELeTe
```



The *COPY CHAN CONF TABLE* softkey copies the selected table and stores it under a new name.

IEC/IEEE command:

```
:CONFigure:WCDPower[:BTS]:CTABLE:COpy "CTAB2"
```



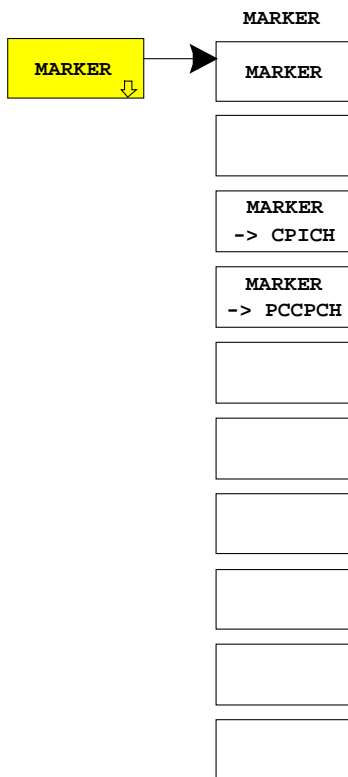
The *RESTORE TEST MOD.* softkey restores the default state when one of the predefined test models has been accidentally overwritten. The channel tables of the 3GPP test models in the current directory are overwritten with the default tables preset upon instrument delivery.

IEC/IEEE command:

```
:CONFigure:WCDPower[:BTS]:CTABLE:REStore
```

## MARKER Functions

Submenu: *CONFIGURATION - MODE - 3GPP BTS ANALYZER - CODE DOM POWER*



The **MARKER** softkey opens a submenu with the marker settings.

Markers are not available in the tabulated display modes *RESULT SUMMARY* and *CHANNEL TABLE*.

The parameters concerning an activated marker are output at the top of the diagram:

```
Marker 1 [T1]
                -5.00 dB
slot 10 SR  30 ksps chan  23
```

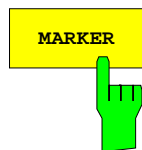
Fig. 6-30 Parameters of the marker info field

Besides the channel power, which is displayed relative to the value specified with *POWER REF TOT/CPICH*, the parameters are:

**Slot:** Slot number of the channel (unassigned codes have a timing offset of 0 chip referred to beginning of the frame)

**SR:** Symbol rate of the channel (for unassigned codes 7.5 ksps)

**Chan:** Number of the spreading code of the channel



The **MARKER** softkey switches the marker on or off.

IEC/IEEE-bus commands:

```
:CALCulate<1|2>:MARKer<1>:STATe ON
:CALCulate<1|2>:MARKer<1>:X <channel_number>
:CALCulate<1|2>:MARKer<1>:Y?
```



The **MARKER -> CPICH** sets the marker to the common pilot channel (code number 0 for spreading factor 256; corresponds to displayed code numbers 0 and 1 of the x-axis).

IEC/IEEE-bus commands: `:CALCulate<1|2>:MARKer<1>:FUNCTION:CPICH`  
`:CALCulate<1|2>:MARKer<1>:Y?`



The **MARKER -> PCCPCH** sets the marker to the primary common control physical channel (code number 1 for spreading factor 256; corresponds to displayed code numbers 2 and 3 of the x-axis).

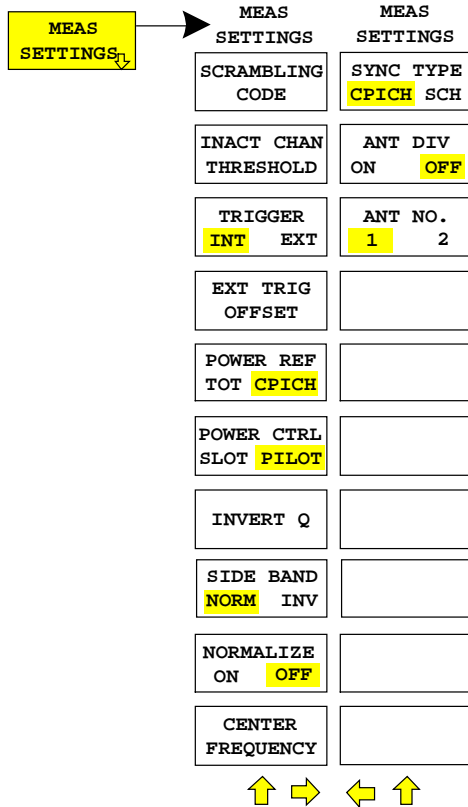
IEC/IEEE-bus commands:

```
:CALCulate<1|2>:MARKer<1>:FUNCTION:PCCPch
:CALCulate<1|2>:MARKer<1>:Y?
```

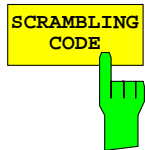


### Configuration of CDP Measurement – MEAS SETTINGS

Submenu: CONFIGURATION - MODE - 3GPP BTS ANALYZER - CODE DOM POWER



The *MEAS SETTINGS* softkey opens a submenu with setting parameters for the CDP measurement.



The *SCRAMBLING CODE* softkey opens a window for entering the scrambling code. The scrambling code is output in hex format.

The entered scrambling code has to coincide with that of the signal. Otherwise a CDP measurement of the signal is not possible.

IEC/IEEE-bus command: `: [SENSe:]CDPower:LCODE[:VALue] #H2`



The *INACT CHAN THRESH* softkey activates the entry of the minimum power which a single channel should have as compared to the total signal in order to be considered an active channel.

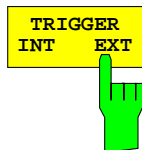
Channels which are below the specified threshold are considered to be not active irrespective of whether they contain pilot symbols or not. Channels that are not active appear in blue colour in the CDP diagram.

The two measurements *COMPOSITE EVM* and *PEAK CODE DOMAIN ERR*, specified as measurements on the total signal, are performed with the aid of the list of active channels. These two measurements are falsified whenever active channels are recognized as not active (see above example) or if unassigned codes get the status "assigned channel". *INACT CHAN THRESHOLD* is therefore used to influence the results of the two measurements.

The default value is -20 dB which allows all channels of signals like the 3 GPP test signals to be detected in the CDP analysis. If not all channels in the signal are automatically detected, *INACT CHAN THRES* has to be decremented.

IEC/IEEE-bus command:

```
: [SENSe:]CDPower:ICTReshold -50dB to +10dB
```



The *TRIGGER INT EXT* softkey switches between internal (*FREE RUN*) and external triggering.

For internal triggering, at the beginning of the measurement a section (approx. 20 ms) of the signal, which must contain at least one frame of the WCDMA signal, is recorded and analyzed at a moment which cannot be determined by the user. The start of the next complete WCDMA frame is searched for in the recorded signal section and the signal is measured from this point.

In case of external triggering, R&S® FSIQK72/K74 expects a trigger at the beginning of the WCDMA frame (frame trigger). There is no search for the beginning of the frame in the recorded signal section. The start of the WCDMA frame is only searched for within the first 2560 chips after the trigger event.

Because of the power control which according to the 3GPP standard is performed for always one slot at the beginning of the pilot symbols of the previous slot (power group), the data record must contain 1024 chips for CDP analysis before the start of a WCDMA frame. Because of the chips required before the start, the CDP analysis cannot be started at slot 0 of a WCDMA frame when the trigger offset is 0 in the case of external triggering. Slot 1 of the next frame is selected instead as a start slot for the analysis. When a negative trigger offset of  $-266.67 \mu\text{s}$  is entered (default setting of R&S® FSIQK72/K74), the CDP analysis starts with slot 0 of the next WCDMA frame. The start slot of the analysis is displayed as the first slot in the *COMPOSITE EVM* and *PEAK CODE DOMAIN ERROR* diagrams.

For external triggering the trigger output of the base station has to be connected to the R&S® FSIQ trigger input at the rear panel of the instrument.

Since with internal triggering the start of the next complete WCDMA frame is located in the middle of the recorded signal section (after approx. 10 ms) in the worst case, an external frame trigger reduces the search time for the frame start and consequently the computing time for the overall measurement.

IEC/IEEE-bus command:

```
:TRIGger[:SEquence]:SOURce IMMEDIATE|EXTERNAL
```



The *EXT TRG OFFSET* softkey activates the entry of the offset for external triggering (step width 40 ns).

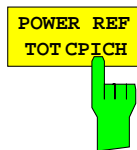
The trigger offset can compensate for the shift of the frame trigger at the actual start of a frame. In the *RESULT DISPLAY* mode, the interval between the trigger event and the start of the WCDMA frame is indicated under "Trg to Frame". An offset of the trigger event influences the interval specified there.

Because of the power control specified by the 3GPP standard, the CDP analysis requires at least 1024 chips before the start of the WCDMA frame. This corresponds to a trigger offset of  $-266.67 \mu\text{s}$ . This trigger offset permitting the display of *COMPOSITE EVM* and *PEAK CODE DOMAIN ERROR* to be started at slot 0 is set as the softkey default value.

If the trigger offset is set inadequately, the measurement may not be able to detect the start of a WCDMA frame in the search range. In this case, the measurement results are invalid and the code power of each channel is displayed in blue with almost the same level.

A modification of the trigger offset can influence the search range of R&S® FSIQK72/K74 and thus secure the feasibility of the measurement.

IEC/IEEE-bus command: `:TRIGger:SEquence:HOLDoff <num_value>`



The *POWER REF TOT / CPICH* softkey determines the reference power for the relative power displays:

**TOT** All the relative powers (display modes *CDP RELATIVE* and *POWER VS SLOT*) are referred slot by slot to the total signal power in the slot involved.

**CPICH** The reference power is that of the CPICH in the relevant slot.

The default setting of the softkey is *CPICH*.

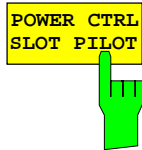
Since 3GPP specifies a slot-specific power control for every channel, the total power of the signal will change from slot to slot in accordance with the power control of the individual channels. As a result, with activated power control and reference to the total power of the signal, a relative CDP display versus the slot number (*POWER VS SLOT*) does not necessarily represent the power control of the selected channel.

Example:

If the signal (theoretically) contains only one data channel whose power is controlled, and if the power is referred to the total power of the signal (which is formed only by the contribution of this data channel), a straight line appears in the *POWER VS SLOT* diagram instead of the expected power staircase. Consequently, the reference value *TOT* of the relative displays is informative only if the signal does not contain power control.

By contrast, the *CPICH* setting also reflects the exact characteristic of the power versus the slot number in a selected channel for signals with power control. Since the CPICH is never power controlled, this yields the same reference value in every slot.

IEC/IEEE-bus command: `: [SENSe:]CDPower:PREference TOTAL|CPICH`



The *POWER CTRL SLOT/PILOT* softkey selects the position of the power control.

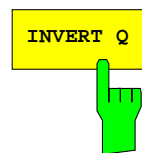
The power control is performed either at the slot limit (*SLOT*) or at the beginning of the pilot symbols (*PILOT*) of the previous slot.

The setting has an effect on all graphics in which the power of a specific channel is plotted versus the time (slot number). The power is determined in the specified limits.

The setting of the power control position has no effect on the following:

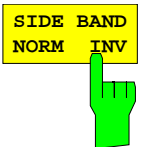
- graphics in which the power of channels is plotted in a defined period of time (e.g. code domain power)
- the measurements Composite EVM and Peak Code Domain Error stipulated in the standard since the results are strictly determined via a slot starting with Frame Start
- all graphics in which parameters of a channel are plotted in a specific slot

IEC/IEEE-bus command: `:[SENSe:]CDPower:PCONtrol PILOt | SLOt`



The *INVERT Q* softkey inverts the sign of the Q component of the signal. The softkey is deactivated in the default setting.

IEC/IEEE-bus command: `[SENSe:]CDPower:QINVert OFF`



The *SIDE BAND NORM / INV* softkey is used to perform the measurement both in the normal (*NORM*) and inverted position (*INV*).

**NORM** The normal position allows the measurement of RF signals from the base station.

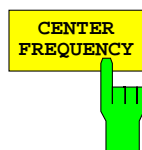
**INV** The inverted position is useful for measurements on IF modules or components in case of spectral inversion (default setting).

IEC/IEEE-bus command: `:[SENSe:]CDPower:SBANd NORMal | INVers`



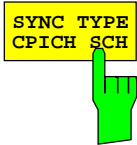
The *NORMALIZE ON / OFF* softkey eliminates the DC offset of the signal. Default setting is OFF.

IEC/IEEE-bus command : `[SENSe:]CDPower:NORMAlize OFF`



The *CENTER FREQUENCY* activates the input of the center frequency of the WCDMA signal.

IEC/IEEE-bus command: `:[SENSe:]FREQuency:CENTer 870.03 MHz`

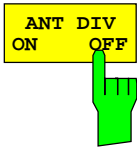


The *SYNC TYPE CPICH/SCH* softkey selects the type of synchronization:

- CPICH Synchronization to CPICH (default). For this kind of synchronization the CPICH must be included in the transmitted signal.
- SCH Synchronization without CPICH. This kind of synchronization is intended for test model 4, which is defined with or without DPICH.

IEC/IEEE-bus command:

: [SENSe<1 | 2>:]CDPower:SType CPICH | SCHannel

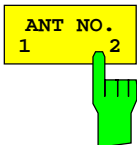


The *ANT DIV ON/OFF* softkey switches the antenna diversity mode on or off.

OFF Antenna diversity mode switched off.

- 1 | 2 According to 3 GPP, the pilot symbols of the channels are different for depending on the antenna used. The CPICH symbols are different and the synchronization channels are transmitted alternately in every second slot.

IEC/IEEE-bus command : [SENSe<1 | 2>:]CDPower:ANTenna OFF | 1 | 2

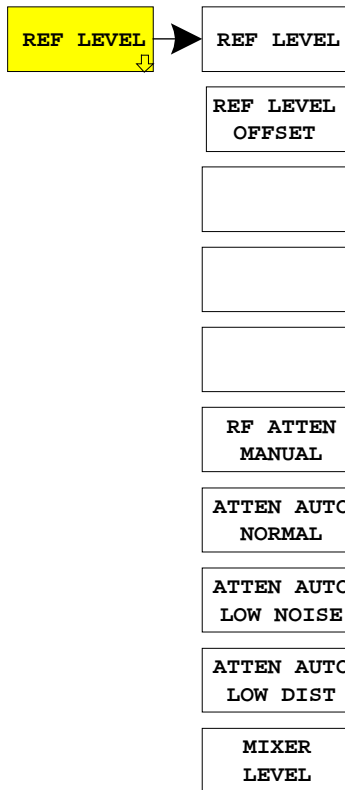


The *ANT NO. 1/2* softkey selects the antenna of the diversity path. The softkey is only available when *ANTENNA DIVERSITY* is ON. Antenna No. 1 is the default setting

IEC/IEEE-bus command: : [SENSe<1 | 2>:]CDPower:ANTenna OFF | 1 | 2

## Level Settings – REV LEVEL

Submenu: *CONFIGURATION - MODE - 3GPP BTS ANALYZER - CODE DOM POWER*

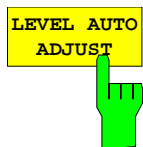


The *REF LEVEL* softkey opens a submenu for level setting.

The softkeys and their function are identical to the *REF LEVEL* menu in the basic unit and are described in the operating manual of the basic instrument.

## Automatic Adaptation to Input Level - LEVEL AUTO ADJUST

Submenu: *CONFIGURATION- MODE – 3GPP BTS ANALYZER – LEVEL AUTO ADJUST*



The *LEVEL AUTO ADJUST* softkey is used for automatically setting the RF attenuation and reference level to the level of the applied signal. Manual re-adjustment is permissible with the *REF LEVEL* softkey.

The instrument is to be switched to the *ATTEN MANUAL* mode so as to set the RF attenuation and reference level to optimum values independently of each other. This mode is maintained after changing from code-domain power measurements to the spectrum analyzer or vector signal analyzer mode.

IEC/IEEE-bus command sequence:

```
*RST
:INSTRument[:SElect] BWCDpower
:INITiate:CONTinuous OFF
:[SENSe:]CDPower:LEVel:ADJust; *OPC?
:INITiate[IMMediate]; *OPC?
:TRACe? TRACE1
```

## Automatic Setting of CDP Measurement Mode - CDP AUTO ADJUST

Submenu: *CONFIGURATION - MODE - 3GPP BTS ANALYZER - CODE DOM POWER*



The *CDP AUTO ADJUST* softkey automatically adapts the settings of the CDP measurement in such a way that a valid measurement on the signal is possible with high probability. For this purpose

- the following measurement parameters are set to predefined values:

Trigger:	FREE RUN
Marker / delta marker:	OFF
Code number:	0
Slot number:	0
Symbol rate:	15 ksps (referred to CPICH)
- RF attenuation and reference level are set using *LEVEL AUTO ADJUST*
- a *SINGLE SWEEP* in *CODE CHAN AUTOSEARCH* is carried out.

With these settings, the CDP measurement can be performed with high probability, provided a valid WCDMA signal to 3GPP is applied to the RF input of analyzer. The parameters *CENTER FREQUENCY*, *SCRAMBLING CODE* as well as an external reference for the measurement have to be manually adapted to the signal.

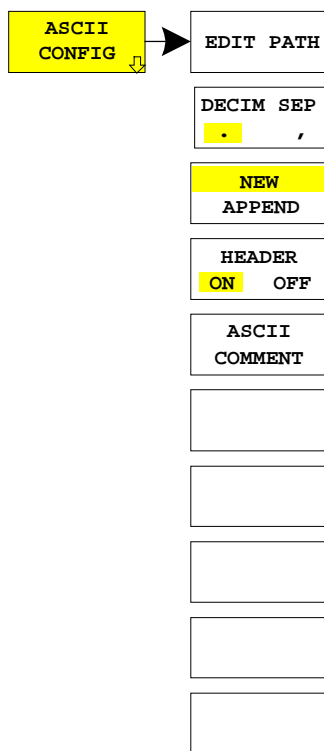
IEC/IEEE-bus command: : [SENSe:]CDPower:PRESet

## Trace Settings - TRACE Key Group

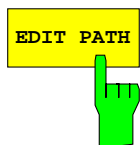
The *TRACE MATH* and *DETECTOR* settings are not available in the *TRACE* menu. The remaining softkeys are identical to those of the basic unit and are described in the R&S® FSIQ operating manual. The *DISPLAY MODE CDP* softkey opens the *RESULT DISPLAY* submenu of the CDP measurement mode.

The *TRACE* side menu contains the softkeys for ASCII trace export. Using this softkeys, traces can be stored in files with ASCII format. This way, traces are available for mathematical processing in corresponding programs. These softkeys are used to store traces in a file so that the traces are available in a form that can be processed with mathematical programs.

The *ASCII EXPORT* softkey stores the corresponding trace in a file with ASCII format. The export function can be configured in the *ASCII CONFIG* submenu.



The *ASCII CONFIG* softkey calls a submenu for various settings for the *TRACE ASCII EXPORT* function.



The *EDIT PATH* softkey defines the directory in which the file is to be stored.

IEC/IEEE-bus command      --



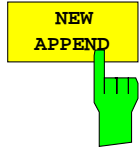


The *DECIM SEP* softkey selects the decimal separator for the ASCII file. The choice is '.' (decimal point) or ',' (comma).

This means that the decimal separator used in various language versions of evaluation programs (e.g. MS-Excel) can be selected so that the packages are supported.

IEC/IEEE-bus command

:FORMat:DEXPort:DSEParator POINT|COMMa

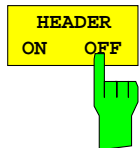


The *APPEND NEW* softkey defines whether output data are to be written to an existing file or a new file.

- With *APPEND*, the data are added to an existing file.
- With *NEW*, either a new file is generated or an existing file is overwritten by storage of the data.

IEC/IEEE-bus command

:FORMat:DEXPort:APPend ON | OFF



The *HEADER ON/OFF* softkey defines whether important instrument settings should be stored at the beginning of the file. The general device settings entered in the file header allow test results to be reproduced. A file header may impair data processing by mathematical programs.

IEC/IEEE-bus command

:FORMat:DEXPort:HEADer ON|OFF



The *ASCII COMMENT* softkey activates the entry of commentary concerning the current ASCII data set. A total of 60 characters are available for this purpose.

IEC/IEEE bus command

:FORMat:DEXPort:COMMENT 'string'



In CDP measurement mode, the *ASCII EXPORT* softkey stores the corresponding trace in a file with ASCII format.

Upon pressing the *ASCII EXPORT* softkey, a file name can be entered. The default name is TRACE.DAT. Then the measured data of the trace are stored.

IEC/IEEE-bus command

:MMEMory:STORE:TRACe

1..4,<Pfad mit Filenamen>

### Structure of the ASCII file for CDPower measurements and measurements of signal spectrum:

The file consists of the header containing important scaling parameters and a data section containing the trace data. The data of the file header consist of three columns, each separated by a semicolon: parameter name; numeric value; basic unit

The data section starts with the keyword " Trace <n> " (<n> = number of stored trace), followed by the measured data in one or several columns (depending on measurement) which are also separated by a semicolon.

This format can be read in from spreadsheet calculation programs, eg MS-Excel. It is necessary to define ';' as a separator.

## 1) Format for CDP measurements

	Content of file	Description
<b>File header</b>	Type;FSIQ 7; Version;4.10; Date;26.Mar 2001; Comment;ASCII file; Mode;CDP; Measurement;Code Domain Power; Digital Standard;WCDMA 3GPP FWD; Center Freq;2117500000.000000;Hz; Freq Offset;0.000000;Hz; Ref. Level;-6.000000;dBm; Level Offset;0.000000;dB; RF Att;10.000000;dB; y per div;2;dB; Ref Value y-Axis;0;dB; Ref Value Position;100.000000;% Sweep Count;0; Spreading Factor;256; Reference Slot;0; Channel Slot;0; First Slot;0; Code Number;0; Scrambling Code;0000H; Scr Type;N/A; Channel Threshold;-20; Invert Sideband;OFF; Normalize;OFF; Invert Q;OFF;	Instrument model Firmware version Date record storage date Comment Instrument operating mode Display mode (CDP, bitstream, ...) Digital standard (3GPP REV, 3GPP FWD) Center frequency Frequency offset Reference level Level offset Input attenuation Scaling of y axis per division Scaling of y axis, reference value Scaling of y axis, position of reference value Number of sweeps set Spreading factor Slot of the reference channel (CPICH) Channel slot First slot Code number: 0 to 511 Scrambling code: 0000 to 1FFFH Scrambling type: N/A Channel threshold Sideband; ON, OFF; Normalize;ON, OFF; Invert Q;ON, OFF; N/A
<b>Data section of the file (CDP abs / CDP rel / Channel Table)</b>	Trace 1: Trace Mode;CLR/WRITE; Values;238; 8;0;-13.643795;-3.643795;0;0;-; 7;32;-21.409958;-11.409958;256;8;-; 7;33;-23.137810;-13.137810;15360;8;-; 7;34;-15.651539;-5.651539;3328;8;-; 7;35;-21.930389;-11.930389;32768;8;-; 7;36;-18.120872;-8.120872;0;8;-; ...	Trace Display mode of trace: CLR/WRITE, AVERAGE, MAXHOLD, INHOLD Number of data blocks / measurement values <CodeClass>;<CodeNumber>;<yabs>;<yrel>; <TimingOffset>;<PilotLength>;<Mapping>;  in R&S® FSIQK72/K74 the mapping value is not relevant, therefore a minus '-' is output

	Content of file	Description
<b>Data section of the file (Result Summary)</b>	Trace 2: Trace Mode:CLR/WRITE;  3.135467;%; -52.303844;dB; -9.127991;Hz; -5.221600;ppm; -7.365761;dBm; -122.502686;ms; 5.236792;%; 2.605927;%; 0.010436;%; 0.938106;%; 8; 0; -2.310928; 0.000000; 0.000000; 8; -;	Trace Display mode of trace: CLR/WRITE, AVERAGE, MAXHOLD, INHOLD Peak value composite EVM Peak value PCDE Frequency error (carrier deviation) Chip rate error Total power of signal Trigger offset to frame start Peak value EVM RMS value EVM IQ offset IQ imbalance Code class Code number Y absolute Y relative Timing offset Pilot length Mapping (for R&S® FSIQK72/K74: '-')
<b>Data section of the file (Power versus Slot / Peak Code Domain Error / Composite EVM)</b>	TRACE 2: Trace Mode:CLR/WRITE;  Values;15; 0;16.843128; 1;0.554786; 2;11.818155; 3;15.885643; ....	Trace Display mode of trace: CLR/WRITE, AVERAGE, MAXHOLD, INHOLD Number of data blocks / measurement values <Slot>; <LevelValue>;
<b>Data section of the file (Symbol Constellation)</b>	TRACE 2: Trace Mode:CLR/WRITE;  Values;10; -0.293423;1.388842; 0.038587;-0.735293; 0.961711;-1.217144; 2.015055;-0.696284; ....	Trace Display mode of trace: CLR/WRITE, AVERAGE, MAXHOLD, INHOLD Number of data blocks / measurement values <LevelValue Real>;<LevelValue Imag>;
<b>Data section of the file (Bitstream)</b>	TRACE 2: Trace Mode:CLR/WRITE;  Values;160; 0;1;0;1;1;1;0;1;1;0; 0;0;1;1;0;0;1;0;1;0; 0;1;9;9;9;9;9;9;9;9; 1;0;1;0;0;1;1;0;0;0; ....	Trace Display mode of trace: CLR/WRITE, AVERAGE, MAXHOLD, INHOLD Number of data blocks / measurement values <Symbol>;

	Content of file	Description
<b>Data section of the file (Symbol EVM)</b>	TRACE 2: Trace Mode;CLR/WRITE;	Trace Display mode of trace: CLR/WRITE, AVERAGE, MAXHOLD, INHOLD
	Values;10; 5.288429; 1.950043; 3.740749; 2.073324; ....	Number of data blocks / measurement values <Level/Value>;

## 2) Format for CCDF measurements

	Content of file	Description
<b>File header</b>	Type;FSIQ 7; Version;4.10 ; Date;26.Mar 2001; Comment;ASCII-File; Mode;CCDF;	Instrument model Firmware version Date record storage date Comment
	Mode;CCDF; Center Freq;211750000.000000;Hz Freq Offset;0.000000;Hz x-Axis;LIN; Ref. Level;-20.000000;dBm Level Offset;0.000000;dBm RF Att;10.000000;dB RBW;1000000.000000;Hz SWT;0.074000;s Detector;AUTOPEAK;	Instrument operating mode Center frequency Frequency offset Scaling of x axis linear (LIN) or logarithmic (LOG) Reference level Level offset Input attenuation Resolution bandwidth Sweep time Detector set: AUTOPEAK, MAXPEAK, MINPEAK, AVERAGE, RMS, SAMPLE
<b>Data section of the file</b>	Sweep Count;0; Sample Count;0; y max;0; y min;0; Averaging;OFF;	Number of sweeps set Number of samples set Maximum level Minimum level Averaging ON/OFF
	TRACE 1: Trace Mode;CLR/WRITE;  x-Unit;dB; Values;500; 0.000000;-12.450729;-106.249130 26052104.208417;-74.768776;-108.954018 52104208.416834;-74.841995;-107.017891 78156312.625251;-74.569473;-103.686615 ...	Trace Unit of x values: Mean Pwr + ... dB; Number of measurement points <x value>, <y1>, <y2> <y2> being available only with AUTOPEAK detector and containing in this case the smaller of the two measured values for a measurement point.

## 3) Format for Spectrum Emmission Mask measurements

	Content of file	Description
<b>File header</b>	Type;FSIQ 7 Version;4.10; Date;26.Mar 2001; Comment;ASCII-File; Mode;SEM; Start;0.000000;Hz Stop;7000000000.000000;Hz Center Freq;2117500000.000000;Hz Span;7000000000.000000;Hz Freq Offset;0.000000;Hz x-Axis;LIN; y-Axis;LOG; Level Range;100.000000;dB  Ref. Level;-20.000000;dBm Level Offset;0.000000;dBm Max. Level;-20.000000;dBm RF Att;10.000000;dB RBW;STD; VBW;3000000.000000;Hz SWT;0.074000;s Detector;RMS;  Sweep Count;0; Channel Power; 0; Limit Line; P>31;	Instrument model Firmware version Date record storage date Comment Instrument operating mode Start/stop of the display range. Unit: Hz for span > 0, s for span = 0, Center frequency Frequency range (0 Hz for zero span) Frequency offset Scaling of x axis linear (LIN) or logarithmic (LOG) Scaling of y axis linear (LIN) or logarithmic (LOG) Display range in y direction. Unit: dB for x axis LOG, % for x axis LIN Reference level Level offset Maximum level Input attenuation Resolution bandwidth Video bandwidth Sweep time Detector set: AUTOPEAK, MAXPEAK, MINPEAK, AVERAGE, RMS, SAMPLE Number of sweeps set Channel power Selected limit line
<b>Data section of the file</b>	TRACE 1: Trace Mode;CLR/WRITE;  x-Unit;Hz;  y-Unit;dBm;  Values;500; 6487500000.000000;-90.754356; 6487550100.200400;-90.956367; 6487600200.400802;-90.655090; 6487650300.601202;-91.537399; ...	Trace Unit of x values: Hz for span > 0; s for span = 0; dBm/dB for statistics measurements Unit of y values: dB*V/AW depending on the selected unit for y axis LOG or % for y axis LIN Number of measurement points Measured values: <x value>, <y1>, <y2> <y2> being available only with AUTOPEAK detector and containing in this case the smaller of the two measured values for a measurement point.

## Overview of Other Menus

### SYSTEM Key Group

The *PRESET*; *CAL* and *INFO* menus in the code domain measurement mode are identical to the corresponding menus in the basic unit and are described in the R&S® FSIQ operating manual.

The parameters marked with grey are not available in the *DISPLAY* menu. The screen display is set to *SPLIT SCREEN* in the code domain measurement mode. The remaining softkeys are identical to those of the basic unit and are described in the R&S® FSIQ operating manual.

### CONFIGURATION Key Group

The *MODE* menu enables selection of the mode. The analyzer, vector analyzer and tracking generator modes are described in the operating manual for the R&S® FSIQ basic unit. The code domain measurement mode is described in the present manual.

The *SETUP* menu in the code domain measurement mode is identical to the corresponding menu in the basic unit and is described in the R&S® FSIQ operating manual.

### FREQUENCY Key Group

In the *CENTER* menu, the center frequency can be set for synchronization with the DUT and a frequency offset entered.

The *SPAN*, *START* and *STOP* keys have no function in the code domain measurement mode.

### LEVEL Key Group, INPUT Key

The *REF*, *RANGE* and *INPUT* menus in the code domain measurement mode are identical to the corresponding menus in the basic unit and are described in the R&S® FSIQ operating manual.

### MARKER Key Group

The *NORMAL* menu in the code domain measurement mode is identical to the *CONFIGURATION MODE – 3GPP BTS ANALYZER – CODE DOM POWER* submenu.

The *DELTA* menu in the code domain measurement mode is identical to the corresponding menu in the vector analyzer mode and is described in the R&S® FSIQ operating manual.

The *SEARCH* and *MKR* → keys have no function in the code domain measurement mode.

### LINES Key Group

The *LIMIT LINES* and *D-LINES* keys have no function in the code domain measurement mode.

## **SWEEP Key Group**

The softkeys *FREE RUN*, *EXTERN*, *TRIGGER OFFSET* and *SLOPE POS/NEG* are available in the *TRIGGER* menu.

In the *SWEEP* menu only the parameters *SINGLE SWEEP* and *CONTINUOUS SWEEP* are available.

The *COUPLING* key has no function in the code domain measurement mode.

## **HCOPY and MEMORY Key Group**

The *SETTINGS*, *RECALL* and *CONFIG* menus in the code-domain measurement mode are identical to the corresponding menus in the basic unit and are described in the R&S® FSIQ operating manual.

The *SAVE* menu offers the possibility to store the WCDMA channel tables. To this end, selection "WCDMA channel table" is included in the *ITEMS TO SAVE* selection list. The corresponding data set file has the extension \*.ctb.

## 7 Remote-Control Commands

The following chapter describes the remote-control commands for the application firmware. An alphabetical list at the end of this chapter provides an overview of the commands.

The commands, which are also valid for the basic unit in the signal analyzer and vector signal analyzer modes as well as the system settings, are described in the operating manual of the analyzer.

### CALCulate Subsystem

**:CALCulate<1|2>:FEED <string>**

This command selects the measured data that are to be displayed. .

**Parameter:**       <string>::=     'XPOW:CDP' |  
   'XPOW:CDP:RAT' |  
   'XTIM:CDP:MACCuracy' |  
   'XTIM:CDP:PVSLOT' |  
   'XTIM:CDP:BSTReam' |  
   'XTIM:CDP:ERR:SUMM' |  
   'XTIM:CDP:ERR:CTABLE' |  
   'XTIM:CDP:ERR:PCDomain' |  
   'XTIM:CDP:SYMB:CONStellation' |  
   'XTIM:CDP:SYMB:EVM'

**Example:**       " :CALC2:FEED 'XTIM:CDP:MACCuracy' "

**Features:**       \*RST value:   'XTIM:DDEM:MEAS' (vector signal analysis)  
                                   SCPI:       conforming

**Note:**   *For code domain power (CDP) measurements, the display is always operated in the SPLIT SCREEN mode and the assignment of display mode to measurement window is fixed. Therefore, the numeric suffix that is required or permitted is given in brackets for each display mode.*

The string parameters have the following meaning:

'XPOW:CDP'	Result display of code domain power as bargraph (CALCulate<1>)
'XPOW:CDP:RAT'	Result display of code domain power ratio as bargraph (CALCulate<1>)
'XTIM:CDP:ERR:SUMM'	Result display in tabular form (CALCulate2)
'XTIM:CDP:ERR:CTABLE'	Result display of channel assignment table (CALCulate<1>)
'XTIM:CDP:ERR:PCDomain'	Result display of peak code domain error (CALCulate2)
'XTIM:CDP:MACCuracy'	Result display of composite EVM (error vector magnitude referred to the overall signal) (CALCulate2)
'XTIM:CDP:PVSLOT'	Result display of power versus slot (CALCulate2)
'XTIM:CDP:BSTReam'	Result display of bit stream (CALCulate2)
'XTIM:CDP:SYMB:CONStellation'	Result display of symbol constellation (CALCulate2)
'XTIM:CDP:SYMB:EVM'	Result display of symbol error vector magnitude (CALCulate2)



**:CALCulate:LIMit:ESpectrum:MODE** AUTO | MANUal | USER

This command switches on or off the automatic selection of limit lines for spectrum emission mask measurements.

**Parameter:**

AUTO	the set limit line depends on the measured channel power
MANUAL	one out of four fixed limit line is activated. The selection is done with command <code>CALC:LIM:ESP:VAL</code>
USER	only query possible, user-defined limit lines are switched on (see manual of instrument for description of limit line functions)

**Example:** `" :CALC:LIM:ESP:MODE AUTO "`

**Features:**

*RST value:	AUTO
SCPI:	device-specific

**:CALCulate:LIMit:ESpectrum:VALue** <numeric\_value>

This command switches to manual selection of limit lines. The limit line is selected by entering the expected power as a value. Depending on the value entered, one of four possible limit lines is selected:

Expected power in dBm	name of selected limit line	retrieved value
value $\geq$ 43	"P $\geq$ 43"	43
$39 \leq$ value < 43	"39 $\leq$ P < 43"	39
$31 \leq$ value < 39	"31 $\leq$ P < 39"	31
value < 31	"P < 31"	0

**Example:** `" :CALC:LIM:ESP:VAL 39 "` selects limit line "39  $\leq$  P < 43"

**Features:**

*RST value:	0
SCPI:	device-specific

**:CALCulate<1|2>:MARKer<1>:FUNction:CPIC**

This command sets the marker to channel 0 (Common Pilot Channel).

**Example:** `" :CALC:MARK:FUNC:CPIC "`

**Features:**

*RST value:	—
SCPI:	device-specific

This command is an <Event> and has therefore neither \*RST value nor query. Only the numeric suffix 1 is permissible in `MARKer`.

The numeric suffix in `CALCulate` that is required or permissible depends on the selected display mode for which the marker is to be valid and has to coincide with it:

`CALCulate<1>` for CDP absolute and relative

`CALCulate2` for composite EVM, peak code domain error, power versus slot, bit stream, symbol constellation and EVM

**:CALCulate<1|2>:MARKer<1>:FUNCTION:PCCPch**

This command sets the marker to channel 1.

**Example:** " : CALC : MARK : FUNC : PCCP "

**Features:** \*RST value: \_  
SCPI: device-specific

This command is an <Event> and has therefore neither \*RST value nor query. Only the numeric suffix 1 is permissible in MARKer.

The numeric suffix in CALCulate that is required or permissible depends on the selected display mode for which the marker is to be valid and has to coincide with it:

- CALCulate<1> for CDP absolute and relative
- CALCulate2 for composite EVM, peak code domain error, power versus slot, bit stream, symbol constellation and EVM

**CALCulate<1>:MARKer<1>:FUNCTION:CRESt?**

Queries the Crest factor in the time domain measurement. Only the numeric suffix 1 is permissible in CALCulate and MARKer.

**Example:** "CALC : MARK : FUNC : CRES? "

**Features:** \*RST value: --  
SCPI: device-specific

**:CALCulate<1|2>:MARKer<1...4>:FUNCTION:WCDPower[:BTS]:RESult?**

PTOTAL | FERRor | TFRame | TOFFset | MACCuracy | PCDerror | EVMRms | EVMPeak |  
CERRor | CSLot | SRATe | CHANnel | CDPabsolute | CDPRelative | IQOFFset | IQIMbalance |  
MTYPE

This command queries the measured and calculated results of the WCDMA code domain power measurement.

PTOTAL	total power	FERRor	frequency error in Hz
TFRame	trigger to frame	TOFFset	timing offset
MACCuracy	composite EVM	PCDerror	peak code domain error
EVMRms	error vector magnitude RMS	EVMPeak	error vector magnitude peak
CERRor	chip rate error	CSLot	channel slot number
SRATe	symbol rate	CHANnel	channel number
CDPabsolute	channel power absolute	CDPRelative	channel power relative
IQOFFset	IQ offset	IQIMbalance	IQ imbalance
MTYPE	modulation type (2: QPSK, 4: 16QAM, 15: slot switched off)		

**Example:** " : CALC : MARK : FUNC : WCDP : RES? PTOT "

**Features:** \*RST value: --  
SCPI: device-specific

**:CALCulate:MARKer:Y:PERCent 0 to 100%**

This command positions the marker in CCDF measurements to the selected percent value of the y-axis scaling (probability).

**Example:** " : CALC : MARK : Y : PERC 40 "

**Features:** \*RST value: -  
SCPI: device-specific

This command is an event which is why it is not assigned an \*RST value and has no query.

## CALCulate:STATistics - Subsystem

The CALCulate:STATistics subsystem controls the statistical measurement functions in the instrument. The measurement window cannot be selected with these functions. The numeric suffix in CALCulate is therefore ignored.

COMMAND	PARAMETER	UNIT	COMMENT
:CALCulate			
:STATistics			
[:BTS]			
:CCDF			
[:STATe]	<Boolean>		
:NSAMples	<numeric_value>	--	
:SCALe			
:Y			
:UPPer	<numeric_value>	--	
:LOWer	<numeric_value>	--	

### :CALCulate:STATistics[:BTS]:CCDF[:STATe] ON | OFF

This command switches on or off the measurement of the complementary cumulative distribution function (CCDF).

**Example:** "CALC:STAT:CCDF ON"

**Features:** \*RST value: OFF  
SCPI: device-specific

### :CALCulate:STATistics:NSAMples 100 to 32768

This command sets the number of measurement points to be acquired for the statistical measurement functions

**Example:** "CALC:STAT:NSAM 5000"

**Features:** \*RST value: 10000  
SCPI: device-specific

### :CALCulate:STATistics:SCALe:Y:UPPer 1E-5 to 1.0

This command defines the upper limit for the Y-axis of the diagram in statistical measurements. Since probabilities are specified on the Y-axis, the entered numerical values are dimensionless.

**Example:** "CALC:STAT:SCAL:Y:UPP 0.01"

**Features:** \*RST value: 1.0  
SCPI: device-specific

### :CALCulate:STATistics:SCALe:Y:LOWer 1E-6 to 0.1

This command defines the lower limit for the Y-axis of the diagram in statistical measurements. Since probabilities are specified on the Y-axis, the entered numerical values are dimensionless.

**Example:** "CALC:STAT:SCAL:Y:LOW 0.001"

**Features:** \*RST value: 1E-6  
SCPI: device-specific

## CONFigure:WCDPower Subsystem

This subsystem comprises the commands for configuring the code domain power measurements. Only the numeric suffix 1 is permissible in CONFigure.

### CONFigure<1>:WCDPower[:BTS]:MEASurement POWER | ACLR | ESPectrum | OBANdwith | OBWidth | WCDPower | FDOMain | TDOMain | CCDF

This command selects the WCDMA base station tests. The settings of the predefined measurements are described for the associated softkey in chapter 6.

<b>Parameter:</b>	POWER	Channel power measurement (standard 3GPP WCDMA Forward) with predefined settings
	ACLR	Adjacent channel power measurement (standard 3GPP WCDMA Forward) with predefined settings
	ESPectrum	Measurement of spectrum emission mask
	OBANdwith   OBWidth	Measurement of occupied power bandwidth
	WCDPower	Code domain power measurement. This selection has the same effect as command INSTRUMENT:SElect WCDPower.
	FDOMain	Overview measurement in the frequency domain with predefined settings
	TDOMain	Measurement of crest factor in the time domain with predefined settings
	CCDF	Measurement of Complementary Cumulative Distribution Function

**Example:** "CONF:WCDP:MEAS POW"

**Features:** \*RST value: POWER  
SCPI: device-specific

### CONFigure:WCDPower[:BTS]:CTABLE[:STATe] ON | OFF

This command switches the channel table on or off. On switching on, the measured channel table is stored under the name RECENT and switched on. After the RECENT channel table is switched on, another channel table can be selected with the command CONF:WCDP:CTABLE:SElect.

**Note:** The RECENT channel table must always be switched on first with the command CONF:WCDP:CTAB:STAT and then the required channel table can be selected with the command CONF:WCDP:CTAB:SEL

**Example:** ":CONF:WCDP:CTAB ON"

**Features:** \*RST value: OFF  
SCPI: device-specific

### CONFigure:WCDPower[:BTS]:CTABLE:SElect <string>

This command selects a predefined channel table file. Before using this command, the RECENT channel table must be switched on first with the command CONF:WCDP:CTAB:STATe ON.

**Example:** ":CONF:WCDP:CTABLE ON"  
":CONF:WCDP:CTAB:SEL '3GB\_1\_32'"

**Features:** \*RST value: "RECENT"  
SCPI: device-specific

**:CONFigure:WCDPower[:BTS]:CTABLE:NAME** <file\_name>

This command selects an existing channel table or creates the name of a new channel table.

**Example:** " : CONF : WCDP : CTAB : NAME 'NEW\_TAB' "

**Features:** \*RST value: "RECENT"  
SCPI: device-specific

**:CONFigure:WCDPower[:BTS]:CTABLE:DATA**

2..9 , 0..511 , 0|1 , <numeric\_value> | AUTO, 2|4|8|16 , 0|1|2|3|4|5 , <numeric\_value>...

This command defines the values of the selected channel table.

Each line of the table consists of 8 values:

<code class>,<code number>,<use TFCI>,<timing offset | AUTO>,<pilot length>,<channel type>,<status>,<CDP relative [dB]>....

Code class: 2 to 9  
Code number: 0 to 511  
use TFCI: 0: not used, 1: used  
Timing offset: 0 to 38400, for code class 9, the step width is 512, else 256,  
for AUTO, the timing offset is calculated by the instrument  
Pilot length: code class 9: 4  
code class 8: 2, 4, 8  
code class 7: 4, 8  
code class 5/6: 8  
code class 2/3/4: 16  
Channel Type: 0: DPCH Dedicated Physical Channel  
1: PICH Paging Indication Channel  
2: SCCPCH Secondary Common Control Physical Channel  
3: HS\_SCCH HSDPA: High Speed Shared Control Channel  
4: HS\_PDSCH HSDPA: High Speed Physical Downlink Shared Channel  
5: CHAN jeder andere Kanal ohne Pilotsymbole  
Status: 0: not active, 1: active  
CDP relative: for setting commands any value, for query CDP relative value

Channels CPICH and PCCPCH may only be defined once. They have the same channel type like data channels. However, they can be determined via their channel numbers. If channel CPICH or PCCPCH is missing in the command, it is automatically added at the end of the table.

Prior to this command, the name of the channel table has to be defined with command  
CONF : WCDP : CTAB : NAME.

**Example:** " : CONF : WCDP : CTAB : DATA 8,0,0,0,0,0,1,0.00,  
8,1,0,0,0,0,1,0.00,7,1,0,256,8,0,1,0.00 "  
2 channels are defined: CPICH, PCCPCH and a channel in code class 7

**Features:** \*RST value: -  
SCPI: device-specific

**:CONFigure:WCDPower[:BTS]:CTABLE:COMMENT** <string>

This command defines a comment for the selected channel table

Prior to this command, the name of the channel table has to be defined with command  
CONF : WCDP : CTAB : NAME and the values of the table have to be defined with command  
CONF : WCDP : CTAB : DATA .

**Example:** " : CONF : WCDP : CTAB : COMM 'Comment for table 1' "

**Features:** \*RST value: ""  
SCPI: device-specific

**:CONFigure:WCDPower[:BTS]:CTABLE:COpy** <file\_name>

This command copies one channel table onto another one. The channel table to be copied is selected with command `CONF:WCDP:CTAB:NAME`.

**Parameter:** <file\_name> ::= name of the new channel table

**Example:** " : CONF : WCDP : CTAB : COPY ' CTAB\_2 ' "

**Features:** \*RST value: --  
SCPI: device-specific

The name of the channel table may contain a maximum of 8 characters. This command is an "event" which is why it is not assigned an \*RST value and has no query.

**:CONFigure:WCDPower[:BTS]:CTABLE:DELeTe**

This command deletes the selected channel table. The channel table to be deleted is selected with command `CONF:WCDP:CTAB:NAME`.

**Example:** " : CONF : WCDP : CTAB : DEL "

**Features:** \*RST value: --  
SCPI: device-specific

This command is an "event" which is why it is not assigned an \*RST value and has no query.

**:CONFigure:WCDPower[:BTS]:CTABLE:REStore**

This command restores the default channel tables preset upon instrument delivery.

**Example:** " : CONF : WCDP : CTAB : REST "

**Features:** \*RST value: --  
SCPI: device specific

This command is an "event" which is why it is not assigned an \*RST value and has no query.

**:CONFigure:WCDPower[:BTS]:CTABLE:CATalog?**

This command reads out the names of all channel tables stored on the harddisk.

Syntax of output format:

<Sum of file lengths of all subsequent files>,<free memory on hard disk>,  
<1st file name>,,<1st file length>,<2nd file name>,,<2nd file length>,,...,<nth file name>,  
<nth file length>

**Example:** " : CONF : WCDP : CTAB : CAT ? "

**Features:** \*RST value: --  
SCPI: device-specific

## INSTrument Subsystem

**:INSTrument[:SElect]** SANalyzer | DDEMod | ADEMod | BGSM | MSGM | CDPower | **WCDPower|BWCDpower**

This command switches between the operating modes by means of text parameters.

Selection BWCDpower or WCDPower presets the instrument as described in Chapter 2, Section "Basic Settings in Code Domain Measurement Mode".

**Example:** " :INST BWCD "

**Features:** \*RST value: SANalyzer  
SCPI: conforming

## SENSE:CDPower Subsystem

This subsystem controls the parameters for the code domain mode. The numeric suffix in `SENSE<1 | 2>` is not significant in this subsystem.

**:[SENSE:]CDPower:SFACTor** 4 | 8 | 16 | 32 | 64 | 128 | 256 | 512

This command defines the spreading factor. The spreading factor is only significant for display mode PEAK CODE DOMAIN ERROR.

**Example:** " :SENS:CDP:SFACTor 16 "

**Features:** \*RST value: 512  
SCPI: device-specific

**:[SENSE:]CDPower:CODE** 0 to 511

This command sets the code number. The code number refers to code class 9 (spreading factor 512).

**Example:** " :SENS:CDP:CODE 30 "

**Features:** \*RST value: 0  
SCPI: device-specific

**:[SENSE:]CDPower:NORMALize** ON | OFF

This command switches normalization of the unit circle with the IQ offset on or off.

**Example:** " :SENS:CDP:NORM OFF "

**Features:** \*RST value: OFF  
SCPI: device-specific

**Mode:** WCDP

**:[SENSe<1|2>:]CDPower:PCONtrol PILot | SLOt**

This command sets the power control position. A distinction is made between a power control at the slot limit (SLOt) and a power control at the beginning of pilot symbols (PILot).

**Example:** " :CDP:PCON SLOt "

**Features:** \*RST value: PILot  
SCPI: device-specific

**:[SENSe:]CDPower:PRESet**

This command sets the parameters of the WCDMA measurement to predefined values (see softkey *CDP AUTO ADJUST* in chapter 6).

**Example:** " :CDP:PREs "

**Features:** \*RST value: -  
SCPI: device-specific

This command is an <Event> and has therefore neither \*RST value nor query.

**:[SENSe:]CDPower:QINVert ON | OFF**

This command inverts the Q component of the signal.

**Example:** " :SENS:CDP:QINV ON "

**Features:** \*RST value: OFF  
SCPI: device-specific

**:[SENSe:]CDPower:SLOt 0 to 14**

This command sets the slot number of the common pilot channels (CPICH).

**Example:** " :SENS:CDP:SLOt 3 "

**Features:** \*RST value: 0  
SCPI: device-specific

**:[SENSe:]CDPower:SBANd NORMal | INVers**

This command is for interchanging the left and the right sideband.

**Example:** " :CDP:CDP:SBAN INV "

**Features:** \*RST value: INV  
SCPI: device-specific

**Mode:** WCDP

**:[SENSe:]CDPower:LCODE[:VALue] #H0 to #H1fff**

This command defines the scrambling code in hexadecimal format.

**Example:** " :CDP:LCOD #H2 "

**Features:** \*RST value: 0  
SCPI: device-specific



**:[SENSe:]CDPower:ICTReshold** -50 dB to + 10 dB

This command sets the threshold value from which a channel is treated as active. The level entered refers to the total signal power.

**Example:** " :CDP:ICTR -10DB "

**Features:** \*RST value: -20 dB  
SCPI: device-specific

**:[SENSe:]CDPower:LEVel:ADJust**

This command is used for setting automatically the RF attenuation and IF gain to the level of the applied signal. The instrument is to be switched to the *ATTEN MANUAL* mode so as to set the RF attenuation and IF gain separately to optimum values. This mode is maintained after changing from code domain power measurements to the analyzer or vector analyzer modes.

**Example:** " :CDP:LEV:ADJ "

**Features:** \*RST value: -  
SCPI: device-specific

This command is an <Event> and has therefore neither \*RST value nor query.

**:[SENSe:]CDPower:PREference** TOTal | CPICH

This command switches between the use of total power or CPICH power as reference for the relative CDP measurement values.

**Example:** " :SENS:CDP:PREF CPIC "

**Features:** \*RST value: TOTal  
SCPI: device-specific

**:[SENSe<1|2>:]CDPower:STYPe** CPICH | SCHannel

This command selects the type of synchronization.

CPICH Synchronizaton to CPICH (default). The CPICH has to be contained in signal.

SCHannel Synchronization without CHICH. This type of synchronization is provided for test model 4 which is defined with or without CPICH.

**Example:** " :CDP:STYP SCH "

**Features:** \*RST value: CPICH  
SCPI: device-specific

**:[SENSe<1|2>:]CDPower:ANTenna** OFF | 1 | 2

This command switches the antenna diversity mode on or off and selects the antenna of the diversity path.

OFF Antenna diversity mode switched off.

1 | 2 According to 3 GPP, the pilot symbols of the channels are different depending on the antenna used. The CPICH symbols are different and the synchronization channels are transmitted alternately in every second slot.

**Example:** " :CDP:ANT 1 "

**Features:** \*RSTvalue: OFF  
SCPI: device-specific

## TRACe Subsystem

**:TRACe[:DATA]** TRACE1 |TRACE2 | ABITstream | PWCDp | CTABLE | CWCDp

This command transfers trace data from the controller to the instrument, the query reads trace data out of the instrument.

**Example:**            ":TRAC TRACE1, "+A\$     (A\$: data list in current format)  
                      ":TRAC? TRACE1"

**Features:**        \*RST value:     -  
                      SCPI:           conforming

Only TRACE1, TRACE2, PWCDp, ABITstream or CTABLE can be queried depending on the display mode.

### CODE PWR ABSOLUTE / RELATIVE , CHANNEL TABLE (TRACE1)

Each channel is defined by the class, the channel number, the absolute level, the relative level and the timing offset. The class denotes the spreading factor of the channel.

Class 9 corresponds to the highest spreading factor (512, symbol rate 7.5 ksps), class 2 to the lowest admissible spreading factor (4, symbol rate 960 ksps).

Five values are transmitted for each channel.

< class>,<cannel number>,<absolute level>,<relative level>,<timing offset>, .....

For CODE PWR ABSOLUTE / RELATIVE, the channels are output in ascending order sorted according to the code numbers, i.e in the same sequence as they are displayed on the screen. For CHANNEL TABLE, the channels are sorted according to the code classes, i.e. the unassigned channels are transmitted last.

The units are:

Absolute level	dBm,
Relative level	dB referred to CPICH.
Timing offset	chips

The example shows the results of a query for three channels with the following configuration:

1<sup>st</sup> channel:   spreading factor 512, channel number 7, timing offset 0  
2<sup>nd</sup> channel:   spreading factor 4, channel number 1, timing offset 256 chips  
3<sup>rd</sup> channel:   spreading factor 128, channel number 255, timing offset 2560 hips

This yields the following result: 9,7,-40,-20,0,2,1,-40,-20,256,7,255,-40,-20,2560

The channels come in the same order as in the CDP diagram, i.e. depending on their position in the code domain of spreading factor 512.

### CODE PWR ABSOLUTE / RELATIVE (PWCDp) , CHANNEL TABLE (PWCDp)

PWCDp can be set only if CODE PWR ABSOLUTE / RELATIVE , CHANNEL TABLE is selected for Screen A. The pilot length is transmitted in addition to the same five values as transmitted for TRACE1:

< class>,<cannel number>,<absolute level>,<relative level>,<timing offset> or <l/Q-mapping>,<pilot length>,...

The pilot length is given in symbols.

### CODE PWR ABSOLUTE / RELATIVE (CWCDp) , CHANNEL TABLE (CWCDp)

TRAC? CWCDp can be set only if CODE PWR ABSOLUTE / RELATIVE , CHANNEL TABLE is selected for Screen A. The same data as for TRAC? TRACE1 is transmitted, additionally pilot length, channel type, modulation type and a reserved value are given. For each channel therefore 10 values are transmitted.



## SYMBOL EVM (TRACE2)

The number of level values depends on the spreading factor:

Spreading factor 512	5 values
Spreading factor 256	10 values
Spreading factor 128	20 values
Spreading factor 64	40 values
Spreading factor 32	80 values
Spreading factor 16	160 values
Spreading factor 8	320 values
Spreading factor 4	640 values

## PEAK CODE DOMAIN ERR and COMPOSITE EVM (TRACE2)

15 pairs of slot (slotnumber of CPICH) and level values are always transferred.

PEAK CODE DOMAIN ERR: <slot number>, <level value in dB>,.....

COMPOSITE EVM: <slot number>, <level value in %>, .....

## SYMBOL CONST DIAG(TRACE2)

The real and the imaginary part are transferred as a pair:

<re 0>,<im 0>,<re 1>,<im 1>.....<re n>, <im n>

The number of level values depends on the spreading factor:

Spreading factor 512	5 values
Spreading factor 256	10 values
Spreading factor 128	20 values
Spreading factor 64	40 values
Spreading factor 32	80 values
Spreading factor 16	160 values
Spreading factor 8	320 values
Spreading factor 4	640 values

## BITSTREAM (TRACE2)

The bitstream of one slot is transferred. One value is transferred per bit (range 0,1,). The number of symbols is not constant and may vary for each sweep. Specific symbols in the bitstream may be invalid depending on the channel type and the bit rate (symbols without power). The assigned invalid bits are marked by "9". The number of bits of a 16QAM modulated channel is twice the number of bits of a QPSK modulated channel.

Example for a bitstream trace: 0,1,0,9,0,1, .....

## BITSTREAM (ABITstream)

ABITstream can be set only if `CALC2:FEED "XTIM:CDP:BSTream"` is selected (in the lower bitstream window). This command returns the bitstreams of all 15 slots one after the other, the output format may be REAL, UINT or ASCII.

## Alphabetical List of Commands

Command	Parameter	Page
:CALCulate<1 2>:FEED	'XPOW:CDP' 'XPOW:CDP:RAT' 'XTIM:CDP:MACCuracy' 'XTIM:CDP:PVSLOT' 'XTIM:CDP:BSTReam' 'XTIM:CDP:ERR:CTABLE' 'XTIM:CDP:ERR:SUMM' 'XTIM:CDP:ERR:PCDomain' 'XTIM:CDP:SYMB:CONStellation' 'XTIM:CDP:SYMB:EVM'	70
:CALCulate:LIMit:ESpectrum:MODE	AUTO   MANual   USER	71
:CALCulate:LIMit:ESpectrum:VALue	<numeric_value>	71
:CALCulate<1 2>:MARKer<1>:FUNction:CPICh		71
:CALCulate<1 2>:MARKer<1>:FUNction:PCCPch		72
CALCulate<1>:MARKer<1>:FUNction:CRESt?		72
CALCulate<1 2>:MARKer<1 to 4>:FUNction:WCDPower:BTS:RESult?	*PTOTal   FERRor   TFRame   MACCuracy   PCDerror   EVMRms   EVMPeak   CERRor   CSLot   SRATe   CHANnel   CDPabsolute   CDPRelative   IQOfset   IQIMbalance   MTYPE	72
:CALCulate:MARKer:Y:PERCent	0 to 100%	72
:CALCulate:STATistics[:BTS]:CCDF[:STATe]	ON   OFF	73
:CALCulate:STATistics:NSAMples	100 to 32768	73
:CALCulate:STATistics:SCALE:Y:UPPer	-1E-5 to 1.0	73
:CALCulate:STATistics:SCALE:Y:LOWer	-1E-6 to 0.1	73
:CONFigure<1>:WCDPower[:BTS]:MEASurement	POWER   ACLR   ESpectrum   OBANdwidth OBWidth   WCDPower   FDOMain   TDOMain   CCDF	74
:CONFigure<1>:WCDPower[:BTS]:CTABLE[:STATe]	ON   OFF	74
:CONFigure<1>:WCDPower[:BTS]:CTABLE:SElect	<string>	74
:CONFigure<1>:WCDPower[:BTS]:CTABLE:NAME	<file_name>	75
:CONFigure<1>:WCDPower[:BTS]:CTABLE:DATA	2 ... 9, 0 .. 511, 0 1, <numeric_value>   AUTO, 2 4 8 16 , 0 1 2 3 4 5, <numeric_value>....	75
:CONFigure<1>:WCDPower[:BTS]:CTABLE:COMMeNT	<string>	75
:CONFigure<1>:WCDPower[:BTS]:CTABLE:COpy	<file_name>	76
:CONFigure<1>:WCDPower[:BTS]:CTABLE:DELeTe		76
:CONFigure<1>:WCDPower[:BTS]:CTABLE:REStore		76
:CONFigure<1>:WCDPower[:BTS]:CTABLE:CATALog?		76
<b>:INSTRument[:SElect]</b>	<b>WCDPower BWCDpower</b>	77
:[SENSe:]CDPower:SFACTOR	4   8   16   32   64   128   256   512	77
:[SENSe:]CDPower:CODE	0 to 511	77
:[SENSe:]CDPower:NORMalize	ON   OFF	77
:[SENSe:]CDPower:PCONtrol	PILot   SLOT	78
:[SENSe:]CDPower:PRESet		78
:[SENSe:]CDPower:QINVert	ON   OFF	78
:[SENSe:]CDPower:SLOT	0 .to 14	78
:[SENSe:]CDPower:SBANd	*NORMal   INVers	78
:[SENSe:]CDPower:LCODE[:VALue]	#H0 to #H1fff	78
:[SENSe:]CDPower:ICTReshold	-50 to 10 dB	79
:[SENSe:]CDPower:LEVel:ADJust		79
:[SENSe:]CDPower:PREference	TOTAL   CPICh	79
:[SENSe:]CDPower:STYPe	CPICh   SCHannel	79
:[SENSe:]CDPower:ANTenna	OFF   1   2	79
:TRACe[:DATA]	TRACE1 TRACE2   ABITstream   PWCDp   CTABLE   CWCDp	80

Table of Softkeys with Assignment of IEC/IEEE Commands

CONFIGURATION Key Group

MODE	
3GPP BTS ANALYZER	:INSTrument:SElect BWCDpower
POWER	:CONFigure<1>:WCDPower:MEASurement POver Query of results: :CALCulate<1>:MARKer<1>:FUNction:POWer:RESult? CPower
ACLR	:CONFigure<1>:WCDPower:MEASurement ACLR Query of results: :CALCulate<1>:MARKer<1>:FUNction:POWer:RESult? ACPower
SPECTRUM EM MASK	:CONFigure:WCDPower:MEASurement ESpectrum Query of results: :CALCulate<1>:LIMit<1>:FAIL?
LIMIT LINE AUTO	:CALCulate<1>:LIMit<1>:ESpectrum:MODE AUTO
LIMIT LINE MANUAL	:CALCulate<1>:LIMit<1>:ESpectrum:MODE MANual :CALCulate<1>:LIMit<1>:ESpectrum:VALue <numeric_value>
LIMIT LINE USER	:CALCulate:LIMit<1>:NAME <string> :CALCulate:LIMit<1>:UNIT DBM :CALCulate:LIMit<1>:CONTRol[:DATA] <num_value>, <num_value>, ... :CALCulate:LIMit<1>:CONTRol:DOMain FREQuency :CALCulate:LIMit<1>:CONTRol:TRACe 1 :CALCulate:LIMit<1>:CONTRol:OFFset <num_value> :CALCulate:LIMit<1>:CONTRol:MODE RELative  :CALCulate:LIMit<1>:UPPer[:DATA] <num_value>, <num_value>.. :CALCulate:LIMit<1>:UPPer:STATe ON   OFF :CALCulate:LIMit<1>:UPPer:OFFset <num_value> :CALCulate:LIMit<1>:UPPer:MARGin <num_value> :CALCulate:LIMit<1>:UPPer:MODE ABSolute :CALCulate:LIMit<1>:UPPer:SPACing LINear
<p><b>Notes:</b></p> <ul style="list-style-type: none"> <li>- If the y values are entered using the command :CALCulate:LIMit&lt;1&gt;:LOWer[:DATA] the limit check yields "failed" if the values are below the limit line.</li> <li>- If a user-defined limit line is activated, it has priority over limit lines selected via AUTO und MANUAL.</li> </ul>	
OCCUPIED BANDWIDTH	:CONFigure<1>:WCDPower:MEASurement OBANdwidth Query of results: :CALCulate<1>:MARKer<1>:FUNction:POWer:RESult? OBANdwidth
SPECTRUM	:CONFigure<1>:WCDPower:MEASurement FDOMain Query of results: -- (visual evaluation)
TIME DOMAIN	:CONFigure<1>:WCDPower:MEASurement TDOMain Query of results: :CALCulate<1>:MARKer<1>:FUNction:CREST? :CALCulate<1>:MARKer<1>:FUNction:SUMMery:RMS:RESult? :CALCulate<1>:MARKer<1>:FUNction:SUMMery[:STATe] ON
CCDF	:CONFigure:WCDPower:MEASurement CCDF or :CALCulate:STATistics[:BTS]:CCDF[:STATe] ON Query of results: CALCulate:MARKer:X?

PERCENT MARKER	:CALCulate:MARKer:Y:PERCent 1 to 100%
NO OF SAMPLES	CALCulate:STATistics:NSAMamples 1 to 32768
AVERAGE ON OFF	:DISPlay[:WINDow]:TRACe<1>:MODE AVERAge   VIEW
SWEEP COUNT	:[SENSe<1 2>]:SWEep:COUNT 6
Y MAX	:CALCulate:STATistics:SCALE:Y:UPPer 1E-5 to 1
Y MIN	:CALCulate:STATistics:SCALE:Y:LOWer 1E-6 to 0.1
CODE DOM POWER	:INSTRument<1>[:SElect] WCDPower
	Query of results:
	:TRACe:DATA? TRACE1   TRACE2   ABITstream  PWCDp   CTABLE
	or
	:CALCulate<1 2>:MARKer<1>:FUNctIon:WCDPower:RESult? PTOTal   FERRor   TFRame   TOFFset   MACCuracy   PCDerror   EVMRms   EVMPeak   CERRor   CSLot   SRATe   CHANnel   CDPabsolute   CDPRelative   IQOFFset   IQIMbalance
	or Marker functions (see MARKER submenu)
CONTINUOUS SWEEP	:INITiate<1>:CONTInuous ON; INITiate<1>[:IMMediate]
SINGLE SWEEP	:INITiate<1>:CONTInuous OFF; INITiate<1>[:IMMediate]
RESULT DISPLAY	--
CODE PWR RELATIVE	:CALCulate<1>:FEED `XPOW:CDP:RAT`
CODE PWR ABSOLUTE	:CALCulate<1>:FEED `XPOW:CDP`
CODE PWR ZOOM	--
COMPOSITE EVM	:CALCulate2:FEED "XTIM:CDP:MACCuracy"
PEAK CODE DOMAIN ERR	:CALCulate2:FEED "XTIM:CDP:ERR:PCDomain"
POWER VS SLOT	:CALCulate2:FEED "XTIM:CDP:PVSLot"
RESULT SUMMARY	:CALCulate2:FEED "XTIM:CDP:ERR:SUMMary"
	Result query:
	:CALCulate:MARKer:FUNctIon:WCDPower[:BTS]:RESult? PTOTal   FERRor   TFRame   TOFFset   MACCuracy   PCDerror   EVMRms   EVMPeak   CERRor   CSLot   SRATe   CHANnel   CDPabsolute   CDPRelative   IQOFFset   IQIMbalance
SELECT PCDE SF	:[SENSe:]CDPower:SFACtor 4   8   16   32   64   128   256   512
SELECT CODE NO.	:[SENSe:]CDPower:CODE 0 to 511
SELECT CPICH SLOT	:[SENSe:]CDPower:SLOT 0 to 14

CHANNEL TABLE	:CALCulate<1>:FEED "XTIM:CDP:ERR:CTable"
SYMBOL CONST DIAG	:CALCulate2:FEED "XTIM:CDP:SYMB:CONStellation"
SYMBOL EVM	:CALCulate2:FEED "XTIM:CDP:SYMB:EVM"
BITSTREAM	:CALCulate2:FEED "XTIM:CDP:SYMB:BITStream"
CODE CHAN CONFIG	--
CODE CHAN AUTOSEARCH	:CONFigure:WCDPower[:BTS]:CTABLE[:STATE] OFF
CODE CHAN PREDEFINED	:CONFigure:WCDPower[:BTS]:CTABLE[:STATE] ON :CONFigure:WCDPower[:BTS]:CTABLE:SElect <channel table name>
EDIT CHAN CONF TABLE	
CHAN TABLE HEADER	:CONFigure:WCDPower[:BTS]:CTABLE:NAME "channel table name" :CONFigure:WCDPower[:BTS]:CTABLE:COMMeNt "comment for new table"
CHAN TABLE VALUES	:CONFigure:WCDPower[:BTS]:CTABLE:NAME "channel table name" :CONFigure:WCDPower[:BTS]:CTABLE:DATA <numeric_value>
ADD PICH	--
INSERT LINE	--
DELETE LINE	
MEAS CHAN CONF TABLE	--
SAVE TABLE	(automatically executed in remote control)
SORT TABLE	--
NEW CHAN CONF TABLE	<b>See</b> EDIT CHAN CONF TABLE
DEL CHAN CONF TABLE	:CONFigure:WCDPower[:BTS]:CTABLE:NAME "channel table name" :CONFigure:WCDPower[:BTS]:CTABLE:DELeTe
COPY CHAN CONF TABLE	:CONFigure:WCDPower[:BTS]:CTABLE:NAME "channel table name" :CONFigure:WCDPower[:BTS]:CTABLE:COpy "new channel table name"
RESTORE TEST MOD.	:CONFigure:WCDPower[:BTS]:CTABLE:REStore
MARKER	--
MARKER	:CALCulate<1 2>:MARKEr<1>[:STATE] ON   OFF; :CALCulate<1 2>:MARKEr<1>:X <numeric_value>; :CALCulate<1 2>:MARKEr<1>:Y?
MARKER -> CPICH	:CALCulate<1 2>:MARKEr<1>:FUNctioN:CPICH; :CALCulate<1 2>:MARKEr<1>:Y?
MARKER -> PCCPCH	:CALCulate<1 2>:MARKEr<1>:FUNctioN:PCCPCH; :CALCulate<1 2>:MARKEr<1>:Y?



MEAS SETTINGS	--
SCRAMBLING CODE	:[SENSE:]CDPower:LCODE[:VALue) #H0 to #H1fff <hex>
INACT CHAN TRESH	:[SENSE:]CDPower:ICTReshold -50 dB to +10 dB
TRIGGER INT EXT	:TRIGger[:SEquence]:SOURce IMMEDIATE   EXTERNAL
EXT TRG OFFSET	:TRIGger<1>[:SEquence]:HOLDoff <num_value>
POWER REF TOT CPICH	:[SENSE:]CDPower:PREference TOTAL   CPICH
POWER CTRL SLOT PILOT	:[SENSE:]CDPower:PCONTrol SLOT   PILOT
INVERT Q	:[SENSE:]CDPower:QINvert ON   OFF
SIDE BAND NORM INV	:[SENSE:]CDPower:SBAND NORMAL   INVERSE
NORMALIZE ON OFF	:[SENSE:]CDPower:NORMALize ON   OFF
CENTER FREQUENCY	:[SENSE:]FREquency:CENTer <num_value>
SYNC TYPE CPICH SCH	:[SENSE:]CDPower:STYPe CPICHh   SCHannel
ANT DIV ON OFF	:[SENSE:]CDPower:ANTenna OFF   1   2
ANT NO. 1 2	:[SENSE:]CDPower:ANTenna OFF   1   2
REF LEVEL	--
REF LEVEL	:DISPlay[:WINDow<1 2>]:TRACe<1 2>:Y[:SCALE]:RLEVEL <num_value>
REF LEVEL OFFSET	:DISPlay[:WINDow<1 2>]:TRACe<1 2>:Y[:SCALE]:RLEVEL:OFFSet <num_value>
RF ATTEN MANUAL	:INPut<1 2>:ATTenuation <num_value>
ATTEN AUTO NORMAL	:INPut<1 2>:ATTenuation:AUTO:MODE NORMAL; :INPut<1 2>:ATTenuation:AUTO ON
ATTEN AUTO LOW NOISE	:INPut<1 2>:ATTenuation:AUTO:MODE LNOise; :INPut<1 2>:ATTenuation:AUTO ON
ATTEN AUTO LOW DIST	:INPut<1 2>:ATTenuation:AUTO:MODE LDISTortion; :INPut<1 2>:ATTenuation:AUTO ON
MIXER LEVEL	:INPut<1 2>:MIXer <num_value>
LEVEL AUTO ADJUST	:[SENSE:]CDPower:LEVel:ADJust
CDP AUTO ADJUST	:[SENSE:]CDPower:PRESet

**STATus:QUESTionable:SYNC Register**

This register comprises information about error status of the CDP measurements of application R&S® FSIQK72/K74.

It can be queried with commands `STATus:QUESTionable:SYNC:CONDition?` and `"STATus:QUESTionable:SYNC[:EVENT]?"`.

Table 1 Meaning of bits in STATus:QUESTionable:SYNC register

Bit No.	Meaning
0 to 5/7	not used in R&S® FSIQK72/K74
6	<b>K72/K74 Check Pilot Symbols</b> This bit is set if invalid sequences were found during the check of the pilot symbols of the data channels.
8	<b>K72/K74 Evaluation Error</b> This bit is set if an error that the subsequent bits do not describe in greater detail has occurred during the data evaluation for the code domain power analysis.
9	<b>K72/K74 Bad long code number</b> This bit is set if an invalid scrambling code was entered.
10	<b>K72/K74 Frame sync failed</b> This bit is set if the synchronization to a frame was not possible.
11	<b>K72/K74 Slot format not supported</b> This bit is set if the channel table contains an invalid slot format.
12	<b>K72/K74 Channel type not supported</b> This bit is set if the channel table contains an invalid channel type. Supported channel types are DPCH and PICH.
13	<b>K72/K74 No active channel</b> This bit is set if no active channel was found.
14	<b>K72/K74 No waveQual symbols on</b> This bit is set if the EVM measurement is aborted because ON symbols are not available
15	This bit is always 0.

## 8 Performance Test

- Switch off R&S® FSIQ before removing or inserting modules.
- Check the setting of the AC supply voltage selector (230 V) prior to switching on the unit.
- Measure the parameters after a warm-up time of at least 30 min. and the completion of system error correction of R&S® FSIQ and SMIQ. Only then is it ensured that the specifications are complied with.
- Unless specified otherwise all settings are made after a PRESET.
- Conventions for settings on R&S® FSIQ during the measurement:

[<Key>]            Press a key on the front panel, eg [SPAN]  
 [<SOFTKEY>]      Press a softkey, eg [MARKER -> PEAK]  
 [<nn unit>]        Enter a value and terminate by entering the unit, eg [12 kHz]  
 {<nn>}             Enter values indicated in one of the following tables.

Successive entries are separated by [:], eg [**SPAN**: 15 kHz].

- The values stated hereinafter are not guaranteed values. Only the data sheet specifications are binding.

### Required Measuring Equipment and Accessories

Table 8-1        Required Measuring Equipment and Accessories

Item	Instrument type	Recommended characteristics	Recommended equipment	R&S Order No.	Use
1	Signal generator	Vector signal generator for generating cdmaOne signals	SMIQ with options: SMIQB42 SMIQB20 SMIQB11	1125.5555.xx  1104.7936.02 1125.5190.02 1085.4502.04	

### Test Procedure

The performance test refers exclusively to results of the code-domain power. It is not required to check the POWER-, ACLR- and SPECTRUM results since they are covered by the performance test of the basic unit.

Default settings on SMIQ:

```

[PRESET]
[LEVEL :            0 dBm]
[FREQ:             2.1175 GHz]
DIGITAL STD
  WCDMA 3GPP
    TEST MODELS ...
      TEST1_32
        SELECT BS/MS
          BS 1 ON
            PICH STATE: OFF
              STATE: ON
  
```

Trigger output: *RADIO FRAME*

Check set channels against the following table:

CHNO	TYPE	SYM.R	CH.CD	POW	DATA	TOFFS	PILOT	TPC	MC	STATE
0	P-CPICH	15	0	-10.0					OFF	ON
2	P-SCH	15		-13.0					OFF	ON
3	S-SCH	15		-13.0					OFF	ON
4	P-CCPCH	15	1	-10.0	PN9					ON
11	DPCH	30	2	-13.0	PN9	86	8	PATTOFF		ON
12	DPCH	30	11	-13.0	PN9	134	8	PATTOFF		ON
13	DPCH	30	17	-14.0	PN9	52	8	PATTOFF		ON
14	DPCH	30	23	-15.0	PN9	45	8	PATTOFF		ON
15	DPCH	30	31	-17.0	PN9	143	8	PATTOFF		ON
16	DPCH	30	38	-14.0	PN9	112	8	PATTOFF		ON
17	DPCH	30	47	-16.0	PN9	59	8	PATTOFF		ON
18	DPCH	30	55	-18.0	PN9	23	8	PATTOFF		ON
19	DPCH	30	62	-16.0	PN9	1	8	PATTOFF		ON
20	DPCH	30	69	-19.0	PN9	88	8	PATTOFF		ON
21	DPCH	30	78	-17.0	PN9	30	8	PATTOFF		ON
22	DPCH	30	85	-15.0	PN9	18	8	PATTOFF		ON
23	DPCH	30	94	-17.0	PN9	30	8	PATTOFF		ON
24	DPCH	30	102	-22.0	PN9	61	8	PATTOFF		ON
25	DPCH	30	113	-20.0	PN9	128	8	PATTOFF		ON
26	DPCH	30	119	-24.0	PN9	143	8	PATTOFF		ON
27	DPCH	30	7	-20.0	PN9	83	8	PATTOFF		ON
28	DPCH	30	13	-18.0	PN9	25	8	PATTOFF		ON
29	DPCH	30	20	-14.0	PN9	103	8	PATTOFF		ON
30	DPCH	30	27	-14.0	PN9	97	8	PATTOFF		ON
31	DPCH	30	35	-15.0	PN9	56	8	PATTOFF		ON
32	DPCH	30	41	-19.0	PN9	104	8	PATTOFF		ON
33	DPCH	30	51	-18.0	PN9	51	8	PATTOFF		ON
34	DPCH	30	58	-17.0	PN9	26	8	PATTOFF		ON
35	DPCH	30	64	-22.0	PN9	137	8	PATTOFF		ON
36	DPCH	30	74	-19.0	PN9	65	8	PATTOFF		ON
37	DPCH	30	82	-19.0	PN9	37	8	PATTOFF		ON
38	DPCH	30	88	-16.0	PN9	125	8	PATTOFF		ON
39	DPCH	30	97	-18.0	PN9	149	8	PATTOFF		ON
40	DPCH	30	108	-15.0	PN9	123	8	PATTOFF		ON
41	DPCH	30	117	-17.0	PN9	83	8	PATTOFF		ON
42	DPCH	30	125	-12.0	PN9	5	8	PATTOFF		ON

all other channels      STATE    OFF

Default settings on  
R&S® FSIQ:

**[PRESET]**  
**[CENTER:**                    2.1175 GHz]  
**[REF:**                         10 dBm]  
**[MODE:**                      3GPP BTS ANALYZER: CODE DOM POWER  
 MEAS SETTINGS              SCRAMBLING CODE 0  
 MEAS SETTINGS              TRIGGER EXT  
 RESULT DISPLAY              CHANNEL TABLE

Test setup and other settings

- Connect external trigger input of R&S® FSIQ to SMIQ

[TRIGGER: TRIGGER OFFSET: 0μs]

- Connect external reference output of R&S® FSIQ to SMIQ

SMIQ UTILITIES

REF OSC

SOURCE: EXT

FSIQ [SETUP:

REFERENCE INT]

The display of the R&S® FSIQ should show the following:



Ref Lvl 10 dBm CF 2.1175 GHz SR 15 ksps  
 Channel Table Chan Code 0  
 CPICH Slot 0 Chan Slot 0

CHANNEL TABLE										
Type	Symb R.	Code#	Status	TFCI	PilotL	PWR ABS	PWR REL	T	Offs	
CPICH	15 ksps	0	Active	---	--	-11.59	0.00	---	---	
PSCH	15 ksps	---	Active	---	--	---	---	---	---	
SSCH	15 ksps	---	Active	---	--	---	---	---	---	
PCCPCH	15 ksps	1	Active	---	--	-11.59	0.01	---	---	
DPCH	30 ksps	2	Active	OFF	8	-14.61	-3.02	22016		
DPCH	30 ksps	7	Active	OFF	8	-21.54	-9.94	21248		
DPCH	30 ksps	11	Active	OFF	8	-14.59	-3.00	34304		
DPCH	30 ksps	13	Active	OFF	8	-19.61	-8.01	6400		
DPCH	30 ksps	17	Active	OFF	8	-15.57	-3.97	13312		
DPCH	30 ksps	20	Active	OFF	8	-15.60	-4.01	26368		
DPCH	30 ksps	23	Active	OFF	8	-16.59	-4.99	11520		

A

SGL

Ref Lvl 10 dBm CF 2.1175 GHz SR 15 ksps  
 Result Summary Chan Code 0  
 CPICH Slot 0 Chan Slot 0

RESULT SUMMARY			
GLOBAL RESULTS			
Total PWR	-1.72 dBm	Carr Freq Err	69.00 mHz
Chip Rate Err	-0.04 ppm	Trg to Frame	70 ns
IQ Offset	0.00 %	IQ Imbalance	0.58 %
Modulation Acc	2.62 % rms	Pk Code Dom Err	-54.12 dB rms
CPICH Slot Number	0		(7.5 ksps)
CHANNEL RESULTS			
Symb Rate	15 ksps	Timing Offset	0 Chips
Channel Code	0	Chan Slot Number	0
Chan Pow rel.	0.00 dB	Chan Pow abs.	-11.59 dBm
Error Vector Mag	0.58 % rms	Error Vector Mag	0.86 % Pk

B

SGL

Date: 3.JAN.2001 08:24:45

- Transfer the measurement results indicated in the channel table to the performance test protocol (read the parameters of all channels by scrolling).

## Performance Test Report

**Note:** The values specified in the data sheet are guaranteed limits. To these limits, the tolerances of the instruments used in the performance test must be added because of their measurement uncertainty.

Table 8-2 Performance Test Report

Channel No	Type	Symbol rate	Channel No	Timing offset	Number of pilot-bits	Power (rel.) min value	Power actual value	power (rel.) max value
1	CPICH	15	0	--	--	-0.0		-0.0
2	PCCPCH	15	1	--	--	-0.1		+0.1
3	DPCH	30	2	22016	8	-3.1		-2.9
4	DPCH	30	7	21248	8	-10.1		-9.9
5	DPCH	30	11	34304	8	-3.1		-2.9
6	DPCH	30	13	6400	8	-8.1		-7.9
7	DPCH	30	17	13312	8	-4.1		-3.9
8	DPCH	30	20	26368	8	-4.1		-3.9
9	DPCH	30	23	11520	8	-5.1		-4.9
10	DPCH	30	27	24832	8	-4.1		-3.9
11	DPCH	30	31	36608	8	-7.1		-6.9
12	DPCH	30	35	14336	8	-5.1		-4.9
13	DPCH	30	38	28672	8	-4.1		-3.9
14	DPCH	30	41	26624	8	-9.1		-8.9
15	DPCH	30	47	15104	8	-6.1		-5.9
16	DPCH	30	51	13056	8	-8.1		-7.9
17	DPCH	30	55	5888	8	-8.1		-7.9

Channel No	Type	Symbol rate	Channel No	Timing offset	Number of pilot-bits	Power (rel.) min value	Power actual value	power (rel.) max value
18	DPCH	30	58	6656	8	-7.1		-6.9
19	DPCH	30	62	256	8	-6.1		-5.9
20	DPCH	30	64	35072	8	-12.1		-11.9
21	DPCH	30	69	22528	8	-9.1		-8.9
22	DPCH	30	74	16640	8	-9.1		-8.9
23	DPCH	30	78	7680	8	-7.1		-6.9
24	DPCH	30	82	9472	8	-9.1		-8.9
25	DPCH	30	85	4608	8	-5.1		-4.9
26	DPCH	30	88	32000	8	-6.1		-5.9
27	DPCH	30	94	7680	8	-7.1		-6.9
28	DPCH	30	97	38144	8	-8.1		-7.9
29	DPCH	30	102	15616	8	-12.1		-11.9
30	DPCH	30	108	31488	8	-5.1		-4.9
31	DPCH	30	113	32768	8	-10.1		-9.9
32	DPCH	30	117	21248	8	-7.1		-7.9
33	DPCH	30	119	36608	8	-14.1		-13.9
34	DPCH	30	125	1280	8	-2.1		-1.9

## 9 Glossary

CPICH	<p>Common pilot channel (spreading code number 0 with spreading factor 128)</p> <p>The channel constantly contains the symbol (1,1) throughout the total length of the WCDMA frame. For the measurements, the CPICH (Primary CPICH) is used for synchronization. For this reason, the CPICH must be contained in the signal to be measured.</p>
Crest factor	Ratio of peak to average value of the signal.
DPCH	Dedicated physical channel, data channel. The data channels which can be sent at different transmission rates are automatically recognized during the measurement.
Inactive Channel Threshold	Minimum power that a single channel must have as compared to the total signal to be recognized as an active channel
Composite EVM	In accordance with the 3GPP specifications, the squared error between the real and imaginary parts of the test signal and an ideal reference signal is determined (EVM referred to the total signal) in a composite EVM measurement.
PCCPCH	<p>Primary common control physical channel (spreading code number 1 with spreading factor 128)</p> <p>The channel is used for synchronizing the measurements. For this reason, it must be contained in the signal to be measured.</p>
Peak Code Domain Error	In accordance with the 3GPP specifications, the error between the test signal and the ideal reference signal is projected onto the classes of the different spreading factors in the case of a peak code domain measurement.
PICH	<p>Paging indication channel</p> <p>This special channel is defined in the test models to 3GPP for measurements on base station signals. Since it does not contain any pilot symbols, it cannot automatically be recognized during the measurement. Therefore this channel must be deactivated for CDP measurements.</p>
SCH	<p>Synchronization channel, divided into P-SCH (Primary Synchronization Channel) and S-SCH (Secondary Synchronization Channel).</p> <p>The two channels are required for synchronizing the measurement. Therefore they must always be contained in the signal to be measured.</p>
Timing offset	Offset between the start of the first slot of a channel and the start of the analyzed WCDMA frame (in multiples of 256 chips).



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