

# IEEE 802.16 WiMAX Digital Standard for R&S<sup>®</sup> Signal Generators Operating Manual



1171.5277.12 – 11



Test & Measurement

Operating Manual

This document describes the following software options:

- R&S®AMU-K49/-K249  
1402.7002.02, 1402.8309.02
- R&S®SMATE-K49  
1404.6803.02
- R&S®SMBV-K49/-K249  
1415.8119.xx, 1415.8319.xx
- R&S®SMJ-K49/-K249  
1404.1101.02, 1409.1216.02
- R&S®SMU-K49/-K249  
1161.0366.02, 1408.6214.02
- R&S®AFQ-K249  
1401.6654.02
- R&S®CMW-KW700  
1203.1358.02
- R&S®SFU-K249  
2115.2314.02

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The following abbreviations are used throughout this manual: R&S®AMU is abbreviated as R&S AMU, R&S®SMATE is abbreviated as R&S SMATE, R&S®SMBV is abbreviated as R&S SMBV, R&S®SMJ is abbreviated as R&S SMJ, R&S®SMU is abbreviated as R&S SMU, R&S®WinIQSIM2 is abbreviated as R&S WinIQSIM2

# Basic Safety Instructions

## Always read through and comply with the following safety instructions!

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

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

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

## Symbols and safety labels

							
Notice, general danger location Observe product documentation	Caution when handling heavy equipment	Danger of electric shock	Warning! Hot surface	PE terminal	Ground	Ground terminal	Be careful when handling electrostatic sensitive devices

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

### Tags and their meaning

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

	indicates a hazardous situation which, if not avoided, will result in death or serious injury.
	indicates a hazardous situation which, if not avoided, could result in death or serious injury.
	indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.
	indicates the possibility of incorrect operation which can result in damage to the product. In the product documentation, the word ATTENTION is used synonymously.

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

### Operating states and operating positions

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

1. Unless otherwise specified, the following requirements apply to Rohde & Schwarz products: predefined operating position is always with the housing floor facing down, IP protection 2X, pollution severity 2, overvoltage category 2, use only indoors, max. operating altitude 2000 m above sea level, max. transport altitude 4500 m above sea level. A tolerance of  $\pm 10\%$  shall apply to the nominal voltage and  $\pm 5\%$  to the nominal frequency.
2. Do not place the product on surfaces, vehicles, cabinets or tables that for reasons of weight or stability are unsuitable for this purpose. Always follow the manufacturer's installation instructions when installing the product and fastening it to objects or structures (e.g. walls and shelves). An installation that is not carried out as described in the product documentation could result in personal injury or death.
3. Do not place the product on heat-generating devices such as radiators or fan heaters. The ambient temperature must not exceed the maximum temperature specified in the product documentation or in the data sheet. Product overheating can cause electric shock, fire and/or serious personal injury or death.

### Electrical safety

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

1. Prior to switching on the product, always ensure that the nominal voltage setting on the product matches the nominal voltage of the AC supply network. If a different voltage is to be set, the power fuse of the product may have to be changed accordingly.
2. In the case of products of safety class I with movable power cord and connector, operation is permitted only on sockets with an earthing contact and protective earth connection.
3. 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.
4. If the product does not have a power switch for disconnection from the AC supply network, the plug of the connecting cable is regarded as the disconnecting device. In such cases, always ensure that the power plug is easily reachable and accessible at all times (corresponding to the length of connecting cable, approx. 2 m). Functional or electronic switches are not suitable for providing disconnection from the AC supply network. If products without power switches are integrated into racks or systems, a disconnecting device must be provided at the system level.
5. Never use the product if the power cable is damaged. Check the power cable on a regular basis to ensure that it is in proper operating condition. By taking appropriate safety measures and carefully laying the power cable, you can ensure that the cable will not be damaged and that no one can be hurt by, for example, tripping over the cable or suffering an electric shock.
6. The product may be operated only from TN/TT supply networks fused with max. 16 A (higher fuse only after consulting with the Rohde & Schwarz group of companies).
7. Do not insert the plug into sockets that are dusty or dirty. Insert the plug firmly and all the way into the socket. Otherwise, sparks that result in fire and/or injuries may occur.
8. Do not overload any sockets, extension cords or connector strips; doing so can cause fire or electric shocks.
9. For measurements in circuits with voltages  $V_{\text{rms}} > 30 \text{ V}$ , suitable measures (e.g. appropriate measuring equipment, fusing, current limiting, electrical separation, insulation) should be taken to avoid any hazards.
10. Ensure that the connections with information technology equipment, e.g. PCs or other industrial computers, comply with the IEC60950-1/EN60950-1 or IEC61010-1/EN 61010-1 standards that apply in each case.
11. Unless expressly permitted, never remove the cover or any part of the housing while the product is in operation. Doing so will expose circuits and components and can lead to injuries, fire or damage to the product.
12. If a product is to be permanently installed, the connection between the 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 licensed electrician.
13. 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 anyone who has access to the product, as well as the product itself, is adequately protected from injury or damage.

## Basic Safety Instructions

14. Use suitable overvoltage protection to ensure that no overvoltage (such as that caused by a bolt of lightning) can reach the product. Otherwise, the person operating the product will be exposed to the danger of an electric shock.
15. Any object that is not designed to be placed in the openings of the housing must not be used for this purpose. Doing so can cause short circuits inside the product and/or electric shocks, fire or injuries.
16. Unless specified otherwise, products are not liquid-proof (see also section "Operating states and operating positions", item 1. Therefore, the equipment must be protected against penetration by liquids. If the necessary precautions are not taken, the user may suffer electric shock or the product itself may be damaged, which can also lead to personal injury.
17. Never use the product under conditions in which condensation has formed or can form in or on the product, e.g. if the product has been moved from a cold to a warm environment. Penetration by water increases the risk of electric shock.
18. Prior to cleaning the product, disconnect it completely from the power supply (e.g. AC supply network or battery). Use a soft, non-linting cloth to clean the product. Never use chemical cleaning agents such as alcohol, acetone or diluents for cellulose lacquers.

### Operation

1. Operating the products requires special training and intense concentration. Make sure that persons who use the products are physically, mentally and emotionally fit enough to do so; otherwise, injuries or material damage may occur. It is the responsibility of the employer/operator to select suitable personnel for operating the products.
2. Before you move or transport the product, read and observe the section titled "Transport".
3. As with all industrially manufactured goods, the use of substances that induce an allergic reaction (allergens) such as nickel cannot be generally excluded. If you develop an allergic reaction (such as a skin rash, frequent sneezing, red eyes or respiratory difficulties) when using a Rohde & Schwarz product, consult a physician immediately to determine the cause and to prevent health problems or stress.
4. Before you start processing the product mechanically and/or thermally, or before you take it apart, be sure to read and pay special attention to the section titled "Waste disposal", item 1.
5. Depending on the function, certain products such as RF radio equipment can produce an elevated level of electromagnetic radiation. Considering that unborn babies require increased protection, pregnant women must be protected by appropriate measures. Persons with pacemakers may also be exposed to risks from electromagnetic radiation. The employer/operator must evaluate workplaces where there is a special risk of exposure to radiation and, if necessary, take measures to avert the potential danger.
6. Should a fire occur, the product may release hazardous substances (gases, fluids, etc.) that can cause health problems. Therefore, suitable measures must be taken, e.g. protective masks and protective clothing must be worn.
7. If a laser product (e.g. a CD/DVD drive) is integrated into a Rohde & Schwarz product, absolutely no other settings or functions may be used as described in the product documentation. The objective is to prevent personal injury (e.g. due to laser beams).

### Repair and service

1. The product may be opened only by authorized, specially trained personnel. Before any work is performed on the product or before the product is opened, it must be disconnected from the AC supply network. Otherwise, personnel will be exposed to the risk of an electric shock.
2. Adjustments, replacement of parts, maintenance and repair may be performed only by electrical experts authorized by Rohde & Schwarz. Only original parts may be used for replacing parts relevant to safety (e.g. power switches, power transformers, fuses). A safety test must always be performed after parts relevant to safety have been replaced (visual inspection, PE conductor test, insulation resistance measurement, leakage current measurement, functional test). This helps ensure the continued safety of the product.

### Batteries and rechargeable batteries/cells

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

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

### Transport

1. The product may be very heavy. Therefore, the product must be handled with care. In some cases, the user may require a suitable means of lifting or moving the product (e.g. with a lift-truck) to avoid back or other physical injuries.

2. Handles on the products are designed exclusively to enable personnel to transport the product. It is therefore not permissible to use handles to fasten the product to or on transport equipment such as cranes, fork lifts, wagons, etc. The user is responsible for securely fastening the products to or on the means of transport or lifting. Observe the safety regulations of the manufacturer of the means of transport or lifting. Noncompliance can result in personal injury or material damage.
3. If you use the product in a vehicle, it is the sole responsibility of the driver to drive the vehicle safely and properly. The manufacturer assumes no responsibility for accidents or collisions. Never use the product in a moving vehicle if doing so could distract the driver of the vehicle. Adequately secure the product in the vehicle to prevent injuries or other damage in the event of an accident.

### **Waste disposal**

1. If products or their components are mechanically and/or thermally processed in a manner that goes beyond their intended use, hazardous substances (heavy-metal dust such as lead, beryllium, nickel) may be released. For this reason, the product may only be disassembled by specially trained personnel. Improper disassembly may be hazardous to your health. National waste disposal regulations must be observed.
2. If handling the product releases hazardous substances or fuels that must be disposed of in a special way, e.g. coolants or engine oils that must be replenished regularly, the safety instructions of the manufacturer of the hazardous substances or fuels and the applicable regional waste disposal regulations must be observed. Also observe the relevant safety instructions in the product documentation. The improper disposal of hazardous substances or fuels can cause health problems and lead to environmental damage.

## Informaciones elementales de seguridad

### **Es imprescindible leer y observar las siguientes instrucciones e informaciones de seguridad!**

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

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



## Informaciones elementales de seguridad

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

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

### Símbolos y definiciones de seguridad

							
Aviso: punto de peligro general  Observar la documentación del producto	Atención en el manejo de dispositivos de peso elevado	Peligro de choque eléctrico	Advertencia: superficie caliente	Conexión a conductor de protección	Conexión a tierra	Conexión a masa	Aviso: Cuidado en el manejo de dispositivos sensibles a la electrostática (ESD)

					
Tensión de alimentación de PUESTA EN MARCHA / PARADA	Indicación de estado de espera (Standby)	Corriente continua (DC)	Corriente alterna (AC)	Corriente continua / Corriente alterna (DC/AC)	El aparato está protegido en su totalidad por un aislamiento doble (reforzado)

## Palabras de señal y su significado

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



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



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



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



AVISO indica la posibilidad de utilizar mal el producto y, como consecuencia, dañarlo.

En la documentación del producto se emplea de forma sinónima el término CUIDADO.

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

## Estados operativos y posiciones de funcionamiento

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

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

## Seguridad eléctrica

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

1. Antes de la puesta en marcha del producto se deberá comprobar siempre que la tensión preseleccionada en el producto coincida con la de la red de alimentación eléctrica. Si es necesario modificar el ajuste de tensión, también se deberán cambiar en caso dado los fusibles correspondientes del producto.
2. Los productos de la clase de protección I con alimentación móvil y enchufe individual solamente podrán enchufarse a tomas de corriente con contacto de seguridad y con conductor de protección conectado.
3. Queda prohibida la interrupción intencionada del conductor de protección, tanto en la toma de corriente como en el mismo producto. La interrupción puede tener como consecuencia el riesgo de que el producto sea fuente de choques eléctricos. Si se utilizan cables alargadores o regletas de enchufe, deberá garantizarse la realización de un examen regular de los mismos en cuanto a su estado técnico de seguridad.
4. Si el producto no está equipado con un interruptor para desconectarlo de la red, se deberá considerar el enchufe del cable de conexión como interruptor. En estos casos se deberá asegurar que el enchufe siempre sea de fácil acceso (de acuerdo con la longitud del cable de conexión, 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 bastidores o instalaciones, se deberá colocar el interruptor en el nivel de la instalación.
5. No utilice nunca el producto si está dañado el cable de conexión a red. Compruebe regularmente el correcto estado de los cables de conexión a red. Asegúrese, mediante las medidas de protección y de instalación adecuadas, de que el cable de conexión a red no pueda ser dañado o de que nadie pueda ser dañado por él, p. ej. al tropezar o por un choque eléctrico.
6. Solamente está permitido el funcionamiento en redes de alimentación TN/TT aseguradas con fusibles de 16 A como máximo (utilización de fusibles de mayor amperaje solo previa consulta con el grupo de empresas Rohde & Schwarz).
7. Nunca conecte el enchufe en tomas de corriente sucias o llenas de polvo. Introduzca el enchufe por completo y fuertemente en la toma de corriente. La no observación de estas medidas puede provocar chispas, fuego y/o lesiones.
8. No sobrecargue las tomas de corriente, los cables alargadores o las regletas de enchufe ya que esto podría causar fuego o choques eléctricos.
9. En las mediciones en circuitos de corriente con una tensión  $U_{\text{eff}} > 30 \text{ V}$  se deberán tomar las medidas apropiadas para impedir cualquier peligro (p. ej. medios de medición adecuados, seguros, limitación de tensión, corte protector, aislamiento etc.).
10. Para la conexión con dispositivos informáticos como un PC o un ordenador industrial, debe comprobarse que éstos cumplan los estándares IEC60950-1/EN60950-1 o IEC61010-1/EN 61010-1 válidos en cada caso.
11. A menos que esté permitido expresamente, no retire nunca la tapa ni componentes de la carcasa mientras el producto esté en servicio. Esto pone a descubierto los cables y componentes eléctricos y puede causar lesiones, fuego o daños en el producto.

12. Si un producto se instala en un lugar fijo, se deberá primero conectar el conductor de protección fijo con el conductor de protección del producto antes de hacer cualquier otra conexión. La instalación y la conexión deberán ser efectuadas por un electricista especializado.
13. En el caso de dispositivos fijos que no estén provistos de fusibles, interruptor automático ni otros mecanismos de seguridad similares, el circuito de alimentación debe estar protegido de modo que todas las personas que puedan acceder al producto, así como el producto mismo, estén a salvo de posibles daños.
14. Todo producto debe estar protegido contra sobretensión (debida p. ej. a una caída del rayo) mediante los correspondientes sistemas de protección. Si no, el personal que lo utilice quedará expuesto al peligro de choque eléctrico.
15. No debe introducirse en los orificios de la caja del aparato ningún objeto que no esté destinado a ello. Esto puede producir cortocircuitos en el producto y/o puede causar choques eléctricos, fuego o lesiones.
16. Salvo indicación contraria, los productos no están impermeabilizados (ver también el capítulo "Estados operativos y posiciones de funcionamiento", punto 1). Por eso es necesario tomar las medidas necesarias para evitar la entrada de líquidos. En caso contrario, existe peligro de choque eléctrico para el usuario o de daños en el producto, que también pueden redundar en peligro para las personas.
17. No utilice el producto en condiciones en las que pueda producirse o ya se hayan producido condensaciones sobre el producto o en el interior de éste, como p. ej. al desplazarlo de un lugar frío a otro caliente. La entrada de agua aumenta el riesgo de choque eléctrico.
18. Antes de la limpieza, desconecte por completo el producto de la alimentación de tensión (p. ej. red de alimentación o batería). Realice la limpieza de los aparatos con un paño suave, que no se deshilache. No utilice bajo ningún concepto productos de limpieza químicos como alcohol, acetona o diluyentes para lacas nitrocelulósicas.

## Funcionamiento

1. El uso del producto requiere instrucciones especiales y una alta concentración durante el manejo. Debe asegurarse que las personas que manejen el producto estén a la altura de los requerimientos necesarios en cuanto a aptitudes físicas, psíquicas y emocionales, ya que de otra manera no se pueden excluir lesiones o daños de objetos. El empresario u operador es responsable de seleccionar el personal usuario apto para el manejo del producto.
2. Antes de desplazar o transportar el producto, lea y tenga en cuenta el capítulo "Transporte".
3. Como con todo producto de fabricación industrial no puede quedar excluida en general la posibilidad de que se produzcan alergias provocadas por algunos materiales empleados, los llamados alérgenos (p. ej. el níquel). Si durante el manejo de productos Rohde & Schwarz se producen reacciones alérgicas, como p. ej. irritaciones cutáneas, estornudos continuos, enrojecimiento de la conjuntiva o dificultades respiratorias, debe avisarse inmediatamente a un médico para investigar las causas y evitar cualquier molestia o daño a la salud.
4. Antes de la manipulación mecánica y/o térmica o el desmontaje del producto, debe tenerse en cuenta imprescindiblemente el capítulo "Eliminación", punto 1.

5. Ciertos productos, como p. ej. las instalaciones de radiocomunicación RF, pueden a causa de su función natural, emitir una radiación electromagnética aumentada. Deben tomarse todas las medidas necesarias para la protección de las mujeres embarazadas. También las personas con marcapasos pueden correr peligro a causa de la radiación electromagnética. El empresario/operador tiene la obligación de evaluar y señalar las áreas de trabajo en las que exista un riesgo elevado de exposición a radiaciones.
6. Tenga en cuenta que en caso de incendio pueden desprenderse del producto sustancias tóxicas (gases, líquidos etc.) que pueden generar daños a la salud. Por eso, en caso de incendio deben usarse medidas adecuadas, como p. ej. máscaras antigás e indumentaria de protección.
7. En caso de que un producto Rohde & Schwarz contenga un producto láser (p. ej. un lector de CD/DVD), no debe usarse ninguna otra configuración o función aparte de las descritas en la documentación del producto, a fin de evitar lesiones (p. ej. debidas a irradiación láser).

### **Reparación y mantenimiento**

1. El producto solamente debe ser abierto por personal especializado con autorización para ello. Antes de manipular el producto o abrirlo, es obligatorio desconectarlo de la tensión de alimentación, para evitar toda posibilidad de choque eléctrico.
2. El ajuste, el cambio de partes, el mantenimiento y la reparación deberán ser efectuadas solamente por electricistas autorizados por Rohde & Schwarz. Si se reponen partes con importancia para los aspectos de seguridad (p. ej. el enchufe, los transformadores o los fusibles), solamente podrán ser sustituidos por partes originales. Después de cada cambio de partes relevantes para la seguridad deberá realizarse un control de seguridad (control a primera vista, control del conductor de protección, medición de resistencia de aislamiento, medición de la corriente de fuga, control de funcionamiento). Con esto queda garantizada la seguridad del producto.

### **Baterías y acumuladores o celdas**

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

1. No deben desmontarse, abrirse ni triturarse las celdas.
2. Las celdas o baterías no deben someterse a calor ni fuego. Debe evitarse el almacenamiento a la luz directa del sol. Las celdas y baterías deben mantenerse limpias y secas. Limpiar las conexiones sucias con un paño seco y limpio.
3. Las celdas o baterías no deben cortocircuitarse. Es peligroso almacenar las celdas o baterías en estuches o cajones en cuyo interior puedan cortocircuitarse por contacto recíproco o por contacto con otros materiales conductores. No deben extraerse las celdas o baterías de sus embalajes originales hasta el momento en que vayan a utilizarse.
4. Mantener baterías y celdas fuera del alcance de los niños. En caso de ingestión de una celda o batería, avisar inmediatamente a un médico.
5. Las celdas o baterías no deben someterse a impactos mecánicos fuertes indebidos.

## Informaciones elementales de seguridad

6. En caso de falta de estanqueidad de una celda, el líquido vertido no debe entrar en contacto con la piel ni los ojos. Si se produce contacto, lavar con agua abundante la zona afectada y avisar a un médico.
7. En caso de cambio o recarga inadecuados, las celdas o baterías que contienen electrolitos alcalinos (p. ej. las celdas de litio) pueden explotar. Para garantizar la seguridad del producto, las celdas o baterías solo deben ser sustituidas por el tipo Rohde & Schwarz correspondiente (ver lista de recambios).
8. Las baterías y celdas deben reciclarse y no deben tirarse a la basura doméstica. Las baterías o acumuladores que contienen plomo, mercurio o cadmio deben tratarse como residuos especiales. Respete en esta relación las normas nacionales de eliminación y reciclaje.

### Transporte

1. El producto puede tener un peso elevado. Por eso es necesario desplazarlo o transportarlo con precaución y, si es necesario, usando un sistema de elevación adecuado (p. ej. una carretilla elevadora), a fin de evitar lesiones en la espalda u otros daños personales.
2. Las asas instaladas en los productos sirven solamente de ayuda para el transporte del producto por personas. Por eso no está permitido utilizar las asas para la sujeción en o sobre medios de transporte como p. ej. grúas, carretillas elevadoras de horquilla, carros etc. Es responsabilidad suya fijar los productos de manera segura a los medios de transporte o elevación. Para evitar daños personales o daños en el producto, siga las instrucciones de seguridad del fabricante del medio de transporte o elevación utilizado.
3. Si se utiliza el producto dentro de un vehículo, recae de manera exclusiva en el conductor la responsabilidad de conducir el vehículo de manera segura y adecuada. El fabricante no asumirá ninguna responsabilidad por accidentes o colisiones. No utilice nunca el producto dentro de un vehículo en movimiento si esto pudiera distraer al conductor. Asegure el producto dentro del vehículo debidamente para evitar, en caso de un accidente, lesiones u otra clase de daños.

### Eliminación

1. Si se trabaja de manera mecánica y/o térmica cualquier producto o componente más allá del funcionamiento previsto, pueden liberarse sustancias peligrosas (polvos con contenido de metales pesados como p. ej. plomo, berilio o níquel). Por eso el producto solo debe ser desmontado por personal especializado con formación adecuada. Un desmontaje inadecuado puede ocasionar daños para la salud. Se deben tener en cuenta las directivas nacionales referentes a la eliminación de residuos.
2. En caso de que durante el trato del producto se formen sustancias peligrosas o combustibles que deban tratarse como residuos especiales (p. ej. refrigerantes o aceites de motor con intervalos de cambio definidos), deben tenerse en cuenta las indicaciones de seguridad del fabricante de dichas sustancias y las normas regionales de eliminación de residuos. Tenga en cuenta también en caso necesario las indicaciones de seguridad especiales contenidas en la documentación del producto. La eliminación incorrecta de sustancias peligrosas o combustibles puede causar daños a la salud o daños al medio ambiente.

# Qualitätszertifikat

## Certificate of quality

## Certificat de qualité

Certified Quality System  
**ISO 9001**

Certified Environmental System  
**ISO 14001**

### **Sehr geehrter Kunde,**

Sie haben sich für den Kauf eines Rohde&Schwarz-Produktes entschieden. Hiermit erhalten Sie ein nach modernsten Fertigungsmethoden hergestelltes Produkt. Es wurde nach den Regeln unseres Qualitätsmanagementsystems entwickelt, gefertigt und geprüft. Das Rohde&Schwarz-Qualitätsmanagementsystem ist u.a. nach ISO9001 und ISO14001 zertifiziert.

### **Der Umwelt verpflichtet**

- ▮ Energie-effiziente, RoHS-konforme Produkte
- ▮ Kontinuierliche Weiterentwicklung nachhaltiger Umweltkonzepte
- ▮ ISO 14001-zertifiziertes Umweltmanagementsystem

### **Dear Customer,**

You have decided to buy a Rohde&Schwarz product. You are thus assured of receiving a product that is manufactured using the most modern methods available. This product was developed, manufactured and tested in compliance with our quality management system standards. The Rohde&Schwarz quality management system is certified according to standards such as ISO9001 and ISO14001.

### **Environmental commitment**

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

### **Cher client,**

Vous avez choisi d'acheter un produit Rohde&Schwarz. Vous disposez donc d'un produit fabriqué d'après les méthodes les plus avancées. Le développement, la fabrication et les tests respectent nos normes de gestion qualité. Le système de gestion qualité de Rohde&Schwarz a été homologué, entre autres, conformément aux normes ISO9001 et ISO14001.

### **Engagement écologique**

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

# Customer Support

## Technical support – where and when you need it

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

## Up-to-date information and upgrades

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

### Europe, Africa, Middle East

Phone +49 89 4129 12345  
[customersupport@rohde-schwarz.com](mailto:customersupport@rohde-schwarz.com)

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# 1 Preface

## 1.1 Documentation Overview

The user documentation for the R&S Signal Generator consists of the following parts:

- Online Help system on the instrument,
- "Quick Start Guide" printed manual,
- Documentation CD-ROM with:
  - Online help system (\*.chm) as a standalone help,
  - Operating Manuals for base unit and options,
  - Service Manual,
  - Data sheet and specifications,
  - Links to useful sites on the R&S internet.

### Online Help

The Online Help is embedded in the instrument's firmware. It offers quick, context-sensitive access to the complete information needed for operation and programming. The online help contains help on operating the R&S Signal Generator and all available options.

### Quick Start Guide

The Quick Start Guide is delivered with the instrument in printed form and in PDF format on the Documentation CD-ROM. It provides the information needed to set up and start working with the instrument. Basic operations and an example of setup are described. The manual includes also general information, e.g., Safety Instructions.

### Operating Manuals

The Operating Manuals are a supplement to the Quick Start Guide. Operating Manuals are provided for the base unit and each additional (software) option.

These manuals are available in PDF format - in printable form - on the Documentation CD-ROM delivered with the instrument. In the Operating Manual for the base unit, all instrument functions are described in detail. Furthermore, it provides an introduction to remote control and a complete description of the remote control commands with programming examples. Information on maintenance, instrument interfaces and error messages is also given.

In the individual option manuals, the specific instrument functions of the option are described in detail. For additional information on default settings and parameters, refer to the data sheets. Basic information on operating the R&S Signal Generator is not included in the option manuals.

These manuals can also be orderd in printed form (see ordering information in the data sheet).

### Service Manual

The Service Manual is available in PDF format - in printable form - on the Documentation CD-ROM delivered with the instrument. It describes how to check compliance with rated specifications, on instrument function, repair, troubleshooting and fault elimination. It contains all information required for repairing the instrument by the replacement of modules.

This manual can also be orderd in printed form (see ordering information in the data sheet).

### Release Notes

The release notes describe new and modified functions, eliminated problems, and last minute changes to the documentation. The corresponding firmware version is indicated on the title page of the release notes. The current release notes are provided in the Internet.

## 1.2 Typographical Conventions

The following text markers are used throughout this documentation:

Convention	Description
"Graphical user interface elements"	All names of graphical user interface elements on the screen, such as dialog boxes, menus, options, buttons, and softkeys are enclosed by quotation marks.
KEYS	Key names are written in capital letters.
File names, commands, program code	File names, commands, coding samples and screen output are distinguished by their font.
<i>Input</i>	Input to be entered by the user is displayed in italics.
<a href="#">Links</a>	Links that you can click are displayed in blue font.
"References"	References to other parts of the documentation are enclosed by quotation marks.

## 2 Introduction

The R&S Signal Generator provides you with the ability to generate signals in accordance with the Institute of Electrical and Electronics Engineers (IEEE 802.16-2004) standard.

WiMAX is a wireless metropolitan-area network technology that provides interoperable broadband wireless connectivity to fixed and portable users. It provides up to 50 kilometers of service area, allows users to get broadband connectivity without the need of direct line-of-sight to the base station, and provides total data rates up to 75 Mbps - enough bandwidth to simultaneously support hundreds of businesses and homes with a single base station.

The R&S Signal Generator generates the IEEE 802.16 WiMAX signals in the arbitrary waveform mode; the signal is first calculated and then output.

The R&S Signal Generator simulates IEEE 802.16 WiMAX at the physical level.

Supported features include:

- Configuration of OFDM (orthogonal frequency division multiplexing) and OFDMA (orthogonal frequency division multiple access) physical layer mode.
- Downlink and Uplink mode.
- Pre-defined settings for receiver tests.
- All frame duration settings defined by the standard, including a "user" mode with freely configurable Frame Duration, and a "continuous" mode. In "continuous" mode, gaps between bursts/subframes are eliminated.
- Sequence length of up to 511 frames.
- Up to 64 bursts per frame/zone with independent power setting.
- Channel bandwidth and sampling rate settings according to the ETSI, MMDS, WCS, U-NII or WiBro bands, or alternatively arbitrary settings in "User" mode.
- Full RS/CC, CC and CTC channel coding.
- BPSK, QPSK, 16-QAM or 64-QAM modulation, independently configurable for any of the 64 bursts.
- FCH, DL-MAP and UL-MAP burst generation in "automatic" mode (using signal configuration parameters set by the user) or in "user" mode, with arbitrary data.
- Ranging Bursts in uplink
- Up to 8 Zones per frame in OFDMA mode
- Predefined data sources such as PN9, PN11 and others, or arbitrary user data.
- Optional generic MAC headers and CRC for each burst.
- Subchannelization modes.
- Clipping for reducing the crest factor.

**Table 2-1: Parameters of the modulation system IEEE 802.16 WiMAX**

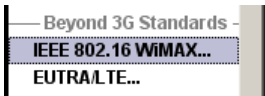
Digital standard 802.16-2004	meets IEEE Std 802.16™-2004/Cor2/D4 and 802.16e-2005
Physical layer modes	OFDM, OFDMA, OFDMA – WiBro
Link direction	forward link and reverse link

<b>Digital standard 802.16-2004</b>	<b>meets IEEE Std 802.16™-2004/Cor2/D4 and 802.16e-2005</b>
Frame durations	2, 2.5, 4, 5, 8, 10, 12.5, 20 ms, continuous, user definable
Sequence length	1 – 511 frames (depending on frame duration)
Clipping	Vector or scalar clipping, applied before filtering
Marker modes	Restart, frame start, frame active part, pulse, pattern, on/off ratio
<b>Parameters in OFDM Mode</b>	
Duplexing	TDD, FDD
Predefined frames	Short, mid and long length test messages for testing receivers with all modulation types and RS-CC rates
Level reference	FCH/Burst or preamble level
Frequency bands	ETSI, MMDS, WCS, U-NII, User
Channel bandwidth	1.25 – 30 MHz, depending on selected frequency band
Sampling rate	1.5 – 32 MHz, depending on channel bandwidth
Tg / Tb settings	1/4, 1/8, 1/16, 1/32
FFT size	256 (fixed)
Nr. Of possible subchannels in subchannelization mode	1, 2, 4, 8, 16 (all)
Nr. Of bursts per frame	0 – 64
Preamble / midamble modes	Burst preamble / midambles off, burst preamble in downlink, midamble repetition 5, 9 or 17 in uplink
Modulation & RS-CC rates	BPSK 1/2, QPSK 1/2, QPSK 3/4, 16-QAM 1/2, 16-QAM 3/4, 64-QAM 2/3, 64-QAM 3/4
Data	all 0 , all 1, pattern (up to 64 bit), PN 9 to PN 23, data lists
Burst power range	-80 dB - +10 dB
MAC functions	One generic MAC header + CRC available per burst
<b>Parameters in OFDMA Mode</b>	
Duplexing	TDD
Level reference	Subframe RMS Power or preamble level (downlink only)
Frequency bands	ETSI, MMDS, WCS, U-NII, WiBro, User
Channel bandwidth	1.25 – 30 MHz, depending on selected frequency band
Sampling rate	1.5 – 32 MHz, depending on channel bandwidth
Tg / Tb settings	1/4, 1/8, 1/16, 1/32



<b>Digital standard 802.16-2004</b>	<b>meets IEEE Std 802.16™-2004/Cor2/D4 and 802.16e-2005</b>
FFT size	128, 512, 1024 or 2048
Subcarrier Permutation	PUSC, FUSC (downlink only), AMC 2x3, Sounding (uplink only)
Nr. Of bursts per frame	0 – 64
Modulation & CC rates	QPSK ½, QPSK ¼, 16-QAM ½, 16-QAM ¼, 64-QAM ½, 64-QAM 2/3, 64-QAM ¼, 64-QAM 5/6
Data	all 0 , all 1, pattern (up to 64 bit), PN 9 to PN 23, data lists
Burst power range	-80 dB - +10 dB
MAC functions	One generic MAC header + CRC available per burst
<b>Parameters in OFDMA - WiBro Mode (identical to OFDMA)</b>	
Duplexing	TDD
Level reference	Subframe RMS Power or preamble level (downlink only)
Frequency bands	ETSI, MMDS, WCS, U-NII, WiBro, User
Channel bandwidth	1.25 – 30 MHz, depending on selected frequency band
Sampling rate	1.5 – 32 MHz, depending on channel bandwidth
Tg / Tb settings	¼, 1/8, 1/16, 1/32
FFT size	128, 512, 1024 or 2048
Subcarrier Permutation	PUSC, FUSC (downlink only), AMC 2x3, Sounding (uplink only)
Nr. Of bursts per frame	0 – 64
Modulation & CC rates	QPSK ½, QPSK ¼, 16-QAM ½, 16-QAM ¼, 64-QAM ½, 64-QAM 2/3, 64-QAM ¼, 64-QAM 5/6
Data	all 0 , all 1, pattern (up to 64 bit), PN 9 to PN 23, data lists
Burst power range	-80 dB - +10 dB
MAC functions	One generic MAC header + CRC available per burst

### 3 WiMAX User Interface

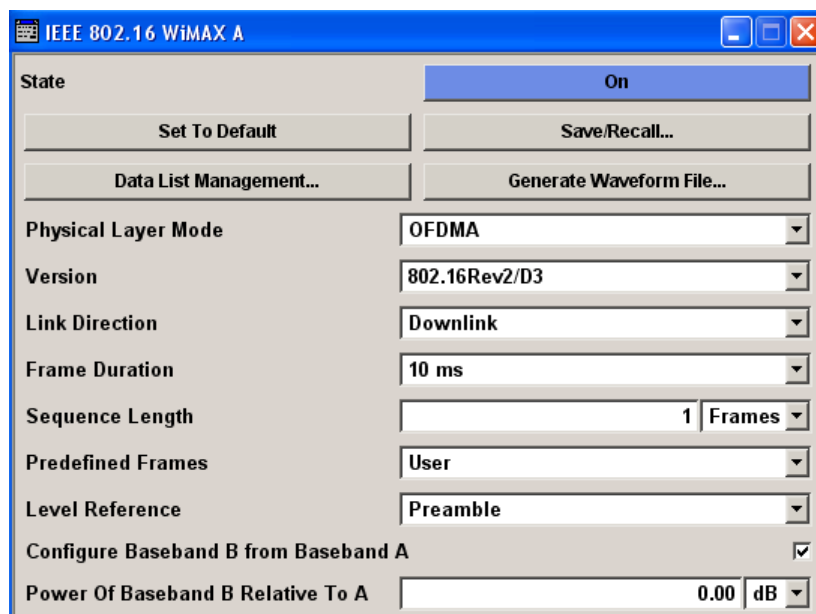


The menu for setting the IEEE 802.16 WiMAX digital standard is either called from the baseband block or from the menu tree under "Baseband".

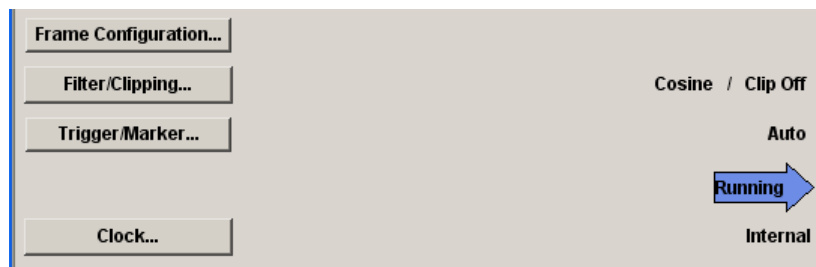
The menu is split into several sections for configuring the standard. The choice of transmission direction determines which displays and parameters are made available in the lower section.

The upper section of the menu is where the IEEE 802.16 WiMAX digital standard is enabled, the default settings are called and the physical layer mode, the duplexing and the transmission direction are selected. Additional parameters include Frame Duration, Sequence Length and a set of Predefined Frames for receiver testing.

A button leads to the submenu for loading and saving the IEEE 802.16 WiMAX configuration.



The buttons of the lower menu section lead to submenus for configuring the frame and for setting the filter, clipping, trigger, and clock parameters.



### 3.1 General Settings for WiMAX Signals

The upper menu section is where the IEEE 802.16 WiMAX digital standard is enabled and reset and where all the settings for the signal in both transmission directions are made.

#### State

Enables/disables the IEEE 802.16 WiMAX standard.

Enabling this standard disables all the other digital standards and digital modulation modes.

In case of two-path instruments, this affects the same path.

**Note:** For two path instruments and enabled parameter Use of Baseband A+B, enabling the WiMAX signal simulation will disable all other digital standards and digital modulation modes even in the path B.

The IEEE 802.16 WiMAX signal is generated in arbitrary waveform mode.

SCPI command:

[\[:SOURce<hw>\]:BB:WIMax:STATe](#) on page 115

#### Set to Default

Calls the default settings. The following table gives an overview of the settings. The preset value for each parameter is specified in the description of the remote-control commands.

Parameter	Value
General Settings	
State	Not affected by Set to default
Physical Layer Mode	OFDM
Version	802.16-2004/Cor1-2005 and 802.16e-2005
Duplexing	TDD
Link Direction	Downlink
Frame Duration	10 ms
Sequence Length	1 frame
Predefined Frames	User
Level Reference	FCH/Burst
Clipping	Off
<b>OFDM mode</b>	
Frequency Band	ETSI
Channel Bandwidth	1.75 MHz
Sampling Rate	2.00 MHz
BSID (4 LSBs)	0
Tg/Tb	1/4

Parameter	Value
Nr. of used Subchannels	16 (all)
Frame Preamble	Long
FCH Configuration	On, Auto mode, Frame Number Offset = 0 and Configuration Change Count = 0
Nr. of Bursts	1
<b>OFDMA mode</b>	
Frequency Band	ETSI
Channel Bandwidth	1.75 MHz
Sampling Rate	2.00 MHz
n =	8/7
Tg/Tb	1/4
FFT Size	2048
Subcarrier Permutation	PUSC
Subchannel 0 ... 59 State	ON
<b>OFDMA - WiBro mode</b>	
Frequency Band	WiBro
Channel Bandwidth	8.75 MHz
Sampling Rate	10 MHz
n =	8/7
Tg/Tb	1/8
FFT Size	1024
Subcarrier Permutation	PUSC
Subchannel 0 ... 59 State	ON
Frame Duration	5 ms

SCPI command:

[ :SOURce<hw> ] :BB:WIMax:PRESet on page 113

### Save/Recall

Calls the "Save/Recall" menu.

From the "Save/Recall" menu, the "File Select" windows for saving and recalling IEEE 802.16 WiMAX configurations and the "File Manager" can be called.



IEEE 802.16 WiMAX configurations are stored as files with the predefined file extension \*.wimax. The file name and the directory they are stored in are user-definable.

The complete settings in the "IEEE 802.16 WiMAX" menu are saved and recalled.

- |                        |  |
|------------------------|--|
| "Recall WiMAX Setting" | Opens the "File Select" window for loading a saved IEEE 802.16 WiMAX configuration.<br>The configuration of the selected (highlighted) file is loaded by pressing the "Select" button.   |
| "Save WiMAX Setting"   | Opens the "File Select" window for saving the current IEEE 802.16 WiMAX signal configuration.<br>The name of the file is specified in the "File name" entry field, the directory selected in the "save into" field. The file is saved by pressing the "Save" button. |
| "File Manager"         | Calls the "File Manager".<br>The "File Manager" is used to copy, delete, and rename files and to create new directories.   |

SCPI command:

[\[:SOURce<hw>\]:BB:WIMax:SETTing:CATalog](#) on page 113

[\[:SOURce<hw>\]:BB:WIMax:SETTing:LOAD](#) on page 114

[\[:SOURce<hw>\]:BB:WIMax:SETTing:STORE](#) on page 114

[\[:SOURce<hw>\]:BB:WIMax:SETTing:DELeTe](#) on page 114

### Data List Management...

Calls the "Data List Management" menu. This menu is used to create and edit a data list.



All data lists are stored as files with the predefined file extension \*.dm\_iqd. The file name and the directory they are stored in are user-definable.

The data lists must be selected as a data source from the submenus under the individual function, e.g. in the channel table of the cells.

**Note:** All data lists are generated and edited by means of the SOURce:BB:DM subsystem commands. Files containing data lists usually end with \*.dm\_iqd. The data lists are selected as a data source for a specific function in the individual subsystems of the digital standard.

**Example: Creating and editing the data list**

```
SOUR:BB:DM:DLIS:SEL "d_list1"
SOUR:BB:DM:DLIS:DATA #B1111010101000001111....
SOUR:BB:DM:DLIS:DATA:APP #B1111010101000001111....
```

SCPI command:

[\[:SOURce<hw>\]:BB:WIMax:AOFDM\[:ZONE<st0>\]:BURSt<ch0>:DATA](#)

on page 161

[\[:SOURce<hw>\]:BB:WIMax:AOFDM\[:ZONE<st0>\]:BURSt<ch0>:DATA:DSElect](#)

on page 162

[\[:SOURce<hw>\]:BB:WIMax:OFDM:BURSt<ch0>:DATA](#) on page 198

[\[:SOURce<hw>\]:BB:WIMax:OFDM:BURSt<ch0>:DATA:DSElect](#) on page 198

[\[:SOURce<hw>\]:BB:WIMax:OFDM:FCH:DATA](#) on page 208

[\[:SOURce<hw>\]:BB:WIMax:OFDM:FCH:DATA:DSElect](#) on page 208

**Generate Waveform File...**

Calls the "Generate Waveform" menu. This menu is used to store the current WiMAX signal as ARB signal in a waveform file.

This file can be loaded in the "ARB" menu and processed as multicarrier or multisegment signal.

The file name is entered in the submenu. The file is stored with the predefined file extension \*.wv. The file name and the directory it is stored in are user-definable.

SCPI command:

[\[:SOURce<hw>\]:BB:WIMax:WAVeform:CREate](#) on page 116

**Physical Layer Mode**

Selects the physical layer mode.

The settings of the frame are provided in the submenu "Frame Configuration" (see [Frame Configuration OFDM](#)) in accordance with the selection.

- |         |  |
|---------|--|
| "OFDM"  | The OFDM mode supports signal generation according to IEEE 802.16-2004 section 8.3 with a fixed FFT size of 256.   |
| "OFDMA" | Orthogonal Frequency Division Multiple Access (OFDMA) groups multiple subcarriers of the OFDM into sub-channels. A single client or subscriber station might transmit using all of the sub-channels within the carrier space, or multiple clients might transmit with each using a portion of the total number of sub-channels simultaneously. OFDMA thus enables a more flexible use of resources. It can support nomadic and mobile operation. |

"OFDMA - WiBro" The OFDMA – WiBro (Wireless Broadband) mode groups multiple sub-carriers of the OFDM into sub-channels. A single client or subscriber station might transmit using all of the sub-channels within the carrier space, or multiple clients might transmit with each using a portion of the total number of sub-channels simultaneously. OFDMA thus enables a more flexible use of resources. It can support nomadic and mobile operation.

The OFDMA – WiBro mode is identical to the OFDMA mode. When selecting OFDMA – WiBro, these parameters are set to their WiBro defaults (see [Set to Default](#)):

- Frame Duration: 5ms
- Frequency Band: WiBro
- Channel Bandwidth: 8.75 MHz
- Sampling Rate: 10 MHz
- Tg/Tb: 1/8
- FFT Size: 1024

SCPI command:

[\[:SOURCE<hw>\]:BB:WIMax:MODE](#) on page 111

### Version

Selects the version of the standard to use.

"802.16 Rev2/D3" Selecting "802.16 Rev2/D3" ensures that all signal parameters are in line with the latest Revision 2 version of the standard. Using this mode is recommended.

"802.16-2004/Cor1-2005 and 802.16e-2005" Selecting 802.16-2004/Cor1-2005 and 802.16e-2005 provides backward compatibility for devices that do not yet comply with the latest Release 2 version.

SCPI command:

[\[:SOURCE<hw>\]\[:BB\]:WIMax:SVERsion](#) on page 116

### Duplexing

Selects the duplexing. The duplexing mode determines how the uplink and downlink signals are separated.

"TDD" In TDD mode, the same frequency is used for both directions of transmission (uplink and downlink). With one baseband, either downlink or uplink frames can be generated.

"FDD (OFDM only)" In FDD mode, different frequencies are used for downlink and uplink directions. If only one link direction is considered at once, the IEEE 802.16 standard defines no differences between TDD and FDD signals on the physical layer.

The FDD mode has been provided for convenience, it completely fills the defined frame with bursts to simulate a continuous transmission environment. It is recommended to use TDD mode instead if FDD devices are to be tested with frames including transmission gaps.

SCPI command:

[\[:SOURCE<hw>\]:BB:WIMax:DUPLExing](#) on page 109

**Link Direction**

Selects the transmission direction.

"Downlink" The transmission direction selected is base station to subscriber station. The signal corresponds to that of a base station.

"Uplink" The transmission direction selected is subscriber station to base station. The signal corresponds to that of a subscriber station.

SCPI command:

[ :SOURce<hw> ] :BB:WiMax:LINK on page 110

**Frame Duration**

Selects the frame duration.

Only distinct values are allowed in the standard. For test reasons, continuous generation or generation for a freely selectable duration (User) are available. In continuous mode, the frame duration equals the sum of the burst durations in OFDM mode or the subframe duration in OFDMA mode.

SCPI command:

[ :SOURce<hw> ] :BB:WiMax:FRAMe:TIME on page 110

**User Frame Duration**

(available for Frame Duration set to User)

Sets the frame duration for selection User. The values are freely selectable.

SCPI command:

[ :SOURce<hw> ] :BB:WiMax:FRAMe:TIME:USER on page 110

**Downlink Subframe Duration**

(available for uplink direction in TDD mode)

Delays the first uplink burst by the set time duration.

SCPI command:

[ :SOURce<hw> ] :BB:WiMax:SUBFrame:TIME on page 115

**Initial Delay of Burst 1**

(available for the uplink direction in FDD mode with physical layer mode OFDM)

Delays the first uplink burst by the set time duration.

In FDD mode, this parameter is provided for convenience to enable a constant delay of the signal with respect to an internal or external frame trigger.

SCPI command:

[ :SOURce<hw> ] :BB:WiMax:FRAMe:BURSt:DELay on page 109

**Sequence Length**

Sets the sequence length of the signal in number of frames. The signal is calculated in advance and output in the arbitrary waveform generator. Burst data sources are continuously read over the whole sequence length.

SCPI command:

[ :SOURce<hw> ] :BB:WiMax:SELENgth on page 115



**Predefined Frames**

Selects the frame type.

"Test Message BPSK 1/2 Short, Test Message BPSK 1/2 Mid, ...(OFDM only)"  
 Predefined setups for receiver test messages according to IEEE 802.16-2004 section 8.3.11

"Downlink/Uplink 35MHz QPSK 1/2, Downlink/Uplink 35MHz QPSK 3/4,... (OFDMA/OFDMA-WiBro only)"  
 Predefined setups for receiver test messages. The available predefined frames depend on the selected link direction.

"User" The settings for the frame can be defined by the user.

SCPI command:

[\[:SOURce<hw>\]:BB:WIMax:OFDM:FRAME:PREDefined](#) on page 211

[\[:SOURce<hw>\]:BB:WIMax:AOFDM:FRAME:PREDefined](#) on page 143

**Level Reference**

Selects the level reference.

"FCH / Burst (OFDM only)"  
 The instrument's level setting refers to the mean power of FCH (Frame Control Header) or bursts with a burst power setting of 0 dB. To obtain the absolute burst power value, the burst power value has to be added to the level value.

"Preamble (OFDM uplink and downlink OFDMA/OFDMA - WiBro downlink only)"  
 The instrument's level setting refers to the preamble, which is FCH / Burst power + 3dB in OFDM mode.

"Subframe RMS Power (OFDMA/OFDMA - WiBro only)"  
 The instrument's level setting refers to the rms power of the subframe. This includes the preamble and all symbols with allocated carriers in downlink or the whole uplink subframe in uplink.

"Subframe RMS Power w/o Preamble (OFDMA/OFDMA - WiBro only)"

The instrument's level setting refers to the rms power of the subframe, excluding the preamble. This includes all symbols with allocated carriers in downlink or the whole uplink subframe in uplink.

SCPI command:

[\[:SOURce<hw>\]:BB:WiMax:OFDM:POWer:REFeRence](#) on page 212

[\[:SOURce<hw>\]:BB:WiMax:AOFDM:POWer:REFeRence](#) on page 144

### Use Baseband A+B

(Available only in path A of two-path instruments and for OFDMA and OFDMA-WiBro Physical Layer Mode)

Enables/disables control of both paths via the WiMAX menu.

**Note:** For two path instruments and enabled parameter Use of Baseband A+B, enabling the WiMAX signal simulation disables all other digital standards and digital modulation modes in path B.

An active Baseband A+B mode is useful for STC (MIMO) signal setups. In this case, baseband B is controlled from baseband A and generates an identical setup, just with opposite STC antenna configuration. Triggering is performed automatically such that both basebands are aligned in time.

### Example:

1. Configure baseband A to generate one SISO zone (set the parameter "Space-Time Coding Mode" to off for this zone)
2. Configure one additional STC zone with antenna 0 (parameter "Space-Time Coding Antenna" set to Antenna 0).
3. Enable parameter "Use Baseband A+B".
4. Switch on baseband A .
  - 4.1 Baseband B is automatically activated.
  - 4.2 Baseband A generates preamble, SISO zone and STC zone with antenna 0.
  - 4.3 Baseband B omits preamble and SISO zone and generates the STC zone with antenna 1.

For STC modes with 4 antennas, using antenna 0 in baseband A generates antenna 1 in baseband B. Using antenna 2 in baseband A generates antenna 3 in baseband B. A two-path instrument can either provide antennas 0 & 1 or antennas 2 & 3.

SCPI command:

[\[:SOURce<hw>\]:BB:WiMax:PATH:COUPling\[:STATe\]](#) on page 112

### Power Of Baseband B Relative to A

(Available only in path A of two-path instruments and enabled parameter Use Baseband A+B)

This parameter sets the relative power offset of path B compared to the power level of the path A.

A value of 0 dB refers to the level set in the main RF level setting of the instrument.

Negative values lower the level of baseband B, i.e. the level of Baseband A matches the main level setting, Baseband B is offset by the set amount. The level display of path B is however not changed.

Positive values lower the level of baseband A, i.e. the level of Baseband B matches the main level setting, Baseband A is offset by the set amount. The level display of path A is however not changed.

SCPI command:

`[ :SOURce<hw> ] :BB:WIMax:PATH:COUPling[:STATe]` on page 112

`[ :SOURce<hw> ] :BB:WIMax:PATH:COUPling:POFFset` on page 112

### Frame Configuration

Calls the menu for configuration of the frame.

The menu is described separately for the two physical layer modes in [chapter 3.2, "Frame Configuration OFDM"](#), on page 22 and [chapter 3.10, "Frame Configuration OFDMA"](#), on page 39.

SCPI command:

n.a.

### Filter / Clipping

Calls the menu for setting clipping and the sample rate variation of the arbitrary waveform. The current setting is displayed next to the button.

The menu is described in [chapter 3.26, "Filter/Clipping Settings"](#), on page 92

SCPI command:

n.a.

### Trigger/Marker

(R&S SMx and R&S AMU instruments only)

Calls the menu for selecting the trigger source, for configuring the marker signals and for setting the time delay of an external trigger signal (see [chapter 3.27, "Trigger/Marker/Clock Settings"](#), on page 97).

The currently selected trigger source is displayed to the right of the button.

SCPI command:

n.a.

### Execute Trigger

Executes trigger manually.

A manual trigger can be executed only when an internal trigger source and a trigger mode other than "Auto" have been selected.

SCPI command:

`[ :SOURce<hw> ] :BB:WIMax:TRIGger:EXECute` on page 124

### Clock

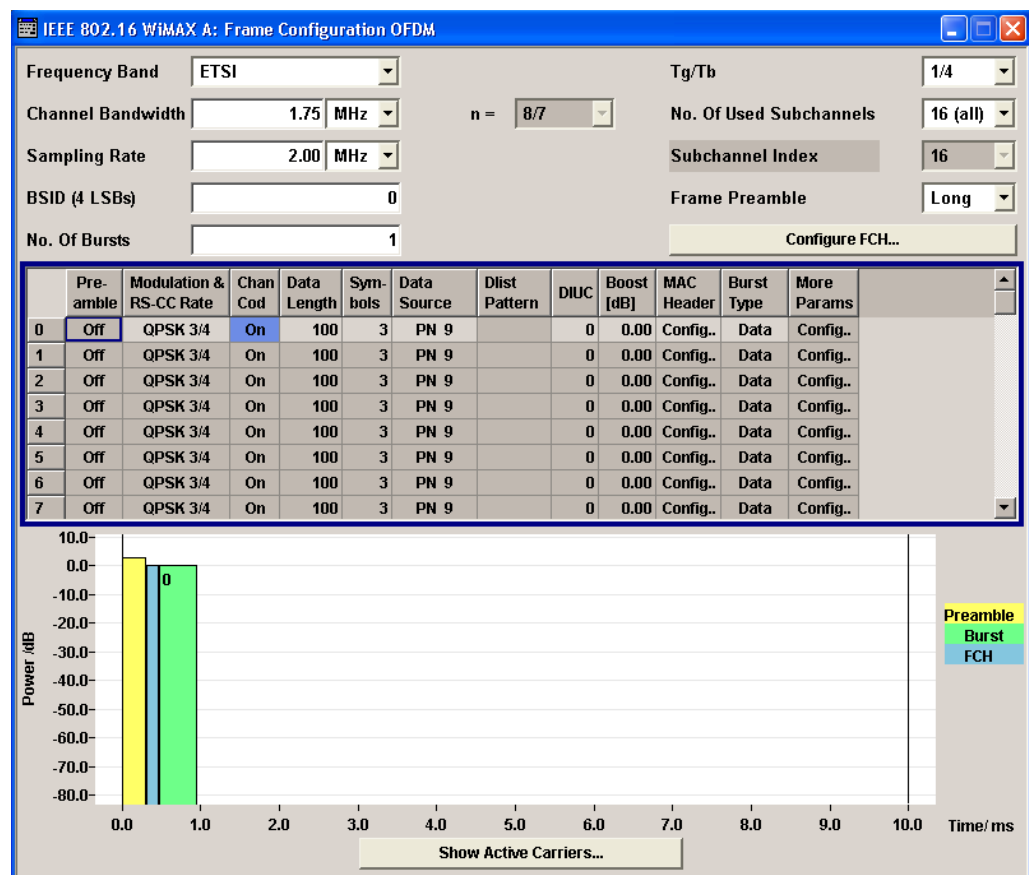
(R&S SMx and R&S AMU instruments only)

Calls the menu for selecting the clock source and for setting a delay (see [chapter 3.27.4](#), "Clock Settings", on page 105).

SCPI command:  
n.a.

## 3.2 Frame Configuration OFDM

This menu provides all parameters to configure frames in OFDM mode. The menu differs depending on the selected link direction. The following graph shows the menu for down-link direction.



### 3.2.1 Frame Configuration Settings

#### Frequency Band OFDM

Selects the frequency band for the carrier frequencies. The available ranges for setting the channel bandwidth and the sampling rate depend on the selection here.

"ETSI"	The frequency band as defined Norm by the European Telecommunications Standards Institute applies. The range is 1.75 to 28 MHz for the channel bandwidth and 2 to 32 MHz for the sampling rate.
"MMDS"	The frequency band as defined by the "Multichannel Multipoint Distribution Service" applies. The RF frequency range is 2500 to 2686 MHz. The range is 1.50 to 24 MHz for the channel bandwidth and 1.72 to 27.52 MHz for the sampling rate.
"WCS"	The frequency band as defined by the "Wireless Communication Service" applies. It is in the 2.3 GHz band of the electromagnetic spectrum from 2305 to 2320 MHz and 2345 to 2360 MHz. The range is 2.5 to 15 MHz for the channel bandwidth and 2.88 to 17.28 MHz for the sampling rate.
"U-NII"	The frequency band as defined by the "Unlicensed National Information Infrastructure" applies. It is in the 5 GHz band of the electromagnetic spectrum from 5150 to 5350 GHz and 5750 to 5825 GHz. The range is 10 to 20 MHz for the channel bandwidth and 11.52 to 23.04 MHz for the sampling rate.
"User"	This mode is provided for choosing any other channel bandwidth / sampling rate combination. The range is 1.25 to 28 MHz for the channel bandwidth and 1.44 to 32 MHz for the sampling rate.

SCPI command:

[ :SOURce<hw> ] :BB:WIMax:OFDM:FBAND on page 207

### Channel Bandwidth OFDM

Sets the channel bandwidth. The range is 1.25 to 28 MHz.

The selected channel bandwidth has to be a multiple of 1.25, 1.5, 1.75, 2.0 or 2.75 MHz. The channel bandwidth determines the parameter n (see [Sampling Ratio n OFDM](#)):

- For channel bandwidths
  - that are a multiple of 1.75 MHz then  $n = 8/7$
  - that are a multiple of 1.5 MHz then  $n = 86/75$
  - that are a multiple of 1.25 MHz then  $n = 144/125$
  - that are a multiple of 2.75 MHz then  $n = 316/275$
  - that are a multiple of 2.0 MHz then  $n = 57/50$
- else for channel bandwidths not otherwise specified then  $n = 8/7$

The sampling rate is derived from the channel bandwidth as follows:

$\text{SamplingRate} = \text{floor}(n * \text{ChannelBandwidth} / 8000) * 8000$

SCPI command:

[ :SOURce<hw> ] :BB:WIMax:OFDM:BW on page 206

### Sampling Ratio n OFDM

Indicates the sampling ratio. The sampling ratio is determined by the channel bandwidth (see [Channel Bandwidth OFDM](#)).

SCPI command:

[ :SOURce<hw> ] :BB:WIMax:OFDM:N on page 212

**Sampling Rate OFDM**

Sets the sampling rate. The possible settings depend on the selected frequency band. The full range in "User" mode is 1.44 to 32 MHz.

The sampling rate is related to the channel bandwidth by the parameter n:

$$\text{SamplingRate} = \text{floor}(n * \text{ChannelBandwidth} / 8000) * 8000$$

SCPI command:

[\[:SOURce<hw>\]:BB:WiMax:OFDM:SRATe](#) on page 213

**BSID OFDM**

Sets the 4 LSBs of the Base Station ID.

The BSID is transmitted in the FCH (when set to "Auto" mode), and it is used to initialize the randomizer.

SCPI command:

[\[:SOURce<hw>\]:BB:WiMax:OFDM:BSID](#) on page 197

**Number of Bursts OFDM**

Sets the number of active bursts in one frame.

With number of bursts = 0, a preamble only or a preamble with an FCH burst is generated.

SCPI command:

[\[:SOURce<hw>\]:BB:WiMax:OFDM:BURSt\[:COUNT\]](#) on page 206

**Tg/Tb Ratio OFDM**

Selects the ratio of guard period to symbol period.

This value sets the length of the cyclic prefix in fractions of the symbol period.

SCPI command:

[\[:SOURce<hw>\]:BB:WiMax:OFDM:TGTB](#) on page 214

**Number of used Subchannels OFDM**

Selects the number of used subchannels.

Selection 16 (all) deactivates subchannelization and activates all possible carriers. The values 1, 2, 4 and 8 activate only a part of the available subcarriers, unused carriers are blanked.

SCPI command:

[\[:SOURce<hw>\]:BB:WiMax:OFDM:SUBChannel\[:COUNT\]](#) on page 214

**Subchannel Index OFDM**

Selects the subchannel index in subchannelization mode.

The subchannel index determines the set of used subcarriers according to table 213 of IEEE 802.16-2004 standard.

SCPI command:

[\[:SOURce<hw>\]:BB:WiMax:OFDM:SUBChannel:INDEX](#) on page 213

**Frame Preamble OFDM**

Activates/deactivates the generation of a frame preamble. Either a long preamble or a short preamble can be activated.

The 802.16 standard requires a long preamble as frame start.

SCPI command:

[ :SOURce<hw> ] :BB:WIMax:OFDM:PREamble:MODE on page 213

#### **Frame Number OFDM**

Selects the frame number of the uplink frame in which the UL map that specifies the uplink burst was transmitted.

SCPI command:

[ :SOURce<hw> ] :BB:WIMax:OFDM:FRAME [ :NUMBer ] on page 211

#### **Configure FCH OFDM**

Calls the menu for configuring FCH mode and parameters (see [chapter 3.4, "FCH Configuration Downlink OFDM"](#), on page 31).

SCPI command:

n.a.

#### **Generate UL-MAP**

Calls the menu for generating the UL-map.

SCPI command:

n.a.

### **3.2.2 Burst Table**

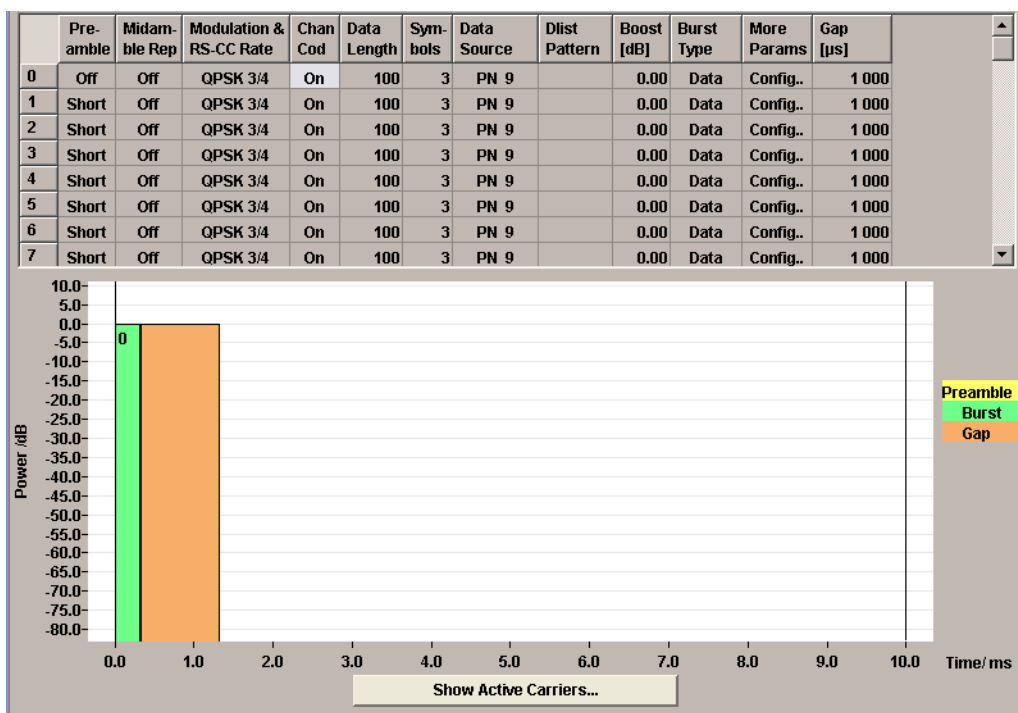
The "burst table" is located in the lower part of the menu. The burst table is where the individual burst parameters are set. A graphic display below the table shows length, position and power of all configured bursts within the frame.

Up to 64 bursts can be configured per frame. Each table row defines the settings of one specific burst, where the first row defines the first burst of the frame and the last row defines the last burst.

For both transmission directions, different modulations and channel coding rates are available for each burst. A generic MAC header with encrypted payload and checksum determination can be activated.

Some setting parameters differ for the two transmission directions.

The graph below shows the table in uplink direction.



**Burst Index OFDM**

Displays the consecutive burst index from 0 to 63.

All the rows are always displayed, even if the bursts are inactive. They are switched on and off by the selection of "No. of Bursts" above the table. The active bursts are highlighted.

SCPI command:

n.a.

(selected via the suffix to the keyword BURSt<n>)

**Preamble OFDM**

Enables generation of the burst preamble.

If activated, a preamble is placed before the burst. Long or short preambles are available. The preamble has the same power as the burst. If subchannelization is used, a sub-channelization preamble is generated accordingly.

SCPI command:

[ :SOURce<hw> ] :BB:WIMax:OFDM:BURSt<ch0>:PREamble:MODE on page 204

**Midamble Repetition OFDM**

Activates/deactivates midamble repetition.

If midamble repetition is switched on, midambles are placed into the burst with the specified interval, i.e. if 5 is selected, every 5th symbol of the burst is a midamble.



A short preamble is used as midamble when subchannelization is off or a subchannelization preamble is used in subchannelization mode. The power of the midambles is identical to the burst power.

SCPI command:

`[ :SOURCE<hw> ] :BB:WiMax:OFDM:BURSt<ch0>:MIDamble` on page 203

#### Modulation and RS-CC Rate OFDM

Selects the modulation and channel coding rate. Channel coding includes randomization, reed solomon coding, convolutional coding and interleaving.

For a given modulation type and channel coding rate, the data length determines the number of symbols and vice versa.

SCPI command:

`[ :SOURCE<hw> ] :BB:WiMax:OFDM:BURSt<ch0>:FORMat` on page 201

#### Channel Coding OFDM

Switches channel coding on or off.

If channel coding is switched off, the bits read from the data source are directly modulated onto the carriers. Due to randomization missing, this could result in very high crest factors of the signal.

SCPI command:

`[ :SOURCE<hw> ] :BB:WiMax:OFDM:BURSt<ch0>:CCODing:STATe` on page 198

#### Data Length OFDM

Determines the data length in bytes.

The given number of bytes is read from the data source. The total number of data bytes in the burst (before channel coding) is determined as follows:

$$\text{TotalDataBytes} = \text{DataLength} + \text{MACHeaderBytes} + \text{CRCBytes} + \text{TailByte}$$

The tail byte is only added when channel coding is switched on. The same is the case for the MAC header and CRC, they are not added when switched off. Additionally padding with 0xFF bytes is applied at the end of the data sequence to reach an integer number of OFDM symbols.

The data length determines the number of symbols and vice versa. The maximum data length of 10000 bytes defines the maximum number of symbols for a given modulation type and channel coding rate.

SCPI command:

`[ :SOURCE<hw> ] :BB:WiMax:OFDM:BURSt<ch0>:DLENgth` on page 199

#### Number of Symbols OFDM

Enters the number of symbols for the selected burst. If the number of symbols is changed, the data length is adjusted to fill the specified number of symbols with data so that no padding has to be applied.

The maximum data length of 10 000 bytes defines the maximum number of symbols for a given modulation type and channel coding rate.

SCPI command:

`[ :SOURCE<hw> ] :BB:WiMax:OFDM:BURSt<ch0>:SYMBol [ :COUNT ]` on page 204

**Data Source OFDM**

Selects data source for the selected bursts.

The data sources "PN9", "PN11", "PN15", "PN16", "PN20", "PN21", "PN23", "ALL 0", "ALL1", "Pattern" and "Data List" are all available to choose from.

"Data lists" can be generated internally in the data editor or externally.

Data lists are selected in the "File Select" window, which is called by means of the "Data List Management" button.

If the "Pattern" data type is used, the bit pattern is defined in the "Pattern" input box. The length is limited to 64 bits.

SCPI command:

[ :SOURce<hw> ] :BB:WiMax:OFDM:BURSt<ch0>:DATA on page 198

[ :SOURce<hw> ] :BB:WiMax:OFDM:BURSt<ch0>:DATA:PATtern on page 199

[ :SOURce<hw> ] :BB:WiMax:OFDM:BURSt<ch0>:DATA:DSElect on page 198

**DIUC OFDM**

Sets the specific interval usage code.

The code is used to initialize the randomizer.

SCPI command:

[ :SOURce<hw> ] :BB:WiMax:OFDM:BURSt<ch0>:DIUC on page 199

**Boost OFDM**

Sets the burst power in dB.

To set the absolute power of a burst correctly, level reference "FCH / Burst" must be selected. In this mode, the output power of a burst equals Level + BurstPower.

In downlink, the preamble is transmitted with +3 dB and the FCH is transmitted with 0 dB.

In uplink, the power of the first burst is fixed to 0 dB.

SCPI command:

[ :SOURce<hw> ] :BB:WiMax:OFDM:BURSt<ch0>:POWer on page 204

**MAC Header OFDM**

Calls the menu for configuring the generic MAC (Media Access Control) header of the selected burst and for activating the checksum determination.

SCPI command:

n.a.

**Burst Type OFDM**

Select the burst type from Data, DL-MAP, UL-MAP or Ranging.

"DATA" Regular bursts are called "Data" bursts. All data sources are available for this type of burst.

"DL-MAP"	<p>A DL-MAP is generated, taking into account all active bursts. The DL-MAP fields are filled with the following parameters:</p> <ul style="list-style-type: none"> <li>• DCD COUNT</li> <li>• Set to "Configuration Change Count" from the FCH panel</li> <li>• "Base Station ID" Set to BSID from the Frame Configuration panel</li> <li>• "CID" Set to CID from the MAC header panel for each burst</li> <li>• "DIUC" Set to DIUC from the burst table for each burst</li> <li>• "Preamble present" Set to 1 if a burst preamble is present</li> <li>• "Start Time" Set to burst start time in OFDM symbols, relative to frame start</li> </ul>
"UL-MAP"	<p>A UL-MAP is generated using the specified data list, including additional parameters from the "More Param" panel. See <a href="#">Generate UL-MAP</a> for more information on how to create UL-MAP bursts.</p>
"Ranging"	<p>An uplink ranging burst is composed of a long preamble following two subchannelized preambles using one active subchannel. The subchannel index for the two preambles is read from the configured data source. For each frame 4 bits are read from the data source (called "data"), which define the subchannel index as follows: Index = data * 2 + 1</p>

SCPI command:

[\[:SOURCE<hw>\]:BB:WiMax:OFDM:BURSt<ch0>:TYPE](#) on page 205

#### More Parameter OFDM – WiMAX

Calls the menu for configuring additional parameters for the bursts.

SCPI command:

n.a.

#### Gap OFDM

Sets the length of the gap between the selected burst and the next burst in  $\mu$ s. The setting is only available for transmission direction uplink.

SCPI command:

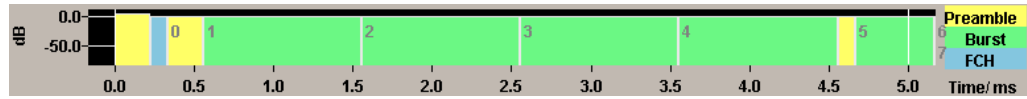
[\[:SOURCE<hw>\]:BB:WiMax:OFDM:BURSt<ch0>:GAP](#) on page 201

### 3.2.3 Frame Graph OFDM

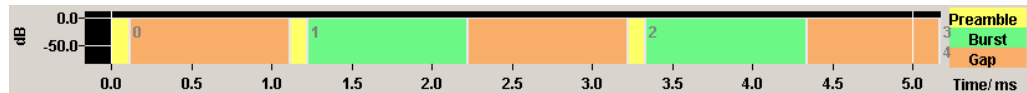
The frame graph indicates the configuration of one frame. The scaling of the X-axis is always adapted to the set frame duration. The preamble length, FCH length and the burst length are drawn to scale. The relative power can be taken from the height of the bar. The power of the preamble is always +3 dB and of the FCH always 0 dB relative to the power of the other bursts.

The shown frame configuration is repeated over the whole sequence length.

In downlink direction the frame preamble is sent at the beginning of the frame.

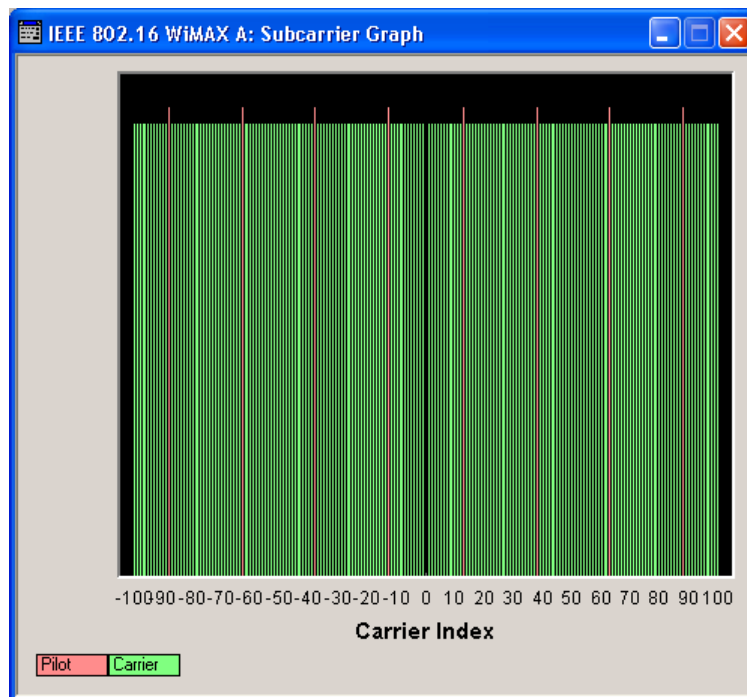


In uplink direction each burst starts with a preamble. The first gap at the beginning of the frame is determined by the Downlink Subframe Duration (specified in the main menu), the following gaps are defined by the gap value specified for the associated burst in the burst table.



### 3.3 Show Active Carriers OFDM

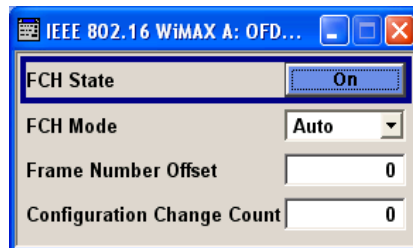
The Active Carrier graph is reached via the "Show Active Carrier" button at the Bottom of the "Frame Configuration" submenu.



The graph shows used pilots and carriers of the current subchannelization mode. When subchannelization is activated by setting "No. of used Subchannels" to a value different than 16, the graph shows the used and blanked carriers according to the setting of "Subchannel Index".

### 3.4 FCH Configuration Downlink OFDM

The "FCH Configuration" menu is reached via the "Configure FCH" button in the frame configuration menu. The FCH is only available in downlink mode. The following describes the FCH options in OFDM mode.



#### FCH State OFDM

Switches the FCH on or off.

SCPI command:

[\[:SOURCE<hw>\]:BB:WiMax:OFDM:FCH:STATE](#) on page 210

#### FCH Mode OFDM

Selects the mode for generating the FCH.

Channel Coding of the FCH is performed both in "Auto" and "User" mode.

"Auto"	<p>In "Auto" mode, the DLFP (Downlink Frame Prefix) fields, which form the FCH, are filled automatically with parameters specified at different locations.</p> <p>The following list shows the mapping that applies in Auto mode:</p> <ul style="list-style-type: none"> <li>• <b>Base_Station_ID</b> Set to the BSID value specified in the frame configuration menu</li> <li>• <b>Frame_Number</b> Set to the current frame number modulo 16. The first frame of the generated sequence has the number specified in Frame Number Offset below. For the following frames, this number will increase by 1 per frame</li> <li>• <b>Configuration_Change_Count</b> Set to the value specified below</li> <li>• <b>Rate_ID</b> The Rate ID parameter of the first burst is set according to its modulation setting</li> <li>• <b>DIUC</b> The DIUC value for the second, third and fourth burst is taken from the DIUC value in the burst table</li> <li>• <b>Preamble Present</b> Set to 1 when the burst preamble is activated for the corresponding burst</li> <li>• <b>Length</b> Set to the calculated number of symbols of the corresponding burst</li> <li>• <b>HCS</b> The Header Check Sequence is automatically calculated</li> </ul>
"User"	<p>In "User" mode, the FCH is filled with data specified under Data Source. This enables any arbitrary data to be sent with the FCH burst.</p>

SCPI command:

[\[:SOURCE<hw>\]:BB:WiMax:OFDM:FCH:MODE](#) on page 209

#### **Frame Number Offset FCH OFDM**

Sets the frame number offset.

This value is added to the current frame number of the sequence. After modulo 16 division, the result is used as Frame\_Number in the FCH (in Auto mode) and is also used to initialize the randomizers.

SCPI command:

[\[:SOURCE<hw>\]:BB:WiMax:OFDM:FCH:FNOFfset](#) on page 209

#### **Configuration Change Count FCH OFDM**

Sets the configuration change count value.

This value is used for the corresponding FCH field in Auto mode.

SCPI command:

[\[:SOURCE<hw>\]:BB:WiMax:OFDM:FCH:CCC](#) on page 207

**Data Source FCH OFDM**

Specifies the data source in User mode.

The FCH contents are filled from the selected data source.

The data sources "PN9", "PN11", "PN15", "PN16", "PN20", "PN21", "PN23", "ALL 0", "ALL1", "Pattern" and "Data List" are all available to choose from.

"Data lists" can be generated internally in the data editor or externally.

Data lists are selected in the "File Select" window, which is called by means of the "Data List Management" button.

If the "Pattern" data type is used, the bit pattern is defined in the "Pattern" input box. The length is limited to 64 bits.

SCPI command:

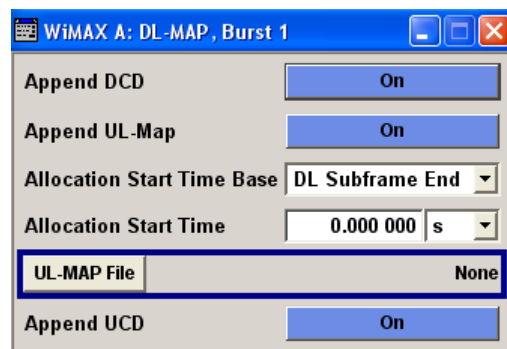
[\[:SOURce<hw>\]:BB:WiMax:OFDM:FCH:DATA](#) on page 208

[\[:SOURce<hw>\]:BB:WiMax:OFDM:FCH:DATA:PATtern](#) on page 209

[\[:SOURce<hw>\]:BB:WiMax:OFDM:FCH:DATA:DSElect](#) on page 208

### 3.5 DL-MAP Configuration Downlink OFDM

The "DL-MAP Configuration" menu is reached via the "More Params" button in the OFDM burst table for burst type DL-MAP. The DL-MAP is only available in OFDM downlink mode.

**Append DCD OFDM**

If activated, a DCD is appended to the DL-MAP. The DCD message carries its own MAC header and CRC, but is included within the DL-MAP burst.

SCPI command:

[\[:SOURce<hw>\]:BB:WiMax:OFDM:BURSt<ch0>:DLMap:DCD:STATe](#) on page 200

**Append UL-Map OFDM**

If activated, a UL-Map is appended to the DL-Map.

SCPI command:

[\[:SOURce<hw>\]:BB:WiMax:OFDM:BURSt<ch0>:DLMap:ULM:STATe](#) on page 201

**Allocation Start Time Base OFDM**

Selects the Allocation Start Time base, required for the UL-Map appended to the DL-Map. The "Allocation Start Time" field of the UL-Map specifies the start of the uplink subframe.

If Start Time Base is set to DL Subframe End, the "Allocation Start Time" of the UL-Map is set to the end of the downlink subframe + Allocation Start Time parameter set below.

When Start Time Base is set to Frame Start, the Allocation Start Time of the UL-Map is set to the beginning of the frame + "Allocation Start Time" parameter set below.

SCPI command:

`[ :SOURCE<hw> ] :BB:WiMax:OFDM:BURSt<ch0>:DLMap:AMODE` on page 200

**Allocation Start Time OFDM**

Sets the "Allocation Start Time" in the UL-Map, appended to the DL-Map.

SCPI command:

`[ :SOURCE<hw> ] :BB:WiMax:OFDM:BURSt<ch0>:DLMap:ATIME` on page 200

**UL-MAP File OFDM**

Opens the menu for selecting the UL-Map file.

SCPI command:

n.a.

**Append UCD OFDM**

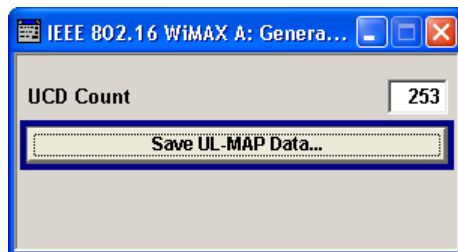
If activated, the UCD is appended to the DL-MAP. The UCD message is transmitted with its own MAC header and CRC, included in the same burst allocation used by the DL-MAP.

SCPI command:

`[ :SOURCE<hw> ] :BB:WiMax:OFDM:BURSt<ch0>:DLMap:UCD:STATE` on page 201

## 3.6 Generate UL-MAP Uplink OFDM

The "Generate UL-MAP" menu is reached via the "Generate UL-MAP".. button in the frame configuration menu.

**UCD Count OFDM**

Sets the value for the UCD count.

SCPI command:

`[ :SOURCE<hw> ] :BB:WiMax:OFDM:UCD` on page 214



**Save UL-MAP Data OFDM**

Opens the "File Select" window for saving the current UL-map.

The name of the file is specified in the "File name" entry field, the directory selected in the save into field. The file is saved by pressing the "Save" button.

The file is stored with the predefined file extension \*.dm\_iqd. The file name and the directory it is stored in are user-definable.

The saved \*.dm\_iqd file is in the data list format and contains a UL-MAP that describes the current uplink subframe.

The following list shows the parameters the UL-MAP is composed of:

- UCD Count  
Set to UCD Count specified above
- Allocation Start Time  
Set to 0. Can be modified later when loading the UL-MAP in downlink mode
- CID  
CID from the "More Param" panel for each burst
- Start Time  
Burst start in OFDM symbols for each burst
- Subchannel Index  
Subchannel Index set in the Frame Configuration panel
- UIUC  
UIUC from the "More Param" panel for each burst
- Duration  
Burst duration in symbols
- Midamble repetition interval  
Midamble repetition for each burst

**Generating a valid UL-MAP**

The following steps are required to generate a valid UL-MAP

1. Switch to uplink mode
2. Define the layout of the uplink subframe by setting a number of bursts and specifying the parameters above for each burst
3. Select Generate UL-MAP and save the UL-MAP to a file
4. Switch to downlink mode
5. Set one of the downlink bursts to Burst Type UL-MAP
6. Open the "More Params" panel
7. Select UL-MAP File and load the file created before.

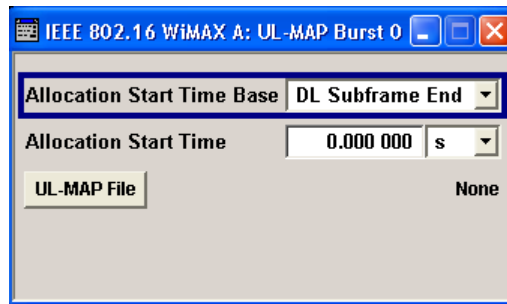
The downlink frame is then transmitting a UL-MAP that specifies the uplink structure defined in uplink mode before.

SCPI command:

[\[:SOURCE<hw>\]:BB:WIMax:OFDM:ULMap:CREate](#) on page 215

## 3.7 UL-MAP Downlink OFDM

The "UL-MAP" menu is enabled for burst type UL-MAP only and can be reached via the "More Param" button in the OFDM burst table.



### Allocation Start Time Base

Selects the Allocation Start Time base. The Allocation Start Time field of the UL-MAP specifies the start of the uplink subframe.

When Start Time Base is set to DL Subframe End, the Allocation Start Time of the UL-MAP is set to the end of the downlink subframe + the "Allocation Start Time" parameter set below.

When Start Time Base is set to Frame Start, the Allocation Start Time of the UL-MAP is set to the beginning of the frame + the Allocation Start Time parameter set below.

SCPI command:

[\[:SOURCE<hw>\]:BB:WiMax:OFDM:BURSt<ch0>:ULMap:AMODe](#) on page 205

### Allocation Start Time

Sets the Allocation Start Time in the UL-MAP.

SCPI command:

[\[:SOURCE<hw>\]:BB:WiMax:OFDM:BURSt<ch0>:ULMap:ATIME](#) on page 206

### UL-MAP File

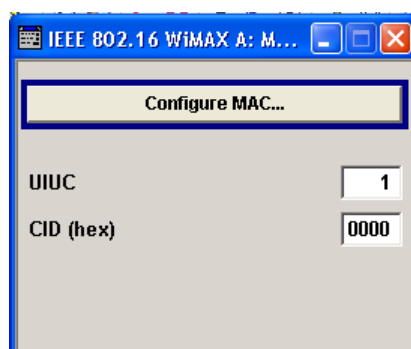
Calls the menu for selecting the UL-map file.

SCPI command:

n.a.

## 3.8 More Parameters Uplink OFDM

The "More parameters" menu is reached via the OFDM burst table.



**Configure MAC**

Calls the menu for configuring the Mac header panel for the selected burst.

SCPI command:

n.a.

**UIUC OFDM**

Sets the specific UIUC.

SCPI command:

[\[:SOURCE<hw>\]:BB:WiMax:OFDM:BURSt<ch0>:UIUC](#) on page 205

**MAC CID**

The command sets the CID (connection control identifier) of the medium access control layer (MAC). The CID identifies a connection to equivalent peers in the MAC of the base station and subscriber station.

This parameter is identical to the CID set in the MAC Header settings.

SCPI command:

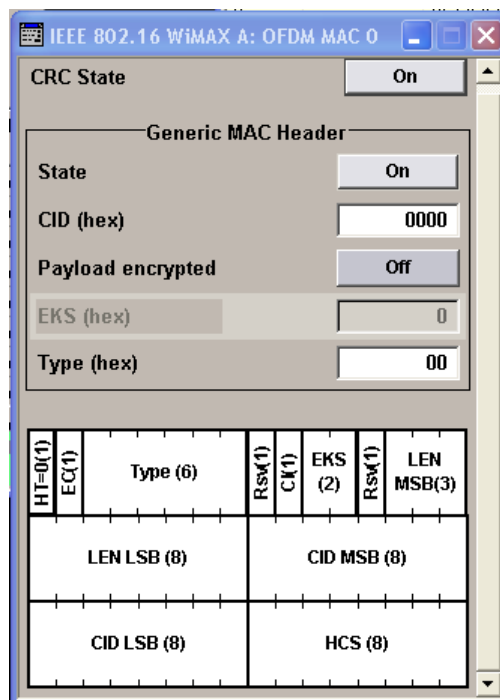
[\[:SOURCE<hw>\]:BB:WiMax:OFDM:BURSt<ch0>:MAC:CID](#) on page 202

### 3.9 MAC Header Configuration OFDM

The "MAC" menu is reached via the "Configure MAC"... button of the "More Parameters menu" of the burst table.

This menu provides settings for a generic MAC header, which is placed at the beginning of the burst when activated.

In addition CRC (cyclic redundancy check) can be activated, which is added at the end of the burst. It covers MAC header and all data.



The screenshot shows a configuration window for IEEE 802.16 WiMAX A: OFDM MAC 0. The 'CRC State' is set to 'On'. The 'Generic MAC Header' section includes: 'State' (On), 'CID (hex)' (0000), 'Payload encrypted' (Off), 'EKS (hex)' (0), and 'Type (hex)' (00). Below this is a bit field diagram for the MAC header structure:

HT=0(1)	EC(1)	Type (6)	Rsv(1)	CK(1)	EKS (2)	Rsv(1)	LEN MSB(3)
LEN LSB (8)				CID MSB (8)			
CID LSB (8)				HCS (8)			

### CRC State

Activates/deactivates the checksum determination. The state of the CRC can be set independently of the state of MAC header generation.

SCPI command:

`[ :SOURCE<hw> ] :BB:WIMax:OFDM:BURSt<ch0>:MAC:CRC:STATe` on page 202

### MAC Header State

Activates the generation of the generic MAC header.

SCPI command:

`[ :SOURCE<hw> ] :BB:WIMax:OFDM:BURSt<ch0>:MAC:STATe` on page 203

### MAC CID

The command sets the CID (connection control identifier) of the medium access control layer (MAC). The CID identifies a connection to equivalent peers in the MAC of the base station and subscriber station.

This parameter is identical to the CID set in the MAC Header settings.

SCPI command:

`[ :SOURCE<hw> ] :BB:WIMax:OFDM:BURSt<ch0>:MAC:CID` on page 202

### Payload encrypted

Activates/deactivates payload encryption.

If activated, the EC (encryption control) field is set to 1 and the EKS (encryption key sequence) field can be set.

SCPI command:

`[ :SOURCE<hw> ] :BB:WIMax:OFDM:BURSt<ch0>:MAC:ENCRypted:STATe` on page 202

**EKS**

Sets the EKS (encryption key sequence) value in the MAC header. The payload encryption itself is not performed by the signal generator.

SCPI command:

[ :SOURCE<hw> ] :BB:WiMax:OFDM:BURSt<ch0>:MAC:EKS on page 202

**Mac Type**

Specifies the MAC type.

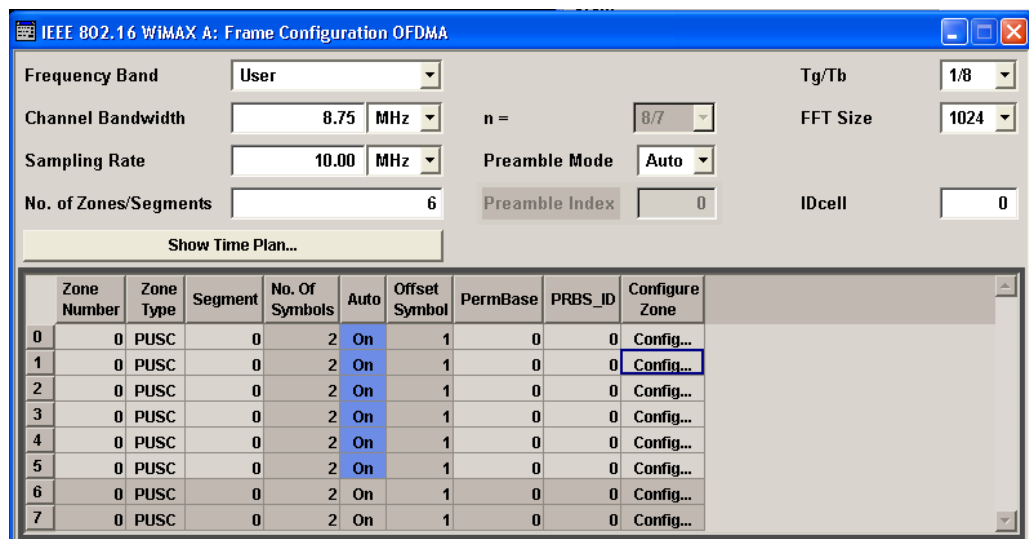
The value of the 6-bit type field is set which indicates the payload type, including the presence of subheaders.

SCPI command:

[ :SOURCE<hw> ] :BB:WiMax:OFDM:BURSt<ch0>:MAC:TYPE on page 203

## 3.10 Frame Configuration OFDMA

This menu provides all parameters to configure frames in OFDMA mode.



### 3.10.1 Frame Configuration Settings

**Frequency Band OFDMA**

Selects the frequency band for the carrier frequencies. The available ranges for setting the channel bandwidth and the sampling rate depend on the selection here.

"ETSI" The frequency band as defined by the European Telecommunications Standards Institute applies.  
The range is 1.75 to 28 MHz for the channel bandwidth and 2 to 32 MHz for the sampling rate.

"MMDS"	The frequency band as defined by the "Multichannel Multipoint Distribution Service" applies. The RF frequency range is 2500 to 2686 MHz. The range is 1.50 to 24 MHz for the channel bandwidth and 1.68 to 26.88 MHz for the sampling rate.
"WCS"	The frequency band as defined by the "Wireless Communication Service" applies. It is in the 2.3 GHz band of the electromagnetic spectrum from 2305 to 2320 MHz and 2345 to 2360 MHz. The range is 2.5 to 15 MHz for the channel bandwidth and 2.8 to 16.8 MHz for the sampling rate.
"U-NII"	The frequency band as defined by the "Unlicensed National Information Infrastructure" applies. It is in the 5 GHz band of the electromagnetic spectrum from 5150 to 5350 GHz and 5750 to 5825 GHz. The range is 10 to 20 MHz for the channel bandwidth and 11.2 to 22 MHz for the sampling rate.
"WiBro"	The frequency band as defined by the Telecommunications Technology Association of Korea. It is in the 2.3 GHz band of the electromagnetic spectrum.
"User"	This mode is provided for choosing any other channel bandwidth / sampling rate combination. The range is 1.25 to 28 MHz for the channel bandwidth and 1.4 to 32 MHz for the sampling rate.

SCPI command:

[ :SOURce<hw> ] :BB:WiMax:AOFDM:FBAND on page 142

### Channel Bandwidth OFDMA

Sets the channel bandwidth. The range is 1.25 to 28 MHz.

The selected channel bandwidth has to be a multiple of 1.25, 1.5, 1.75, 2.0 or 2.75 MHz. The channel bandwidth determines the parameter n (see [Sampling Ratio n OFDMA](#)).

- For channel bandwidths
  - that are a multiple of 1.75 MHz then  $n = 8/7$
  - that are a multiple of 1.5 MHz then  $n = 28/25$
  - that are a multiple of 1.25 MHz then  $n = 28/25$
  - that are a multiple of 2.75 MHz then  $n = 28/25$
  - that are a multiple of 2.0 MHz then  $n = 28/25$
- else for channel bandwidths not otherwise specified then  $n = 8/7$

The sampling rate is derived from the channel bandwidth as follows:

$\text{SamplingRate} = \text{floor} (n * \text{ChannelBandwidth} / 8000) * 8000$

SCPI command:

[ :SOURce<hw> ] :BB:WiMax:AOFDM:BW on page 141

### Sampling Ratio n OFDMA

Indicates the sampling ratio. The sampling ratio is determined by the channel bandwidth (see [Channel Bandwidth OFDMA](#)).

SCPI command:

[ :SOURce<hw> ] :BB:WiMax:AOFDM:N on page 144

**Sampling Rate OFDMA**

Sets the sampling rate. The possible settings depend on the selected frequency band. The full range in User mode is 1.44 to 32 MHz.

The sampling rate is related to the channel bandwidth by the parameter n:

$$\text{SamplingRate} = \text{floor} (n * \text{ChannelBandwidth} / 8000) * 8000$$

SCPI command:

[\[:SOURce<hw>\]:BB:WiMax:AOFDM:SRATE](#) on page 146

**Number of Zones/Segments OFDMA**

Sets the number of active zones/segments in one frame.

SCPI command:

[\[:SOURce<hw>\]:BB:WiMax:AOFDM:ZONE:COUNT](#) on page 146

**Preamble Mode OFDMA**

Selects the mode for selecting the preamble index.

"Auto"                The preamble index value is automatically derived from the segments used in the first zone and the IDcell parameter. The Preamble Index field below shows the used preamble index. If more than one segment is active in the first zone, the Preamble Index shows -1. In this case, a multi-segment preamble is generated.

"User"                Sets the preamble index to one of the available indices from 1 to 113 specified in the "Preamble Index" field.

SCPI command:

[\[:SOURce<hw>\]:BB:WiMax:AOFDM:PREamble:INDEX:MODE](#) on page 145

**Preamble Index OFDMA**

Sets the preamble index to one of the available indices from 1 to 113 in preamble mode "user".

SCPI command:

[\[:SOURce<hw>\]:BB:WiMax:AOFDM:PREamble:INDEX](#) on page 145

**Tg/Tb Ratio OFDMA**

Selects the ratio of guard period to symbol period.

This value sets the length of the cyclic prefix in fractions of the symbol period.

SCPI command:

[\[:SOURce<hw>\]:BB:WiMax:AOFDM:TGTB](#) on page 146

**FFT Size OFDMA**

Selects the FFT size.

SCPI command:

[\[:SOURce<hw>\]:BB:WiMax:AOFDM:FFT](#) on page 143

**IDCell OFDMA**

Sets the IDcell. The IDcell is used in the preamble, as PermBase parameter for the permutation equations in the first downlink zone and partly sets the subcarrier randomizer initialisation vector in the first downlink zone.

SCPI command:

[ :SOURce<hw> ] :BB:WIMax:AOFDM:IDCell on page 144

**Show Time Plan OFDMA**

Calls the graphical display of the OFDMA Time Plan (see [chapter 3.10.2, "Time Plan"](#), on page 42).

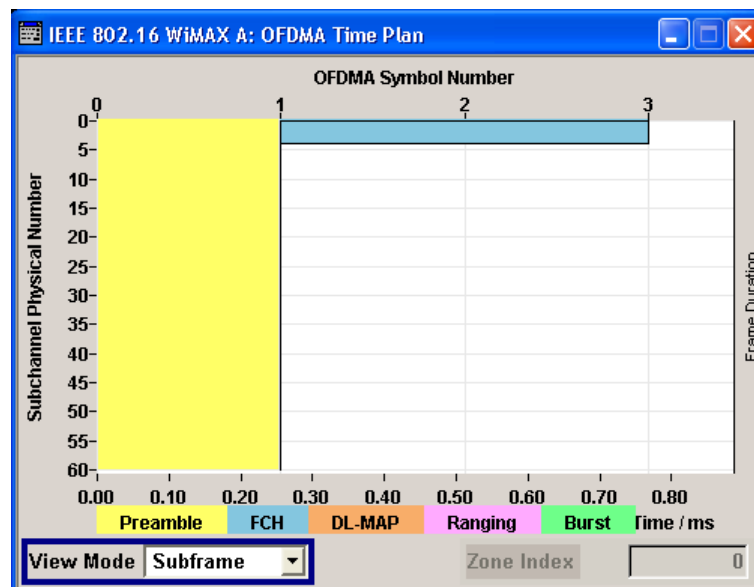
SCPI command:

n.a.

**3.10.2 Time Plan**

The time plan indicates the assignment of the active bursts. The x-axis shows the OFDMA symbol number relative to frame/zone start on the top of the diagram and the time in ms relative to frame/zone start on the bottom of the diagram. The vertical line on the right side shows the frame boundary. The y-axis indicates the physical/logical subchannel numbers.

The bursts are numbered with ZoneIndex.

**Time Plan View Mode OFDMA**

Selects the display range.

Remote-control command: n.a.

"Total Frame" The display range extends to all zones including the gap to the frame duration. The y-axis shows the physical subchannels. All logical subchannels are mapped to physical before display. In uplink mode, the data subchannel rotation is not displayed.



"Subframe" The display range is zoomed to the subframe of the corresponding link direction.

"Zone" The display range is zoomed to the selected zone index. The y-axis shows the logical subchannels of the zone/segment.

SCPI command:  
n.a.

**Time Plan Zone Index OFDMA**

Selects the zone index to be displayed.

This feature is only available, if "Zone" is selected in the "View Mode" field.

SCPI command:  
n.a.

**3.10.3 Zone Table**

The "zone table" is located in the lower part of the menu. The zone table is where the individual zone parameters are set.

	Zone Number	Zone Type	Segment	No. Of Symbols	Auto	Offset Symbol	PermBase	PRBS_ID	Configure Zone
0	0	PUSC	0	2	On	1	0	0	Config...
1	0	PUSC	0	2	On	1	0	0	Config...
2	0	PUSC	0	2	On	1	0	0	Config...
3	0	PUSC	0	2	On	1	0	0	Config...
4	0	PUSC	0	2	On	1	0	0	Config...
5	0	PUSC	0	2	On	1	0	0	Config...
6	0	PUSC	0	2	On	1	0	0	Config...
7	0	PUSC	0	2	On	1	0	0	Config...

**Zone Index OFDMA**

Displays the consecutive zone index from 0 to 7.

SCPI command:  
n.a.

**Zone Number OFDMA**

Sets the zone number of the zone. The value range is 0 to 7. Zones are generated in the order of zone number, the lowest zone number is generated first. If the same zone number is applied to more than one row, different segments can be used within one zone. In this case, the segment numbers must differ and the activated subchannels of the segments must not overlap.

SCPI command:  
[\[:SOURCE<hw>\]:BB:WiMax:AOFDM\[:ZONE<st0>\]:NUMBER](#) on page 150

**Zone Type OFDMA**

Selects the type of subcarrier permutation for the zone.

SCPI command:  
[\[:SOURCE<hw>\]:BB:WiMax:AOFDM\[:ZONE<st0>\]:TYPE](#) on page 195

**Segment OFDMA**

Selects the segment of the zone index. Multiple segments within one zone can be configured by setting the same zone number and configuring different segment numbers for each zone index. The activated subchannels must not overlap between the segments of one zone.

SCPI command:

`[ :SOURCE<hw> ] :BB:WiMax:AOFDM:ZONE<st0>:SEGMENT` on page 151

**No. Of Symbols OFDMA**

Sets the zone length in number of symbols. Zones with identical zone number have the same length, as they overlap in time.

SCPI command:

`[ :SOURCE<hw> ] :BB:WiMax:AOFDM:ZONE<st0>:SYMBOL:COUNT` on page 159

**Auto OFDMA**

Activates or deactivates automatic zone length. In auto mode, the number of symbols in the zone is derived from the configured bursts such that all bursts fit into the zone, except if the frame duration is exceeded.

SCPI command:

`[ :SOURCE<hw> ] :BB:WiMax:AOFDM:ZONE<st0>:SYMBOL:COUNT:AUTO`  
on page 159

**Offset Symbol OFDMA**

Displays the symbol offset of the zone.

SCPI command:

`[ :SOURCE<hw> ] :BB:WiMax:AOFDM:ZONE<st0>:SYMBOL:OFFSET` on page 160

**PermBase OFDMA**

Selects the PermBase of the zone.

SCPI command:

`[ :SOURCE<hw> ] :BB:WiMax:AOFDM:ZONE<st0>:PERMbase` on page 150

**PRBS\_ID OFDMA**

Selects the PRBS\_ID of the zone.

SCPI command:

`[ :SOURCE<hw> ] :BB:WiMax:AOFDM:ZONE<st0>:PRBSid` on page 151

**Configure Zone OFDMA**

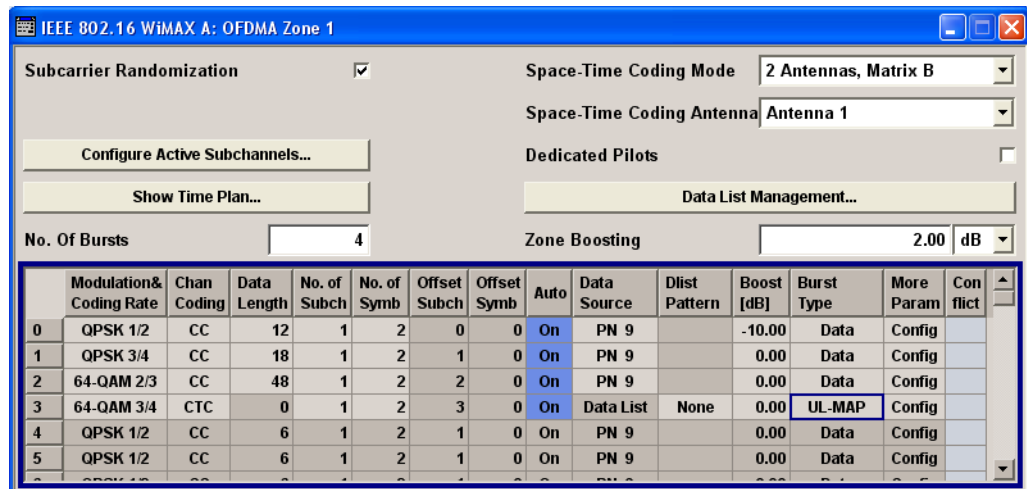
Calls the menu for configuring the parameters of the zone.

SCPI command:

n.a.

## 3.11 Zone Configuration OFDMA

This menu provides all parameters to configure zones in OFDMA mode.



### 3.11.1 OFDMA Zone Settings

#### Subcarrier Randomization OFDMA

Activates or deactivates the subcarrier randomization. Subcarrier randomization is performed after PUSC/FUSC/AMC permutation and before IFFT conversion.

SCPI command:

```
[ :SOURCE<hw> ] :BB:WIMax:AOFDM:ZONE<st0>:SCARrier:RANDomizer
```

on page 151

#### Subchannel Rotation OFDMA

(Available for zone type PUSC in link direction uplink only)

Activates or deactivates the subchannel rotation.

SCPI command:

```
[ :SOURCE<hw> ] :BB:WIMax:AOFDM[ :ZONE<st0> ] :SUBChannel:ROTation
```

on page 194

#### CSTD..

(Available for STC Mode CSTD only)

Calls the menu for configuring the Cyclic Shift Transmit Diversity (see [chapter 3.13, "CSTD OFDMA"](#), on page 58).

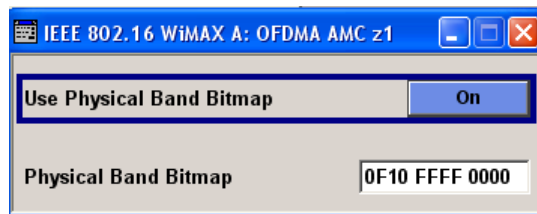
SCPI command:

n.a.

#### Configure Band AMC

(Available for zone type AMC2x3 only)

Calls the menu for configuring Band AMC mode.



#### Use Physical Bands Bitmap ← Configure Band AMC

Activates/deactivates Band AMC mode.

If activated, the "Physical Bands Bitmap" parameter specifies the active physical bands.

If deactivated, all available physical bands are used.

SCPI command:

```
[ :SOURCE<hw> ] :BB:WIMax:AOFDM:ZONE<st0>:AMC:BITMap [ :STATE ]
```

on page 147

#### Physical Bands Bitmap ← Configure Band AMC

Sets the AMC physical bands bitmap pattern in hexadecimal input format.

The LSB (right most bit) corresponds to physical band 0 (the lowest frequency OFDMA subcarriers). Deactivated bits in this pattern deactivate the corresponding bands, i.e. they will not be used for allocating bursts.

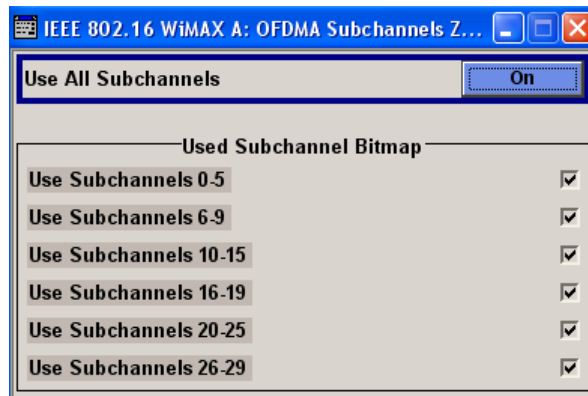
SCPI command:

```
[ :SOURCE<hw> ] :BB:WIMax:AOFDM:ZONE<st0>:AMC:BITMap:PATtern
```

on page 147

#### Configure active Subchannels OFDMA

Calls the menu for activating/deactivating subchannels.



#### Use All Subchannels ← Configure active Subchannels OFDMA

Activates the generation of all subchannels.

SCPI command:

```
[ :SOURCE<hw> ] :BB:WIMax:AOFDM [ :ZONE<st0> ] :SUBChannel:MODE
```

on page 194

**Use Subchannels x...y (downlink PUSC only) ← Configure active Subchannels OFDMA**

Activates the generation of the selected group(s) of subchannels.

SCPI command:

```
[ :SOURCE<hw> ] :BB:WiMax:AOFDM [ :ZONE<st0> ] :SUBChannel<ch>:MAP
on page 195
```

**Allocated Subchannels Bitmap (uplink only) ← Configure active Subchannels OFDMA**

In uplink mode, each physical subchannel can be individually activated or deactivated. This is realized with a 9 byte field identical to the UL allocated subchannels bitmap in the UCD message. The bytes of the bitmap are read from left to right and specify the physical subchannels in LSB first order. The LSB of the first (most left) byte selects the physical subchannel 0.

The same order applies for all FFT Sizes. Subchannel bitmap bits that are not needed in modes with less than 70 physical subchannels are discarded.

SCPI command:

```
[ :SOURCE<hw> ] :BB:WiMax:AOFDM [ :ZONE<st0> ] :SUBChannel:PATtern
on page 194
```

**Show Time Plan OFDMA**

Calls the graphical display of the OFDMA Time Plan (see [chapter 3.10.2, "Time Plan"](#), on page 42).

SCPI command:

n.a.

**No of Bursts OFDMA**

Sets the number of active bursts in the zone/segment.

SCPI command:

```
[ :SOURCE<hw> ] :BB:WiMax:AOFDM [ :ZONE<st0> ] :BURSt [ :COUNT ] on page 189
```

**Space-Time Coding Mode OFDMA**

Sets the space-time coding mode or switches diversity off.

"Off"	Deactivates diversity.
"2 Antennas, Matrix A/ 2 Antennas, Matrix B"	Sets the space-time coding mode to 2 Antennas and Matrix A or Matrix B encoding respectively.
"4 Antennas, Matrix A/ 4 Antennas, Matrix B/ 4 Antennas, Matrix C"	Sets the space-time coding mode to 4 Antennas with Matrix A, Matrix B or Matrix C encoding respectively.

- "Burst Defined" Enables mixing Matrix A and Matrix B encoding on burst level. The used matrix can be defined in the More Parameter dialog box of each burst.  
See also [Data Configuration OFDMA](#) and [UL-MAP Configuration Downlink OFDMA](#).
- "Collaborative Multiplexing" Enables Uplink Collaborative spatial multiplexing.
- "CSTD" Enables Cyclic Shift Transmit Diversity. The CSTD parameters are set in the CSTD dialog (see [CSTD OFDMA](#)).

SCPI command:

`[ :SOURCE<hw> ] :BB:WiMax:AOFDM:ZONE<st0>:STC:MODE` on page 159

### Space-Time Coding Antenna OFDMA

Sets the antenna for the space-time coding modes.

SCPI command:

`[ :SOURCE<hw> ] :BB:WiMax:AOFDM:ZONE<st0>:STC:ANTenna` on page 158

### Generate UL-MAP

(Available for link direction uplink only)

Calls the menu for generating a UL-MAP.

SCPI command:

n.a.

### Dedicated Pilots OFDMA

(This feature is available only for zone type AMC and PUSC with link direction Downlink).

When activated, pilot symbols are generated for subchannels with allocated bursts only. When deactivated, pilot symbols are generated for all subchannels allocated to the current segment, whether or not bursts are active on these subchannels.

SCPI command:

`[ :SOURCE<hw> ] :BB:WiMax:AOFDM:ZONE<st0>:PILDedicated` on page 151

### Data List Management...

Calls the "Data List Management" menu. This menu is used to create and edit a data list.

### Pilot Pattern OFDMA

Sets the pilot pattern in uplink Collaborative Multiplexing mode.

SCPI command:

`[ :SOURCE<hw> ] :BB:WiMax:AOFDM:ZONE<st0>:STC:PILOtpattern`  
on page 159

### Zone Boosting OFDMA

Sets an additional zone boosting in dB.

The zone boosting is applied to both the data and pilot carriers.

SCPI command:

`[ :SOURCE<hw> ] :BB:WiMax:AOFDM:ZONE<st0>:BOOST` on page 147

### 3.11.2 Burst Table

The "burst table" is located in the lower part of the menu where individual burst parameters are set. A graphic display of the current burst locations in time and subchannel space can be viewed with the "Show Time Plan" button.

Each frame supports up to 64 bursts with individual parameters. For both transmission directions, different modulations and channel coding rates are available. For each burst, an optional generic MAC header and CRC is provided.

	Modulation Coding Rate	Chan Coding	Data Length	No. of Subch	No. of Symb	Offset Subch	Offset Symb	Auto	Data Source	Dist Pattern	Boost [dB]	Burst Type	More Param	Conflict	
0	QPSK 1/2	CC	7	1	4	0	0	On			0.00	SUB-MAP	Config		
1	QPSK 1/2	CC	7	1	4	1	0	On			0.00	SUB-MAP	Config		
2	QPSK 1/2	CC	7	1	4	2	0	On			0.00	SUB-MAP	Config		
3	QPSK 1/2	CC	24	1	4	3	0	On	PN 9		0.00	Data	Config		
4		CTC		1	4	4	0	On			0.00	HARQ	Config		
5	QPSK 1/2	CC	24	1	4	5	0	On	PN 9		0.00	Data	Config		
6	QPSK 1/2	CC	24	1	4	6	0	On	PN 9		0.00	Data	Config		
7	QPSK 1/2	CC	24	1	4	7	0	On	PN 9		0.00	Data	Config		
8	QPSK 1/2	CC	24	1	4	8	0	On	PN 9		0.00	Data	Config		
9	QPSK 1/2	CC	6	1	2	1	0	On	PN 9		0.00	Data	Config		

#### Burst Index OFDMA

Displays the consecutive burst index from 0 to 63.

All the rows are always displayed, even if the bursts are inactive. They are switched on and off by the selection of "No. of Bursts" above the table. The active bursts are highlighted.

SCPI command:

n.a.

#### Modulation and Coding Rate OFDMA

Selects the modulation and channel coding rate. Channel coding includes randomization, convolutional/turbo coding and interleaving.

SCPI command:

`[ :SOURce<hw> ] :BB:WIMax:AOFDm [ :ZONE<st0> ] :BURSt<ch0> :FORMat`

on page 166

#### Channel Coding OFDMA

Selects the channel coding mode. Available modes are CC (convolutional coding), CTC (convolutional turbo coding) or Off. In Off mode, channel coding is switched off completely.

SCPI command:

`[ :SOURce<hw> ] :BB:WIMax:AOFDm [ :ZONE<st0> ] :BURSt<ch0> :CCODing:MODE`

on page 160

#### Data Length OFDMA

Determines the data length in bytes.

The given number of bytes is read from the data source. The total number of data bytes in the burst (before channel coding) is determined as follows:

$TotalDataBytes = DataLength + MACHeaderBytes + CRCBytes$

Additionally padding with 0xFF bytes is applied at the end of the data sequence to fill up the allocated slots specified by "No. of Subch" and "No. of Symb" in downlink mode and "Duration [Slots]" in uplink mode. Thus, the Data Length can be lower than the burst's allocated number of bytes.

Up to 10 000 data bytes can be set for each burst.

SCPI command:

[ :SOURCE<hw> ] :BB:WiMax:AOFDM [ :ZONE<st0> ] :BURSt<ch0>:DATA:LENGth  
on page 163

#### Number of Subchannels OFDMA

Enters the number of subchannels for the selected burst. If the number of subchannels is changed, the data length is adjusted to fill the allocated space defined by "No. of Subch" and "No. of Symb" with data so that no padding has to be applied. The data length can be lowered afterwards if data bytes less than the allocated number shall be read from the data source.

SCPI command:

[ :SOURCE<hw> ] :BB:WiMax:AOFDM [ :ZONE<st0> ] :BURSt<ch0>:SUBChannel [ :  
COUNT ] on page 184

#### Number of Symbols OFDMA

Enters the number of symbols for the selected burst.

If the number of symbols is changed, the data length is adjusted to fill the allocated space defined by "No. of Subch" and "No. of Symb" with data so that no padding has to be applied. The data length can be decreased afterwards if data bytes less than the allocated number shall be read from the data source. The entered number of symbols is automatically adjusted to a multiple of the number of symbols per slot for the set subcarrier permutation.

SCPI command:

[ :SOURCE<hw> ] :BB:WiMax:AOFDM [ :ZONE<st0> ] :BURSt<ch0>:SYMBOL [ :  
COUNT ] on page 185

#### Duration-Slots OFDMA

Enters the number of slots for the selected burst. If the number of slots is changed, the data length is adjusted to fill the specified number of slots with data so that no padding has to be applied.

SCPI command:

[ :SOURCE<hw> ] :BB:WiMax:AOFDM [ :ZONE<st0> ] :BURSt<ch0>:SLOT:COUNT  
on page 184

#### Offset Subchannel OFDMA

Indicates the subchannel offset for the selected burst. This value can be modified after "Auto Offset" is deactivated.

It is possible that bursts overlap in manual offset mode. The Conflict column indicates overlapping bursts.

SCPI command:

[ :SOURCE<hw> ] :BB:WiMax:AOFDM [ :ZONE<st0> ] :BURSt<ch0>:OFFSet:  
SUBChannel on page 176



**Offset Symbol OFDMA**

Indicates the symbol offset for the selected burst. The symbol offset is specified relative to zone start. In the first downlink zone, symbol offset 0 refers to the first symbol after the preamble.

This value can be modified after "Auto Offset" is deactivated.

The set symbol offset is rounded to a multiple of the number of symbols per slot defined by the set subcarrier permutation.

It is possible that bursts overlap in manual offset mode. The Conflict column indicates overlapping bursts.

SCPI command:

```
[ :SOURce<hw> ] :BB:WiMax:AOFDM [ :ZONE<st0> ] :BURSt<ch0>:OFFSet:
SYMBol on page 177
```

**Auto OFDMA**

Activates/deactivates the "Auto Offset" mode. In Auto mode, "Offset Subchannel" and "Offset Symbol" are set such that bursts are not overlapping in the subchannel/symbol space.

SCPI command:

```
[ :SOURce<hw> ] :BB:WiMax:AOFDM [ :ZONE<st0> ] :BURSt<ch0>:OFFSet:MODE
on page 176
```

**Data Source OFDMA**

Selects data source for the selected bursts.

The data sources "PN9", "PN11", "PN15", "PN16", "PN20", "PN21", "PN23", "ALL 0", "ALL1", "Pattern" and "Data List" are all available to choose from.

"Data lists" can be generated internally in the data editor or externally.

Data lists are selected in the "File Select" window, which is called by means of the "Data List Management" button.

If the "Pattern" data type is used, the bit pattern is defined in the "Pattern" input box. The length is limited to 64 bits.

SCPI command:

```
[ :SOURce<hw> ] :BB:WiMax:AOFDM [ :ZONE<st0> ] :BURSt<ch0>:DATA
```

on page 161

```
[ :SOURce<hw> ] :BB:WiMax:AOFDM [ :ZONE<st0> ] :BURSt<ch0>:DATA:PATtern
```

on page 163

```
[ :SOURce<hw> ] :BB:WiMax:AOFDM [ :ZONE<st0> ] :BURSt<ch0>:DATA:DSElect
```

on page 162

**Boost OFDMA**

Sets the burst power in dB. This setting affects the data tones only in downlink mode, the pilot power is fixed. In uplink, the setting affects both data and pilot tones.

SCPI command:

```
[ :SOURce<hw> ] :BB:WiMax:AOFDM [ :ZONE<st0> ] :BURSt<ch0>:POWer
```

on page 182

**Burst Type OFDMA**

Selects the burst type from Data, FCH, DL-MAP, UL-MAP, Ranging, HARQ, Fast Feedback or SUB-MAP.

"DATA"	Regular bursts are called "Data" bursts. All data sources are available for this type of burst.
"FCH"	An FCH is generated at subchannel and symbol offset 0. See <a href="#">FCH Configuration Downlink OFDMA</a> on the FCH contents.
"DL-MAP"	A DL-MAP is generated, taking into account all active bursts of all zones. See <a href="#">DL-MAP Configuration Downlink OFDMA</a> on the DL-MAP contents.
"UL-MAP"	A UL-MAP is generated using the specified data list, including additional parameters from the More Param panel. See <a href="#">UL-MAP Configuration Downlink OFDMA</a> for more information on how to create UL-MAP bursts.
"Ranging"	An uplink ranging allocation is configured, which can be used for initial ranging, periodic ranging, or bandwidth request transmissions. See <a href="#">Ranging Uplink OFDMA</a> for more information on how to create ranging channels. The burst type Ranging requires a PUSC zone.
"HARQ"	A HARQ burst is generated. See <a href="#">HARQ Configuration OFDMA</a> for more information on how to create HARQ bursts.
"Fast Feedback"	A fast feedback burst is generated. See <a href="#">Fast Feedback Configuration OFDMA</a> for more information on how to create fast feedback bursts. The burst type Fast Feedback requires a PUSC zone.
"DCD"	A regular data burst containing a DCD message is generated. The DCD message specifies a downlink burst profile for each DIUC value that is being used in the zone configuration.
"UCD"	A regular data burst containing a UCD message is generated. The UCD message specifies an uplink burst profile for each UIUC value that is being used in the zone configuration.
"SUB-MAP"	A SUB-DL-UL-MAP message is generated. Altogether up to three SUB-DL-UL-MAP messages can be enabled for all zones. The SUB-DL-UL-MAP message additional parameters can be configured in the <a href="#">SUB-DL-UL-MAP Configuration OFDMA</a> dialog reached from the "More Param" panel. For each Data, UL-MAP, HARQ, DCD or UCD burst inclusion into one of the three available SUB-DL-UL-MAPs can be activated. In this case, the corresponding map carries a DL-MAP IE specifying the position of the included burst.

SCPI command:

```
[ :SOURce<hw> ] :BB:WIMax:AOFDm [ :ZONE<st0> ] :BURSt<ch0> :TYPE
```

on page 185

**More Parameter OFDMA**

Calls the menu for configuring additional parameters for the bursts.

The menu depends on the selected burst type.

SCPI command:

n.a.

### Conflict OFDMA

Indicates a conflict between the settings of the bursts.

Conflicts can occur if subchannel and symbol offsets are set manually and two or more bursts overlap. Bursts can also overlap with the FCH or DL-MAP. The position of FCH and DL-MAP is fixed and cannot be changed. In uplink mode, a conflict is also indicated for bursts that do not fit into the available zone space and are therefore omitted.

SCPI command:

[ :SOURce<hw> ] :BB:WIMax:AOFDM[ :ZONE<st0> ] :BURSt<ch0> :CONFlict[ :STATe ] on page 161

## 3.12 Sounding Zone Configuration OFDMA

This menu provides all parameters to configure the sounding zones in OFDMA mode.

Sounding Symbol	CID	Power Boost	No. Of Freq. Bands	Start Freq. Band	Sounding Relevance	Cyclic Shift Index	Decimation Offset	Period
0	1 0000	Off	1	0	On	0	0	1
1	1 0000	Off	1	0	On	0	0	1
2	1 0000	Off	1	0	On	0	0	1
3	1 0000	Off	1	0	On	0	0	1
4	1 0000	Off	1	0	On	0	0	1
5	1 0000	Off	1	0	On	0	0	1
6	1 0000	Off	1	0	On	0	0	1
7	1 0000	Off	1	0	On	0	0	1
8	1 0000	Off	1	0	On	0	0	1
9	1 0000	Off	1	0	On	0	0	1
10	1 0000	Off	1	0	On	0	0	1
11	1 0000	Off	1	0	On	0	0	1
12	1 0000	Off	1	0	On	0	0	1
13	1 0000	Off	1	0	On	0	0	1
14	1 0000	Off	1	0	On	0	0	1
15	1 0000	Off	1	0	On	0	0	1

### 3.12.1 OFDMA Sounding Zone Settings

#### Sounding Type OFDMA

Selects either sounding type A or B.

SCPI command:

`[ :SOURCE<hw> ] :BB:WiMax:AOFDM:ZONE<st0>:SOUNDing:TYPE` on page 158

#### Sounding Relevance Flag OFDMA

Selects whether sounding is relevant individually for each CID or for all CIDs.

SCPI command:

`[ :SOURCE<hw> ] :BB:WiMax:AOFDM:ZONE<st0>:SOUNDing:RELevance:FLAG`  
on page 157

#### Separability Type OFDMA

(only for Sounding Type A)

Selects the sounding separability type.

SCPI command:

`[ :SOURCE<hw> ] :BB:WiMax:AOFDM:ZONE<st0>:SOUNDing:SEParability`  
on page 158

#### Total Number Of CIDs OFDMA

Sets the total number of CIDs.

SCPI command:

`[ :SOURCE<hw> ] :BB:WiMax:AOFDM:ZONE<st0>:SOUNDing:CID:COUNT`  
on page 152

#### Zone Boosting OFDMA

Sets an additional zone boosting in dB.

The zone boosting is applied to both the data and pilot carriers.

SCPI command:

`[ :SOURCE<hw> ] :BB:WiMax:AOFDM:ZONE<st0>:BOOST` on page 147

#### Allocation Mode OFDMA

(only for sounding type A)

Selects the frequency allocation mode for sounding CIDs.

"Normal"            The used sounding allocations are specified with "Number Of Freq. Bands" and "Start Freq. Band".

"Band AMC"        A "Band Bitmap" pattern determines the frequencies to be sent.

SCPI command:

`[ :SOURCE<hw> ] :BB:WiMax:AOFDM:ZONE<st0>:SOUNDing:AMODE` on page 152

**No. Of Symbols OFDMA**

Sets the zone length in number of symbols. Zones with identical zone number have the same length, as they overlap in time.

SCPI command:

`[ :SOURCE<hw> ] :BB:WiMax:AOFDM:ZONE<st0>:SYMBOL:COUNT` on page 159

**Sounding Relevance OFDMA**

(only if Sounding Relevance Flag is set to Same For All CIDs)

Selects the sounding relevance mode.

SCPI command:

`[ :SOURCE<hw> ] :BB:WiMax:AOFDM:ZONE<st0>:SOUNDING:RELEVANCE:MODE`  
on page 157

**Max Cyclic Shift Index OFDMA**

(only for Sounding Type A and Separability Type Cyclic Shift)

Sets the value for the maximum cyclic shift index.

SCPI command:

`[ :SOURCE<hw> ] :BB:WiMax:AOFDM:ZONE<st0>:SOUNDING:CMAXIMUM`  
on page 156

**Permutation OFDMA**

(only for Sounding Type B)

Indicates the permutation used for this sounding zone.

SCPI command:

`[ :SOURCE<hw> ] :BB:WiMax:AOFDM:ZONE<st0>:SOUNDING:PERMUTATION`  
on page 157

**DL PermBase OFDMA**

(only for Sounding Type B)

Sets the value for the DL Perm Base.

SCPI command:

`[ :SOURCE<hw> ] :BB:WiMax:AOFDM:ZONE<st0>:SOUNDING:DLPERMBASE`  
on page 156

**Decimation Value OFDMA**

(only for Sounding Type A and Separability Type Decimated Subcarriers)

Sets the value for the decimation.

SCPI command:

`[ :SOURCE<hw> ] :BB:WiMax:AOFDM:ZONE<st0>:SOUNDING:DECIMATION:VALUE`  
on page 156

**Decimation Offset Randomization OFDMA**

(only for Sounding Type A and Separability Type Decimated Subcarriers)

Activates/deactivates the decimation offset randomization.

SCPI command:

[ :SOURce<hw> ] :BB:WIMax:AOFDM:ZONE<st0>:SOUNDing:DECimation:RANDomization[:STATe] on page 156

### Shift Value U OFDMA

(only for sounding type A)

Sets the shift value (u) used for decimation offset and cyclic shift index.

SCPI command:

[ :SOURce<hw> ] :BB:WIMax:AOFDM:ZONE<st0>:SOUNDing:UVAL on page 158

## 3.12.2 Sounding Table

The "sounding table" is located in the lower part of the menu where individual sounding parameters for each CID are set.

	Sounding Symbol	CID	Power Boost	No. Of Freq. Bands	Start Freq. Band	Sounding Relevance	Cyclic Shift Index	Decimation Offset	Periodicity
0	1	0000	On	1	0	On	0	0	1
1	1	0000	Off	1	0	On	0	0	1
2	1	0000	Off	1	0	On	0	0	1
3	1	0000	Off	1	0	On	0	0	1
4	1	0000	Off	1	0	On	0	0	1
5	1	0000	Off	1	0	On	0	0	1
6	1	0000	Off	1	0	On	0	0	1
7	1	0000	Off	1	0	On	0	0	1
8	1	0000	Off	1	0	On	0	0	1
9	1	0000	Off	1	0	On	0	0	1
10	1	0000	Off	1	0	On	0	0	1
11	1	0000	Off	1	0	On	0	0	1
12	1	0000	Off	1	0	On	0	0	1
13	1	0000	Off	1	0	On	0	0	1
14	1	0000	Off	1	0	On	0	0	1
15	1	0000	Off	1	0	On	0	0	1

### Sounding Index OFDMA

Displays the consecutive CID index from 0 to 15.

All the rows are always displayed, even if the CIDs are inactive. They are switched on and off by the selection of "Total Number Of CIDs" above the table. The active CIDs are highlighted.

SCPI command:

n.a.

### Sounding Symbol OFDMA

Sets the symbol used for this CID from the available symbols of the zone. Each sounding CID occupies one symbol only.

SCPI command:

[ :SOURce<hw> ] :BB:WIMax:AOFDM:ZONE<st0>:SOUNDing:CID<ch0>:SYMBOL on page 155

**CID OFDMA**

Sets the CID (connection control identifier).

SCPI command:

```
[ :SOURce<hw> ] :BB:WiMax:AOFDM:ZONE<st0>:SOUNDing:CID<ch0>:CID
```

on page 153

**Power Boost OFDMA**

Activates/deactivates the power boost.

SCPI command:

```
[ :SOURce<hw> ] :BB:WiMax:AOFDM:ZONE<st0>:SOUNDing:CID<ch0>:POWER [ :
```

```
STATe ] on page 154
```

**No. Of Freq. Bands OFDMA**

(only for Sounding Type A and normal Allocation Mode)

Sets the number of frequency bands used by the corresponding CID.

SCPI command:

```
[ :SOURce<hw> ] :BB:WiMax:AOFDM:ZONE<st0>:SOUNDing:CID<ch0>:FBAND [ :
```

```
COUNT ] on page 154
```

**Start Freq. Band OFDMA**

(only for Sounding Type A and normal Allocation Mode)

Sets the start frequency band.

SCPI command:

```
[ :SOURce<hw> ] :BB:WiMax:AOFDM:ZONE<st0>:SOUNDing:CID<ch0>:FBAND:
```

```
START on page 153
```

**Band Bitmap OFDMA**

(only for Sounding Type A and Allocation Mode set to Band AMC)

Sets the logical band bitmap of the corresponding CID.

A "1" enables sounding transmission in the corresponding logical band, a "0" disables it.

The right-most bit (LSB) corresponds to logical band 0 (the lowest frequency subcarriers).

SCPI command:

```
[ :SOURce<hw> ] :BB:WiMax:AOFDM:ZONE<st0>:SOUNDing:CID<ch0>:BBITmap
```

on page 152

**Sounding Relevance**

Activates/deactivates the sounding relevance.

SCPI command:

```
[ :SOURce<hw> ] :BB:WiMax:AOFDM:ZONE<st0>:SOUNDing:CID<ch0>:
```

```
RELevance [ :STATe ] on page 154
```

**Cyclic Shift Index OFDMA**

(only for Sounding Type A)

Sets the value for the cyclic shift index. If the "Separability Type" is set to "Decimated Subcarriers", the cyclic shift index is not used.

SCPI command:

`[ :SOURCE<hw> ] :BB:WiMax:AOFDM:ZONE<st0>:SOUNDing:CID<ch0>:CINDEX`

on page 153

#### **Decimation Offset OFDMA**

(only for Sounding Type A)

Sets the value for the decimation offset. If the "Separability Type" is set to "Cyclic Shift", the decimation offset is not used.

SCPI command:

`[ :SOURCE<hw> ] :BB:WiMax:AOFDM:ZONE<st0>:SOUNDing:CID<ch0>:`

`DECoffset` on page 153

#### **Periodicity**

Sets the value for the periodicity.

A value of 0 transmits this sounding CID only once at the beginning of the signal sequence.

A value of 1 activates continuous transmission of the sounding CID with each frame.

Larger values specify the period in frames that active sounding CIDs occur.

SCPI command:

`[ :SOURCE<hw> ] :BB:WiMax:AOFDM:ZONE<st0>:SOUNDing:CID<ch0>:`

`PERiodicity` on page 154

#### **No. Of Subch**

(only for Sounding Type B)

Sets the number of subchannels.

SCPI command:

`[ :SOURCE<hw> ] :BB:WiMax:AOFDM:ZONE<st0>:SOUNDing:CID<ch0>:`

`SUBChannel [ :COUNT ]` on page 155

#### **Offset Subch**

(only for Sounding Type B)

Sets the subchannel offset.

SCPI command:

`[ :SOURCE<hw> ] :BB:WiMax:AOFDM:ZONE<st0>:SOUNDing:CID<ch0>:`

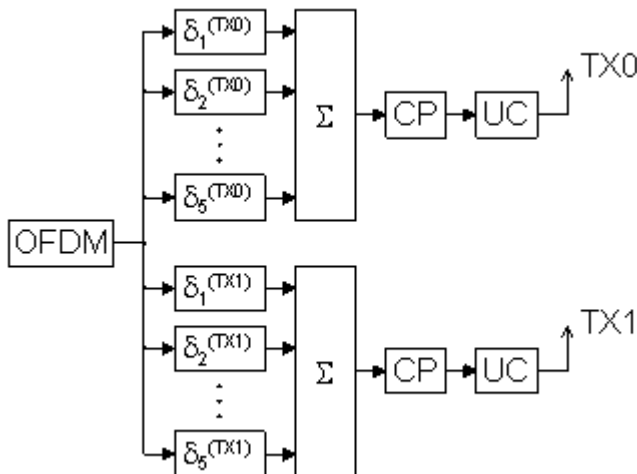
`SUBChannel:OFFSet` on page 155

### **3.13 CSTD OFDMA**

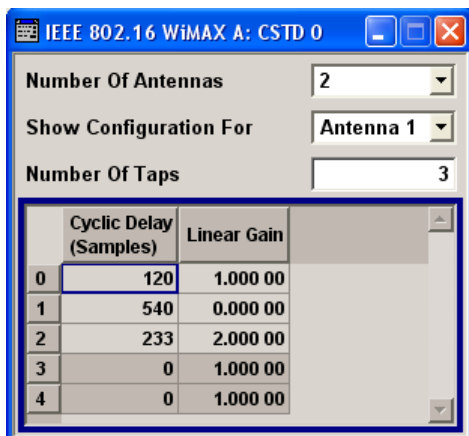
The "CSTD" menu is reached via the "CSTD" button in the OFDMA zone configuration menu. The CSTD is only available in downlink for STC Mode set to CSTD.



A zone with activated CSTD is encoded like a regular SISO zone (STC off). After the IFFT a multi-tap delay line is applied to the time-domain signal. Each tap can be weighted with a different linear factor before summation of all taps. The cyclic prefix is applied on the sum output. Different cyclic-delay filters can be applied to every antenna.



The following describes the CSTD options in OFDMA mode.



**Number Of Antennas OFDMA**

Sets the number of antennas used for cyclic shift transmit diversity (CSTD).

One baseband is only generating one antenna at a time.

SCPI command:

```
[ :SOURce<hw> ] :BB:WIMax:AOFDM:ZONE<st0>:CSTD:ANTCount on page 148
```

**Show Configuration For OFDMA**

Selects the antenna for which the configuration is made.

This parameter selects which antenna to configure with the parameters below. The antenna actually generated by the current baseband is selected with "Space-Time Coding Antenna" in the zone configuration dialogue.

SCPI command:

n.a.

**Number Of Taps OFDMA**

Sets the number of samples by which the OFDM symbols are cyclically shifted on the given tap.

SCPI command:

```
[ :SOURCE<hw> ] :BB:WiMax:AOFDM:ZONE<st0>:CSTD<ch0>:TAPCount
```

on page 149

**Cyclic Delay (Samples) OFDMA**

Sets the cyclic delay with that the OFDM symbols of the selected antenna will be cyclically shifted.

With CSTD, each antenna sends a circularly shifted version of the same OFDM symbol, i.e. the antenna selected with the parameter "Show Configuration For" will send the same OFDM symbol as the other antennas, but the OFDM symbol is circularly shifted by the samples set with the parameter Cyclic Delay.

Positive values remove the specified number of samples from the end of the symbol and prepend them to the start of the symbol.

SCPI command:

```
[ :SOURCE<hw> ] :BB:WiMax:AOFDM:ZONE<st0>:CSTD<ch0>:CDELay<dir0>
```

on page 148

**Liner Gain OFDMA**

Sets a linear gain factor for the corresponding tap.

The gain factors are applied to the symbols before summation fo all taps.

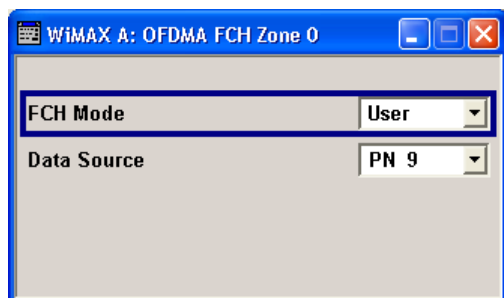
SCPI command:

```
[ :SOURCE<hw> ] :BB:WiMax:AOFDM:ZONE<st0>:CSTD<ch0>:GAIN<dir0>
```

on page 148

## 3.14 FCH Configuration Downlink OFDMA

The "FCH Configuration" menu is reached via the "More Param" button in the OFDMA burst table. The FCH is only available in downlink mode. The following describes the FCH options in OFDMA mode.

**FCH Mode OFDMA**

Selects the mode for generating the FCH.

The Channel Coding of the FCH is performed both in "Auto" and "User" mode.

"Auto" In "Auto" mode, the DLFP (Downlink Frame Prefix) fields, which form the FCH, are filled automatically with parameters specified at different locations.

The following mapping applies in Auto mode:

- Used subchannel bitmap  
Set to the bitmap specified in the "Configure active Subchannels" panel.
- Repetition\_Coding\_Indication  
Specifies the DL-MAP repetition coding set in the "Configure DL-MAP" panel.
- Coding\_Indication  
Specifies channel coding of the DL-MAP (CC or CTC)
- DL-Map\_Length  
Set to the number of slots allocated for the DL-MAP.

The FCH is transmitted with QPSK 1/2 and repetition coding of 4. For FFT Size 128 a reduced FCH is transmitted in one slot.

"User" In "User" mode, the FCH is filled with data specified under Data Source. This enables any arbitrary data to be sent with the FCH burst. 24 bits are read from the data source, these bits are repeated once to form 48 bits. The FCH is transmitted with QPSK 1/2 and repetition coding of 4. For FFT Size 128 a reduced FCH of size 12 bits is transmitted in one slot.

SCPI command:

`[ :SOURCE<hw> ] :BB:WIMax:AOFDM:ZONE<st0>:FCH:MODE` on page 149

### Data Source OFDMA

Selects data source for the selected bursts.

The data sources "PN9", "PN11", "PN15", "PN16", "PN20", "PN21", "PN23", "ALL 0", "ALL1", "Pattern" and "Data List" are all available to choose from.

"Data lists" can be generated internally in the data editor or externally.

Data lists are selected in the "File Select" window, which is called by means of the "Data List Management" button.

If the "Pattern" data type is used, the bit pattern is defined in the "Pattern" input box. The length is limited to 64 bits.

SCPI command:

`[ :SOURCE<hw> ] :BB:WIMax:AOFDM [ :ZONE<st0> ] :BURSt<ch0>:DATA`

on page 161

`[ :SOURCE<hw> ] :BB:WIMax:AOFDM [ :ZONE<st0> ] :BURSt<ch0>:DATA:PATtern`

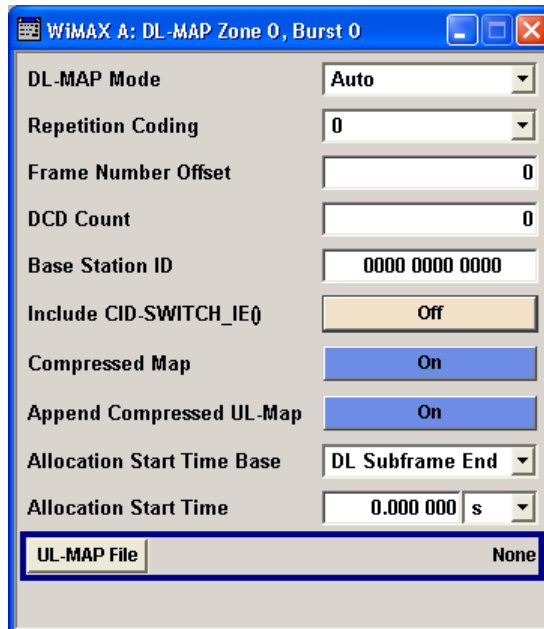
on page 163

`[ :SOURCE<hw> ] :BB:WIMax:AOFDM [ :ZONE<st0> ] :BURSt<ch0>:DATA:DSElect`

on page 162

### 3.15 DL-MAP Configuration Downlink OFDMA

The DL-MAP "Configuration" menu is reached via the "More Param" button in the OFDMA burst table. The DL-MAP is only available in OFDMA downlink mode.



DL-MAP Mode	Auto
Repetition Coding	0
Frame Number Offset	0
DCD Count	0
Base Station ID	0000 0000 0000
Include CID-SWITCH_IE0	Off
Compressed Map	On
Append Compressed UL-Map	On
Allocation Start Time Base	DL Subframe End
Allocation Start Time	0.000 000 s
UL-MAP File	None

#### DL-MAP Mode OFDMA

Selects the mode for generating the DL-MAP.

Channel Coding of the DL-MAP is performed both in "Auto" and "User" mode.

- "Auto"
- In "Auto" mode, the DL-MAP is filled automatically with parameters specified at different locations.
- The following mapping applies in Auto mode:
- Frame Duration Code  
Specified by the Frame Duration set in the WiMAX main panel.
  - Frame Number  
Starts with the value specified by "Frame Number Offset" in the first generated frame and advances by 1 in every following frame.
  - DCD Count  
Directly set by the "DCD Count" field.
  - Base Station ID  
48 bits specified by the "Base Station ID" field.
  - No. OFDMA symbols  
Set to the total number of OFDMA symbols in all downlink zones
- For each burst:
- DIUC  
Set to the "DIUC" field in the "More Param" Panel.
  - CID  
Set to the "CID" field in the More "Param Panel". This field is only included if "Include CID-SWITCH\_IE()" is active.
  - OFDMA Symbol offset  
Set to "Offset Symb" + 1 for the first zone and to the absolute symbol offset in all other zones.
  - Subchannel offset  
Set to "Offset Subch" of the burst table.
  - Boosting  
Depends on the "Boost" setting of the corresponding burst.  
The following mapping applies:  
000: 0dB  
001: +6dB  
010: -6dB  
011: +9dB  
100: +3dB  
101: -3dB  
110: -9dB  
111: -12dB  
000 is set if any other value is specified for "Boost".
  - No. OFDMA Symbols  
Set to "No. of Symb" of the burst table.
  - No. Subchannels  
Set to "No. of Subch" of the burst table.
  - Repetition Coding Indication  
Set to Repetition Coding in the "More Param" Panel.

"User" In "User" mode, the DL-MAP is filled with data specified under Data Source. This enables any arbitrary data to be sent with the DL-MAP burst.

SCPI command:

`[ :SOURCE<hw> ] :BB:WiMax:AOFDM [ :ZONE<st0> ] :DLMap:MODE` on page 193

#### **DL-MAP Repetition Coding OFDMA**

Repetition coding can be activated for the DL-MAP by specifying any value other than 0.

SCPI command:

`[ :SOURCE<hw> ] :BB:WiMax:AOFDM [ :ZONE<st0> ] :DLMap:REPCoding`  
on page 193

#### **Frame Number Offset DL-MAP OFDMA**

Sets the frame number offset.

This value is added to the current frame number of the sequence. The result is used as Frame Number in the DL-MAP (in Auto mode).

SCPI command:

`[ :SOURCE<hw> ] :BB:WiMax:AOFDM [ :ZONE<st0> ] :DLMap:FNOFset`  
on page 192

#### **DCD Count DL-MAP OFDMA**

Sets the DCD count value.

This value is used for the corresponding DL-MAP field (in "Auto" mode).

SCPI command:

`[ :SOURCE<hw> ] :BB:WiMax:AOFDM [ :ZONE<st0> ] :DLMap:DATA:DCD [ :COUNT ]`  
on page 192

#### **Base Station ID OFDMA**

Sets the Base Station ID.

This value is used for the corresponding DL-MAP field in ("Auto" mode).

SCPI command:

`[ :SOURCE<hw> ] :BB:WiMax:AOFDM [ :ZONE<st0> ] :DLMap:BSID` on page 190

#### **Configure MAC OFDMA**

Calls the menu for configuring the Mac header panel for the DL-MAP.

SCPI command:

n.a.

#### **Include CID-Switch\_IE() OFDMA**

Includes/excludes the CID-Switch\_IE().

SCPI command:

`[ :SOURCE<hw> ] :BB:WiMax:AOFDM [ :ZONE<st0> ] :DLMap:IE:STATE`  
on page 193

**Append DCD OFDMA**

If activated, the DCD is appended to the DL-MAP. The DCD message carries its own MAC header and CRC, but is included within the DL-MAP burst.

SCPI command:

```
[ :SOURCE<hw> ] :BB:WiMax:AOFDM [ :ZONE<st0> ] :DLMap:DCD:STATE
on page 192
```

**DCD CID OFDMA**

(only if Append DCD is ON)

Enters the value for the DCD CID.

This CID (connection control identifier) is independent from the DL-Map CID and is only used for the DCD message.

SCPI command:

```
[ :SOURCE<hw> ] :BB:WiMax:AOFDM [ :ZONE<st0> ] :DLMap:DCD:CID on page 192
```

**Compressed Map OFDMA**

If activated, a compressed map is generated instead of a normal map.

SCPI command:

```
[ :SOURCE<hw> ] :BB:WiMax:AOFDM [ :ZONE<st0> ] :DLMap:COMPRESSED:STATE
on page 191
```

**Append Compressed UL-Map OFDMA**

(only if Compressed Map is ON)

If activated, a compressed UL-Map is appended to the DL-Map.

SCPI command:

```
[ :SOURCE<hw> ] :BB:WiMax:AOFDM [ :ZONE<st0> ] :DLMap:COMPRESSED:ULMap:
STATE on page 191
```

**Allocation Start Time Base OFDMA**

Selects the Allocation Start Time base, required for the UL-Map appended to the DL-Map. The Allocation Start Time field of the UL-Map specifies the start of the uplink subframe.

If Start Time Base is set to DL Subframe End, the Allocation Start Time of the UL-Map is set to the end of the downlink subframe + "Allocation Start Time" parameter set below.

When Start Time Base is set to Frame Start, the Allocation Start Time of the UL-Map is set to the beginning of the frame + "Allocation Start Time" parameter set below.

SCPI command:

```
[ :SOURCE<hw> ] :BB:WiMax:AOFDM [ :ZONE<st0> ] :DLMap:COMPRESSED:AMODE
on page 190
```

**Allocation Start Time OFDMA**

Sets the Allocation Start Time in the UL-Map, appended to the DL-Map.

SCPI command:

```
[ :SOURCE<hw> ] :BB:WiMax:AOFDM [ :ZONE<st0> ] :DLMap:COMPRESSED:ATIME
on page 190
```

**UL-MAP File OFDMA**

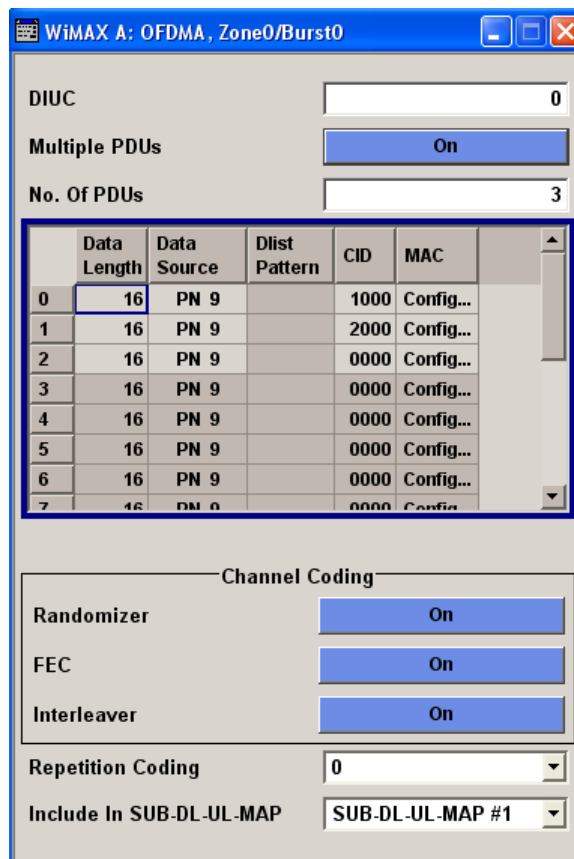
Calls the menu for selecting the UL-Map file.

SCPI command:

[ :SOURce<hw> ] :BB:WiMax:AOFDM [ :ZONE<st0> ] :DLMap:COMPRESSED:ULMap:DSElect on page 191

## 3.16 Data Configuration OFDMA

The "Data Configuration" menu is reached via the "More Param" button in the OFDMA burst table.



### 3.16.1 OFDMA Data Configuration Settings

**DIUC OFDMA**

Sets the specific DIUC.

In DL-MAP mode "Auto", the DIUC of each burst is included in the DL-MAP.

SCPI command:

[ :SOURce<hw> ] :BB:WiMax:AOFDM [ :ZONE<st0> ] :BURSt<ch0>:DIUC on page 163



**UIUC OFDMA**

(This feature is only available in uplink direction.)

Sets the specific UIUC. The UIUC is used for the UL-MAP, if generated.

SCPI command:

```
[ :SOURCE<hw> ] :BB:WIMax:AOFDM [ :ZONE<st0> ] :BURSt<ch0>:UIUC
```

on page 186

**Multiple PDUs OFDMA**

Enables/disables configuration of multiple PDUs. If this parameter is enabled, multiple PDUs each with own MAC header and CRC are available within one burst (see [PDU Table](#) ).

SCPI command:

```
[ :SOURCE<hw> ] :BB:WIMax:AOFDM [ :ZONE<st0> ] :BURSt<ch0>:PDU:STATe
```

on page 177

**No. Of PDUs OFDMA**

Available for enabled parameter Multiple PDUs only

Sets the number of PDUs in the burst.

Remote-control command:SOUR:BB:WIM:AOFDM:ZONE0:BURS2:PDU:COUN 7

SCPI command:

```
[ :SOURCE<hw> ] :BB:WIMax:AOFDM [ :ZONE<st0> ] :BURSt<ch0>:PDU:COUNT
```

on page 177

**MAC CID**

The command sets the CID (connection control identifier) of the medium access control layer (MAC). The CID identifies a connection to equivalent peers in the MAC of the base station and subscriber station.

This parameter is identical to the CID set in the MAC Header settings.

SCPI command:

```
[ :SOURCE<hw> ] :BB:WIMax:AOFDM [ :ZONE<st0> ] :BURSt<ch0>:MAC:CID
```

on page 174

**Configure MAC**

Available for disabled parameter Multiple PDUs only

Calls the menu for configuring the MAC header panel for the selected burst (see [MAC Header Configuration OFDMA](#)).

SCPI command:

n.a.

**Channel Coding Randomizer**

Activates or deactivates the randomizer applied before channel coding.

SCPI command:

```
[ :SOURCE<hw> ] :BB:WIMax:AOFDM [ :ZONE<st0> ] :BURSt<ch0>:CCODing:
```

RANDomizer on page 161

**FEC**

Activates or deactivates the FEC.

SCPI command:

```
[ :SOURCE<hw> ] :BB:WiMax:AOFDM [ :ZONE<st0> ] :BURSt<ch0>:CCODing:FEC
```

on page 160

**Interleaver**

Activates or deactivates the interleaver state.

SCPI command:

```
[ :SOURCE<hw> ] :BB:WiMax:AOFDM [ :ZONE<st0> ] :BURSt<ch0>:CCODing:
```

```
INTerleaver on page 160
```

**Repetition Coding**

Activates repetition coding by specifying any value other than 0.

SCPI command:

```
[ :SOURCE<hw> ] :BB:WiMax:AOFDM [ :ZONE<st0> ] :BURSt<ch0>:CCODing:
```

```
REPCoding on page 161
```

**Space-Time Coding Mode**

Selects the space time coding mode for the specified burst.

This parameter is available only, if the "Space-Time Coding Mode" is set to "Burst Defined".

SCPI command:

```
[ :SOURCE<hw> ] :BB:WiMax:AOFDM [ :ZONE<st0> ] :BURSt<ch0>:STC:MODE
```

on page 184

**Include In SUB-DL-UL-MAP**

Selects whether a DL-MAP IE is included in the specified SUB-DL-UL-MAP message for this burst.

The default value of this parameter is off. One of the three available SUB-DL-UL-MAPs can be selected to carry the DL-MAP IE for this burst.

SCPI command:

```
[ :SOURCE<hw> ] :BB:WiMax:AOFDM [ :ZONE<st0> ] :BURSt<ch0>:DLUL:INCLude
```

on page 165

**Ranging Backoff Start**

(only for burst type UCD)

Sets the start value for the ranging backoff.

SCPI command:

```
[ :SOURCE<hw> ] :BB:WiMax:AOFDM [ :ZONE<st0> ] :BURSt<ch0>:UCD:RANGing:
```

```
BOStart on page 186
```

**Ranging Backoff End**

(only for burst type UCD)

Sets the end value for the ranging backoff.

SCPI command:

[ :SOURCE<hw> ] :BB:WIMax:AOFDM [ :ZONE<st0> ] :BURSt<ch0>:UCD:RANGing:BOENd on page 185

### Request Backoff Start

(only for burst type UCD)

Sets the start value for the request backoff.

SCPI command:

[ :SOURCE<hw> ] :BB:WIMax:AOFDM [ :ZONE<st0> ] :BURSt<ch0>:UCD:REQuest:BOStArt on page 186

### Request Backoff End

(only for burst type UCD)

Sets the end value for the request backoff.

SCPI command:

[ :SOURCE<hw> ] :BB:WIMax:AOFDM [ :ZONE<st0> ] :BURSt<ch0>:UCD:REQuest:BOENd on page 186

### Burst Profile Mapping

(only for burst type UCD and DCD)

Determines whether the burst profile mapping is performed automatically or manually. In manual configuration, the mapping of the [FEC & Modulation Type](#) to the UIUCs/DUICs is defined by the user.

Burst Profile Mapping		Manual
UIUC	FEC & Modulation Type	
0	1	QPSK (CC) 1/2
1	2	QPSK (CC) 3/4
2	3	16QAM (CC) 1/2
3	4	16QAM (CC) 3/4
4	5	64QAM (CC) 1/2
5	6	64QAM (CC) 2/3
6	7	64QAM (CC) 3/4
7	8	QPSK (CTC) 1/2
8	9	QPSK (CTC) 3/4
9	10	16QAM (CTC) 1/2

SCPI command:

[ :SOURCE<hw> ] :BB:WIMax:AOFDM [ :ZONE<st0> ] :BURSt<ch0>:PMAP on page 181

### FEC & Modulation Type ← Burst Profile Mapping

(only for burst type UCD and DCD and manual Burst Profile Mapping)

Sets the FEC and the modulation for the selected UIUC/DUIC.

SCPI command:

`[ :SOURCE<hw> ] :BB:WiMax:AOFDM [ :ZONE<st0> ] :BURSt<ch0> :PMAP :  
DMODulation<dir0>` on page 181

`[ :SOURCE<hw> ] :BB:WiMax:AOFDM [ :ZONE<st0> ] :BURSt<ch0> :PMAP :  
UMODulation<dir0>` on page 182

### 3.16.2 PDU Table

The "PDU table" is located in the middle part of the menu where individual PDU parameters are set.

Each burst supports up to 16 PDUs with individual parameters. For each PDU, the data length, the data source, the CID and the MAC can be individually configured.

	Data Length	Data Source	Dist Pattern	CID	MAC
0	16	PN 9		1000	Config...
1	16	PN 9		2000	Config...
2	16	PN 9		0000	Config...
3	16	PN 9		0000	Config...
4	16	PN 9		0000	Config...
5	16	PN 9		0000	Config...
6	16	PN 9		0000	Config...
7	16	PN 9		0000	Config...

#### Data Length PDU OFDMA

Available for enabled parameter Multiple PDUs only

Sets the data length for the selected PDU in the burst.

SCPI command:

`[ :SOURCE<hw> ] :BB:WiMax:AOFDM [ :ZONE<st0> ] :BURSt<ch0> :PDU<dir0> :  
DLENgth` on page 179

#### Data Source PDU OFDMA

Available for enabled parameter Multiple PDUs only

Sets the PDU data source.

The data sources "PN9", "PN11", "PN15", "PN16", "PN20", "PN21", "PN23", "ALL 0", "ALL1", "Pattern" and "Data List" are all available to choose from.

"Data lists" can be generated internally in the data editor or externally.

Data lists are selected in the "File Select" window, which is called by means of the "Data List Management" button.

If the "Pattern" data type is used, the bit pattern is defined in the "Pattern" input box. The length is limited to 64 bits.

SCPI command:

```
[ :SOURCE<hw> ] :BB:WIMax:AOFDM [ :ZONE<st0> ] :BURSt<ch0>:PDU<dir0>:
```

DATA on page 178

```
[ :SOURCE<hw> ] :BB:WIMax:AOFDM [ :ZONE<st0> ] :BURSt<ch0>:PDU<dir0>:
```

DATA:DSElect on page 178

```
[ :SOURCE<hw> ] :BB:WIMax:AOFDM [ :ZONE<st0> ] :BURSt<ch0>:PDU<dir0>:
```

DATA:PATtern on page 179

### MAC CID (PDU)

The command sets the CID (Connection Control Identifier) of the medium access control layer (MAC). The CID identifies a connection to equivalent peers in the MAC of the base station and subscriber station.

SCPI command:

```
[ :SOURCE<hw> ] :BB:WIMax:AOFDM [ :ZONE<st0> ] :BURSt<ch0>:PDU<dir0> [ :
```

MAC ] :CID on page 181

### MAC Config... PDU OFDMA

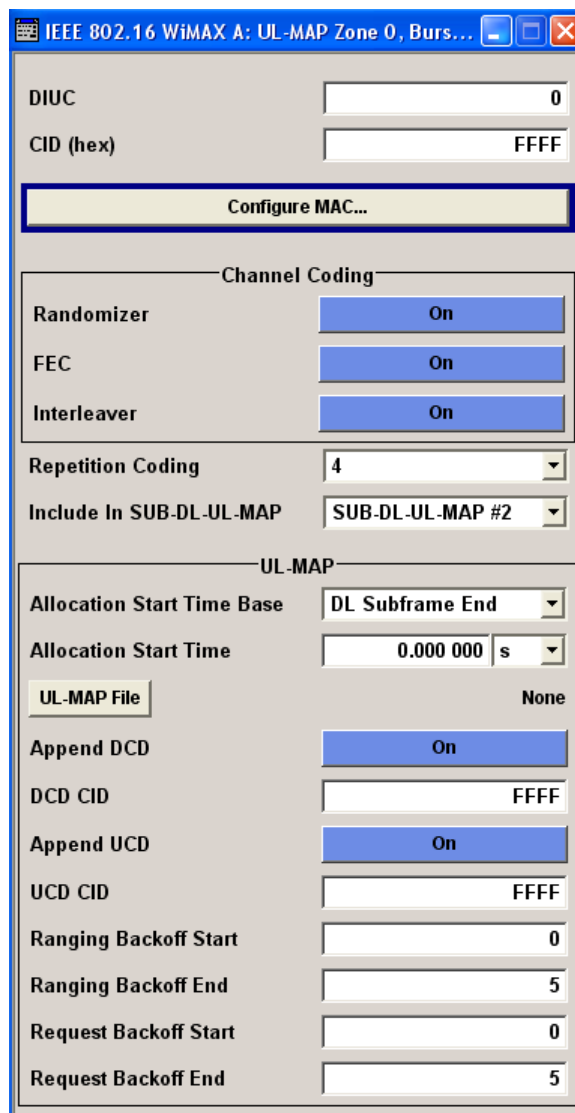
Calls the menu for configuring the MAC header panel for the selected PDU (see [PDU MAC Configuration OFDMA](#)).

SCPI command:

n.a.

## 3.17 UL-MAP Configuration Downlink OFDMA

The "UL-MAP" Configuration menu is reached via the "More Param" button in the OFDMA burst table.



IEEE 802.16 WiMAX A: UL-MAP Zone 0, Burs...

DIUC

CID (hex)

**Configure MAC...**

**Channel Coding**

Randomizer  On

FEC  On

Interleaver  On

Repetition Coding

Include In SUB-DL-UL-MAP

**UL-MAP**

Allocation Start Time Base

Allocation Start Time  s

UL-MAP File

Append DCD  On

DCD CID

Append UCD  On

UCD CID

Ranging Backoff Start

Ranging Backoff End

Request Backoff Start

Request Backoff End

**DIUC OFDMA**

Sets the specific DIUC.

In DL-MAP mode "Auto", the DIUC of each burst is included in the DL-MAP.

SCPI command:

```
[ :SOURCE<hw> ] :BB:WIMax:AOFDM [ :ZONE<st0> ] :BURSt<ch0> :DIUC
```

on page 163

**MAC CID**

The command sets the CID (connection control identifier) of the medium access control layer (MAC). The CID identifies a connection to equivalent peers in the MAC of the base station and subscriber station.

This parameter is identical to the CID set in the MAC Header settings.

SCPI command:

```
[ :SOURCE<hw> ] :BB:WiMax:AOFDM [ :ZONE<st0> ] :BURSt<ch0>:MAC:CID
```

on page 174

### Configure MAC

Calls the menu for configuring the Mac header panel for the selected burst.

SCPI command:

n.a.

### Channel Coding Randomizer

Activates or deactivates the randomizer applied before channel coding.

SCPI command:

```
[ :SOURCE<hw> ] :BB:WiMax:AOFDM [ :ZONE<st0> ] :BURSt<ch0>:CCODing:
```

RANDomizer on page 161

### FEC

Activates or deactivates the FEC.

SCPI command:

```
[ :SOURCE<hw> ] :BB:WiMax:AOFDM [ :ZONE<st0> ] :BURSt<ch0>:CCODing:FEC
```

on page 160

### Interleaver

Activates or deactivates the interleaver state.

SCPI command:

```
[ :SOURCE<hw> ] :BB:WiMax:AOFDM [ :ZONE<st0> ] :BURSt<ch0>:CCODing:
```

INTerleaver on page 160

### Repetition Coding

Activates repetition coding by specifying any value other than 0.

SCPI command:

```
[ :SOURCE<hw> ] :BB:WiMax:AOFDM [ :ZONE<st0> ] :BURSt<ch0>:CCODing:
```

REPCoding on page 161

### Include In SUB-DL-UL-MAP

Selects whether a DL-MAP IE is included in the specified SUB-DL-UL-MAP message for this burst.

The default value of this parameter is off. One of the three available SUB-DL-UL-MAPs can be selected to carry the DL-MAP IE for this burst.

SCPI command:

```
[ :SOURCE<hw> ] :BB:WiMax:AOFDM [ :ZONE<st0> ] :BURSt<ch0>:DLUL:INCLude
```

on page 165

### Allocation Start Time Base

Selects the Allocation Start Time base. The Allocation Start Time field of the UL-MAP specifies the start of the uplink subframe.

When Start Time Base is set to DL Subframe End, the Allocation Start Time of the UL-MAP is set to the end of the downlink subframe + Allocation Start Time parameter set below.

When Start Time Base is set to Frame Start, the Allocation Start Time of the UL-MAP is set to the beginning of the frame + Allocation Start Time parameter set below.

SCPI command:

```
[ :SOURCE<hw> ] :BB:WiMax:AOFDM [ :ZONE<st0> ] :BURSt<ch0>:ULMap:AMODE  
on page 187
```

#### Allocation Start Time

Sets the Allocation Start Time in the UL-MAP.

SCPI command:

```
[ :SOURCE<hw> ] :BB:WiMax:AOFDM [ :ZONE<st0> ] :BURSt<ch0>:ULMap:ATIME  
on page 187
```

#### UL-MAP File

Calls the menu for selecting the UL-MAP file.

SCPI command:

n.a.

#### Append DCD OFDMA

If activated, the DCD is appended to the UL-MAP. The DCD message is transmitted with its own MAC header and CRC, included in the same burst allocation used by the UL-MAP.

SCPI command:

```
[ :SOURCE<hw> ] :BB:WiMax:AOFDM [ :ZONE<st0> ] :BURSt<ch0>:ULMap:DCD:  
STATE on page 188
```

#### DCD CID OFDMA

(only if Append DCD is ON)

Enters the value for the DCD CID.

This CID (connection control identifier) is independent from the UL-Map CID and only used for the DCD.

SCPI command:

```
[ :SOURCE<hw> ] :BB:WiMax:AOFDM [ :ZONE<st0> ] :BURSt<ch0>:ULMap:DCD:  
CID on page 187
```

#### Append UCD OFDMA

If activated, the UCD is appended to the UL-MAP. The UCD message is transmitted with its own MAC header and CRC, included in the same burst allocation used by the UL-MAP.

SCPI command:

```
[ :SOURCE<hw> ] :BB:WiMax:AOFDM [ :ZONE<st0> ] :BURSt<ch0>:ULMap:UCD:  
STATE on page 189
```



**UCD CID OFDMA**

(only if Append DCD is ON)

Enters the value for the UCD CID.

This CID (connection control identifier) is independent from the DL-Map CID and only used for the UCD.

SCPI command:

```
[ :SOURCE<hw> ] :BB:WIMax:AOFDM [ :ZONE<st0> ] :BURSt<ch0>:ULMap:UCD:
CID on page 189
```

**Ranging Backoff Start**

Sets the start value for the ranging backoff.

SCPI command:

```
[ :SOURCE<hw> ] :BB:WIMax:AOFDM [ :ZONE<st0> ] :BURSt<ch0>:ULMap:
RANGing:BOStArt on page 188
```

**Ranging Backoff End**

Sets the end value for the ranging backoff.

SCPI command:

```
[ :SOURCE<hw> ] :BB:WIMax:AOFDM [ :ZONE<st0> ] :BURSt<ch0>:ULMap:
RANGing:BOENd on page 188
```

**Request Backoff Start**

Sets the start value for the request backoff.

SCPI command:

```
[ :SOURCE<hw> ] :BB:WIMax:AOFDM [ :ZONE<st0> ] :BURSt<ch0>:ULMap:
REQuest:BOStArt on page 189
```

**Request Backoff End**

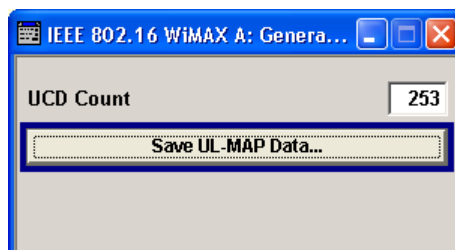
Sets the end value for the request backoff.

SCPI command:

```
[ :SOURCE<hw> ] :BB:WIMax:AOFDM [ :ZONE<st0> ] :BURSt<ch0>:ULMap:
REQuest:BOENd on page 188
```

## 3.18 Generate UL-MAP Uplink OFDMA

The "Generate UL-MAP" menu is reached via the "Generate UL-MAP".. button in the zone configuration menu.



**UCD Count OFDMA**

Sets the value for the UCD count.

SCPI command:

[ :SOURce<hw> ] :BB:WIMax:AOFDM [ :ZONE<st0> ] :UCD on page 195

**Save UL-MAP Data OFDMA**

Opens the "File Select" window for saving the current UL-map.

The name of the file is specified in the "File name" entry field, the directory selected in the "save into" field. The file is saved by pressing the "Save" button.

The file is stored with the predefined file extension \*.dm\_iqd. The file name and the directory it is stored in are user-definable.

The saved \*.dm\_iqd file is in data list format and contains a UL-MAP that describes the current uplink zone.

The following list shows the parameters the UL-MAP is composed of:

- UCD Count  
Set to UCD Count specified above
- Allocation Start Time  
Set to 0. Can be modified later when loading the UL-MAP in downlink mode
- No. OFDMA Symbols  
Total number of OFDMA symbols in the uplink subframe.
- CID  
CID from the "More Param" panel for each burst
- UIUC  
UIUC from the "More Param" panel for each burst or 12 for ranging.

For ranging bursts:

- OFDMA Symbol offset  
Symbol offset relative to allocation starttime
- Subchannel offset  
Lowest subchannel used for ranging allocation
- No. OFDMA symbols  
Symbols in ranging allocation
- No. Subchannels  
Subchannels in ranging allocation
- Ranging method  
Defined by the Opportunity Size in the Ranging panel.

For data bursts:

- Duration  
Burst duration in slots
- Repetition coding indication  
Repetition coding from the "More Param" panel for each burst

**Generating a valid UL-MAP**

The following steps are required to generate a valid UL-MAP:

1. Switch to uplink mode
2. Define the layout of the uplink zone by setting a number of bursts and specifying the parameters above for each burst
3. Select Generate UL-MAP and save the UL-MAP to a file
4. Switch to downlink mode

- 5. Set one of the downlink bursts to Burst Type UL-MAP
- 6. Open the More Param panel
- 7. Select UL-MAP File and load the file created before.

The downlink zone is then transmitting a UL-MAP that specifies the uplink structure defined in uplink mode before.

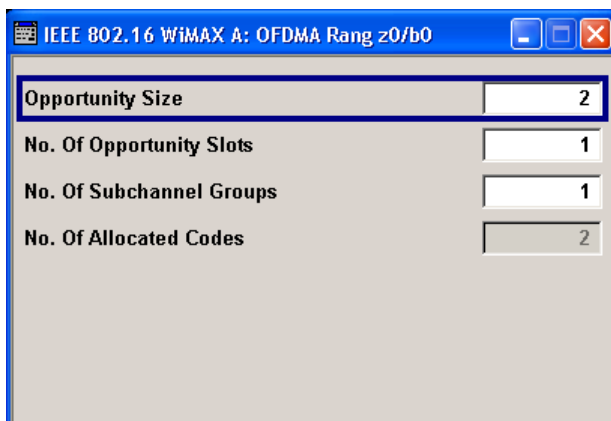
SCPI command:

`[ :SOURCE<hw> ] :BB:WiMax:AOFDM [ :ZONE<st0> ] :ULMap:CREate` on page 196

## 3.19 Ranging Uplink OFDMA

Burst type Ranging offers ranging allocations which can be used for initial / periodic ranging or bandwidth request transmissions. For each ranging / bandwidth request slot, 8 bits are read from the data source. These 8 bits select the used code. The codes are numbered from 0 to 255. For opportunity size 4, 8 bits are read once per slot. The first code is specified by the 8 bits and the second consecutive code is the first code advanced by one. For opportunity size 3, the same method is applied. The second code is the first code + 1, the third code is the first code + 2.

The "Ranging" menu is reached via the "More Param" button in the OFDMA burst table in uplink mode. The following describes the ranging options in OFDMA mode.



### Opportunity Size

Sets the ranging opportunity size. The opportunity size specifies the number of symbols required to transmit one CDMA ranging code.

For initial ranging transmissions, values of 2 or 4 are used. With opportunity size 2, one CDMA code is transmitted in two symbols. With opportunity size 4, two consecutive ranging codes are transmitted in four symbols.

For periodic ranging and bandwidth request transmissions, values of 1 or 3 are used. With opportunity size 1, one CDMA code is transmitted in one symbol. With opportunity size 3, three consecutive ranging codes are transmitted in three symbols.

SCPI command:

`[ :SOURCE<hw> ] :BB:WiMax:AOFDM [ :ZONE<st0> ] :BURSt<ch0>:RANGing:OPPortunity:SIZE` on page 183

**No. Of Opportunity Slots**

The number of opportunity slots defines the length of the ranging allocation:

Length of Ranging Allocation = OpportunitySize \* NoOfOpportunitySlots OFDMA symbols.

SCPI command:

```
[ :SOURCE<hw> ] :BB:WiMax:AOFDM[ :ZONE<st0> ] :BURSt<ch0>:RANGing:
OPPortunity:SLOTcount on page 183
```

**No. Of Subchannel Groups**

Sets the number of subchannel groups used in the ranging allocation. In PUSC mode, 6 subchannels form one subchannel group.

SCPI command:

```
[ :SOURCE<hw> ] :BB:WiMax:AOFDM[ :ZONE<st0> ] :BURSt<ch0>:RANGing:
SCGCount on page 183
```

**No. Of Allocated Codes**

Displays the number of allocated codes. The number of codes is "NoOfOpportunity-Slots" \* "NoOfSubchannelGroups".

Consecutive codes of opportunity sizes 3 and 4 are not taken into account.

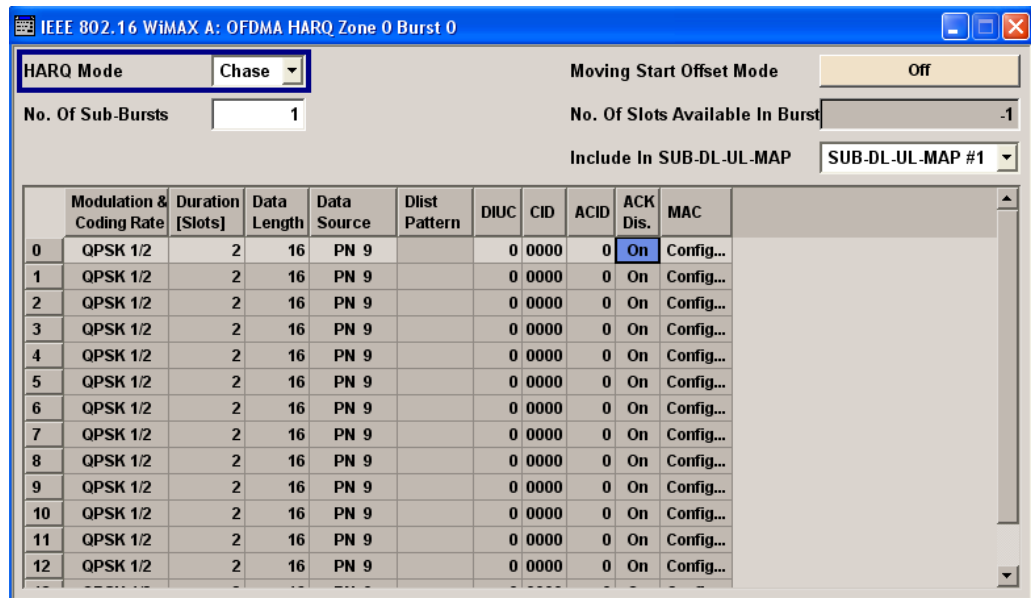
SCPI command:

```
[ :SOURCE<hw> ] :BB:WiMax:AOFDM[ :ZONE<st0> ] :BURSt<ch0>:RANGing:
ACODE on page 182
```

## 3.20 HARQ Configuration OFDMA

The "HARQ Configuration" menu is reached via the "More Param" button in the OFDMA burst table. HARQ bursts are only available with CTC channel coding.

The parameters in the HARQ sub-burst table depend on the selected HARQ mode.



### 3.20.1 OFDMA HARQ Settings

#### HARQ Mode

Selects the mode of the HARQ burst.

"Chase" Selects Chase Combining HARQ. For each sub-burst, only one version of the packet is generated.

"IR" Selects Incremental Redundancy HARQ. For each sub-burst, several versions of encoded sub-packets can be generated. They are identified by a sub-packet ID (SPID).

SCPI command:

```
[ :SOURCE<hw> ] :BB:WIMax:AOFDM [ :ZONE<st0> ] :BURSt<ch0> :HARQ:MODE
```

on page 167

#### No. Of Sub-Bursts

Sets the number of sub-bursts in the HARQ burst. Each HARQ burst allocated in the Zone Configuration panel can be divided into up to 15 sub-bursts. The length of each sub-burst is set by the "Duration [Slots]" parameter.

SCPI command:

```
[ :SOURCE<hw> ] :BB:WIMax:AOFDM [ :ZONE<st0> ] :BURSt<ch0> :HARQ:COUNT
```

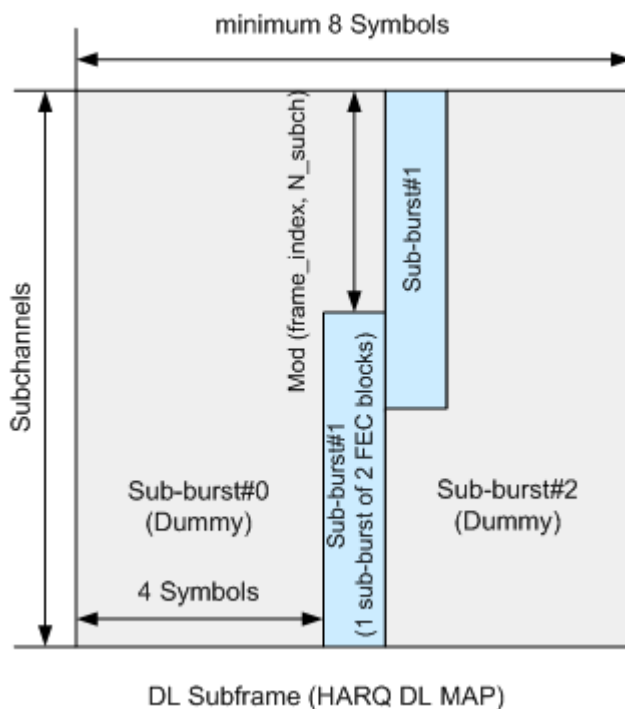
on page 167

#### Moving Start Offset Mode

(for HARQ Mode Chase only)

Enables/disables moving of start offset mode.

If enabled, the subburst structure resembles the specified structure required for MRCT Test 9.1.24.4, according to "WiMAX Forum™ Mobile Radio Conformance Test".



To use this mode according to the WiMAX MRCT specification, perform following configuration:

- 1. Configure exactly 3 HARQ subbursts.  
The first and third subbursts are dummy bursts with QPSK modulation.  
The second subburst is the desired subburst (with usually 2 FEC blocks).
- 2. Configure the length of the first subburst such that it fills at least the first 4 symbols (e.g. 64 slots in 1024 FFT mode).  
This burst can be slightly longer than the slots available in the first 4 symbols.
- 3. Configure the second subburst to the desired length
- 4. Configure the length of the third subburst such that it fills the remaining space.
- 5. Enable Moving Start Offset Mode
- 6. Select a desired number of frames (longer than 1 frame).
- **Result:**  
The Signal Generator automatically modifies the length of the first and third subbursts such that the second one moves its start position with every frame according to the MRCT requirement ( $\text{mod}(\text{frame\_index}, N_{\text{subch}})$ ).  
The dummy bursts will be automatically cut off or enlarged as required.  
The DL-MAP is updated with every frame to reflect the changed conditions.

SCPI command:

```
[ :SOURce<hw> ] :BB:WIMax:AOFDm [ :ZONE<st0> ] :BURSt<ch0>:HARQ:
MStArt [ :STATe ] on page 167
```

**No. Of Slots Available In Burst**

Displays the remaining number of slots available for the burst. The number of slots is defined in the zone configuration panel with "No. of Subch" and "No. of Symb" in the downlink and "Duration [Slots]" in the uplink.

SCPI command:

[ :SOURCE<hw> ] :BB:WiMax:AOFDM [ :ZONE<st0> ] :BURSt<ch0>:HARQ:SLFRee  
on page 168

**Include In SUB-DL-UL-MAP**

Selects whether a DL-MAP IE is included in the specified SUB-DL-UL-MAP message for this burst.

The default value of this parameter is off. One of the three available SUB-DL-UL-MAPs can be selected to carry the DL-MAP IE for this burst.

SCPI command:

[ :SOURCE<hw> ] :BB:WiMax:AOFDM [ :ZONE<st0> ] :BURSt<ch0>:DLUL:INCLude  
on page 165

**3.20.2 HARQ Sub-burst Table**

The parameters in the HARQ sub-burst table depend on the selected HARQ mode.

- HARQ Chase Mode

	Modulation & Coding Rate	Duration [Slots]	Data Length	Data Source	Dist Pattern	DIUC	CID	ACID	ACK Dis.	MAC
0	64-QAM 5/6	2	16	PN 9		0	0000	3	On	Config...
1	QPSK 1/2	2	16	PN 9		0	0000	0	On	Config...
2	QPSK 1/2	2	16	PN 9		0	0000	0	On	Config...
3	QPSK 1/2	2	16	PN 9		0	0000	0	On	Config...

- HARQ IR Mode

	Packet Size[Bits]	Duration [Slots]	Modulation	Rate	Data Length	Data Source	Dist Pattern	CID	ACID	SPID Sequence	ACK Dis.	MAC	
0	144	2	16-QAM	3/8	16	PN 9		0000	3		0	On	Config...
1	144	2	16-QAM	3/8	16	PN 9		0000	0		0	On	Config...
2	144	2	16-QAM	3/8	16	PN 9		0000	0		0	On	Config...
3	144	2	QPSK		16	PN 9		0000	0			On	Config...

**Sub-Burst Index**

Displays the consecutive sub-burst index from 0 to 14.

All the rows are always displayed, even if the sub-bursts are inactive. They are switched on and off by the selection of No. of Sub-Bursts above the table. The active sub-bursts are highlighted.

SCPI command:

n.a.

**Modulation & Coding Rate**

(for HARQ Chase Mode only)

Sets the sub-burst modulation and coding rate.

SCPI command:

```
[ :SOURCE<hw> ] :BB:WiMax:AOFDM [ :ZONE<st0> ] :BURSt<ch0>:HARQ<dir0>:
MODRate on page 173
```

### Packet Size [Bits]

(for HARQ IR Mode only)

Sets the HARQ sub-burst packet size (in bits).

SCPI command:

```
[ :SOURCE<hw> ] :BB:WiMax:AOFDM [ :ZONE<st0> ] :BURSt<ch0>:HARQ<dir0>:
PSIZE on page 173
```

### Duration [Slots]

Sets the duration of the sub-bursts in slots. The duration range is dynamic and depends on the selected link direction and packet size.

SCPI command:

```
[ :SOURCE<hw> ] :BB:WiMax:AOFDM [ :ZONE<st0> ] :BURSt<ch0>:HARQ<dir0>:
SLOTcount on page 174
```

### Modulation

(for HARQ IR Mode only)

Displays the sub-burst modulation.

The modulation is determined by the parameters "Packet Size" and "Duration" and cannot be altered directly.

SCPI command:

```
[ :SOURCE<hw> ] :BB:WiMax:AOFDM [ :ZONE<st0> ] :BURSt<ch0>:HARQ<dir0>:
FORMat on page 171
```

### Rate

(for HARQ IR Mode only)

Displays the sub-burst code rate. The code rate is determined by the parameters "Packet Size" and "Duration" and cannot be altered directly

SCPI command:

```
[ :SOURCE<hw> ] :BB:WiMax:AOFDM [ :ZONE<st0> ] :BURSt<ch0>:HARQ<dir0>:
RATE on page 173
```

### Data Length

Sets the data length of the sub-burst. The data length range is dynamic and depends on the packet size and the MAC header state.

SCPI command:

```
[ :SOURCE<hw> ] :BB:WiMax:AOFDM [ :ZONE<st0> ] :BURSt<ch0>:HARQ<dir0>:
DLENgth on page 170
```

### Data Source

Selects data source for the selected sub-bursts.



The data sources "PN9", "PN11", "PN15", "PN16", "PN20", "PN21", "PN23", "ALL 0", "ALL1", "Pattern" and "Data List" are all available to choose from.

"Data lists" can be generated internally in the data editor or externally.

Data lists are selected in the "File Select" window, which is called by means of the "Data List Management" button.

If the "Pattern" data type is used, the bit pattern is defined in the "Pattern" input box. The length is limited to 64 bits.

SCPI command:

`[ :SOURce<hw> ] :BB:WiMax:AOFDm [ :ZONE<st0> ] :BURSt<ch0> :HARQ<dir0> :  
DATA` on page 169

`[ :SOURce<hw> ] :BB:WiMax:AOFDm [ :ZONE<st0> ] :BURSt<ch0> :HARQ<dir0> :  
DATA:PaTtErn` on page 170

`[ :SOURce<hw> ] :BB:WiMax:AOFDm [ :ZONE<st0> ] :BURSt<ch0> :HARQ<dir0> :  
DATA:DSElect` on page 169

### DIUC

(for HARQ Chase Mode only)

Sets the DIUC (Downlink Interval User Code) for the specified sub-burst.

SCPI command:

`[ :SOURce<hw> ] :BB:WiMax:AOFDm [ :ZONE<st0> ] :BURSt<ch0> :HARQ<dir0> :  
DIUC` on page 170

### MAC CID

The command sets the CID (Connection Control Identifier) of the medium access control layer (MAC). The CID identifies a connection to equivalent peers in the MAC of the base station and subscriber station.

SCPI command:

`[ :SOURce<hw> ] :BB:WiMax:AOFDm [ :ZONE<st0> ] :BURSt<ch0> :HARQ<dir0> :  
MAC:CID` on page 171

### ACID

Sets the HARQ channel identifier for the specified sub-burst.

SCPI command:

`[ :SOURce<hw> ] :BB:WiMax:AOFDm [ :ZONE<st0> ] :BURSt<ch0> :HARQ<dir0> :  
ACID` on page 168

### SPID Sequence

(for HARQ IR Mode only)

Sets the sub-packet ID sequence which is used to select the generated sub-packet out of the four possible sub-packets for each frame. Each SPID is identified by a number from 0 to 3. Up to 8 numbers can be entered, separated by colons.

During signal generation, one SPID out of the sequence is used to generate the encoder packet for each frame. The index in the SPID sequence is advanced frame by frame and starts again from the beginning after all entered numbers have been used.

**Example:**

SPID sequence: 0,1,2

Sequence Length set in the main panel: 10 frames.

The following sequence is output:

0,1,2,0,1,2,0,1,2,0

SCPI command:

```
[ :SOURce<hw> ] :BB:WiMax:AOFDm [ :ZONE<st0> ] :BURSt<ch0>:HARQ<dir0>:  
SPID on page 174
```

**ACK Disable**

Disables ACK, i.e. the allocated subburst does not require an ACK to be transmitted .

SCPI command:

```
[ :SOURce<hw> ] :BB:WiMax:AOFDm [ :ZONE<st0> ] :BURSt<ch0>:HARQ<dir0>:  
ACKD on page 169
```

**MAC**

Calls the menu for configuring the generic MAC (Media Access Control) header of the selected sub-burst and for activating the checksum determination.

SCPI command:

n.a.

## 3.21 HARQ MAC Header Configuration OFDMA

The "HARQ MAC" menu is reached via the "Config"... button located in the sub-burst table (see [chapter 3.20, "HARQ Configuration OFDMA"](#), on page 78).

This menu provides settings for a generic MAC header, which is placed at the beginning of the sub-burst when activated.

In addition CRC (cyclic redundancy check) can be activated, which is added at the end of the burst. It covers MAC header and all data.

**CRC State**

Activates/deactivates the checksum determination. The state of the CRC can be set independently of the state of MAC header generation.

SCPI command:

[\[:SOURCE<hw>\]:BB:WiMax:AOFDM\[:ZONE<st0>\]:BURSt<ch0>:HARQ<dir0>:MAC:CRC:STATE](#) on page 171

**MAC Header State**

Activates the generation of the generic MAC header.

SCPI command:

[\[:SOURCE<hw>\]:BB:WiMax:AOFDM\[:ZONE<st0>\]:BURSt<ch0>:HARQ<dir0>:MAC:STATE](#) on page 172

**MAC CID**

The command sets the CID (Connection Control Identifier) of the medium access control layer (MAC). The CID identifies a connection to equivalent peers in the MAC of the base station and subscriber station.

SCPI command:

[\[:SOURCE<hw>\]:BB:WiMax:AOFDM\[:ZONE<st0>\]:BURSt<ch0>:HARQ<dir0>:MAC:CID](#) on page 171

**Payload encrypted**

Activates/deactivates payload encryption.

If activated, the EC (encryption control) field is set to 1 and the EKS (encryption key sequence) field can be set.

SCPI command:

`[ :SOURCE<hw> ] :BB:WiMax:AOFDM [ :ZONE<st0> ] :BURSt<ch0>:HARQ<dir0>:MAC:ENCRypted:STATe` on page 172

### EKS

Sets the EKS (Encryption Key Sequence) value in the MAC header. The payload encryption itself is not performed by the signal generator.

SCPI command:

`[ :SOURCE<hw> ] :BB:WiMax:AOFDM [ :ZONE<st0> ] :BURSt<ch0>:HARQ<dir0>:MAC:EKS` on page 172

### Mac Type

Specifies the MAC type.

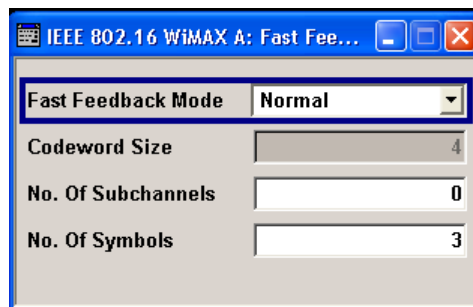
The value of the 6-bit type field is set which indicates the payload type, including the presence of subheaders.

SCPI command:

`[ :SOURCE<hw> ] :BB:WiMax:AOFDM [ :ZONE<st0> ] :BURSt<ch0>:HARQ<dir0>:MAC:TYPE` on page 172

## 3.22 Fast Feedback Configuration OFDMA

The "Fast Feedback Configuration" menu is reached via the More "Param button" in the OFDMA burst table.



### Fast Feedback Mode

Selects the fast feedback mode.

SCPI command:

`[ :SOURCE<hw> ] :BB:WiMax:AOFDM [ :ZONE<st0> ] :BURSt<ch0>:FFB:MODE` on page 166

### Codeword Size

Displays the codeword size. The codeword size depends on the selected "Fast Feedback Mode". In Normal mode, 4 bits are read out of the data source and are mapped to one fast feedback slot. In Enhanced mode, 6 bits are mapped to one slot.

The Enhanced (MIMO) and ACK modes use two codewords per slot. In Enhanced (MIMO) mode, two times 3 bits are read out of the data source and are mapped to one slot. The first 3 bits are mapped to tiles 0, 2, and 4; the second 3 bits are mapped to tile 1, 3, and 5. For the ACK mode, the procedure is similar. Here, the first bit is mapped to the first half slot and the second bit is mapped to the second half slot.

The data source is read out continuously over the configured frames, MSB first. If the length of the data source is smaller than the number of bits required by codeword size, number of slots in the allocation and configured sequence length, reading the data source is restarted from the beginning.

SCPI command:

```
[ :SOURCE<hw> ] :BB:WIMax:AOFDM [ :ZONE<st0> ] :BURSt<ch0> :FFB:CWSize
on page 165
```

#### No. Of Subchannels

Sets the number of subchannels. The number of slots in the fast feedback allocation is subchannels \* symbols / 3.

SCPI command:

```
[ :SOURCE<hw> ] :BB:WIMax:AOFDM [ :ZONE<st0> ] :BURSt<ch0> :FFB:SUBC
on page 166
```

#### No. Of Symbols

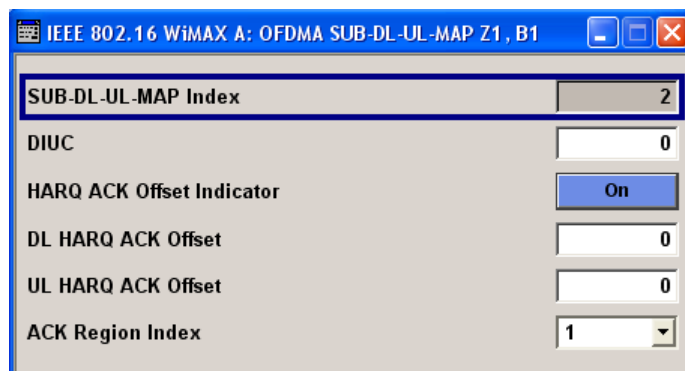
Sets the number of symbols. The number of slots in the fast feedback allocation is subchannels \* symbols / 3.

SCPI command:

```
[ :SOURCE<hw> ] :BB:WIMax:AOFDM [ :ZONE<st0> ] :BURSt<ch0> :FFB:SYMB
on page 166
```

## 3.23 SUB-DL-UL-MAP Configuration OFDMA

The "SUB-DL-UL-MAP Configuration" menu is reached via the "More Param" button in the OFDMA burst table.



#### SUB-DL-UL-MAP Index

Displays the number of the SUB-DL-UL-MAP message.

Altogether up to three SUB-DL-UL-MAP messages can be enabled for all zones. The "SUB-DL-UL-MAP Index" is a consecutive number that is assigned for each configured SUB-DL-UL-MAP message.

SCPI command:

```
[ :SOURCE<hw> ] :BB:WiMax:AOFDM [ :ZONE<st0> ] :BURSt<ch0>:DLUL:MPIX
```

on page 165

#### DIUC OFDMA

Sets the specific DIUC.

In DL-MAP mode "Auto", the DIUC of each burst is included in the DL-MAP.

SCPI command:

```
[ :SOURCE<hw> ] :BB:WiMax:AOFDM [ :ZONE<st0> ] :BURSt<ch0>:DIUC
```

on page 163

#### HARQ ACK Offset Indicator

Enables/disables the inclusion of HARQ offsets.

SCPI command:

```
[ :SOURCE<hw> ] :BB:WiMax:AOFDM [ :ZONE<st0> ] :BURSt<ch0>:DLUL:HARQ:ACKoffset:INDicator
```

on page 164

#### DL HARQ ACK Offset

Sets the ACK channel that corresponds to the first HARQ-enabled DL burst specified in this map message.

SCPI command:

```
[ :SOURCE<hw> ] :BB:WiMax:AOFDM [ :ZONE<st0> ] :BURSt<ch0>:DLUL:HARQ:ACKoffset:DL
```

on page 164

#### UL HARQ ACK Offset ← DL HARQ ACK Offset

Sets the ACK bit index in the DL HARQ ACK that corresponds to the first HARQ-enabled UL burst specified in this map message.

SCPI command:

```
[ :SOURCE<hw> ] :BB:WiMax:AOFDM [ :ZONE<st0> ] :BURSt<ch0>:DLUL:HARQ:ACKoffset:UL
```

on page 164

#### ACK Region Index

Selects whether ACK region 0 or 1 will be used.

SCPI command:

```
[ :SOURCE<hw> ] :BB:WiMax:AOFDM [ :ZONE<st0> ] :BURSt<ch0>:DLUL:ARIX
```

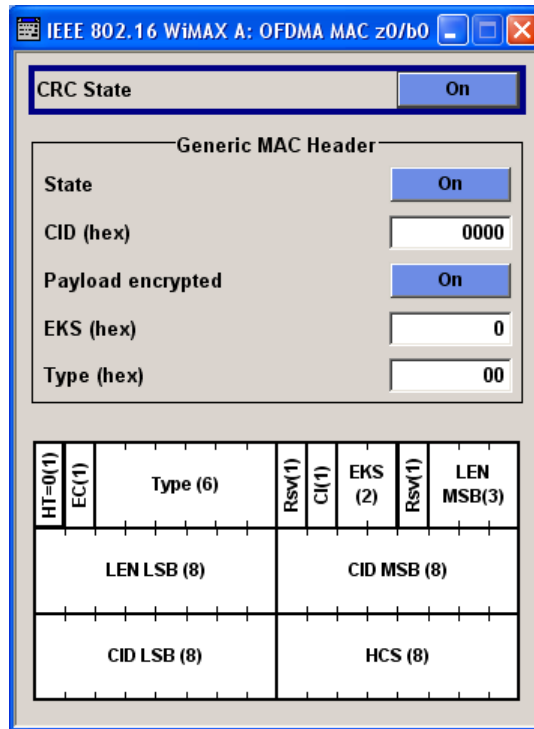
on page 164

## 3.24 MAC Header Configuration OFDMA

The "MAC" menu is reached via the "Configure MAC"... button located in the "More Param" panel.

This menu provides settings for a generic MAC header of the corresponding zone and burst. The MAC header is placed at the beginning of the burst when activated.

In addition CRC (Cyclic Redundancy Check) can be activated, which is added at the end of the burst. It covers MAC header and all data.



The screenshot shows a configuration window for IEEE 802.16 WiMAX A: OFDMA MAC z0/b0. The window has a title bar with standard Windows controls. Inside, there are two main sections. The first is 'CRC State' with a button set to 'On'. The second is 'Generic MAC Header' with several fields: 'State' (On), 'CID (hex)' (0000), 'Payload encrypted' (On), 'EKS (hex)' (0), and 'Type (hex)' (00). Below these fields is a bitfield diagram representing the MAC header structure. The diagram is a grid with columns and rows. The columns are labeled: HT=0(1), EC(1), Type (6), Rsv(1), Cl(1), EKS (2), Rsv(1), LEN MSB(3), LEN LSB (8), CID MSB (8), CID LSB (8), and HCS (8). The rows are labeled: HT=0(1), EC(1), Type (6), Rsv(1), Cl(1), EKS (2), Rsv(1), LEN MSB(3), LEN LSB (8), CID MSB (8), CID LSB (8), and HCS (8).

### CRC State

Activates/deactivates the checksum determination. The state of the CRC can be set independently of the state of MAC header generation.

SCPI command:

```
[ :SOURCE<hw> ] :BB:WIMax:AOFDM [ :ZONE<st0> ] :BURSt<ch0>:MAC:CRc:
STATe on page 175
```

### MAC Header State

Activates the generation of the generic MAC header.

SCPI command:

```
[ :SOURCE<hw> ] :BB:WIMax:AOFDM [ :ZONE<st0> ] :BURSt<ch0>:MAC:STATe
on page 175
```

### MAC CID

The command sets the CID (connection control identifier) of the medium access control layer (MAC). The CID identifies a connection to equivalent peers in the MAC of the base station and subscriber station.

This parameter is identical to the CID set in the MAC Header settings.

SCPI command:

```
[ :SOURCE<hw> ] :BB:WIMax:AOFDM [ :ZONE<st0> ] :BURSt<ch0>:MAC:CID
on page 174
```

**Payload encrypted**

Activates/deactivates payload encryption.

If activated, the EC (Encryption Control) field is set to 1 and the EKS (Encryption Key Sequence) field can be set.

SCPI command:

```
[ :SOURCE<hw> ] :BB:WiMax:AOFDM [ :ZONE<st0> ] :BURSt<ch0>:MAC:  
ENCRypted:STATe on page 175
```

**EKS**

Sets the EKS (Encryption Key Sequence) value in the MAC header. The payload encryption itself is not performed by the signal generator.

SCPI command:

```
[ :SOURCE<hw> ] :BB:WiMax:AOFDM [ :ZONE<st0> ] :BURSt<ch0>:MAC:EKS  
on page 175
```

**Mac Type**

Specifies the MAC type.

The value of the 6-bit type field is set which indicates the payload type, including the presence of subheaders.

SCPI command:

```
[ :SOURCE<hw> ] :BB:WiMax:AOFDM [ :ZONE<st0> ] :BURSt<ch0>:MAC:TYPE  
on page 176
```

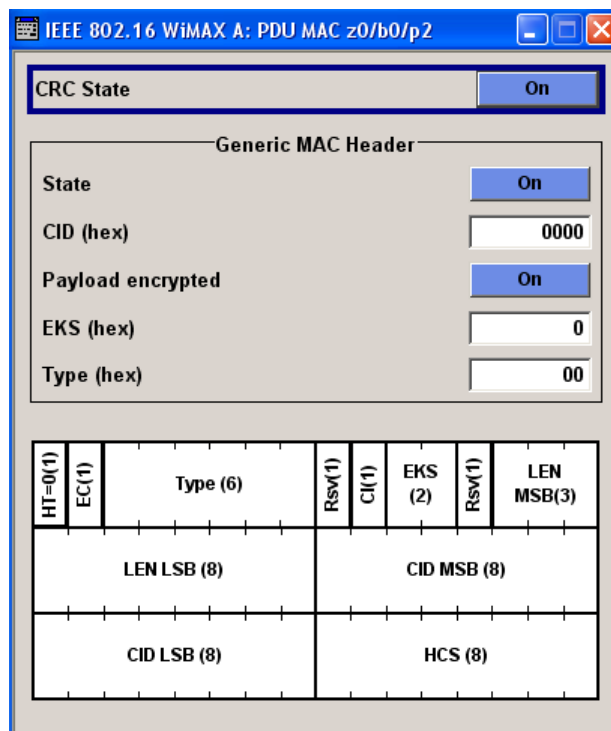
## 3.25 PDU MAC Configuration OFDMA

The "PDU MAC" menu is reached via the "Configure MAC" button located in the "PDU Table".

This menu provides settings for the generic PDU MAC header of the corresponding zone, burst and PDU combination. The MAC header is placed at the beginning of the PDU when activated.

In addition CRC (Cyclic Redundancy Check) can be activated, which is added at the end of the PDU. It covers MAC header and all data.





IEEE 802.16 WiMAX A: PDU MAC z0/b0/p2

CRC State

Generic MAC Header

State

CID (hex)

Payload encrypted

EKS (hex)

Type (hex)

HT=0(1)	EC(1)	Type (6)	Rsv(1)	CI(1)	EKS (2)	Rsv(1)	LEN MSB(3)
LEN LSB (8)				CID MSB (8)			
CID LSB (8)				HCS (8)			

**CRC State (PDU)**

Activates/deactivates the checksum determination. The state of the CRC can be set independently of the state of MAC header generation.

SCPI command:

```
[ :SOURCE<hw> ] :BB:WIMax:AOFDM [ :ZONE<st0> ] :BURSt<ch0>:PDU<dir0>:
MAC:CRc:STATe on page 179
```

**MAC Header State (PDU)**

Activates the generation of the generic MAC header.

SCPI command:

```
[ :SOURCE<hw> ] :BB:WIMax:AOFDM [ :ZONE<st0> ] :BURSt<ch0>:PDU<dir0>:
MAC:STATe on page 180
```

**MAC CID (PDU)**

The command sets the CID (Connection Control Identifier) of the medium access control layer (MAC). The CID identifies a connection to equivalent peers in the MAC of the base station and subscriber station.

SCPI command:

```
[ :SOURCE<hw> ] :BB:WIMax:AOFDM [ :ZONE<st0> ] :BURSt<ch0>:PDU<dir0> [ :
MAC ] :CID on page 181
```

**Payload encrypted (PDU)**

Activates/deactivates payload encryption.

If activated, the EC (Encryption Control) field is set to 1 and the EKS (Encryption Key Sequence) field can be set.

SCPI command:

```
[ :SOURCE<hw> ] :BB:WiMax:AOFDM[ :ZONE<st0> ] :BURSt<ch0> :PDU<dir0> :  
MAC:ENCRypted:STATe on page 180
```

#### **EKS (PDU)**

Sets the EKS (Encryption Key Sequence) value in the MAC header. The payload encryption itself is not performed by the signal generator.

SCPI command:

```
[ :SOURCE<hw> ] :BB:WiMax:AOFDM[ :ZONE<st0> ] :BURSt<ch0> :PDU<dir0> :  
MAC:EKS on page 179
```

#### **Mac Type (PDU)**

Specifies the MAC type.

The value of the 6-bit type field is set which indicates the payload type, including the presence of subheaders.

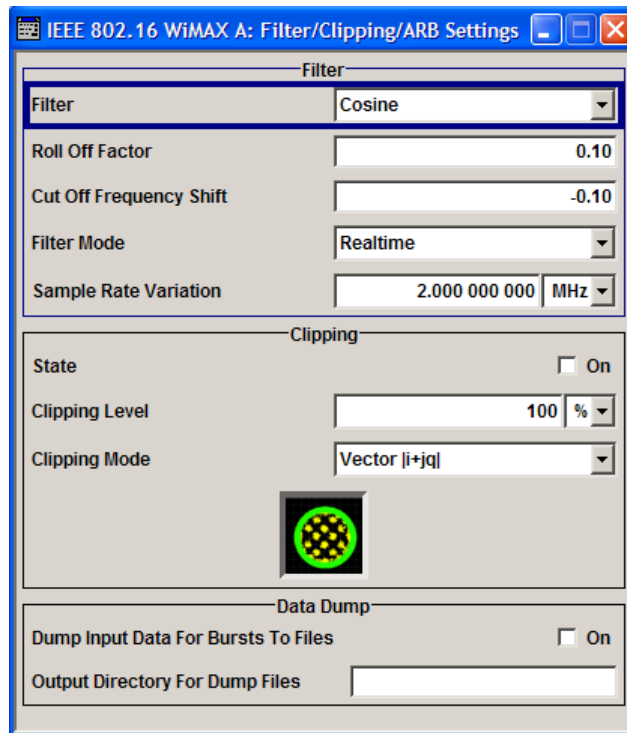
SCPI command:

```
[ :SOURCE<hw> ] :BB:WiMax:AOFDM[ :ZONE<st0> ] :BURSt<ch0> :PDU<dir0> :  
MAC:TYPE on page 180
```

## **3.26 Filter/Clipping Settings**

To access this dialog, select "Main Menu > Filter/Clipping".

The baseband filter, sample rate variation and clipping are defined in this menu.



### 3.26.1 Filter Settings

#### Filter

Sets the baseband filter.

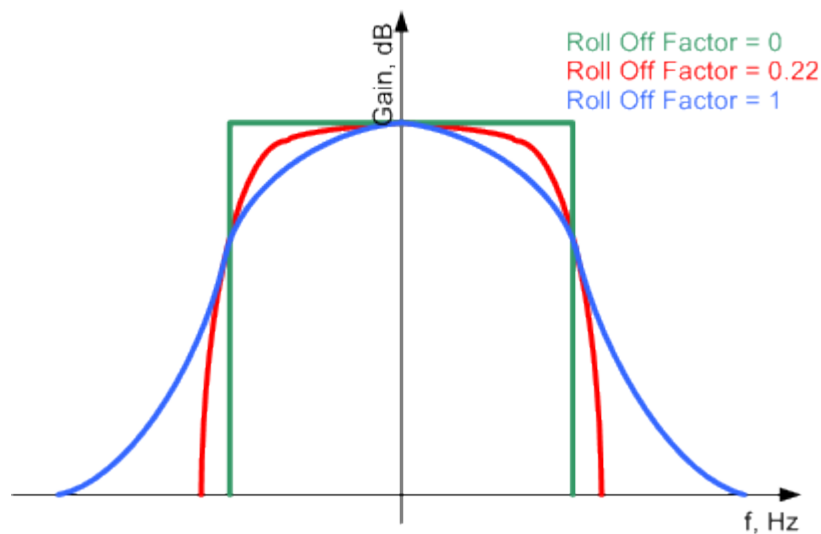
SCPI command:

[\[:SOURce<hw>\]:BB:WIMax:FILTer:TYPE](#) on page 118

#### Roll Off Factor

Indicates the filter parameter.

The Roll Off Factor affects the steepness of the filter flanks. A "Roll Off Factor" = 0 results in the steepest flanks; values near to 1 make the flanks more flat.



**Fig. 3-1: Example of the frequency response of a filter with different Roll Off Factors**

For the default cosine filter a roll off factor of 0.07 is used.

SCPI command:

`[ :SOURce<hw> ] :BB:WIMax:FILTer:PARAmeter:APCO25` on page 120

`[ :SOURce<hw> ] :BB:WIMax:FILTer:PARAmeter:COSine` on page 120

`[ :SOURce<hw> ] :BB:WIMax:FILTer:PARAmeter:GAUSS` on page 121

`[ :SOURce<hw> ] :BB:WIMax:FILTer:PARAmeter:PGAuss` on page 122

`[ :SOURce<hw> ] :BB:WIMax:FILTer:PARAmeter:RCOSine` on page 122

`[ :SOURce<hw> ] :BB:WIMax:FILTer:PARAmeter:SPHase` on page 122

### Cut Off Frequency Shift

(available for filter parameter Cosine only)

The cut off frequency is a filter characteristic that defines the frequency at the 3 dB down point. The "Cut Off Frequency Shift" affects this frequency in the way that the filter flanks are "moved" and the transition band increases by "Cut Off Frequency Shift" \* "Sample Rate".

- A "Cut Off Frequency Shift" = -1 results in a very narrow-band filter
- Increasing the value up to 1 makes the filter more broad-band
- By "Cut Off Frequency Shift" = 0, the -3 dB point is at the frequency determined by the half of the selected "Sample Rate".

**Tip:** Use this parameter to adjust the cut off frequency and reach spectrum mask requirements.

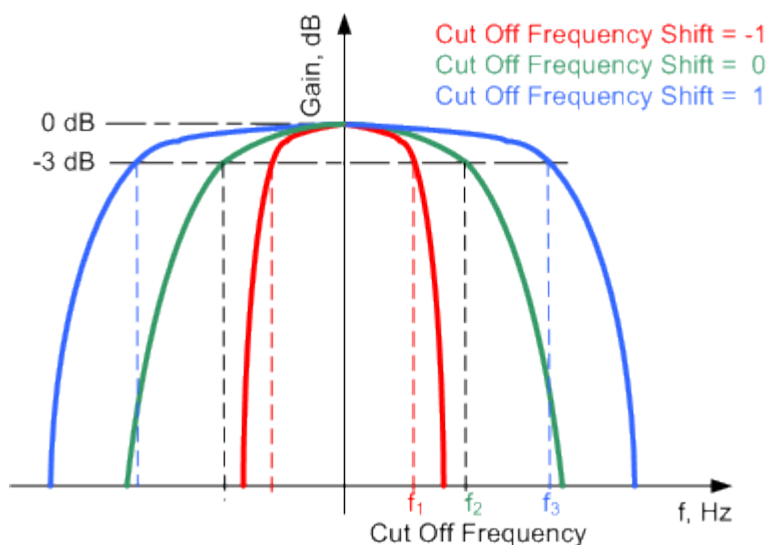


Fig. 3-2: Example of the frequency response of a filter with different Cut Off Frequency Shift

SCPI command:

`[ :SOURce<hw> ] :BB:WIMax:FILTer:PARAmeter:COsine:COFS` on page 120

#### Cut Off Frequency Factor

(available for filter parameter Lowpass only)

Sets the value for the cut off frequency factor. The cut off frequency of the filter can be adjusted to reach spectrum mask requirements.

SCPI command:

`[ :SOURce<hw> ] :BB:WIMax:FILTer:PARAmeter:LPASs` on page 121

`[ :SOURce<hw> ] :BB:WIMax:FILTer:PARAmeter:LPASSEVM` on page 121

#### Filer Mode

(For R&S SMx and R&S AMU instruments only)

Selects whether to apply the filter in real time mode or offline mode.

"Realtime" The filter is applied to the signal in real-time mode.

"Offline" The filter is applied to the signal in offline mode.

This option increases the calculation time and reduces the maximum number of generated frames that can be fit into the ARB memory. It can be useful to filter the signal in offline mode if steeper filter edges are required. In offline mode, more taps are used for the filters; therefore the roll of factor can be further decreased.

SCPI command:

`[ :SOURce<hw> ] :BB:WIMax:FILTer:MODE` on page 119

#### Sample Rate Variation

Sets the sample rate of the signal.

A variation of this parameter only affects the ARB clock rate; all other signal parameters remain unchanged. If the sampling rate in the frame configuration menu is changed, this parameter is reset to the chosen sampling rate.

SCPI command:

[\[:SOURCE<hw>\]:BB:WiMax:SRATE:VARIation](#) on page 122

### Impulse Length

(For WinIQSIM2 only)

Displays the number of filter taps. If the check box is activated, the most sensible parameter values are selected. The value depends on the coherence check. If the check box is deactivated, the values can be changed manually.

SCPI command:

[\[:SOURCE<hw>\]:BB:WiMax:FILTer:ILENgtH:AUTO](#) on page 119

[\[:SOURCE<hw>\]:BB:WiMax:FILTer:ILENgtH](#) on page 119

### Oversampling

(For WinIQSIM2 only)

Determines the upsampling factor. If the check box is activated, the most sensible parameter values are selected. The value depends on the coherence check. If the check box is deactivated, the values can be changed manually.

SCPI command:

[\[:SOURCE<hw>\]:BB:WiMax:FILTer:OSAMpling:AUTO](#) on page 120

[\[:SOURCE<hw>\]:BB:WiMax:FILTer:OSAMpling](#) on page 119

## 3.26.2 Clipping Settings

The settings for clipping are collected in the "Clipping" section.

### Clipping State

Switches baseband clipping on and off.

Baseband clipping is a very simple and effective way of reducing the crest factor of the signal.

With baseband clipping, the signal level is limited to a settable value ("Clipping Level"). This level is specified as a percentage of the highest peak value. Since clipping is done prior to filtering, the procedure does not influence the spectrum. The EVM however increases.

SCPI command:

[\[:SOURCE<hw>\]:BB:WiMax:CLIPping:STATe](#) on page 118

### Clipping Level

Sets the limit for clipping.

This value indicates at what point the signal is clipped. It is specified as a percentage, relative to the highest level. 100% indicates that clipping does not take place.

SCPI command:

[\[:SOURCE<hw>\]:BB:WiMax:CLIPping:LEVel](#) on page 117

**Clipping Mode**

Selects the clipping method. A graphic illustration of the way in which these two methods work is given in the menu.

"Vector  $|i + q|$ " The limit is related to the amplitude  $|i + q|$ . The I and Q components are mapped together, the angle is retained.



"Scalar  $|i| + |q|$ " The limit is related to the absolute maximum of all the I and Q values  $|i| + |q|$ .



The I and Q components are mapped separately, the angle changes.

SCPI command:

[\[:SOURCE<hw>\]:BB:WIMax:CLIPPING:MODE](#) on page 118

**3.26.3 Data Dump****Dump Input Data for Bursts to Files**

Activates burst input data dump. The data that is fed into the channel coding of each burst is output to files named `data_frameXXXX_zoneY_burstZZ.dat`, where `XXXX` specifies the frame number, `Y` the zone index and `ZZ` the burst index. The files contain all data including MAC header and CRC in ASCII hex format, MSB left. Read the files from left to right.

SCPI command:

[\[:SOURCE<hw>\]:BB:WIMax:BDUMP:STATE](#) on page 117

**Output directory for Dump Files**

The directory path specified here is used to store the dumped burst data files. If the field is empty the firmware directory is used (such as `<root>\Program Files\Rohde&Schwarz\SMUFirmware`).

SCPI command:

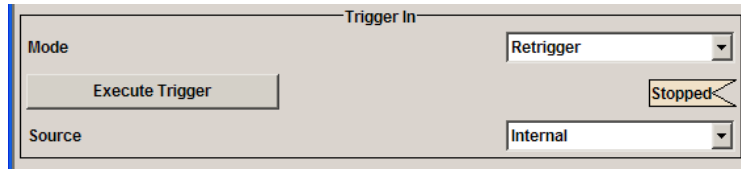
[\[:SOURCE<hw>\]:BB:WIMax:BDUMP:DIReCTory](#) on page 117

**3.27 Trigger/Marker/Clock Settings**

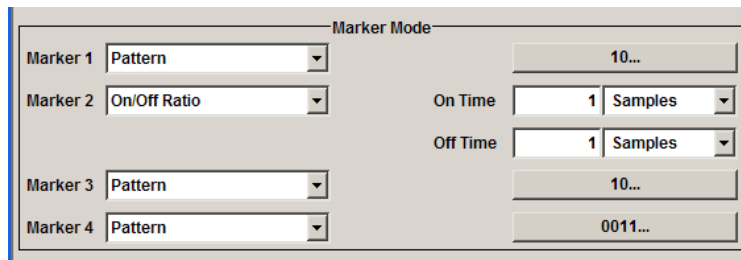
The trigger, clock, and marker delay functions are available for R&S SMx and R&S AMU instruments only.

To access this dialog, select "Main Menu > Trigger/Marker".

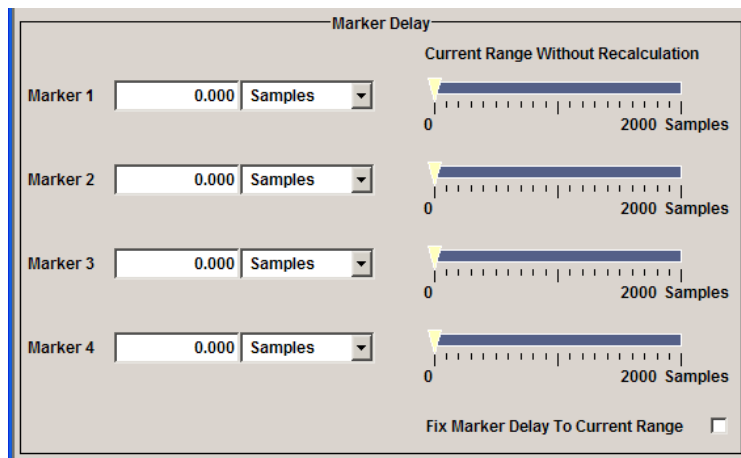
The "Trigger In" section is where the trigger for the signal is set. Various parameters will be provided for the settings, depending on which trigger source - internal or external - is selected. The current status of signal generation ("Running" or "Stopped") is indicated for all trigger modes.



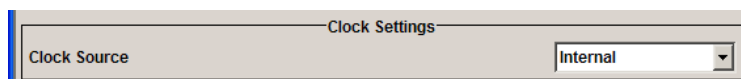
The "Marker Mode" section is where the marker signals at the MARKER output connectors are configured.



The "Marker Delay" section is where a marker signal delay can be defined, either without restriction or restricted to the dynamic section, i.e., the section in which it is possible to make settings without restarting signal and marker generation.

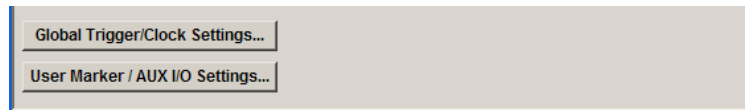


The "Clock Settings" section is where the clock source is selected and - in the case of an external source - the clock type.



The buttons in the last section lead to submenu for general trigger, clock and mapping settings.





### 3.27.1 Trigger In



The trigger functions are available for R&S SMx and R&S AMU instruments only.

The "Trigger In" section is where the trigger for the signal is set. Various parameters will be provided for the settings, depending on which trigger source - internal or external - is selected. The current status of signal generation ("Running" or "Stopped") is indicated for all trigger modes.

#### Trigger Mode

Selects trigger mode.

The trigger mode determines the effect of a trigger on the signal generation.

"Auto"	The signal is generated continuously.
"Retrigger"	The signal is generated continuously. A trigger event (internal or external) causes a restart.
"Armed_Auto"	The signal is generated only when a trigger event occurs. Then the signal is generated continuously. Button "Arm" stops signal generation. A subsequent trigger event (internal with "Execute Trigger" or external) causes a restart.
"Armed_Retrigger"	The signal is generated only when a trigger event occurs. Then the signal is generated continuously. Every subsequent trigger event causes a restart. Button "Arm" stops signal generation. A subsequent trigger event (internal with "Execute Trigger" or external) causes a restart.
"Single"	The signal is generated only when a trigger event occurs. Then the signal is generated once to the length specified at "Signal Duration". Every subsequent trigger event (internal with "Execute Trigger" or external) causes a restart.

SCPI command:

[\[:SOURce<hw>\]:BB:WiMax\[:TRIGger\]:SEQUence](#) on page 128

#### Signal Duration Unit

Defines the unit for the entry of the length of the signal sequence to be output in the Single trigger mode. Available units are frame, chip or sequence length (SL).

SCPI command:

[\[:SOURce<hw>\]:BB:WiMax:TRIGger:SLUNit](#) on page 126

**Signal Duration**

Defines the length of the signal sequence to be output in the Single trigger mode. The input is to be expressed in samples. It is then possible to output deliberately just part of the signal, an exact sequence of the signal, or a defined number of repetitions of the signal.

SCPI command:

`[ :SOURce<hw> ] :BB:WIMax:TRIGger:SLENgth` on page 126

**Running/Stopped**

Displays the status of signal generation for all trigger modes. This display appears only when signal generation is enabled ("State" On).

- "Running"            The modulation signal is generated; a trigger was (internally or externally) initiated in triggered mode.  
If "Armed\_Auto" and "Armed\_Retrigger" have been selected, generation of signals can be stopped with the "Arm" button. A new trigger (internally with "Execute Trigger" or externally) causes a restart.
- "Stopped"            The signal is not generated, and the instrument waits for a trigger event (internal or external).

SCPI command:

`[ :SOURce<hw> ] :BB:WIMax:TRIGger:RMODE` on page 125

**Arm**

Stops signal generation. This button appears only with "Running" signal generation in the "Armed\_Auto" and "Armed\_Retrigger" trigger modes.

Signal generation can be restarted by a new trigger (internally with "Execute Trigger" or externally).

SCPI command:

`[ :SOURce<hw> ] :BB:WIMax:TRIGger:ARM:EXECute` on page 123

**Execute Trigger**

Executes trigger manually.

A manual trigger can be executed only when an internal trigger source and a trigger mode other than "Auto" have been selected.

SCPI command:

`[ :SOURce<hw> ] :BB:WIMax:TRIGger:EXECute` on page 124

**Trigger Source**

Selects trigger source. This setting is effective only when a trigger mode other than "Auto" has been selected.

- "Internal"            The trigger event is executed by "Execute Trigger".
- "Internal  
(Baseband A/  
B)"            (two-path instruments only)  
The trigger event is executed by the trigger signal from the second path

"External (TRIGGER 1 / 2)" The trigger event is executed with the aid of the active edge of an external trigger signal. The trigger signal is supplied via the TRIGGER connector. The polarity, the trigger threshold and the input impedance of the TRIGGER input can be set in the "Global Trigger/Clock Settings" dialog.

SCPI command:

```
[ :SOURCE<hw> ] :BB:WIMax:TRIGger:SOURce on page 127
```

**Sync. Output to External Trigger**

(enabled for Trigger Source External)

Enables/disables output of the signal synchronous to the external trigger event.

For R&S SMBV instruments:

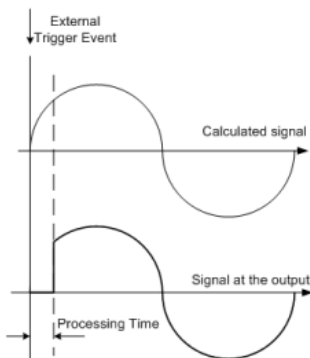
For or two or more R&S SMBVs configured to work in a master-slave mode for synchronous signal generation, configure this parameter depending on the provided system trigger event and the properties of the output signal. See the table below for an overview of the required settings.

*Table 3-1: Typical Applications*

System Trigger	Application	"Sync. Output to External Trigger"
Common External Trigger event for the master and the slave instruments	All instruments are synchronous to the external trigger event	ON
	All instruments are synchronous among themselves but starting the signal from first symbol is more important than synchronicity with external trigger event	OFF
Internal trigger signal of the master R&S SMBV for the slave instruments	All instruments are synchronous among themselves	OFF

"On"

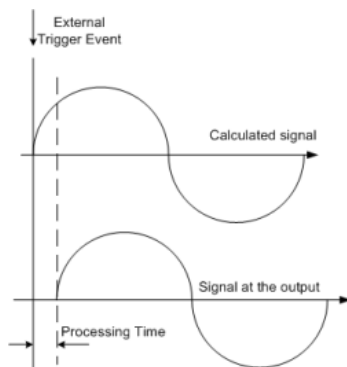
Corresponds to the default state of this parameter. The signal calculation starts simultaneously with the external trigger event but because of the instrument's processing time the first samples are cut off and no signal is outputted. After elapsing of the internal processing time, the output signal is synchronous to the trigger event.



"Off"

The signal output begins after elapsing of the processing time and starts with sample 0, i.e. the complete signal is outputted.

This mode is recommended for triggering of short signal sequences with signal duration comparable with the processing time of the instrument.



SCPI command:

`[ :SOURce<hw> ] :BB:WIMax:TRIGger:EXTernal:SYNChronize:OUTPut`  
on page 124

### Trigger Delay

Sets the trigger signal delay in samples on external triggering or on internal triggering via the second path.

Sets the trigger signal delay in samples on external triggering.

This enables the R&S Signal Generator to be synchronized with the device under test or other external devices.

For two-path instruments, the delay can be set separately for each of the two paths.

SCPI command:

`[ :SOURce<hw> ] :BB:WIMax:TRIGger [ :EXTernal<ch> ] :DELay` on page 127  
`[ :SOURce<hw> ] :BB:WIMax:TRIGger:OBASeband:DELay` on page 124

### Trigger Inhibit

Sets the duration for inhibiting a new trigger event subsequent to triggering. The input is to be expressed in samples.

In the "Retrigger" mode, every trigger signal causes signal generation to restart. This restart is inhibited for the specified number of samples.

This parameter is only available on external triggering or on internal triggering via the second path.

For two-path instruments, the trigger inhibit can be set separately for each of the two paths.

SCPI command:

`[ :SOURce<hw> ] :BB:WIMax:TRIGger [ :EXTernal<ch> ] :INHibit` on page 128  
`[ :SOURce<hw> ] :BB:WIMax:TRIGger:OBASeband:INHibit` on page 125

### 3.27.2 Marker Mode

The marker output signal for synchronizing external instruments is configured in the marker settings section "Marker Mode".

The R&S SMBV supports only two markers.

#### Marker Mode

Selects a marker signal for the associated "MARKER" output.

- |                     |   |
|---------------------|---|
| "Restart"           | A marker signal is generated at the start of each ARB sequence.   |
| "Frame"             | A marker signal is generated at the start of each frame.  |
| "Frame Active Part" | The marker signal is high whenever a burst is active and low during inactive signal parts (such as the gaps between bursts in uplink mode or the uplink subframe in downlink TDD mode).<br>This marker can be used to decrease the carrier leakage during inactive signal parts by feeding it into the pulse modulator. |
| "Pulse"             | A regular marker signal is generated. The pulse frequency is defined by entering a divider. The frequency is derived by dividing the sample rate by the divider. The input box for the divider opens when "Pulse" is selected, and the resulting pulse frequency is displayed below it.                                 |

SCPI command:

[\[:SOURCE<hw>\]:BB:WiMax:TRIGger:OUTPut<ch>:PULSe:DIVider](#)

on page 133

[\[:SOURCE<hw>\]:BB:WiMax:TRIGger:OUTPut<ch>:PULSe:FREQuency](#)

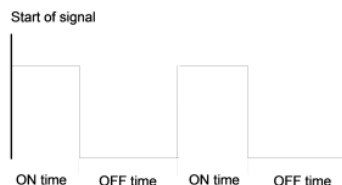
on page 133

- |            |   |
|------------|---|
| "Pattern " | A marker signal that is defined by a bit pattern is generated. The pattern has a maximum length of 32 bits and is defined in an input field which opens when pattern is selected. |
|------------|---|

SCPI command:

[\[:SOURCE<hw>\]:BB:WiMax:TRIGger:OUTPut<ch>:PATtern](#) on page 133

- |                 |  |
|-----------------|--|
| "ON/OFF Period" | A regular marker signal that is defined by an ON/OFF ratio is generated. A period lasts one ON and OFF cycle.<br>The "ON Time" and "OFF Time" are each expressed as a number of samples and are set in an input field which opens when ON/OFF ratio is selected. |
|-----------------|--|



SCPI command:

[\[:SOURCE<hw>\]:BB:WiMax:TRIGger:OUTPut<ch>:ONTime](#) on page 132

[\[:SOURCE<hw>\]:BB:WiMax:TRIGger:OUTPut<ch>:OFFTime](#) on page 132

SCPI command:

[\[:SOURCE<hw>\]:BB:WiMax:TRIGger:OUTPut<ch>:MODE](#) on page 132

**Rise Offset**

Sets the value for the rise offset. The rising ramp of the marker is shifted by the set value in samples. Positive values shift the rising ramp to later positions; negative values shift it to earlier positions.

The value range is -64000 to 64000.

SCPI command:

[\[:SOURce<hw>\]:BB:WiMax:TRIGger:OUTPut<ch>:ROFFset](#) on page 134

**Fall Offset**

Sets the value for the fall offset. The falling ramp of the marker is shifted by the set value in samples. Positive values shift the falling ramp to later positions; negative values shift it to earlier positions.

The value range is -64000 to 64000.

SCPI command:

[\[:SOURce<hw>\]:BB:WiMax:TRIGger:OUTPut<ch>:FOFFset](#) on page 132

**3.27.3 Marker Delay**

The delay of the signals on the MARKER outputs is set in the "Marker Delay" section.



The marker delay functions are available for R&S SMx and R&S AMU instruments only.

The R&S SMBV supports only two markers.

**Marker x Delay**

Enters the delay between the marker signal at the marker outputs and the start of the frame or slot.

The input is expressed as a number of symbols/samples. If the setting "Fix marker delay to dynamic range" is enabled, the setting range is restricted to the dynamic range. In this range the delay of the marker signals can be set without restarting the marker and signal.

SCPI command:

[\[:SOURce<hw>\]:BB:WiMax:TRIGger:OUTPut<ch>:DELay](#) on page 130

**Current Range without Recalculation**

Displays the dynamic range within which the delay of the marker signals can be set without restarting the marker and signal.

The delay can be defined by moving the setting mark.

SCPI command:

[\[:SOURce<hw>\]:BB:WiMax:TRIGger:OUTPut<ch>:DELay:MINimum](#)  
on page 131

[\[:SOURce<hw>\]:BB:WiMax:TRIGger:OUTPut<ch>:DELay:MAXimum](#)  
on page 130

**Fix marker delay to current range**

Restricts the marker delay setting range to the dynamic range. In this range the delay can be set without restarting the marker and signal.

SCPI command:

`[ :SOURce<hw> ] :BB:WIMax:TRIGger:OUTPut:DELAy:FIXed` on page 130

**3.27.4 Clock Settings**

The Clock Settings is used to set the clock source and a delay if required.



The clock functions are available for R&S SMx and R&S AMU instruments only.

**Sync. Mode**

(for R&S SMBV only)

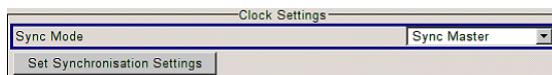
Selects the synchronization mode.

This parameter is used to enable generation of very precise synchronous signal of several connected R&S SMBVs.

**Note:** If several instruments are connected, the connecting cables from the master instrument to the slave one and between each two consecutive slave instruments must have the same length and type.

Avoid unnecessary cable length and branching points.

- "None"            The instrument is working in stand-alone mode.
- "Sync. Master"   The instrument provides all connected instrument with its synchronisation (including the trigger signal) and reference clock signal.



- "Sync. Slave"    The instrument receives the synchronisation and reference clock signal from another instrument working in a master mode.

SCPI command:

`[ :SOURce<hw> ] :BB:WIMax:CLOCK:SYNChronization:MODE` on page 136

**Set Synchronization Settings**

(for R&S SMBV only)

Performs automatically adjustment of the instrument's settings required for the synchronization mode, selected with the parameter "Synchronization Mode".

SCPI command:

`[ :SOURce<hw> ] :BB:WIMax:CLOCK:SYNChronization:EXECute` on page 136

**Clock Source**

Selects the clock source.

- "Internal"        The internal clock reference is used to generate the symbol clock.

"External" The external clock reference is fed in as the symbol clock or multiple thereof via the CLOCK connector.  
The symbol rate must be correctly set to an accuracy of +/-2 % (see data sheet).  
The polarity of the clock input can be changed with the aid of "Global Trigger/Clock Settings".  
In the case of two-path instruments this selection applies to path A.

SCPI command:

[\[:SOURce<hw>\]:BB:WIMax:CLOCK:SOURce](#) on page 135

#### **Clock Mode**

Enters the type of externally supplied clock.

"Sample" A sample clock is supplied via the CLOCK connector.

"Multiple Sample" A multiple of the sample clock is supplied via the CLOCK connector; the sample clock is derived internally from this.  
The Multiplier window provided allows the multiplication factor to be entered.

SCPI command:

[\[:SOURce<hw>\]:BB:WIMax:CLOCK:MODE](#) on page 134

#### **Clock Multiplier**

Enters the multiplication factor for clock type "Multiple".

SCPI command:

[\[:SOURce<hw>\]:BB:WIMax:CLOCK:MULTIplier](#) on page 135

#### **Measured External Clock**

Indicates the measured frequency of the external clock signal. This enables the user to permanently monitor the frequency of the externally introduced clock.

This information is displayed only if the external clock source has been selected.

SCPI command:

`CLOC:INP:FREQ?`

### **3.27.5 Global Settings**

The buttons in this section lead to submenu for general trigger, clock and mapping settings.

This settings are available for R&S SMx and R&S AMU instruments only.

#### **Global Trigger/Clock Settings**

Calls the "Global Trigger/Clock/Input Settings" dialog.

This dialog is used among other things for setting the trigger threshold, the input impedance and the polarity of the clock and trigger inputs.

In the case of two-path instruments, these settings are valid for both paths.

The parameters in this menu affect all digital modulations and standards, and are described in chapter "Global Trigger/Clock/Input Settings" in the Operating Manual.



**User Marker / AUX I/O Settings**

Calls the "User Marker AUX I/O Settings" menu, used to map the connector on the rear of the instruments.

See also "User Marker / AUX I/O Settings" in the Operating Manual.

## 4 Remote-Control Commands

The `SOURce:BB:WiMax` subsystem contains commands for the primary and general settings of the IEEE 802.16 WiMAX standard. These settings concern activation and deactivation of the standard, setting the transmission direction, filter, clock, trigger and clipping settings, defining the frame duration and the sequence length, as well as the preset setting.

The commands for defining the frame configuration for physical layer modes OFDM and OFDMA are described in the next section. The commands are divided up in this way to make the comprehensive `SOURce:BB:WiMax` subsystem clearer.

### `SOURce<hw>`

For one-path instruments, the keyword `SOURce` is optional and can be omitted.

The numeric suffix to `SOURce` distinguishes between signal generation for path A and path B in the case of two-path instruments:

- `SOURce[1]` = path A  
The keyword `SOURce` is optional and can be omitted
- `SOURce2` = path B  
The keyword `SOURce` is mandatory, i.e. the command must contain the keyword with suffix 2.

### `OUTPut<ch>`

The numeric suffix to `OUTPut` distinguishes between the available markers.

Only two markers are available for the R&S SMBV, i.e. the allowed values for the suffix are 1 or 2.

### Placeholder `<root>`

For commands that read out or save files in the default directory, the default directory is set using command `MMEM:CDIRectory`. The examples in this description use the placeholder `<root>` in the syntax of the command.

- `D:\` - for selecting the internal hard disk of Windows instruments
- `E:\` - for selecting the memory stick which is inserted at the USB interface of Windows instruments
- `/var/<instrument>` - for selecting the internal flash card of Linux instrument, where `<instrument>` is the instrument name, e.g. `smbv`.
- `/usb` - for selecting the memory stick which is inserted at the USB interface of Linux instrument.

## 4.1 General Commands

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---

### `[:SOURce<hw>]:BB:WIMax:DUPLexing <Duplexing>`

The command selects the duplexing. The duplexing mode determines how the uplink and downlink signal are separated.

#### Parameters:

<Duplexing>

TDD | FDD

#### TDD

The same frequency is used for both directions of transmission (uplink and downlink). With one baseband, either downlink or uplink frames can be generated.

#### FDD

"(OFDM only)"

If only one link direction is considered at once, the IEEE 802.16 standard defines no differences between TDD and FDD signals on the physical layer. The FDD mode has been provided for convenience, it completely fills the defined frame with bursts to simulate a continuous transmission environment. It is recommended to use TDD mode instead if FDD decives are to be tested with frames including transmission gaps.

\*RST: TDD

#### Example:

```
BB:WIM:DUPL FDD
```

selects frequency division duplexing.

---

### `[:SOURce<hw>]:BB:WIMax:FRAME:BURSt:DELay <Delay>`

The command sets the delay for the first uplink burst.

The command is only available for physical layer mode OFDM in uplink and for FDD duplexing.

**Parameters:**

<Delay> float  
 Range: 0.0 to <frame duration>  
 Increment: 0.1 ms  
 \*RST: 0.0 ms

**Example:**

```
BB:WIM:MODE OFDM
selects physical layer mode OFDM.
BB:WIM:LINK UP
selects transmission direction uplink.
BB:WIM:DUP FDD
selects FDD duplexing.
BB:WIM:FRAM:BURS:DEL 0.004
selects a delay of 4 ms for the first burst.
```

**[[:SOURce<hw>]:BB:WIMax:FRAME:TIME <Time>**

The command selects the frame duration. Only distinct values are allowed in the standard. For test reasons, continuous generation or generation for a freely selectable duration (USER) are available. The user duration is set with command `SOUR:BB:WIM:FRAM:TIME:USER`. In continuous mode, the frame duration equals the sum of the burst durations.

**Parameters:**

<Time> MS2 | MS2D5 | MS4 | MS5 | MS8 | MS10 | MS12D5 | MS20 |  
 CONTInuous | USER  
 \*RST: MS10

**Example:**

```
BB:WIM:FRAM:TIME MS12D5
selects a frame length of 12.5 ms.
```

**[[:SOURce<hw>]:BB:WIMax:FRAME:TIME:USER <User>**

The command sets the frame duration to a freely selectable value.

**Parameters:**

<User> float  
 Range: 0 s to 10E4 s  
 Increment: 1 ms  
 \*RST: 0 ms

**[[:SOURce<hw>]:BB:WIMax:LINK <Link>**

The command defines the transmission direction. The signal either corresponds to that of a base station (FORWARD | DOWN) or that of a subscriber station (REVERSE | UP).

**Parameters:**

<Link> FORWARD | REVERSE | UP | DOWN  
 \*RST: FORWARD|DOWN

**Example:** `BB:WIM:LINK DOWN`  
 the transmission direction selected is base station to subscriber station. The signal corresponds to that of a base station.

---

**[[:SOURce<hw>]:BB:WIMax:MODE <Mode>**

The command selects the Physical Layer Mode.

**Parameters:**

<Mode>

OFDM | AOFDM | WIBRo

**OFDM**

The OFDM mode supports signal generation according to IEEE 802.16-2004 section 8.3 with a fixed FFT size of 256.

Duplexing FDD is only possible for physical layer mode OFDM. Duplexing TDD is automatically set when switching to physical layer mode OFDMA.

**AOFDM**

Orthogonal Frequency Division Multiple Access (OFDMA) groups multiple subcarriers of the OFDM into sub-channels. A single client or subscriber station might transmit using all of the sub-channels within the carrier space, or multiple clients might transmit with each using a portion of the total number of sub-channels simultaneously. OFDMA thus enables a more flexible use of resources. It can support nomadic and mobile operation.

**WIBRo**

The OFDMA – WiBro (Wireless Broadband) mode groups multiple subcarriers of the OFDM into sub-channels. A single client or subscriber station might transmit using all of the sub-channels within the carrier space, or multiple clients might transmit with each using a portion of the total number of sub-channels simultaneously.

OFDMA thus enables a more flexible use of resources. It can support nomadic and mobile operation.

The OFDMA – WiBro mode is identical to the OFDMA mode

When selecting OFDMA – WiBro, these parameters are set to their WiBro defaults:

Frame Duration: 5ms

Frequency Band: WiBro

Channel Bandwidth: 8.75 MHz

Sampling Rate: 10 MHz

Tg/Tb: 1/8

FFT Size: 1024

\*RST: OFDM

**Example:** `BB:WIM:MODE OFDM`  
 selects physical layer mode OFDM.

**[ :SOURce<hw>]:BB:WiMax:PATH:COUPling:POFFset <Poffset>**

(Available only in path A of two-path instruments and for enabled parameter Use Baseband A+B)

Sets the relative power offset of path B compared to the power level of the path A.

A value of 0 dB refers to the level set in the main RF level setting of the instrument.

Negative values lower the level of baseband B, i.e. the level of Baseband A matches the main level setting, Baseband B is offset by the set amount.

Positive values lower the level of baseband A, i.e. the level of Baseband B matches the main level setting, Baseband A is offset by the set amount.

**Parameters:**

<Poffset>	float
Range:	-80.00 dB to 20.00 dB
*RST:	0.00 dB

**Example:**

```
BB:WiMax:PATH:COUP:STAT ON
enables control of both paths via the WiMAX menu.
BB:WiMax:PATH:COUP:POFF -5dB
sets the power offset
:POW?
queries the power level of path A
SOUR2:POW?
queries the power level of path B
Response: -30 dB
Result: The current power level of path A is -30 dB; the current
power level of path B is -35 dB
```

**[ :SOURce<hw>]:BB:WiMax:PATH:COUPling[:STATe] <State>**

(Available only in path A of two-path instruments and for OFDMA and OFDMA-WiBro Physical Layer Mode)

Enables/disables control of both paths via the WiMAX menu.

**Note:** For two path instruments and enabled parameter "Use of Baseband A+B", enabling the WiMAX signal simulation disables all other digital standards and digital modulation modes in path B.

An active Baseband A+B mode is useful for STC (MIMO) signal setups. In this case, baseband B is controlled from baseband A and generates an identical setup, just with opposite STC antenna configuration. Triggering is performed automatically such that both basebands are aligned in time.

For STC modes with 4 antennas, using antenna 0 in baseband A generates antenna 1 in baseband B. Using antenna 2 in baseband A generates antenna 3 in baseband B. A two-path instrument can either provide antennas 0 & 1 or antennas 2 & 3.

**Parameters:**

<State> 0 | 1 | OFF | ON  
 \*RST: OFF

**Example:**

```
BB:WIM:MODE AOFD
selects physical layer mode OFDMA.
BB:WIM:AOFD:ZONE0:STC:MODE OFF
configure baseband A to generate one SISO zone
BB:WIM:AOFD:ZONE1:STC:MODE MA2
Configure baseband A to generate one additional STC zone.
BB:WIM:AOFD:ZONE1:STC:ANT0
Sets Antenna 0 for this STC zone.
BB:WIM:PATH:COUP:STAT ON
enables control of both paths via the WiMAX menu.
BB:WIM:STAT ON
Switch on baseband A; Baseband B is automatically activated.
```

**[[:SOURce<hw>]:BB:WIMax:PRESet**

The command produces a standardized default for the IEEE 802.16 standard. The settings correspond to the \*RST values specified for the commands.

All IEEE 802.16 settings are preset.

**Example:**

```
BB:WIM:PRES
resets all the IEEE 802.16 settings to default values.
```

**Usage:**

Event

**[[:SOURce<hw>]:BB:WIMax:SETTing:CATalog?**

This command reads out the files with IEEE 802.16 settings in the default directory. The default directory is set using command `MMEM:CDIRectory`. Only files with the file extension `*.wimax` will be listed.

**Return values:**

<Catalog> string

**Example:**

```
MMEM:CDIR '<root>\user\wimax
sets the default directory to <root>\user\wimax.
BB:WIM:SETT:CAT?
reads out all the files with IEEE 802.16 settings in the default
directory.
Response: 'ofdm', 'fbpsk'
the files ofdm and fbpsk are available.
```

**Usage:**

Query only

**[[:SOURce<hw>]:BB:WIMax:SETTing:DELeTe <Delete>**

This command deletes the selected file with IEEE 802.16 WiMAX settings. The directory is set using command `MMEM:CDIRectory`. A path can also be specified, in which case the files in the specified directory are read. The file extension may be omitted. Only files with the file extension `*.wimax` will be deleted.

**Setting parameters:**

<Delete> string

**Example:** `BB:WIM:SETT:DEL 'ofdm'`  
deletes file `ofdm`.

**Usage:** Setting only

**[[:SOURce<hw>]:BB:WIMax:SETTing:LOAD <Load>**

This command loads the selected file with IEEE 802.16 WiMAX settings. The directory is set using command `MMEM:CDIRectory`. A path can also be specified, in which case the files in the specified directory are read. The file extension may be omitted. Only files with the file extension `*.wimax` will be loaded.

**Setting parameters:**

<Load> string

**Example:** `BB:WIM:SETT:LOAD 'ofdm'`  
loads file `ofdm`.

**Usage:** Setting only

**[[:SOURce<hw>]:BB:WIMax:SETTing:STORe <Store>**

This command stores the current IEEE 802.16 WiMAX settings into the selected file. The directory is set using command `MMEM:CDIRectory`. A path can also be specified, in which case the files in the specified directory are read. Only the file name has to be entered. IEEE 802.16 WiMAX settings are stored as files with the specific file extensions `*.wimax`.

**Setting parameters:**

<Store> string

**Example:** `BB:WIM:SETT:STOR 'ofdm_tdd'`  
stores the current settings into file `ofdm_tdd`.

**Usage:** Setting only

**[[:SOURce<hw>]:BB:WIMax:SETTing:STORe:FAST <Fast>**

Determines whether the instrument performs an absolute or a differential storing of the settings.

Enable this function to accelerate the saving process by saving only the settings with values different to the default ones.



**Note:** This function is not affected by the "Preset" function.

However, in some test setups, e.g while analyzing the generated WiMAX signal with R&S FSQ equipped with former FW version, it is required to disable the fast save option.

**Parameters:**

<Fast>                    0 | 1 | OFF | ON  
 \*RST:                    0

**[:SOURCE<hw>]:BB:WIMax:SENGth <Slength>**

The command selects the number of frames. The maximum number of frames depends on the sampling rate, the set frame length (2 x sampling rate x frame length / command BB:WIM:FRAM:TIM) and the supplied ARB memory size.

**Parameters:**

<Slength>                float  
 Range:                    1 to MAX  
 \*RST:                    1

**Example:**

BB:WIM:SENG 4  
 selects the generation of 4 frames.

**[:SOURCE<hw>]:BB:WIMax:STATe <State>**

The command activates modulation in accordance with the IEE 802.16 WiMAX standard. Activating this standard deactivates all the other digital standards and digital modulation modes (in case of two-path instruments, this affects the same path).

BB:WIM:STAT ON deactivates the other standards and digital modulation.

**Note:** For two path instruments with enabled parameter "Use of Baseband A+B", activating WiMAX signal simulation disables all other digital standards and digital modulation modes in path B as well.

**Parameters:**

<State>                    0 | 1 | OFF | ON  
 \*RST:                    OFF

**Example:**

BB:WIM:STAT ON  
 activates modulation in accordance with the IEE 802.16 WiMAX standard.

**[:SOURCE<hw>]:BB:WIMax:SUBFrame:TIME <Time>**

The command set the duration of the downlink subframe.

The command is only available for uplink direction and when TDD is selected (in case of two-path instruments, on the same path).

**Parameters:**

<Time> float  
 Range: 0 ms to MAX  
 Increment: 1 ms  
 \*RST: 0 ms

**Example:**

BB:WIM:LINK UP  
 selects uplink transmission.  
 BB:WIM:DUPL TDD  
 selects time division duplexing.  
 BB:WIM:SUBF:TIME 2ms  
 sets a subframe duration of 2 ms.

**[[:SOURce<hw>]:BB:WIMax:WAVEform:CREate <Create>**

This command creates a waveform using the current settings of the "WiMAX" menu. The file name is entered with the command. The file is stored with the predefined file extension \*.wv. The file name and the directory it is stored in are user-definable.

**Setting parameters:**

<Create> string

**Example:**

MMEM:CDIR '<root>\user\waveform'  
 sets the default directory to <root>\user\waveform.  
 BB:WIM:WAV:CRE 'wimax\_1'  
 creates the waveform file wimax\_1.wv in the default directory.

**Usage:**

Setting only

**[[:SOURce<hw>]:[[:BB]:WIMax:SVERSion <Sversion>**

Selects the version of the standard to use.

**Parameters:**

<Sversion> VC1 | VC2D4  
 \*RST: VC1

## 4.2 Filter/Clipping Settings

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---

### `[:SOURce<hw>]:BB:WIMax:BDUMp:DIRectory <Directory>`

The directory path specified here is used to store the dumped burst data files. If the field is empty the firmware directory is used (such as <root>\Program Files\Rohde&Schwarz\SMUFirmware).

#### Parameters:

<Directory>                    string

#### Example:

`BB:WIM:BDUMp:DIRirectory '<root>\wimax\dump'`  
sets the directory for OFDMA burst input dump.

---

### `[:SOURce<hw>]:BB:WIMax:BDUMp:STATe <State>`

Activates burst input data dump..

#### Parameters:

<State>                    0 | 1 | OFF | ON  
\*RST:                    OFF

#### Example:

`BB:WIM:BDUMp:STATe ON`  
activates burst input data dump.

---

### `[:SOURce<hw>]:BB:WIMax:CLIPping:LEVel <Level>`

The command sets the limit for level clipping. This value indicates at what point the signal is clipped. It is specified as a percentage, relative to the highest level. 100% indicates that clipping does not take place.

Level clipping is activated with the command `SOUR:BB:WIM:CLIP:STAT ON`

#### Parameters:

<Level>                    float  
Range:                    1 PCT to 100 PCT  
Increment:                1 PCT  
\*RST:                    100 PCT

**Example:** BB:WIM:CLIP:LEV 80PCT  
sets the limit for level clipping to 80% of the maximum level.  
BB:WIM:CLIP:STAT ON  
activates level clipping.

**[ :SOURCE<hw> ]:BB:WIMax:CLIPping:MODE <Mode>**

The command sets the method for level clipping (Clipping).

**Parameters:**

<Mode> VECTOR | SCALAR

**VECTOR**

The reference level is the amplitude | i+jq |.

**SCALAR**

The reference level is the absolute maximum of the I and Q values.

\*RST: VECTOR

**Example:** BB:WIM:CLIP:MODE SCAL  
selects the absolute maximum of all the I and Q values as the reference level.  
BB:WIM:CLIP:LEV 80PCT  
sets the limit for level clipping to 80% of this maximum level.  
BB:WIM:CLIP:STAT ON  
activates level clipping.

**[ :SOURCE<hw> ]:BB:WIMax:CLIPping:STATE <State>**

The command activates level clipping (Clipping). The value is defined with the command [SOURCE:]BB:WIMax:CLIPping:LEVel, the mode of calculation with the command [SOURCE:]BB:WIMax:CLIPping:MODE.

**Parameters:**

<State> 0 | 1 | OFF | ON

\*RST: OFF

**Example:** BB:WIM:CLIP:STAT ON  
activates level clipping.

**[ :SOURCE<hw> ]:BB:WIMax:FILTer:TYPE <Type>**

The command selects the filter type.

**Parameters:**

<Type> RCOSine | COSine | GAUSs | LGAuss | CONE | COF705 |  
COEqualizer | COFequalizer | C2K3x | APCO25 | SPHase |  
RECTangle | PGAuss | LPASs | DIRac | ENPShape | EWPSshape |  
LPASSEVM

\*RST: GAUSs

**Example:** `BB:WIM:FILT:TYPE RCOS`  
sets the filter type root cosine.

**[:SOURce<hw>]:BB:WIMax:FILTer:MODE <Mode>**

The command sets the filter mode.

**Parameters:**

<Mode> REALtime | OFFLine

**REALtime**

The filter is applied to a signal in real-time mode.

**OFFLine**

The filter is applied to a signal in offline mode. This option increases the calculation time and reduces the maximum number of generated frames that can be fit into the ARB memory. It can be useful to filter the signal in offline mode if steeper filter edges are required. In offline mode, more taps are used for the filters, therefore the roll of factor can be further decreased.

\*RST: REALtime

**Example:** `BB:WIM:FILT:MODE REAL`  
the filter is applied to a signal in real-time mode.

**[:SOURce<hw>]:BB:WIMax:FILTer:ILENght <llength>**

The command sets the impulse length (number of filter tabs).

**Parameters:**

<llength> float  
Range: 1 to 128  
\*RST: 10

**Example:** `BB:WIM:FILT:ILEN 10`  
sets the number of filter tabs to 10.

**[:SOURce<hw>]:BB:WIMax:FILTer:ILENght:AUTO <Auto>**

The command activates/deactivates the impulse length state. If activated, the most sensible parameter values are selected. The value depends on the coherence check.

**Parameters:**

<Auto> 0 | 1 | OFF | ON  
\*RST: ON

**Example:** `BB:WIM:FILT:ILEN:AUTO ON`  
the most sensible parameters are selected automatically.

**[:SOURce<hw>]:BB:WIMax:FILTer:OSAMpling <Osampling>**

The command sets the upsampling factor.

**Parameters:**

<Osampling> float  
 Range: 1 to 32  
 \*RST: 32

**Example:**

BB:WIM:FILT:OSAM 32  
 sets the upsampling factor to 32.

**[[:SOURce<hw>]:BB:WIMax:FILTer:OSAMpling:AUTO <Auto>**

The command activates/deactivates the upsampling factor state. If activated, the most sensible parameter values are selected. The value depends on the coherence check. If deactivated, the values can be changed manually.

**Parameters:**

<Auto> 0 | 1 | OFF | ON  
 \*RST: ON

**Example:**

BB:WIM:FILT:OSAM:AUTO ON  
 the most sensible parameters are selected automatically.

**[[:SOURce<hw>]:BB:WIMax:FILTer:PARAMeter:APCO25 <Apco25>**

The command sets the roll-off factor for the APCO25 filter type.

**Parameters:**

<Apco25> float  
 Range: 0.05 to 0.99  
 \*RST: 0.20

**Example:**

BB:WIM:FILT:PAR:APCO25 0.04  
 the roll-off factor is set to 0.04.

**[[:SOURce<hw>]:BB:WIMax:FILTer:PARAMeter:COSine <Cosine>**

The command sets the roll-off factor for the Cosine filter type.

**Parameters:**

<Cosine> float  
 Range: 0.00 to 0.99  
 \*RST: OFDM: 0.1; OFDMA: 0.1 (sampling frequency below 20 MHz); OFDMA: 0.07 (sampling frequency 20 MHz and above)

**Example:**

BB:WIM:FILT:PAR:COS 0.04  
 the roll-off factor is set to 0.04.

**[[:SOURce<hw>]:BB:WIMax:FILTer:PARAMeter:COSine:COFS <Cofs>**

The command sets the "cut of frequency shift" value for the Cosine filter type. The default value gets set when switching between OFDM and OFDMA.

**Parameters:**

<Cofs> float  
 Range: 0.10 to 1.0  
 \*RST: OFDM: -0.1; OFDMA: 0.0 (sampling frequency below 20 MHz); OFDMA: -0.08 (sampling frequency 20 MHz and above)

**Example:**

BB:WIM:FILT:PAR:COFS 0.04  
 the "cut of frequency shift" value is set to 0.04.

**[:SOURCE<hw>]:BB:WIMax:FILTer:PARAmeter:GAUSs <Gauss>**

The command sets the BxT for the Gauss filter type (FSK).

**Parameters:**

<Gauss> float  
 Range: 0.15 to 2.5  
 \*RST: 0.50

**Example:**

BB:WIM:FILT:PAR:GAUS 0.5  
 'the BxT is set to 0.5.

**[:SOURCE<hw>]:BB:WIMax:FILTer:PARAmeter:LPASs <Lpass>**

The command sets the cut off frequency factor for the Lowpass (ACP optimization) filter type. The value range depends on the set symbol rate.

0.05 x symbol rate ... 2 x symbol rate

**Parameters:**

<Lpass> float  
 Range: 0.05 to 2.0  
 \*RST: 0.50

**Example:**

BB:WIM:FILT:PAR:LPAS 0.5  
 the cut of frequency factor is set to 0.5.

**[:SOURCE<hw>]:BB:WIMax:FILTer:PARAmeter:LPASSEVM <Lpassevm>**

The command sets the cut off frequency factor for the Lowpass (EVM optimization) filter type. The value range depends on the set symbol rate.

0.05 x symbol rate ... 2 x symbol rate

**Parameters:**

<Lpassevm> float  
 Range: 0.05 to 2.0  
 \*RST: 0.5

**Example:**

BB:WIM:FILT:PAR:LPASSEVM 0.5  
 the cut of frequency factor is set to 0.5.

---

**[[:SOURce<hw>]:BB:WIMax:FILTer:PARAmeter:PGAuss <Pgauss>**

The command sets the BxT for the Gauss filter type (pure).

**Parameters:**

<Pgauss> float  
 Range: 0.00 to 2.5  
 \*RST: 0.50

**Example:** BB:WIM:FILT:PAR:PGA 0.5  
 the BxT is set to 0.5.

---

**[[:SOURce<hw>]:BB:WIMax:FILTer:PARAmeter:RCOSine <Rcosine>**

The command sets the roll-off factor for the Root Cosine filter type.

**Parameters:**

<Rcosine> float  
 Range: 0.0 to 0.99  
 \*RST: 0.22

**Example:** BB:WIM:FILT:PAR:RCOS 0.4  
 the roll-off factor is set to 0.4.

---

**[[:SOURce<hw>]:BB:WIMax:FILTer:PARAmeter:SPHase <Sphase>**

The command sets the BxT for the Split Phase filter type.

**Parameters:**

<Sphase> float  
 Range: 0.15 to 2.5  
 \*RST: 2.00

**Example:** BB:WIM:FILT:PAR:SPH 2  
 the BxT is set to 2.0.

---

**[[:SOURce<hw>]:BB:WIMax:SRATe:VARiation <Variation>**

The command enters the output sample rate.

A variation of this parameter only affects the ARB clock rate, all other signal parameters remain unchanged. If the sampling rate in the frame configuration menu is changed, this parameter is reset to the chosen sampling rate.

**Parameters:**

<Variation> float  
 Range: 400 Hz to 10 MHz  
 Increment: 0.001 Hz  
 \*RST: 2 MHz  
 Default unit: Hz (c/s)



**Example:** `BB:WIM:SRAT:VAR 4000000`  
sets the output sample rate to 4 Mcps.

## 4.3 Trigger Settings



The trigger settings are available for R&S SMx and R&S AMU instruments only.

### **EXTernal<ch>**

The numeric suffix to `EXTernal<ch>` distinguishes between the external trigger via the TRIGGER 1 (suffix 1) and TRIGGER 2 (suffix 2) connector.

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### **[:SOURce<hw>]:BB:WIMax:TRIGger:ARM:EXECute**

The command stops signal generation for trigger modes `Armed_Auto` and `Armed_Retrigger`. A subsequent internal or external trigger event restart signal generation.

**Example:** `BB:WIM:TRIG:SOUR INT`  
sets internal triggering.  
`BB:WIM:TRIG:SEQ ARET`  
sets `Armed_Retrigger` mode, i.e. every trigger event causes signal generation to restart.  
`BB:WIM:TRIG:EXEC`  
executes a trigger, signal generation is started.  
`BB:WIM:TRIG:ARM:EXEC`  
signal generation is stopped.  
`BB:WIM:TRIG:EXEC`  
executes a trigger, signal generation is started again.

**Usage:** Event

**[[:SOURce<hw>]:BB:WIMax:TRIGger:EXECute**

The command executes a trigger. The internal trigger source must be selected using the command `:BB:WIM:TRIG:SOUR INT` and a trigger mode other than AUTO must be selected using the command `:BB:WIM:TRIG:SEQ`.

**Example:**

```
BB:WIM:TRIG:SOUR INT
```

sets internal triggering.

```
BB:WIM:TRIG:SEQ RETR
```

sets Retrigger mode, i.e. every trigger event causes signal generation to restart.

```
BB:WIM:TRIG:EXEC
```

executes a trigger.

**Usage:**

Event

**[[:SOURce<hw>]:BB:WIMax:TRIGger:EXTernal:SYNChronize:OUTPut <Output>**

(enabled for "Trigger Source" External)

Enables/disables output of the signal synchronous to the external trigger event.

For R&S SMBV instruments:

See also section ["Sync. Output to External Trigger"](#) on page 101 for a detailed description of the applications of this setting.

**Parameters:**

<Output>

0 | 1 | OFF | ON

**ON**

The signal calculation starts simultaneously with the external trigger event but because of the instrument's processing time the first samples are cut off and no signal is outputted. After elapsing of the internal processing time, the output signal is synchronous to the trigger event.

**OFF**

The signal output begins after elapsing of the processing time and starts with sample 0, i.e. the complete signal is outputted.

```
*RST: ON
```

**Example:**

```
BB:WIM:TRIG:SOUR EXT
```

sets external triggering.

```
BB:WIM:TRIG:EXT:SYNC:OUTP ON
```

enables synchronous output to external trigger

**[[:SOURce<hw>]:BB:WIMax:TRIGger:OBASeband:DELay <Delay>**

The command specifies the trigger delay (expressed as a number of samples) for triggering by the trigger signal from the second path.

**Parameters:**

<Delay> float  
 Range: 0 samples to  $2^{32}-1$  samples  
 Increment: 1 sample  
 \*RST: 0 samples

**Example:**

BB:WIM:TRIG:SOUR OBAS  
 sets for path A the internal trigger executed by the trigger signal from the second path (path B).  
 BB:WIM:TRIG:OBAS:DEL 50  
 sets a delay of 50 samples for the trigger.

**[:SOURce<hw>]:BB:WIMax:TRIGger:OBASeband:INHibit <Inhibit>**

The command specifies the number of samples by which a restart is to be inhibited following a trigger event. This command applies only for triggering by the second path.

**Parameters:**

<Inhibit> float  
 Range: 0 samples to  $2^{32}-1$  samples  
 Increment: 1 sample  
 \*RST: 0 samples

**Example:**

BB:WIM:TRIG:SOUR OBAS  
 sets for path A the internal trigger executed by the trigger signal from the second path (path B).  
 BB:WIM:TRIG:INH 200  
 sets a restart inhibit for 200 samples following a trigger event.

**[:SOURce<hw>]:BB:WIMax:TRIGger:RMODE?**

The command queries the current status of signal generation for all trigger modes with WIMax modulation on.

**Return values:**

<Rmode> STOP | RUN  
**RUN**  
 the signal is generated. A trigger event occurred in the triggered mode.  
**STOP**  
 the signal is not generated. A trigger event did not occur in the triggered modes, or signal generation was stopped by the command :BB:TDSC:TRIG:ARM:EXECute (armed trigger modes only).

**Example:**            `SOUR:BB:WIM:TRIG:MODE ARET`  
                          selects the Armed\_Retrigger mode.  
                          `SOUR:BB:WIM:TRIG:RMOD?`  
                          queries the current status of signal generation.  
                          Response: RUN  
                          the signal is generated, an external trigger was executed.

**Usage:**             Query only

**[[:SOURce<hw>]:BB:WIMax:TRIGger:SLENGth <Slength>**

The command defines the length of the signal sequence to be output in the "Single" trigger mode (`SOUR:BB:WIMax:SEQ SING`). The input is made in terms of samples.

It is possible to output deliberately just part of the frame, an exact sequence of the frame, or a defined number of repetitions of the frame. The unit is defined with command `SOUR:BB:WIMax:TRIG:SLUNit`.

**Parameters:**

<Slength>             float  
                          Range:        1 sample to (2<sup>32</sup>-1) samples  
                          Increment: 1 sample  
                          \*RST:        32768 samples

**Example:**            `BB:WIM:SEQ SING`  
                          sets trigger mode Single.  
                          `BB:WIM:TRIG:SLEN 200`  
                          sets a sequence length of 200 samples. The first 200 samples of the current frame will be output after the next trigger event.

**[[:SOURce<hw>]:BB:WIMax:TRIGger:SLUNit <Slunit>**

The command defines the unit for the entry of the length of the signal sequence (`SOUR:BB:WIMax:TRIG:SLEN`) to be output in the "Single" trigger mode (`SOUR:BB:WIMax:SEQ SING`).

**Parameters:**

<Slunit>                FRAME | CHIP | SEQUENCE  
                          **FRAME**  
                          Unit Frame. A single frame is generated after a trigger event.  
                          **CHIP**  
                          Unit Chip. A single chip is generated after a trigger event.  
                          **SEQUENCE**  
                          Unit Sequence Length. A single sequence is generated after a trigger event.  
                          \*RST:        SEQUENCE

**Example:**            `SOUR:BB:WIM:SEQ SING`  
                          sets trigger mode Single.  
                          `SOUR:BB:WIM:TRIG:SLUN FRAM`  
                          sets unit Frame length for the entry of sequence length.  
                          `SOUR:BB:WIM:TRIG:SLEN 2`  
                          sets a sequence length of 2 frame. Two frames will be output after  
                          the next trigger event.

**[[:SOURce<hw>]:BB:WIMax:TRIGger:SOURce <Source>**

The command selects the trigger source.

**Parameters:**

<Source>

INTernal | EXTernal | BEXTernal | OBASeband

**INTernal**

Triggering is executed by means of the Trigger command `SOURce:BB:WIM:TRIGger:EXECute` or `*TRG` in the case of remote control and by means of "Execute Trigger" in the case of manual operation.

**EXTernal**

Triggering is executed by means of the signal on the TRIGGER 1 connector.

**BEXTernal**

Triggering is executed by means of the signal on the TRIGGER 2 connector.

**OBASeband**

Triggering is executed by means of the trigger signal from the second path (two-path instruments only).

\*RST:        INTernal

**Example:**

`SOUR2:BB:WIM:TRIG:SOUR EXT`  
 sets external triggering via the TRIGGER 1 connector for path B  
 of a two-path instrument.

**[[:SOURce<hw>]:BB:WIMax:TRIGger[:EXTernal<ch>]:DELay <Delay>**

The command specifies the trigger delay (expressed as a number of samples) for external triggering. The numeric suffix to `EXTernal` distinguishes between the external trigger via the TRIGGER 1 (suffix 1) and TRIGGER 2 (suffix 2) connector.

**Parameters:**

<Delay>

float

Range:        0 samples to 65535 samples

Increment:   1 sample

\*RST:        0 samples

**Example:**            `BB:WIM:TRIG:SOUR EXT`  
                          sets an external trigger via the TRIGGER 1 connector.  
                          `BB:WIM:TRIG:DEL 50`  
                          sets a delay of 50 samples for the trigger.

---

**[[:SOURce<hw>]:BB:WIMax:TRIGger[:EXTernal<ch>]:INHibit <Inhibit>**

The command specifies the number of samples by which a restart is to be inhibited following a trigger event. This command applies only in the case of external triggering. The numeric suffix to EXTERNAL distinguishes between the external trigger via the TRIGGER 1 (suffix 1) and TRIGGER 2 (suffix 2) connector.

**Parameters:**

<Inhibit>            float  
                          Range:        0 samples to  $2^{32}-1$  samples  
                          Increment: 1 sample  
                          \*RST:        0 samples

**Example:**            `BB:WIM:TRIG:SOUR EXT`  
                          selects an external trigger via the TRIGGER 1 connector.  
                          `BB:WIM:TRIG:INH 200`  
                          sets a restart inhibit for 200 samples following a trigger event.

---

**[[:SOURce<hw>]:BB:WIMax[:TRIGger]:SEQUence <Sequence>**

The command selects the trigger mode.

**Parameters:**

&lt;Sequence&gt;

AUTO | RETRigger | AAUTo | ARETrigger | SINGle

**AUTO**

The modulation signal is generated continuously.

**RETRigger**

The modulation signal is generated continuously. A trigger event (internal or external) causes a restart.

**AAUTo**

The modulation signal is generated only when a trigger event occurs. After the trigger event the signal is generated continuously. Signal generation is stopped with command

`SOUR:BB:WIM:TRIG:ARM:EXEC` and started again when a trigger event occurs.**ARETrigger**

The modulation signal is generated only when a trigger event occurs. The device automatically toggles to RETRIG mode. Every subsequent trigger event causes a restart.

Signal generation is stopped with command

`SOUR:BB:WIM:TRIG:ARM:EXEC` and started again when a trigger event occurs.**SINGle**The modulation signal is generated only when a trigger event occurs. Then the signal is generated once to the length specified with command `SOUR:BB:WIM:TRIG:SLEN`. Every subsequent trigger event causes a restart.`*RST: AUTO`**Example:**`BB:WIM:SEQ AAUT`sets the "Armed\_auto" trigger mode; the device waits for the first trigger (e.g. with `*TRG`) and then generates the signal continuously.

## 4.4 Marker Settings

This section lists the remote control commands, necessary to configure the markers.



The marker delay settings are available for R&amp;S SMx and R&amp;S AMU instruments only.

**OUTput<ch>**The numeric suffix to `OUTPut` distinguishes between the available markers.

Only two markers are available for the R&amp;S SMBV, i.e. the allowed values for the suffix are 1 or 2.

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---

### **`[:SOURce<hw>]:BB:WIMax:TRIGger:OUTPut:DELay:FIXed` <Fixed>**

The command restricts the marker delay setting range to the dynamic range. In this range the delay can be set without restarting the marker and signal. If a delay is entered in setting ON but is outside this range, the maximum possible delay is set and an error message is generated.

#### **Parameters:**

<Fixed>                    0 | 1 | OFF | ON  
 \*RST:                    OFF

#### **Example:**

`BB:WIM:TRIG:OUTP:DEL:FIX ON`  
 restricts the marker signal delay setting range to the dynamic range.

---

### **`[:SOURce<hw>]:BB:WIMax:TRIGger:OUTPut<ch>:DELay` <Delay>**

The command defines the delay between the signal on the marker outputs and the start of the signal, expressed in terms of samples. Command `:BB:WIMax:TRIGger:OUTPut:DELay:FIXed` can be used to restrict the range of values to the dynamic range, i.e. the range within which a delay of the marker signals can be set without restarting the marker and signal.

#### **Parameters:**

<Delay>                    float  
 Range:                    0 samples to 2<sup>32</sup>-1 samples  
 Increment:                1 sample  
 \*RST:                    0 samples

#### **Example:**

`BB:WIM:TRIG:OUTP2:DEL 1600`  
 sets a delay of 1600 samples for the signal on connector MARKER 2.

---

### **`[:SOURce<hw>]:BB:WIMax:TRIGger:OUTPut<ch>:DELay:MAXimum?`**

The command queries the maximum marker delay for setting `:BB:WIMax:TRIG:OUTP:DEL:FIX ON`.



**Return values:**

<Maximum> float

**Example:**

BB:WIM:TRIG:OUTP:DEL:FIX ON

restricts the marker signal delay setting range to the dynamic range.

BB:WIM:TRIG:OUTP:DEL:MAX

queries the maximum of the dynamic range.

Response: 2000

the maximum for the marker delay setting is 2000 samples.

**Usage:**

Query only

---

**[[:SOURce<hw>]:BB:WIMax:TRIGger:OUTPut<ch>:DELay:MINimum?**

The command queries the minimum marker delay for setting :BB:WIMax:TRIGger:OUTPut: DELay:FIXed ON.

**Return values:**

<Minimum> float

**Example:**

BB:WIM:TRIG:OUTP:DEL:FIX ON

restricts the marker signal delay setting range to the dynamic range.

BB:WIM:TRIG:OUTP:DEL:MIN

queries the minimum of the dynamic range.

Response: 0

the minimum for the marker delay setting is 0 samples.

**Usage:**

Query only

---

```
[ :SOURce<hw>]:BB:WIMax:TRIGger:OUTPut<ch>:MODE <Mode>
```

**Parameters:**

<Mode>            REStart | FRAMe | FACTive | PULSe | PATTern | RATio | TRIGger

**REStart**

A marker signal is generated at the start of each sequence (the sequence length is set with command `SOUR:BB:WIM:FCOUNT`).

**FRAMe**

A marker signal is generated at the start of each frame (the frame length is set with command `SOUR:BB:WIM:FRAM:TIME`).

**FACTive**

The marker signal is high whenever a burst is active and low during inactive signal parts (such as the gaps between bursts in uplink mode or the uplink subframe in downlink TDD mode). This marker can be used to decrease the carrier leakage during inactive signal parts by feeding it into the pulse modulator.

**PATTern**

A marker signal is generated according to the user defined pattern (command `SOURce:BB:WIMax:TRIGger:OUTPut:PATTern`).

**RATio**

A marker signal corresponding to the Time Off / Time On specifications in the commands

`SOURce:BB:WIMax:TRIGger:OUTPut:OFFT` and

"`SOURce:BB:WIMax:TRIGger:OUTPut:ONT`" is generated.

\*RST:            REStart

**Example:**

```
BB:WIM:TRIG:OUTP2:MODE FRAME
selects the frame marker signal on output MARKER 2.
```

---

```
[ :SOURce<hw>]:BB:WIMax:TRIGger:OUTPut<ch>:ONTime <Ontime>
```

```
[ :SOURce<hw>]:BB:WIMax:TRIGger:OUTPut<ch>:OFFTime <Offtime>
```

The command sets the number of samples in a period (ON time + OFF time) during which the marker signal in setting `SOURce:BB:WIMax:TRIGger:OUTPut:MODE RATio` on the marker outputs is OFF.

**Parameters:**

<Offtime>            float

Range:            1 sample to 2<sup>24</sup>-1 samples

Increment:        1 sample

\*RST:            1 sample

**Example:**

```
BB:WIM:TRIG:OUTP2:OFFT 200
sets an OFF time of 200 samples for marker signal 2.
```

---

```
[ :SOURce<hw>]:BB:WIMax:TRIGger:OUTPut<ch>:FOFFset <Foffset>
```

The command sets the fall offset for on/off ratio marker in number of samples.

**Parameters:**

<Foffset> float  
 Range: -640000 to 640000  
 Increment: 1  
 \*RST: 0

**Example:**

BB:WIM:TRIG:OUTP2:FOFF 200  
 sets a fall offset of 20 samples for marker signal 2.

**[[:SOURce<hw>]:BB:WIMax:TRIGger:OUTPut<ch>:PATTern <Pattern>**

The command defines the bit pattern used to generate the marker signal in the setting SOURce:BB:WIMax:TRIGger:OUTPut:MODE PATTern. 0 is marker off, 1 is marker on.

**Parameters:**

<Pattern> integer  
 Range: #B0,1 to #B111...1, 32  
 \*RST: #B,1

**Example:**

BB:WIM:TRIG:OUTP2:PATT #B000000011111111,15  
 sets a bit pattern.  
 BB:WIM:TRIG:OUTP2:MODE PATT  
 activates the marker signal according to a bit pattern on output MARKER 2.

**[[:SOURce<hw>]:BB:WIMax:TRIGger:OUTPut<ch>:PULSe:DIVider <Divider>**

The command sets the divider for Pulse marker mode (SOUR:BB:WIM:TRIG:OUTP:MODE PULSe). The resulting pulse frequency is derived by dividing the symbol rate by the divider.

**Parameters:**

<Divider> float  
 Range: 2 to 2<sup>10</sup>  
 Increment: 1  
 \*RST: 2

**Example:**

BB:WIM:TRIG:OUTP2:PULS:DIV 2  
 sets the divider to 2 for the marker signal on output MARKER 2.  
 BB:WIM:TRIG:OUTP2:FREQ?  
 queries the resulting pulse frequency of the marker signal.  
 Response: 66 000  
 the resulting pulse frequency is 66 kHz.

**[[:SOURce<hw>]:BB:WIMax:TRIGger:OUTPut<ch>:PULSe:FREQuency?**

The command queries the pulse frequency of the pulsed marker signal in the setting SOURce:BB:WIMax:TRIGger:OUTPut:MODE PULSe. The pulse frequency is derived by dividing the symbol rate by the divider.

**Return values:**

&lt;Frequency&gt; float

**Example:**

```
BB:WIM:TRIG:OUTP2:PULS:DIV 2
sets the divider marker signal on output MARKER 2 to the value
2.
BB:WIM:TRIG:OUTP2:MODE PULS
enables the pulsed marker signal.
BB:WIM:TRIG:OUTP2:PULS:FREQ?
queries the pulse frequency of the marker signal.
Response: 33 000
the resulting pulse frequency is 33 kHz
```

**Usage:** Query only

---

**[[:SOURce<hw>]:BB:WIMax:TRIGger:OUTPut<ch>:ROFFset <Roffset>**

The command sets the rise offset for on/off ratio marker in number of samples.

**Parameters:**

<Roffset>	float
Range:	-640000 to 640000
Increment:	1
*RST:	0

**Example:**

```
BB:WIM:TRIG:OUTP2:ROFF 200
sets a rise offset of 20 samples for marker signal 2.
```

## 4.5 Clock Settings

This section lists the remote control commands, necessary to configure the clock.



The clock settings are available for R&amp;S SMx and R&amp;S AMU instruments only.

---

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---

**[[:SOURce<hw>]:BB:WIMax:CLOCK:MODE <Mode>**

The command enters the type of externally supplied clock (:BB:WIMax:CLOCK:SOURce EXTERNAL).

When MSAMple is used, a multiple of the sample clock is supplied via the CLOCK connector and the sample clock is derived internally from this. The multiplier is entered with the command :BB:WIMax:CLOCK:MULTiplier..

For two-path instruments, the only numerical suffix allowed for SOURCE is 1, since the external clock source is permanently allocated to path A.

**Parameters:**

<Mode>                   SAMPLE | MSAMPLE  
\*RST:                    SAMPLE

**Example:**

BB:WIM:CLOC:MODE SAMP  
selects clock type "SAMPLE", i.e. the supplied clock is a sample clock.

**[ :SOURCE<hw> ]:BB:WIMax:CLOCK:MULTIPLIER <Multiplier>**

The command specifies the multiplier for clock type "Multiplied" (:BB:WIMax:CLOCK:MODE MSAMPLE) in the case of an external clock source.

For two-path instruments, the only numerical suffix allowed for SOURCE is 1, since the external clock source is permanently allocated to path A.

**Parameters:**

<Multiplier>           float  
Range:                  1 to 64  
\*RST:                    4

**Example:**

BB:WIM:CLOC:SOUR EXT  
selects the external clock source. The clock is supplied via the CLOCK connector.  
BB:WIM:CLOC:MODE MSAMP  
selects clock type "Multiplied", i.e. the supplied clock has a rate which is a multiple of the sample rate.  
BB:WIM:CLOC:MULT 12  
the multiplier for the external clock rate is 12.

**[ :SOURCE<hw> ]:BB:WIMax:CLOCK:SOURCE <Source>**

The command selects the clock source.

For two-path instruments, selecting EXTERNAL is only possible for path A, since the external clock source is permanently allocated to path A.

**Parameters:**

<Source>                   INTERNAL | EXTERNAL | AINTERNAL

**INTERNAL**

The internal clock reference is used.

**EXTERNAL**

The external clock reference is supplied to the CLOCK connector.

\*RST:                    INTERNAL

**Example:**

BB:WIM:CLOC:MODE INT  
specifies that a sample clock is supplied via the CLOCK connector.

**[ :SOURce<hw> ] :BB:WIMax:CLOCK:SYNChronization:EXECute**

Performs automatically adjustment of the instrument's settings required for the synchronization mode, set with the command `BB:WIM:CLOC:SYNC:MODE`.

**Example:** `BB:WIM:CLOC:SYNC:MODE MAST`  
the instrument is configured to work as a master one.  
`BB:WIM:CLOC:SYNC:EXEC`  
all synchronization's settings are adjusted accordingly.

**Usage:** Event

**[ :SOURce<hw> ] :BB:WIMax:CLOCK:SYNChronization:MODE <Mode>**

Selects the synchronization mode.

This parameter is used to enable generation of very precise synchronous signal of several connected R&S SMBVs.

**Note:** If several instruments are connected, the connecting cables from the master instrument to the slave one and between each two consecutive slave instruments must have the same length and type. Avoid unnecessary cable length and branching points.

**Parameters:**

<Mode>

NONE | MASTer | SLAVe

**NONE**

The instrument is working in stand-alone mode.

**MASTer**

The instrument provides all connected instrument with its synchronization (including the trigger signal) and reference clock signal.

**SLAVe**

The instrument receives the synchronization and reference clock signal from another instrument working in a master mode.

\*RST: NONE

**Example:** `BB:WIM:CLOC:SYNC:MODE MAST`  
the instrument is configured to work as a master one.

## 4.6 OFDMA Physical Layer Settings

The `SOURce:BB:WIMax:AOFDM` systems contain commands for setting the characteristics of signals with OFDMA and OFDMA-WiBro physical layer.

The commands of this system only take effect if the OFDMA physical layer mode is selected:

- `SOURce:BB:WIMax:MODE AOFDMa` or
- `SOURce:BB:WIMax:MODE WIBRo`



In case of remote control, suffix counting for bursts corresponds to the suffix counting with WiMAX starting with burst 0. SCPI prescribes that suffix 1 is the default state and used when no specific suffix is specified. Therefore, burst 1 (and not burst 0) is selected when no suffix is specified.

### Suffixes

**ZONE<st0>**

Value range 0 .. 7

**BURSt<ch0>**

Value range 0 .. 63

**CID<ch0>**

Value range 0 .. 15

**HARQ<dir0>**

Value range 0 .. 14

**PDU<dir0>**

Value range 0 .. 16

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#### [ :SOURce<hw>]:BB:WIMax:AOFDm:BW <Bw>

The command sets the channel bandwidth. The selected channel bandwidth has to be a multiple of 1.25, 1.5, 1.75, 2.0 or 2.75 MHz. The channel bandwidth determines the parameter n (sampling ratio, command `SOUR:BB:WIMax:AOFD:N`).

The sampling rate is derived from the channel bandwidth as follows:

$$\text{SamplingRate} = \text{floor}(n * \text{ChannelBandwidth} / 8000) * 8000$$

"Downlink": The allowed values depend on the selected frequency band (command `SOUR:BB:WIMax:AOFD:FBAN`). Only discrete sets of values are available. If a new value is not allowed, the next allowed value in the direction of change is set.

"Uplink": The full range between 1.25 and 28 MHz is available. Only discrete sets of values are available. If a new value is not allowed, the next allowed value in the direction of change is set.

**Example:** 14 MHz and 28 MHz are allowed, the current value is 14 MHz. If a new value of 15 MHz is entered it is changed to 28 MHz.

#### Parameters:

<Bw>	float
Range:	1.25E6 to 28E6
*RST:	1.75E6

**Example:** `BB:WIM:AOFD:FBAN ETSI`  
selects frequency band according to ETSI specifications.  
`BB:WIM:AOFD:BW 7E6`  
sets the channel bandwidth to 7 MHz.

---

**[:SOURCE<hw>]:BB:WIMax:AOFDm:FBAND <Fband>**

The command selects the available frequency band for the carrier frequencies.

**Parameters:**

<Fband>

ETSI | MMDS | WCS | UNII | USER | WIBRo

**ETSI**

The frequency band as defined by the "European Telecommunications Standards Institute" applies. The range is 1.75 to 28 MHz for the channel bandwidth and 2 to 32 MHz for the sampling rate.

**MMDS**

The frequency band as defined by the "Multichannel Multipoint Distribution Service" applies. The RF frequency range is 2500 to 2686 MHz. The range is 1.50 to 24 MHz for the channel bandwidth and 1.72 to 27.52 MHz for the sampling rate.

**WCS**

The frequency band as defined by the "Wireless Communication Service" applies. It is in the 2.3 GHz band of the electromagnetic spectrum from 2305 to 2320 MHz and 2345 to 2360 MHz. The range is 2.5 to 15 MHz for the channel bandwidth and 2.88 to 17.28 MHz for the sampling rate.

**UNII**

The frequency band as defined by the "Unlicensed National Information Infrastructure" applies. It is in the 5 GHz band of the electromagnetic spectrum from 5150 to 5350 GHz and 5750 to 5825 GHz. The range is 10 to 20 MHz for the channel bandwidth and 11.52 to 23.04 MHz for the sampling rate.

**USER**

This mode is provided for choosing any other channel bandwidth / sampling rate combination. The range is 1.25 to 28 MHz for the channel bandwidth and 1.44 to 32 MHz for the sampling rate.

**WIBRo**

The frequency band as defined by the "Telecommunications Technology Association of Korea". It is in the 2.3 GHz band of the electromagnetic spectrum.

\*RST: ETSI

**Example:** `BB:WIM:AOFD:FBAN ETSI`  
selects frequency band according to ETSI specifications.

**[[:SOURce<hw>]:BB:WiMax:AOFDm:FFT <Fft>**

The command sets the size of the fast fourier transform. For OFDM channels, the size is fixed to 256. For OFDMA configuration, the possible configurations of the subchannel map depend on the selected FFT size.

**Parameters:**

<Fft> FFT128 | FFT512 | FFT1024 | FFT2048  
 \*RST: FFT2048

**Example:**

BB:WiMax:AOFDm:FFT FFT2048  
 sets the FFT size to 2048.

**[[:SOURce<hw>]:BB:WiMax:AOFDm:FRAME:PREDefined <Predefined>**

The command selects predefined setting for the frames.

All commands concerning the frame configuration are preset

**Parameters:**

<Predefined> USER | DL3M21SQPSK12 | DL3M21SQPSK34 |  
 DL3M21S16QAM12 | DL3M21S16QAM34 | DL3M21S64QAM12 |  
 DL3M21S64QAM23 | DL3M21S64QAM34 | DL3M21S64QAM56 |  
 DL5M29SQPSK12 | DL5M29SQPSK34 | DL5M29S16QAM12 |  
 DL5M29S16QAM34 | DL5M29S64QAM12 | DL5M29S64QAM23 |  
 DL5M29S64QAM34 | DL5M29S64QAM56 | DL7M21SQPSK12 |  
 DL7M21SQPSK34 | DL7M21S16QAM12 | DL7M21S16QAM34 |  
 DL7M21S64QAM12 | DL7M21S64QAM23 | DL7M21S64QAM34 |  
 DL7M21S64QAM56 | DL8M27SQPSK12 | DL8M27SQPSK34 |  
 DL8M27S16QAM12 | DL8M27S16QAM34 | DL8M27S64QAM12 |  
 DL8M27S64QAM23 | DL8M27S64QAM34 | DL8M27S64QAM56 |  
 DL10M29SQPSK12 | DL10M29SQPSK34 |  
 DL10M29S16QAM12 | DL10M29S16QAM34 |  
 DL10M29S64QAM12 | DL10M29S64QAM23 |  
 DL10M29S64QAM34 | DL10M29S64QAM56 |  
 UL3M12SQPSK12 | UL3M12SQPSK34 | UL3M12S16QAM12 |  
 UL3M12S16QAM34 | UL5M18SQPSK12 | UL5M18SQPSK34 |  
 UL5M18S16QAM12 | UL5M18S16QAM34 | UL7M12SQPSK12 |  
 UL7M12SQPSK34 | UL7M12S16QAM12 | UL7M12S16QAM34 |  
 UL8M15SQPSK12 | UL8M15SQPSK34 | UL8M15S16QAM12 |  
 UL8M15S16QAM34 | UL10M18SQPSK12 | UL10M18SQPSK34 |  
 UL10M18S16QAM12 | UL10M18S16QAM34

**USER**

The settings for the frame can be defined by the user.

**DL.../UL...**

Predefined settings for receiver testing are selected. The parameter includes the link direction, the bandwidth, the modulation and the channel coding rate.

\*RST: USER

**Example:** `BB:WIM:LINK UP`  
selects transmission direction uplink.  
`BB:WIM:AFDM:FRAM:PREDEF UL3M12SQPSK12`  
selects predefined test message with 3MHz, QPSK modulation  
and channel coding rate 1/2.

---

**[ :SOURce<hw>]:BB:WIMax:AOFDM:IDCell <Idcell>**

Sets the IDcell. The IDcell is used in the preamble, as PermBase parameter for the permutation equations in the first downlink zone and partly sets the subcarrier randomizer initialisation vector in the first downlink zone. The uplink alias command is

`SOURce:BB:WIMax:AOFDM:ULIDL`.

**Parameters:**

<Idcell> float  
Range: 0.0 to 31  
\*RST: 0

**Example:** `BB:WIM:AOFDM:IDC 4`  
sets ID cell 4.

---

**[ :SOURce<hw>]:BB:WIMax:AOFDM:N?**

The command queries the factor n (sampling ratio). The sampling ratio is determined by the channel bandwidth (see "[Channel Bandwidth OFDM](#)" on page 23).

**Return values:**

<N> N8D7 | N86D75 | N144D125 | N316D275 | N57D50 | N28D25

**Example:** `BB:WIM:AOFDM:N?`  
queries the factor n.  
Response: N8D7  
the factor n is 8/7.

**Usage:** Query only

---

**[ :SOURce<hw>]:BB:WIMax:AOFDM:POWER:REFERENCE <Reference>**

The command selects the level reference.

**Parameters:**

&lt;Reference&gt;

RMS | PREamble | WOPRamble

**RMS**

The instrument's level setting refers to the mean power of the subframe.

**PREamble**

The instrument's level setting refers to the preamble, which is FCH / Burst power + 3dB (downlink only).

**WOPRamble**

The instrument's level setting refers to the rms power of the subframe, excluding the preamble. This includes all symbols with allocated carriers in downlink or the whole uplink subframe in uplink (downlink only).

\*RST: PREamble

**Example:**

BB:WIM:MODE AOFD

selects physical layer mode OFDMA.

BB:WIM:LINK DOWN

select transmission direction downlink.

BB:WIM:AOFD:POW:REF PRE

the instrument's level setting refers to the preamble.

**[[:SOURce<hw>]:BB:WIMax:AOFDm:PREamble:INDEX <Index>**

The command selects the preamble index for the generation of a downlink frame preamble.

This command is available only in downlink and in User mode (SOURce:BB:WIMax:AOFD :PRE:IND:MODE USER).

**Parameters:**

&lt;Index&gt;

float

Range: 0 to 113

\*RST: 0

**Example:**

BB:WIM:LINK DOWN

selects downlink transmission.

BB:WIM:AOFD:PRE:IND 10

selects preamble 10.

**[[:SOURce<hw>]:BB:WIMax:AOFDm:PREamble:INDEX:MODE <Mode>**

The command selects the mode for selecting the preamble index.

This command is available only in downlink and in "User" mode (SOURce:BB:WIMax:AOFD :PRE:IND:MODE USER).

**Parameters:**

&lt;Mode&gt;

AUTO | USER

\*RST: AUTO

**Example:** `BB:WIM:LINK DOWN`  
selects downlink transmission.  
`BB:WIM:AOFD:PRE:IND:MODE AUTO`  
the preamble index for the generation of a downlink frame preamble is set automatically.

---

**[:SOURCE<hw>]:BB:WIMax:AOFDm:SRATE <Srate>**

The command sets the sampling rate. The sampling rate is related to the channel bandwidth by the parameter n:

$$\text{SamplingRate} = \text{floor}(n * \text{ChannelBandwidth} / 8000) * 8000$$

**Downlink:**

The value range depends on the selected frequency band (command `SOUR:BB:WIMax:AOFD:FBAN`). Only discrete sets of values are available. If a new value is not allowed, the next allowed value in the direction of change is set.

**Uplink:**

The full range between 1.44 and 32 MHz is available. Only discrete sets of values are available. If a new value is not allowed, the next allowed value in the direction of change is set.

**Example:** 16 MHz and 32 MHz are allowed, the current value is 16 MHz. If a new value of 17 MHz is entered it is changed to 32 MHz.

**Parameters:**

<Srate> float  
Range: 1.44E6 to 32E6  
Increment: 1E3  
\*RST: 2E6

**Example:** `BB:WIM:AOFD:SRAT 2E6`  
sets a sampling rate of 2 MHz.

---

**[:SOURCE<hw>]:BB:WIMax:AOFDm:TGTB <Tgtb>**

The command selects the ratio of guard period to symbol period. This value sets the length of the cyclic prefix in fractions of the symbol period.

**Parameters:**

<Tgtb> TGTB1D4 | TGTB1D8 | TGTB1D16 | TGTB1D32  
\*RST: TGTB1D4

**Example:** `BB:WIM:AOFD:TGTB TGTB1D8`  
sets a ratio of 1 to 8.

---

**[:SOURCE<hw>]:BB:WIMax:AOFDm:ZONE:COUNT <Count>**

The command sets the number of active zones in one frame. The burst configuration is performed for each zone separately.



**Parameters:**

<Count> integer  
 Range: 1 to 8  
 \*RST: 1

**Example:**

BB:WIM:AOFD:ZONE:COUN 2  
 two zones are defined.

**[[:SOURce<hw>]:BB:WIMax:AOFDm:ZONE<st0>:AMC:BITMap:PATtern <Pattern>**

Sets the AMC physical bands bitmap pattern in hexadecimal input format.

The LSB (right most bit) corresponds to physical band 0 (the lowest frequency OFDMA subcarriers). Deactivated bits in this pattern deactivate the corresponding bands, they will not be used for allocating bursts.

**Parameters:**

<Pattern> integer  
 \*RST: OFF

**Example:**

BB:WIM:AOFD:ZONE0:AMC:BITM:STAT ON  
 enables Band AMC mode  
 SOUR:BB:WIM:AOFD:ZONE0:AMC:BITM:PATT  
 #H0F10FFFFF0000,48  
 sets the AMC physical bands bitmap pattern

**[[:SOURce<hw>]:BB:WIMax:AOFDm:ZONE<st0>:AMC:BITMap[:STATe] <State>**

Activates/deactivates Band AMC mode.

If activated, the command SOUR:BB:WIM:AOFD:ZONE0:AMC:BITM:PATT specifies the active physical bands. If deactivated, all available physical bands are used.

**Parameters:**

<State> 0 | 1 | OFF | ON  
 \*RST: OFF

**Example:**

BB:WIM:AOFD:ZONE0:AMC:BITM:STAT ON  
 enables Band AMC mode

**[[:SOURce<hw>]:BB:WIMax:AOFDm:ZONE<st0>:BOOST <Boost>**

Sets an additional zone boosting in dB. The zone boosting is applied to both the data and pilot carriers.

**Parameters:**

<Boost> float  
 Range: -80 to 10  
 \*RST: 0

**Example:**

BB:WIM:AOFD:ZONE0:BOOS -33  
 sets th zone boost to - 33dB.

---

```
[ :SOURce<hw>]:BB:WIMax:AOFDM:ZONE<st0>:CSTD:ANTCount <Antcount>
```

Sets the number of antennas used for cyclic shift transmit diversity (CSTD). One base-band is only generating one antenna at a time.

**Parameters:**

<Antcount>            A1 | A2 | A4  
 \*RST:                A1

**Example:**

```
BB:WIM:AOFD:ZONE0:CSTD:ANTC A2
```

two antennas are selected for CSTD.

---

```
[ :SOURce<hw>]:BB:WIMax:AOFDM:ZONE<st0>:CSTD<ch0>:CDELay<dir0>  

  <Cdelay>
```

Sets the number of samples by which the OFDM symbols are cyclically shifted on the given tap.

With CSTD, each antenna sends a circularly shifted version of the same OFDM symbol, i.e. the antenna selected with the parameter Show Configuration For will send the same OFDM symbol as the other antennas, but the OFDM symbol is circularly shifted by the samples set with the parameter Cyclic Delay.

Positive values remove the specified number of samples from the end of the symbol and prepend them to the start of the symbol.

The antenna, for which the configuration is made, is distinguished with the numerical suffix at CSTD.

The tap, for which the configuration is made, is distinguished with the numerical suffix at CDELay.

**Suffix:**

<ch0>                0|1  
 <dir0>              0..4

**Parameters:**

<Cdelay>            float  
 Range:             -1024 to 1024  
 \*RST:              0

**Example:**

```
BB:WIM:AOFD:ZONE0:CSTD1:CDEL1 256
```

the cyclic delay applied to antenna 1 in the tap 1 is set to 256.

---

```
[ :SOURce<hw>]:BB:WIMax:AOFDM:ZONE<st0>:CSTD<ch0>:GAIN<dir0> <Gain>
```

Sets a linear gain factor for the corresponding tap. The gain factors are applied to the symbols before summation for all taps.

The antenna, for which the configuration is made, is distinguished with the numerical suffix at CSTD.

The tap, for which the configuration is made, is distinguished with the numerical suffix at GAIN.

**Suffix:**

<ch0> 0|1

<dir0> 0..4

**Parameters:**

<Gain> float

Range: 0.00 to 2.00

\*RST: 0.00

**Example:**

BB:WIM:AOFD:ZONE0:CSTD1:GAIN1 0.2

the linear gain of antenna 1 in the tap 1 is set to 0.2

**[:SOURCE<hw>]:BB:WIMax:AOFDm:ZONE<st0>:CSTD<ch0>:TAPCount**  
<Tapcount>

Sets the number of taps available for the selected antenna.

The antenna, for which the configuration is made, is distinguished with the numerical suffix at CSTD.

**Suffix:**

<ch0> 0|1

**Parameters:**

<Tapcount> float

Range: 0 to 4

\*RST: 0

**Example:**

BB:WIM:AOFD:ZONE0:CSTD1:TAPC 3

selects 3 taps for configuration

**[:SOURCE<hw>]:BB:WIMax:AOFDm:ZONE<st0>:FCH:MODE <Mode>**

The command selects the mode for generating the FCH.Channel Coding of the FCH is performed both in Auto and User mode.

**Parameters:**

&lt;Mode&gt;

AUTO | USER

**AUTO**

The DLFP fields, which form the FCH, are filled automatically with parameters specified at different locations. The following mapping applies in Auto mode:

Used subchannel bitmap:

Set to the bitmap specified in the "Configure active Subchannels" panel.

Repetition\_Coding\_Indication:

Specifies the DL-MAP repetition coding set in the "Configure DL-MAP" panel.

Coding\_Indication:

Specifies channel coding of the DL-MAP (CC or CTC).

DL-Map\_Length:

Set to the number of slots allocated for the DL-MAP.

**USER**

the FCH is filled with data specified under Data Source. This enables any arbitrary data to be sent with the FCH burst.

\*RST: AUTO

**Example:**

```
BB:WIM:AOFD:ZONE0:FCH:MODE AUTO
selects FCH mode AUTO.
```

```
[:SOURCE<hw>]:BB:WIMax:AOFDm:ZONE<st0>:NUMBER <Number>
```

The command selects the zone number.

**Parameters:**

&lt;Number&gt;

float

Range: 0 to 7

\*RST: 0

**Example:**

```
BB:WIM:AOFD:ZONE0:NUMB 4
assigns number 4 to zone 1.
```

```
[:SOURCE<hw>]:BB:WIMax:AOFDm:ZONE<st0>:PERMbase <Permbase>
```

The command selects the PermBase of the zone.

**Parameters:**

&lt;Permbase&gt;

float

Range: 0 to 69

\*RST: 0

**Example:**

```
BB:WIM:AOFD:ZONE0:PERM 5
selects PermBase 5.
```

---

**[[:SOURce<hw>]:BB:WIMax:AOFDm:ZONE<st0>:PILDedicated <Pildedicated>**

The command activates/deactivates dedicated pilots. If deactivated, the pilot symbol are broadcast.

**Note:** This feature is available only for zone type AMC and PUSC with link direction Downlink.

**Parameters:**

<Pildedicated>      0 | 1 | OFF | ON  
 \*RST:              OFF

**Example:**

BB:WIM:AOFD:ZONE0:PILD ON  
 activates dedicted pilot symbols for the specified zone.

---

**[[:SOURce<hw>]:BB:WIMax:AOFDm:ZONE<st0>:PRBSid <Prbsid>**

The command selects the PRBS\_ID of the zone.

**Parameters:**

<Prbsid>              float  
 Range:              0 to 3  
 \*RST:              0

**Example:**

BB:WIM:AOFD:ZONE0:PRBS 2  
 selects PRBS\_ID 5.

---

**[[:SOURce<hw>]:BB:WIMax:AOFDm:ZONE<st0>:SCARrier:RANDomizer <Randomizer>**

The command activates / deactivates the subcarrier redomization for OFDMA configurations.

**Parameters:**

<Randomizer>        0 | 1 | OFF | ON  
 \*RST:              ON

**Example:**

BB:WIM:AOFD:ZONE0:SCAR:RAND OFF  
 deactivates the subcarrier randomization.

---

**[[:SOURce<hw>]:BB:WIMax:AOFDm:ZONE<st0>:SEGment <Segment>**

The command selects the zone segment for OFDMA configurations.

**Parameters:**

<Segment>            float  
 Range:              0 to 2  
 \*RST:              0

**Example:**

BB:WIM:AOFD:ZONE:SEGM 1  
 selects one segment for zone 1.

---

```
[:SOURCE<hw>]:BB:WIMax:AOFDM:ZONE<st0>:SOUNDing:AMODE <Amode>
```

"(only for Sounding Type A)"

Selects the frequency allocation mode for sounding CIDs.

**Parameters:**

<Amode>

NORMAL | AMC

**NORMAL**

The used sounding allocations are specified with the commands `SOUR:BB:WIM:AOFDM:ZONE:SOUND:CID:FBAN:COUN` and `SOUR:BB:WIM:AOFDM:ZONE:SOUND:CID:FBAN:STAR`.

**AMC**

AMCA Band Bitmap pattern (set with the command `SOUR:BB:WIM:AOFDM:ZONE:SOUND:CID:BBIT`) determines the frequencies to be sent.

\*RST:        NORMAL

**Example:**

```
BB:WIM:AOFDM:ZONE:SOUND:AMOD AMC
sets AMC allocation mode
```

---

```
[:SOURCE<hw>]:BB:WIMax:AOFDM:ZONE<st0>:SOUNDing:CID:COUNT <Count>
```

The command sets the total number of CIDs.

**Parameters:**

<Count>

integer

Range:        1 to 16

\*RST:        1

**Example:**

```
BB:WIM:AOFDM:ZONE:SOUND:CID5:COUN 1
sets the number of total CIDs to 1.
```

---

```
[:SOURCE<hw>]:BB:WIMax:AOFDM:ZONE<st0>:SOUNDing:CID<ch0>:BBITmap <Bbitmap>
```

"(only for Sounding Type A and Band AMC Allocation Mode)"

Sets the logical band bitmap of the corresponding CID.

A "1" enables sounding transmission in the corresponding logical band, a "0" disables it. The right-most bit (LSB) corresponds to logical band 0 (the lowest frequency subcarriers).

**Parameters:**

<Bbitmap>

integer

\*RST:        0

**Example:**

```
BB:WIM:AOFDM:ZONE:SOUND:CID5:BBIT #HFFE,12
sets band bitmap for CID15.
```

---

**[:SOURce<hw>]:BB:WIMax:AOFDM:ZONE<st0>:SOUNDing:CID<ch0>:CID <Cid>**

The command sets the CID (connection control identifier).

**Parameters:**

<Cid> float  
 Range: 0 to FFFF  
 \*RST: 1

**Example:**

BB:WIM:AOFD:ZONE:SOUN:CID5:CID FFFF  
 sets the connection control identifier to #HFFFF.

---

**[:SOURce<hw>]:BB:WIMax:AOFDM:ZONE<st0>:SOUNDing:CID<ch0>:CINdex <Cindex>**

(only for Sounding Type A)

The command sets the value for the cyclic shift index. The maximum value depends on the setting for the maximum cyclic shift index (command:

SOUR:BB:WIM:AOFD:ZONE<0...7>:SOUN:CMAX).

**Parameters:**

<Cindex> float  
 Range: 0 to MAX  
 \*RST: 0

**Example:**

BB:WIM:AOFD:ZONE:SOUN:CID5:CIND 3  
 sets the value for the cyclic shift index to 3.

---

**[:SOURce<hw>]:BB:WIMax:AOFDM:ZONE<st0>:SOUNDing:CID<ch0>:DECoffset <Decoffset>**

"(only for Sounding Type A)"

The command sets the decimation offset. The maximum value depends on the setting for the decimation value (command:

SOUR:BB:WIM:AOFD:ZONE<0...7>:SOUN:DEC:VAL).

**Parameters:**

<Decoffset> float  
 Range: 0 to MAX  
 \*RST: 0

**Example:**

BB:WIM:AOFD:ZONE:SOUN:CID5:DEC 10  
 sets the decimation offset to 10..

---

**[:SOURce<hw>]:BB:WIMax:AOFDM:ZONE<st0>:SOUNDing:CID<ch0>:FBAND:START <Start>**

"(only for Sounding Type A)"

The command sets the start frequency band.

**Parameters:**

<Start> float  
 Range: 1 to MAX  
 \*RST: 0

**Example:**

BB:WIM:AOFD:ZONE:SOUN:CID5:FBAN:STAR 1  
 sets the value for the start frequency band to 1.

**[:SOURCE<hw>]:BB:WIMax:AOFDm:ZONE<st0>:SOUNDing:CID<ch0>:FBAND[:  
 COUNT] <Count>**

"(only for Sounding Type A)"

The command sets the number of frequency bands.

**Parameters:**

<Count> integer  
 Range: 1 to MAX  
 \*RST: MAX

**Example:**

BB:WIM:AOFD:ZONE:SOUN:CID5:FBAN:COUN 2  
 sets the number of frequency band to 2.

**[:SOURCE<hw>]:BB:WIMax:AOFDm:ZONE<st0>:SOUNDing:CID<ch0>:  
 PERiodicity <Periodicity>**

The command sets the value for the periodicity.

**Parameters:**

<Periodicity> PER0 | PER1 | PER2 | PER4 | PER8 | PER16 | PER32 | PER64  
 \*RST: PER0

**Example:**

BB:WIM:AOFD:ZONE:SOUN:CID5:PER2  
 sets the value for the periodicity to 2.

**[:SOURCE<hw>]:BB:WIMax:AOFDm:ZONE<st0>:SOUNDing:CID<ch0>:POWER[:  
 STATE] <State>**

The command activates/deactivates the power boost.

**Parameters:**

<State> 0 | 1 | OFF | ON  
 \*RST: OFF

**Example:**

BB:WIM:AOFD:ZONE:SOUN:CID5:POW:STAT ON  
 activates the power boost.

**[:SOURCE<hw>]:BB:WIMax:AOFDm:ZONE<st0>:SOUNDing:CID<ch0>:  
 RElevance[:STATE]?**

The command activates/deactivates the sounding relevance.



**Return values:**

<> 0 | 1 | OFF | ON  
 \*RST: ON

**Example:**

BB:WIM:AOFD:ZONE:SOUN:CID5:REL:STAT ON  
 activates the sounding relevance.

**Usage:**

Query only

**[:SOURce<hw>]:BB:WIMax:AOFDm:ZONE<st0>:SOUNding:CID<ch0>:  
 SUBChannel:OFFSet <Offset>**

(only for Sounding Type B)

The command sets the subchannel offset.

**Parameters:**

<Offset> float  
 Range: 1 to MAX  
 \*RST: 0

**Example:**

BB:WIM:AOFD:ZONE:SOUN:CID5:SUBC:OFFS 3  
 sets the subchannel offset to 3.

**[:SOURce<hw>]:BB:WIMax:AOFDm:ZONE<st0>:SOUNding:CID<ch0>:  
 SUBChannel[:COUNt] <Count>**

"(only for Sounding Type B)"

The command sets the number of subchannels.

**Parameters:**

<Count> integer  
 Range: 1 to MAX  
 \*RST: 1

**Example:**

BB:WIM:AOFD:ZONE:SOUN:CID5:SUBC:COUN 3  
 sets the number of subchannels to 3.

**[:SOURce<hw>]:BB:WIMax:AOFDm:ZONE<st0>:SOUNding:CID<ch0>:SYMBol  
 <Symbol>**

Sets the symbol used for this CID from the available symbols of the zone. Each sounding CID occupies one symbol only.

The maximum value depends on the setting for the number of symbols (command: SOUR:BB:WIM:AOFD:ZONE<0...7>:SYMB:COUN)

**Parameters:**

<Symbol> float  
 Range: 1 to MAX  
 \*RST: 1

**Example:** BB:WIM:AOFD:ZONE:SOUN:CID5:SYMB 5  
sets the number of sounding symbols to 5.

---

**[:SOURCE<hw>]:BB:WIMax:AOFDm:ZONE<st0>:SOUNDing:CMAXimum  
<Cmaximum>**

"(only for Sounding Type A and Separability Type Cyclic Shift)"

The command sets the value for the maximum cyclic shift index.

**Parameters:**

<Cmaximum> MC4 | MC8 | MC16 | MC32 | MC9 | MC18  
\*RST: MC4

**Example:** BB:WIM:AOFD:ZONE:SOUN:CMAX MC4  
sets the value for the maximum cyclic shift to 4.

---

**[:SOURCE<hw>]:BB:WIMax:AOFDm:ZONE<st0>:SOUNDing:DECimation:  
RANDomization[:STATe] <State>**

"(only for Sounding Type A and Separability Type Decimated Subcarriers)"

The command activates/deactivates the decimation offset randomization.

**Parameters:**

<State> 0 | 1 | OFF | ON  
\*RST: OFF

**Example:** BB:WIM:AOFD:ZONE:SOUN:DEC:RAND STAT ON  
activates decimation offset randomization.

---

**[:SOURCE<hw>]:BB:WIMax:AOFDm:ZONE<st0>:SOUNDing:DECimation:VALue  
<Value>**

"(only for Sounding Type A and Separability Type Decimated Subcarriers)"

The command sets the value for the decimation.

**Parameters:**

<Value> DEC2 | DEC4 | DEC5 | DEC8 | DEC16 | DEC32 | DEC64 |  
DEC128  
\*RST: DEC2

**Example:** BB:WIM:AOFD:ZONE:SOUN:DEC:VAL DEC16  
sets the value for the decimation to 16.

---

**[:SOURCE<hw>]:BB:WIMax:AOFDm:ZONE<st0>:SOUNDing:DLPermbase  
<Dlpermbase>**

"(only for Sounding Type B)"

The command sets the value for the DL PermBase.

**Parameters:**

<Dlpermbase> float  
 Range: 0 to 63  
 \*RST: 0

**Example:**

BB:WIM:AOFD:ZONE:SOUN:DLP 16  
 sets the value for the decimation to 16.

**[[:SOURce<hw>]:BB:WIMax:AOFDm:ZONE<st0>:SOUNDing:PERMutation?**

"(only for Sounding Type B)"

The command queries the permutation used for the selected sounding zone.

**Return values:**

<> PUSC

**Example:**

BB:WIM:AOFD:ZONE:SOUN:PERM?  
 queries the permutation

**Usage:**

Query only

**[[:SOURce<hw>]:BB:WIMax:AOFDm:ZONE<st0>:SOUNDing:RELevance:FLAG  
<Flag>**

The command selects whether sounding is relevant individually for each CID or for all CIDs.

**Parameters:**

<Flag> SAME | INDividual  
 \*RST: SAME

**Example:**

BB:WIM:AOFD:ZONE:SOUN:REL:FLAG SAME  
 sounding is relevant for all CIDs.

**[[:SOURce<hw>]:BB:WIMax:AOFDm:ZONE<st0>:SOUNDing:RELevance:MODE  
<Mode>**

"(only if Sounding Relevance Flag is set to Same For All CIDs)"

The command selects the sounding relevance mode.

**Parameters:**

<Mode> THIS | NEXT  
 \*RST: THIS

**Example:**

BB:WIM:AOFD:ZONE:SOUN:REL:MODE THIS  
 selects the sounding relevance mode THIS.

---

**[ :SOURce<hw>]:BB:WIMax:AOFDm:ZONE<st0>:SOUNding:SEParability**  
 <Separability>

"(only for Sounding Type A)"

The command selects the sounding separability type.

**Parameters:**

<Separability>      CYCLic | DECimated  
 \*RST:                CYCLic

**Example:**

BB:WIM:AOFD:ZONE:SOUN:SEP CYCL  
 selects the separability mode cyclic.

---

**[ :SOURce<hw>]:BB:WIMax:AOFDm:ZONE<st0>:SOUNding:TYPE** <Type>

The command selects either sounding type A or B.

**Parameters:**

<Type>                A | B  
 \*RST:                A

**Example:**

BB:WIM:AOFD:ZONE:SOUN:TYPE A  
 selects sounding type A.

---

**[ :SOURce<hw>]:BB:WIMax:AOFDm:ZONE<st0>:SOUNding:UVAL** <Uval>

"(only for Sounding Type A)"

Sets the shift value (u) used for decimation offset and cyclic shift index.

**Parameters:**

<Uval>                float  
 Range:                0 to 127  
 \*RST:                0

**Example:**

BB:WIM:AOFD:ZONE:SOUN:UVAL 3  
 sets the shift parameter U

---

**[ :SOURce<hw>]:BB:WIMax:AOFDm:ZONE<st0>:STC:ANTenna** <Antenna>

The command selects the the antenna for the space-time coding modes.

**Parameters:**

<Antenna>            ANT0 | ANT1 | ANT2 | ANT3  
 \*RST:                ANT0

**Example:**

BB:WIM:AOFD:ZONE:STC:ANT ANT4  
 selects antenna 4 for space time coding.

---

**[[:SOURce<hw>]:BB:WiMax:AOFDm:ZONE<st0>:STC:MODE <Mode>**

The command sets the space-timing coding mode (2 antennas, matrix A or B; 4 antennas, matrix A, B or C; Collaborative Multiplexing or CSTD) or switches diversity off.

**Parameters:**

<Mode>                   OFF | MA2antenna | MB2antenna | BURSt | COLLABorative |  
CSTD | MA4antenna | MB4antenna | MC4antenna  
\*RST:            OFF

**Example:**

BB:WIM:AOFD:ZONE:STC:MODE MA2  
selects space time coding mode with two antennas and matrix A  
in zone 1.

---

**[[:SOURce<hw>]:BB:WiMax:AOFDm:ZONE<st0>:STC:PILotpattern <Pilotpattern>**

"(only for Space-Time Coding Mode Collaborative Multiplexing)"

The command sets the pilot pattern in uplink Collaborative Multiplexing mode.

**Parameters:**

<Pilotpattern>           A | B  
\*RST:            A

**Example:**

BB:WIM:AOFD:ZONE:STC:PIL A  
sets the pilot pattern to A.

---

**[[:SOURce<hw>]:BB:WiMax:AOFDm:ZONE<st0>:SYMBol:COUNT <Count>**

The command selects the number of symbols in UL zone for OFDMA configurations. The duration of uplink bursts can not exceed the specified number of symbols.

**Parameters:**

<Count>                   integer  
Range:            0 to MAX  
\*RST:            0

**Example:**

BB:WIM:AOFD:ZONE:SYMB:COUN 3  
selects 3 symbols for zone 1.

---

**[[:SOURce<hw>]:BB:WiMax:AOFDm:ZONE<st0>:SYMBol:COUNT:AUTO <Auto>**

The command activates or deactivates automatic zone length. In auto mode, the number of symbols in the zone is derived from the configured bursts such that all bursts fit into the zone, except if the frame duration is exceeded.

This command is available in downlink only.

**Parameters:**

<Auto>                   0 | 1 | OFF | ON  
\*RST:            OFF

**Example:** `BB:WIM:AOFD:ZONE:SYMB:AUTO ON`  
activates automatic symbol count for zone 1.

---

**[:SOURCE<hw>]:BB:WIMax:AOFDm:ZONE<st0>:SYMBOL:OFFSet?**

The command queries the symbol offset of the zone.

**Return values:**

<> float

**Example:** `BB:WIM:AOFD:ZONE:SYMB:OFFS`  
queries the symbol count offset in zone 1.

**Usage:** Query only

---

**[:SOURCE<hw>]:BB:WIMax:AOFDm[:ZONE<st0>]:BURSt<ch0>:CCODing:FEC  
<Fec>**

The command switches channel coding FEC parameter on or off.

**Parameters:**

<Fec> 0 | 1 | OFF | ON  
\*RST: ON

**Example:** `BB:WIM:AOFD:ZONE0:BURS:CCOD:FEC ON`  
activates channel coding FEC parameter for burst 1.

---

**[:SOURCE<hw>]:BB:WIMax:AOFDm[:ZONE<st0>]:BURSt<ch0>:CCODing:  
INTerleaver <Interleaver>**

The command switches channel coding interleaver on or off.

**Parameters:**

<Interleaver> 0 | 1 | OFF | ON  
\*RST: ON

**Example:** `BB:WIM:AOFD:ZONE:BURS:CCOD:INT ON`  
activates channel coding interleaver for burst 1.

---

**[:SOURCE<hw>]:BB:WIMax:AOFDm[:ZONE<st0>]:BURSt<ch0>:CCODing:MODE  
<Mode>**

The command activates/deactivates channel coding and selects channel coding mode. If channel coding is switched off, the bits read from the data source are directly modulated onto the carriers. Due to randomization missing, this could result in very high crest factors of the signal.

**Parameters:**

<Mode> OFF | CC | CTC  
\*RST: ON

**Example:** BB:WIM:AOFD:ZONE0:BURS2:CCOD:MODE OFF  
deactivates channel coding for burst 1.

---

**[:SOURCE<hw>]:BB:WIMax:AOFDm[:ZONE<st0>]:BURSt<ch0>:CCODing:  
RANDomizer <Randomizer>**

The command switches channel coding randomizer on or off.

**Parameters:**

<Randomizer> 0 | 1 | OFF | ON  
\*RST: ON

**Example:** BB:WIM:AOFD:ZONE0:BURS2:CCOD:RAND ON  
activates channel coding randomizer for burst 1.

---

**[:SOURCE<hw>]:BB:WIMax:AOFDm[:ZONE<st0>]:BURSt<ch0>:CCODing:  
REPCoding <Repcoding>**

The command selects the channel coding repetition coding.

**Parameters:**

<Repcoding> REP0 | REP2 | REP4 | REP6  
\*RST: REP0

**Example:** BB:WIM:AOFD:ZONE0:BURS2:CCOD:REPC REP0  
deactivates repetition coding.

---

**[:SOURCE<hw>]:BB:WIMax:AOFDm[:ZONE<st0>]:BURSt<ch0>:CONFLICT[:  
STATE]?**

The command indicates a conflict between two bursts.

Conflicts can occur if subchannel and symbol offsets are set manually and two or more bursts overlap. Bursts can also overlap with the FCH or DL-MAP. The position of FCH and DL-MAP is fixed and cannot be changed.

**Return values:**

<> 0 | 1 | OFF | ON

**Example:** BB:WIM:AOFD:ZONE0:BURS2:CONF?  
queries if there exist a conflict between the activated OFDMA bursts.  
Response: 0  
there exists not conflict between the activated OFDMA bursts.

**Usage:** Query only

---

**[:SOURCE<hw>]:BB:WIMax:AOFDm[:ZONE<st0>]:BURSt<ch0>:DATA <Data>**

The command determines the data source for the specified bursts.

**Parameters:**

<Data> PN9 | PN11 | PN15 | PN16 | PN20 | PN21 | PN23 | DLIS | ZERO | ONE | PATtern

**PNxx**

The pseudo-random sequence generator is used as the data source. Different random sequence lengths can be selected.

**DLIS**

A data list is used. The data list is selected with the command `:BB:WIMax:AOFD:BURSt:DATA:DSElect`.

**ZERO|ONE**

Internal 0 and 1 data is used.

**PATtern**

Internal data is used. The bit pattern for the data is defined by the command `:BB:WIMax:AOFD:BURSt:DATA:PATtern`.

\*RST: PN9

**Example:**

`BB:WIM:AOFD:ZONE:BURSt:DATA PATT`

selects as the data source for the data fields of burst 1, the bit pattern defined with the following command.

`BB:WIM:AOFD:BURSt:DATA:PAT #H3F,8`

defines the bit pattern.

---

**[ :SOURce<hw> ] :BB:WIMax:AOFDm[ :ZONE<st0> ] :BURSt<ch0> :DATA:DSElect <Dselect>**

The command selects the data list for the DLIS data source selection.

The lists are stored as files with the fixed file extensions `*.dm_iqd` in a directory of the user's choice. The directory applicable to the following commands is defined with the command `MMEMoRY:CDIR`. To access the files in this directory, you only have to give the file name, without the path and the file extension.

**Parameters:**

<Dselect> string

**Example:**

`BB:WIM:AOFD:ZONE0:BURSt:DATA DLIS`

selects the Data Lists data source.

`MMEMoRY:CDIR '<root>\Lists\DM\IqData'`

selects the directory for the data lists.

`BB:WIM:AOFD:ZONE:BURSt:DATA:DLIS 'wimax_list1'`

selects file 'wimax\_list1' as the data source. This file must be in the directory `<root>\Lists\DM\IqData` and have the file extension `*.dm_iqd`.



---

**[:SOURce<hw>]:BB:WIMax:AOFDM[:ZONE<st0>]:BURSt<ch0>:DATA:LENGth**  
<Length>

The command sets the data length in bytes. The given number of bytes is read from the data source. The total number of data bytes in the burst (before channel coding) is determined as follows:

$$\text{TotalDataBytes} = \text{DataLength} + \text{MACHeaderBytes} + \text{CRCBytes} + \text{TailByte}$$

The tail byte is only added when channel coding is switched on. The same is the case for the MAC header and CRC, they are not added when switched off. Additionally padding with 0xFF bytes is applied at the end of the data sequence to reach an integer number of OFDM symbols.

The data length determines the number of symbols and vice versa. The maximum data length of 10000 bytes defines the maximum number of symbols for a given modulation type and channel coding rate.

**Parameters:**

<Length>                    integer  
                                  Range:        0 bytes to 10000 bytes  
                                  \*RST:        100 bytes

**Example:**                    BB:WIM:AOFD:ZONE0:BURS0:DATA:LENG 256  
                                  sets a data length of 256.

---

**[:SOURce<hw>]:BB:WIMax:AOFDM[:ZONE<st0>]:BURSt<ch0>:DATA:PATTern**  
<Pattern>

The command determines the bit pattern for the PATTern selection. The maximum length is 64 bits.

**Parameters:**

<Pattern>                    integer  
                                  Range:        #B0,1 to #B111..1,64  
                                  \*RST:        0

**Example:**                    BB:WIM:AOFD:ZONE0:BURS:DATA:PATT #H3F,8  
                                  defines the bit pattern.

---

**[:SOURce<hw>]:BB:WIMax:AOFDM[:ZONE<st0>]:BURSt<ch0>:DIUC <Diuc>**

The command sets the specific interval usage code. The code is used to initialize the randomizer and is transmitted in the FCH.

**Parameters:**

<Diuc>                        float  
                                  Range:        0.0 to 15.0  
                                  \*RST:        1.0

**Example:**                    BB:WIM:AOFD:ZONE:BURS2:DIUC 12  
                                  sets Interval Usage Code12 for burst 2.

---

```
[:SOURce<hw>]:BB:WIMax:AOFDM[:ZONE<st0>]:BURSt<ch0>:DLUL:ARIX <Arix>
```

Selects whether ACK region 0 or 1 will be used.

**Parameters:**

```
<Arix>          IX0 | IX1
                *RST:    IX0
```

**Example:**

```
BB:WIM:AOFD:ZONE1:BURS2:DLUL:ARIX IX1
sets ARQ Region Index 1.
```

---

```
[:SOURce<hw>]:BB:WIMax:AOFDM[:ZONE<st0>]:BURSt<ch0>:DLUL:HARQ:
  ACKoffset:DL <DI>
```

Sets the ACK channel that corresponds to the first HARQ-enabled DL burst specified in this map message.

**Parameters:**

```
<DI>           float
               Range:    0 to 255
               Increment: 1
               *RST:    0
```

**Example:**

```
BB:WIM:AOFD:ZONE1:BURS2:DLUL:HARQ:ACK:DL 10
sets the DL HARQ ACK offset.
```

---

```
[:SOURce<hw>]:BB:WIMax:AOFDM[:ZONE<st0>]:BURSt<ch0>:DLUL:HARQ:
  ACKoffset:INDicator <Indicator>
```

Enables/disables the inclusion of HARQ ACK offsets.

**Parameters:**

```
<Indicator>    0 | 1 | OFF | ON
                *RST:    ON
```

**Example:**

```
BB:WIM:AOFD:ZONE1:BURS2:DLUL:HARQ:ACK:IND ON
sets the HARQ ACK offset indicator.
```

---

```
[:SOURce<hw>]:BB:WIMax:AOFDM[:ZONE<st0>]:BURSt<ch0>:DLUL:HARQ:
  ACKoffset:UL <UI>
```

Sets the ACK bit index in the DL HARQ ACK that corresponds to the first HARQ-enabled UL burst specified in this map message.

**Parameters:**

```
<UI>           float
               Range:    0 to 255
               Increment: 1
               *RST:    0
```

**Example:** BB:WIM:AOFD:ZONE1:BURS2:DLUL:HARQ:ACK:UL 10  
sets the UL HARQ ACK offset.

---

**[:SOURce<hw>]:BB:WIMax:AOFDm[:ZONE<st0>]:BURSt<ch0>:DLUL:INCLude  
<Include>**

Selects whether a DL-MAP IE is included in the specified SUB-DL-UL-MAP message for this burst.

The default value of this parameter is off. One of the three available SUB-DL-UL-MAPs can be selected to carry the DL-MAP IE for this burst.

**Parameters:**

<Include> OFF | INC1 | INC2 | INC3  
\*RST: OFF

**Example:** BB:WIM:AOFD:ZONE1:BURS2:DLUL:INCL INC2  
the DL-MAP IE will be included in the second SUB-DL-UL-MAP message.

---

**[:SOURce<hw>]:BB:WIMax:AOFDm[:ZONE<st0>]:BURSt<ch0>:DLUL:MPIX?**

Queries the number of the SUB-DL-UL-MAP message.

Altogether up to three SUB-DL-UL-MAP messages can be enabled for all zones. The SUB-DL-UL-MAP Index is a consecutive number that is assigned for each configured SUB-DL-UL-MAP message.

**Return values:**

<> float

**Example:** BB:WIM:AOFD:ZONE1:BURS2:DLUL:MPIX?  
queries the consecutive number of the SUB-DL-UL-MAP message.  
Response: 2

**Usage:** Query only

---

**[:SOURce<hw>]:BB:WIMax:AOFDm[:ZONE<st0>]:BURSt<ch0>:FFB:CWSize?**

The command queries the codeword size.

**Return values:**

<> float

**Example:** BB:WIM:AOFD:ZONE0:BURS2:FFB:CWS  
queries the codeword size.

**Usage:** Query only

---

```
[:SOURce<hw>]:BB:WIMax:AOFDM[:ZONE<st0>]:BURSt<ch0>:FFB:MODE  
  <Mode>
```

The command selects the fast feedback mode.

**Parameters:**

```
<Mode>          NORMAl | ENHanced | ENHMimo | ACK  
*RST:          NORMAl
```

**Example:**           BB:WIM:AOFD:ZONE0:BURS2:FFB:MODE NORM  
selects the fast feedback mode "normal".

---

```
[:SOURce<hw>]:BB:WIMax:AOFDM[:ZONE<st0>]:BURSt<ch0>:FFB:SUBC  
  <Subc>
```

The command sets the number of subchannels.

**Parameters:**

```
<Subc>          float  
Range:          1 to MAX  
*RST:          1
```

**Example:**           BB:WIM:AOFD:ZONE0:BURS2:FFB:SUBC 25  
sets the number of subchannels to 25.

---

```
[:SOURce<hw>]:BB:WIMax:AOFDM[:ZONE<st0>]:BURSt<ch0>:FFB:SYMB  
  <Symb>
```

The command sets the number of symbols.

**Parameters:**

```
<Symb>          float  
Range:          3 to MAX  
Increment:      3  
*RST:          3
```

**Example:**           BB:WIM:AOFD:ZONE0:BURS2:FFB:SYMB 6  
sets the number of symbols to 6.

---

```
[:SOURce<hw>]:BB:WIMax:AOFDM[:ZONE<st0>]:BURSt<ch0>:FORMat <Format>
```

Selects the modulation and channel coding rate. Channel coding includes randomization, reed solomon coding, convoutional coding and interleaving.

For a given modulation type and channel coding rate, the data length determines the number of symbols and vice versa.

QAM5D6X64 is only available for Channel Coding CTC.

**Parameters:**

<Format> QPSK1D2 | QPSK3D4 | QAM1D2X16 | QAM3D4X16 |  
 QAM1D2X64 | QAM2D3X64 | QAM3D4X64 | QAM5D6X64  
 \*RST: AOFDM: QPSK1D2

**Example:**

BB:WIM:AOFD:ZONE0:BURS:FORM QAM3D4X64  
 selects modulation type 64QAM and a channel coding rate of 3.4  
 Msamples for burst 1.

**[:SOURCE<hw>]:BB:WIMax:AOFDM[:ZONE<st0>]:BURSt<ch0>:HARQ:COUNT**  
 <Count>

The command sets the number of sub-bursts in the 2D region.

**Parameters:**

<Count> integer  
 Range: 1 to 15  
 \*RST: 1

**Example:**

BB:WIM:AOFD:ZONE0:BURS2:HARQ:COUN 10  
 sets the number of sub-bursts to 10.

**[:SOURCE<hw>]:BB:WIMax:AOFDM[:ZONE<st0>]:BURSt<ch0>:HARQ:MODE**  
 <Mode>

The command selects the mode of the HARQ burst.

**Parameters:**

<Mode> CHASe | IR  
 \*RST: CHASe

**Example:**

BB:WIM:AOFD:ZONE0:BURS2:HARQ:MODE CHAS  
 sets the HARQ mode to chase.

**[:SOURCE<hw>]:BB:WIMax:AOFDM[:ZONE<st0>]:BURSt<ch0>:HARQ:MStart[:**  
**STATe] <State>**

Enables/disables Moving Start Offset Mode.

If enabled, the subburst structure resembles the specified structure required for RCT test  
 9.1.24.4.

**Parameters:**

<State> 0 | 1 | OFF | ON  
 \*RST: OFF

**Example:**

```

SOUR:BB:WIM:MODE:AOFD
SOUR:BB:WIM:AOFD:FBAN USER
SOUR:BB:WIM:AOFD:BW 10MHz
SOUR:BB:WIM:AOFD:FFT FFT1024
SOUR:BB:WIM:AOFD:ZONE:COUN 2
SOUR:BB:WIM:AOFD:ZONE1:NUMB 1
SOUR:BB:WIM:AOFD:ZONE1:STC:MODE MA2
SOUR:BB:WIM:AOFD:ZONE1:BURS0:TYPE HARQ
SOUR:BB:WIM:AOFD:ZONE1:BURS0:SUBC:COUN 30
SOUR:BB:WIM:AOFD:ZONE1:BURS0:SYMB:COUN 8
SOUR:BB:WIM:AOFD:TONE1:BURS0:HARQ:MODE CHAS
SOUR:BB:WIM:AOFD:ZONE1:BURS0:HARQ:COUN 3
SOUR:BB:WIM:AOFD:ZONE1:BURS0:HARQ0:SLOT 64
SOUR:BB:WIM:AOFD:ZONE1:BURS0:HARQ0:DLEN 382
SOUR:BB:WIM:AOFD:ZONE1:BURS0:HARQ1:SLOT 20
SOUR:BB:WIM:AOFD:ZONE1:BURS0:HARQ1:DLEN 118
SOUR:BB:WIM:AOFD:ZONE1:BURS0:HARQ2:SLOT 32
SOUR:BB:WIM:AOFD:ZONE1:BURS0:HARQ3:DLEN 166
SOUR:BB:WIM:AOFD:ZONE0:BURS0:HARQ:MST:STAT ON
SOUR:BB:WIM:SLLEN 10
SOUR:BB:WIM:STAT ON
enables moving of start offset mode.

```

---

**[:SOURce<hw>]:BB:WIMax:AOFDm[:ZONE<st0>]:BURSt<ch0>:HARQ:SLFRee?**

The command queries the remaining number of slots available for the burst.

**Return values:**

<Slfree> float

**Example:** BB:WIM:AOFD:ZONE0:BURS2:HARQ:SLFR?  
queries the remaining number of slots available for the burst.

**Usage:** Query only

---

**[:SOURce<hw>]:BB:WIMax:AOFDm[:ZONE<st0>]:BURSt<ch0>:HARQ<dir0>:  
ACID <Acid>**

The command sets the HARQ channel identifier for the specified sub-burst.

**Parameters:**

<Acid> float  
Range: 0 to 15  
\*RST: 0

**Example:** BB:WIM:AOFD:ZONE0:BURS2:HARQ5:ACID 12  
sets the sub-burst ACID to 12.

---

```
[:SOURce<hw>]:BB:WIMax:AOFDM[:ZONE<st0>]:BURSt<ch0>:HARQ<dir0>:
  ACKD <Ackd>
```

Disables ACK, i.e. the allocated subburst does not require an ACK to be transmitted .

**Parameters:**

<Ackd>                    0 | 1 | OFF | ON  
 \*RST:                    ON

**Example:**                BB:WIM:AOFD:ZONE0:BURS2:HARQ5:ACKD ON  
 disables ACK.

---

```
[:SOURce<hw>]:BB:WIMax:AOFDM[:ZONE<st0>]:BURSt<ch0>:HARQ<dir0>:
  DATA <Data>
```

The command sets the data source for the specified sub-burst.

**Parameters:**

<Data>                    PN9 | PN11 | PN15 | PN16 | PN20 | PN21 | PN23 | DLISt | ZERO |  
 ONE | PATTErn

**PNxx**

The pseudo-random sequence generator is used as the data source. Different random sequence lengths can be selected.

**DLISt**

A data list is used. The data list is selected with the command :BB:WIMax:AOFD:ZONE:BURS:HARQ:DATA:DSElect.

**ZERO|ONE**

Internal 0 and 1 data is used.

**PATTErn**

Internal data is used. The bit pattern for the data is defined by the command :BB:WIMax:AOFD:ZONE:BURS:DATA:PATTErn.

\*RST:                    PN9

**Example:**                BB:WIM:AOFD:ZONE0:BURS2:HARQ6:DATA PATT  
 selects as the data source the bit pattern defined with the following command.

BB:WIM:AOFD:ZONE0:BURS2:HARQ6:DATA:PATT #H3F,8  
 defines the bit pattern.

---

```
[:SOURce<hw>]:BB:WIMax:AOFDM[:ZONE<st0>]:BURSt<ch0>:HARQ<dir0>:
  DATA:DSElect <Dselect>
```

The command selects the data list for the DLISt data source selection.

The lists are stored as files with the fixed file extensions \*.dm\_iqd in a directory of the user's choice. The directory applicable to the following commands is defined with the command MMEMoRY:CDIR. To access the files in this directory, you only have to give the file name, without the path and the file extension.

**Parameters:****<Dselect>** string**Example:**

```
BB:WIM:AOFD:ZONE0:BURS2:HARQ6:DATA DLIS
selects the Data Lists data source.
```

```
MMEM:CDIR '<root>\Lists\DM\IqData'
selects the directory for the data lists.
```

```
BB:WIM:AOFD:ZONE0:BURS2:HARQ6:DATA:DSEL
'wimax_list1'
```

selects file `wimax_list1` as the data source. This file must be in the directory `<root>\Lists\DM\IqData` and have the file extension `*.dm_iqd`.

**[:SOURce<hw>]:BB:WIMax:AOFDm[:ZONE<st0>]:BURSt<ch0>:HARQ<dir0>:  
DATA:PATtern <Pattern>**

The command determines the bit pattern for the PATtern selection. The maximum length is 64 bits.

**Parameters:****<Pattern>** integer**\*RST:** 0**Example:**

```
BB:WIM:AOFD:ZONE0:BURS2:HARQ6:DATA:PATT #B0,1
defines the bit pattern.
```

**[:SOURce<hw>]:BB:WIMax:AOFDm[:ZONE<st0>]:BURSt<ch0>:HARQ<dir0>:  
DIUC <Diuc>**

(for HARQ Chase Mode only)

Sets the DIUC (Downlink Interval User Code) for the specified sub-burst. The code is used to initialize the randomizer and is transmitted in the FCH.

**Parameters:****<Diuc>** float**Range:** 0 to 15**\*RST:** 0**Example:**

```
BB:WIM:AOFD:ZONE0:BURS2:HARQ:MODE CHAS
sets the HARQ mode to chase.
```

```
BB:WIM:AOFD:ZONE0:BURS2:HARQ6:DIUC5
sets the Interval Usage Code 5 for sub-burst 6.
```

**[:SOURce<hw>]:BB:WIMax:AOFDm[:ZONE<st0>]:BURSt<ch0>:HARQ<dir0>:  
DLENgth <Dlength>**

Sets the data length of the sub-burst. The data length range is dynamic and depends on the packet size and the MAC header state.



**Parameters:**

<Dlength> float  
 Range: 1 to MAX  
 \*RST: MAX

**Example:**

BB:WIM:AOFD:ZONE0:BURS2:HARQ4:DLEN 10  
 sets the data length of the sub-burst to 10.

**[:SOURCE<hw>]:BB:WIMax:AOFDm[:ZONE<st0>]:BURSt<ch0>:HARQ<dir0>:  
 FORMat?**

(for HARQ IR Mode only)

Queries the sub-burst modulation.

**Return values:**

<> NONE | QPSK | QAM16 | QAM64

**Example:**

BB:WIM:AOFD:ZONE0:BURS2:HARQ:MODE IR  
 sets the HARQ mode to IR.  
 BB:WIM:AOFD:ZONE0:BURS2:HARQ5:FORM?  
 queries the sub-burst modulation.

**Usage:**

Query only

**[:SOURCE<hw>]:BB:WIMax:AOFDm[:ZONE<st0>]:BURSt<ch0>:HARQ<dir0>:  
 MAC:CID <Cid>**

The command sets the CID (Connection Control Identifier) of the medium access control layer (MAC). The CID identifies a connection to equivalent peers in the MAC of the base station and subscriber station.

**Parameters:**

<Cid> float  
 Range: 0 to FFFF  
 \*RST: 0

**Example:**

BB:WIM:AOFD:ZONE0:BURS2:HARQ5:MAC:CID #H33  
 sets the CID for sub-burst 5 to 33.

**[:SOURCE<hw>]:BB:WIMax:AOFDm[:ZONE<st0>]:BURSt<ch0>:HARQ<dir0>:  
 MAC:CRC:STATe <State>**

The command activates/deactivates the checksum determination. The state of the CRC can be set independently of the state of MAC header generation.

**Parameters:**

<State> 0 | 1 | OFF | ON  
 \*RST: 0

**Example:**

BB:WIM:AOFD:BURS2:HARQ5:MAC:CRC:STAT ON  
 activates the checksum determination for the specified sub-burst.

---

**[:SOURCE<hw>]:BB:WIMax:AOFDM[:ZONE<st0>]:BURSt<ch0>:HARQ<dir0>:  
MAC:EKS <Eks>**

The command sets the EKS (Encryption Key Sequence) value in the MAC header. The payload encryption itself is not performed by the signal generator.

**Parameters:**

<Eks> float  
Range: 0 to 3  
\*RST: 0

**Example:**

BB:WIM:AOFD:BURS2:HARQ5:MAC:ENCR:STAT ON  
enables payload encryption.  
BB:WIM:AOFD:BURS2:HARQ5:MAC:EKS 2  
sets the EKS for burst 2.

---

**[:SOURCE<hw>]:BB:WIMax:AOFDM[:ZONE<st0>]:BURSt<ch0>:HARQ<dir0>:  
MAC:ENCRypted:STATe <State>**

The command activates/deactivates payload encryption. If activated, the EC (encryption control) field is set to 1 and the EKS (encryption key sequence) field can be set.

**Parameters:**

<State> 0 | 1 | OFF | ON  
\*RST: 0

**Example:**

BB:WIM:AOFD:BURS2:HARQ5:MAC:ENCR:STAT ON  
enables payload encryption for sub-burst 5.  
BB:WIM:AOFD:BURS2:HARQ5:MAC:EKS 2  
sets the EKS.

---

**[:SOURCE<hw>]:BB:WIMax:AOFDM[:ZONE<st0>]:BURSt<ch0>:HARQ<dir0>:  
MAC:STATe <State>**

The command activates/deactivates the checksum determination. The state of the CRC can be set independently of the state of MAC header generation.

**Parameters:**

<State> 0 | 1 | OFF | ON  
\*RST: OFF

**Example:**

BB:WIM:AOFD:BURS2:HARQ5:MAC:STAT ON  
enables generation of the generic MAC header for sub-burst 5.

---

**[:SOURCE<hw>]:BB:WIMax:AOFDM[:ZONE<st0>]:BURSt<ch0>:HARQ<dir0>:  
MAC:TYPE <Type>**

The command specifies the MAC type. The value of the 6-bit type field is set which indicates the payload type, including the presence of subheaders.

**Parameters:**

<Type> float  
 Range: 0 to FFF  
 \*RST: OFF

**Example:**

BB:WIM:AOFD:BURS2:HARQ5:MAC:TYPE #H3F  
 sets the type field of the MAC header of sub-burst 5.

**[:SOURce<hw>]:BB:WIMax:AOFDm[:ZONE<st0>]:BURSt<ch0>:HARQ<dir0>:  
 MODRate <Modrate>**

(for HARQ Chase Mode only)

Sets the sub-burst modulation and coding rate.

**Parameters:**

<Modrate> QPSK\_12 | QPSK\_34 | QAM16\_12 | QAM16\_34 | QAM64\_12 |  
 QAM64\_23 | QAM64\_34 | QAM64\_56  
 \*RST: QPSK\_12

**Example:**

BB:WIM:AOFD:ZONE0:BURS2:HARQ:MODE CHAS  
 sets the HARQ mode to chase.  
 BB:WIM:AOFD:ZONE0:BURS2:HARQ:MODR QPSK\_34  
 sets the modulation and coding rate.

**[:SOURce<hw>]:BB:WIMax:AOFDm[:ZONE<st0>]:BURSt<ch0>:HARQ<dir0>:  
 PSIZe <Psize>**

(for HARQ IR Mode only)

The command sets the HARQ sub-burst packet size (in bits).

**Parameters:**

<Psize> PS48 | PS96 | PS144 | PS192 | PS288 | PS384 | PS480 | PS960 |  
 PS1K92 | PS2K88 | PS3K84 | PS4K8 | PS9K6 | PS14K4 |  
 PS19K2 | PS24K  
 \*RST: PS144

**Example:**

BB:WIM:AOFD:ZONE0:BURS2:HARQ:MODE IR  
 sets the HARQ mode to IR.  
 BB:WIM:AOFD:ZONE0:BURS2:HARQ5:PSIZ PS144  
 sets the packet size to 144 bit.

**[:SOURce<hw>]:BB:WIMax:AOFDm[:ZONE<st0>]:BURSt<ch0>:HARQ<dir0>:  
 RATE?**

(for HARQ IR Mode only)

Queries the sub-burst code rate.

**Return values:**

<> string

**Example:** `BB:WIM:AOFD:ZONE0:BURS2:HARQ:MODE IR`  
sets the HARQ mode to IR.  
`BB:WIM:AOFD:ZONE0:BURS2:HARQ5:RATE?`  
queries the sub-burst rate.

**Usage:** Query only

**[:SOURce<hw>]:BB:WIMax:AOFDm[:ZONE<st0>]:BURSt<ch0>:HARQ<dir0>:  
SLOTcount <Slotcount>**

The command sets the duration of the sub-bursts in slots. The duration range is dynamic and depends of the selected link direction and packet size.

**Parameters:**

<Slotcount> float  
Range: 1 to MAX  
\*RST: 1

**Example:** `BB:WIM:AOFD:ZONE0:BURS2:HARQ5:SLOT 1`  
sets the duration of sub-burst 5 to one slot.

**[:SOURce<hw>]:BB:WIMax:AOFDm[:ZONE<st0>]:BURSt<ch0>:HARQ<dir0>:  
SPID <Spid>**

(for HARQ IR Mode only)

The command sets the sub-packet ID, which is used to identify the four sub-packets generated from an encoder packet.

**Parameters:**

<Spid> string  
\*RST: 0

**Example:** `BB:WIM:AOFD:ZONE0:BURS2:HARQ:MODE IR`  
sets the HARQ mode to incremental redundancy.  
`BB:WIM:AOFD:ZONE0:BURS2:HARQ5:SPID 1, 2, 3`  
sets the SPID sequence.

**[:SOURce<hw>]:BB:WIMax:AOFDm[:ZONE<st0>]:BURSt<ch0>:MAC:CID <Cid>**

The command sets the CID (Connection Control Identifier) of the medium access control layer (MAC). The CID identifies a connection to equivalent peers in the MAC of the base station and subscriber station.

**Parameters:**

<Cid> float  
Range: #H0 to #HFFFF  
\*RST: 0

**Example:** `BB:WIM:AOFD:ZONE0:BURS2:MAC:CID #HE7`  
sets the CID for burst 2 to 231.

---

**[ :SOURce<hw>]:BB:WIMax:AOFDM[:ZONE<st0>]:BURSt<ch0>:MAC:CRC:STATe <State>**

The command activates/deactivates the checksum determination. The state of the CRC can be set independently of the state of MAC header generation.

**Parameters:**

<State>                    0 | 1 | OFF | ON  
 \*RST:                    OFF

**Example:**                BB:WIM:AOFD:BURS2:MAC:CRC:STAT ON  
 activates the checksum determination for burst 2.

---

**[ :SOURce<hw>]:BB:WIMax:AOFDM[:ZONE<st0>]:BURSt<ch0>:MAC:EKS <Eks>**

The command sets the EKS (Encryption Key Sequence) value in the MAC header. The payload encryption itself is not performed by the signal generator.

**Parameters:**

<Eks>                      float  
 Range:                    0 to 4  
 \*RST:                    0

**Example:**                BB:WIM:AOFD:BURS2:MAC:ENCR:STAT ON  
 enables payload encryption.  
 BB:WIM:AOFD:BURS2:MAC:EKS 2  
 sets the EKS for burst 2.

---

**[ :SOURce<hw>]:BB:WIMax:AOFDM[:ZONE<st0>]:BURSt<ch0>:MAC:ENCRypted:STATe <State>**

The command activates/disactivates payload encryption. If activated, the EC (Encryption Control) field is set to 1 and the EKS (Encryption Key Sequence) field can be set.

**Parameters:**

<State>                    0 | 1 | OFF | ON  
 \*RST:                    OFF

**Example:**                BB:WIM:AOFD:BURS2:MAC:ENCR:STAT ON  
 enables payload encryption for burst 2.  
 BB:WIM:AOFD:BURS2:MAC:EKS 2  
 sets the EKS.

---

**[ :SOURce<hw>]:BB:WIMax:AOFDM[:ZONE<st0>]:BURSt<ch0>:MAC:STATe <State>**

The command enables/disables generation of the generic MAC header for the selected burst.

**Parameters:**

<State> 0 | 1 | OFF | ON  
 \*RST: OFF

**Example:**

BB:WIM:AOFD:BURS2:MAC:STAT ON  
 enables generation of the generic MAC header for burst 2.

**[:SOURCE<hw>]:BB:WIMax:AOFDm[:ZONE<st0>]:BURSt<ch0>:MAC:TYPE**  
 <Type>

The command specifies the MAC type..The value of the 6-bit type field is set which indicates the payload type, including the presence of subheaders.

**Parameters:**

<Type> float  
 Range: #H0,0 to #H40,6  
 \*RST: #H0

**Example:**

BB:WIM:AOFD:BURS2:MAC:TYPE #H3F  
 sets the type field of the MAC header of burst 2.

**[:SOURCE<hw>]:BB:WIMax:AOFDm[:ZONE<st0>]:BURSt<ch0>:OFFSet:MODE**  
 <Mode>

The command selects the offset mode for the selected burst. The offset mode determines if the subchannel offset and the symbol offset of each burst are set automatically or manually.

**Parameters:**

<Mode> USER | AUTO  
 \*RST: AUTO

**Example:**

BB:WIM:AOFD:ZONE0:BURS2:OFFS:MODE USER  
 sets the manual offset mode. The start subchannel and symbol of the burst are set manually with commands  
 BB:WIM:ZONE0:AOFD:BURS2:OFFS:SUBChannel and  
 BB:WIM:AOFD:ZONE0:BURS2:OFFS:SYMBOL.

**[:SOURCE<hw>]:BB:WIMax:AOFDm[:ZONE<st0>]:BURSt<ch0>:OFFSet:**  
**SUBChannel <Subchannel>**

The command sets the subchannel offset for the selected burst. This command is only available for offset mode user (BB:WIM:AOFD:ZONE0:BURS2:OFFS:MODE USER).

**Parameters:**

<Subchannel> float  
 Range: 0 to  $2^{32}-1$  (4 294 967 295)  
 \*RST: Burst0: 7; All other bursts: 0

**Example:** `BB:WIM:AOFD:ZONE0:BURS2:OFFS:MODE USER`  
sets the manual offset mode.  
`BB:WIM:AOFD:ZONE0:BURS2:OFFS:SUBC 8`  
selects subchannel 8 as start subchannel for burst 2.

---

**[:SOURCE<hw>]:BB:WIMax:AOFDm[:ZONE<st0>]:BURSt<ch0>:OFFSet:SYMBOL**  
**<Symbol>**

The command sets the symbol offset for the selected burst. This command is only available for offset mode user (`BB:WIM:AOFD:ZONE0:BURS2:OFFS:MODE USER`).

**Parameters:**  
**<Symbol>** float  
Range: 3 to 1000  
\*RST: 0

**Example:** `BB:WIM:AOFD:ZONE0:BURS2:OFFS:MODE USER`  
sets the manual offset mode.  
`BB:WIM:AOFD:ZONE0:BURS2:OFFS:SYMB 2`  
selects symbol 2 as start symbol for burst 2.

---

**[:SOURCE<hw>]:BB:WIMax:AOFDm[:ZONE<st0>]:BURSt<ch0>:PDU:COUNT**  
**<Count>**

Sets the number of PDUs in the burst.

This command is only available for enabled multiple PDUS  
(`BB:WIM:AOFD:ZONE<0..7>;BURS<0..63>;PDU:STAT ON`).

**Parameters:**  
**<Count>** integer  
Range: 1 to 16  
\*RST: 0

**Example:** `BB:WIM:AOFD:ZONE0:BURS2:PDU:STAT ON`  
activates multiple PDUs.  
`BB:WIM:AOFD:ZONE0:BURS2:PDU:COUN 5`  
selects 5 PDUs to be configured.

---

**[:SOURCE<hw>]:BB:WIMax:AOFDm[:ZONE<st0>]:BURSt<ch0>:PDU:STATe**  
**<State>**

Enables/disables configuration of multiple PDUs. If this parameter is enabled, multiple PDUs each with own MAC header and CRC are available within one burst.

**Parameters:**  
**<State>** 0 | 1 | OFF | ON  
\*RST: OFF

**Example:** `BB:WIM:AOFD:ZONE0:BURS2:PDU:STAT ON`  
activates multiple PDUs.

---

```
[ :SOURce<hw>]:BB:WIMax:AOFDM[:ZONE<st0>]:BURSt<ch0>:PDU<dir0>:DATA
<Data>
```

The command sets the data source for the specified PDU.

**Parameters:**

<Data> PN9 | PN11 | PN15 | PN16 | PN20 | PN21 | PN23 | DLISt | ZERO | ONE | PATTErn

**PNxx**

The pseudo-random sequence generator is used as the data source. Different random sequence lengths can be selected.

**DLISt**

A data list is used. The data list is selected with the command :BB:WIMax:AOFDM:ZONE:BURSt:PDU:DATA:DSElect.

**ZERO|ONE**

Internal 0 and 1 data is used.

**PATTErn**

Internal data is used. The bit pattern for the data is defined by the command :BB:WIMax:AOFDM:ZONE:BURSt:PDU:DATA:PATTErn.

\*RST: PN9

**Example:**

```
BB:WIM:AOFDM:ZONE0:BURSt:PDU6:DATA PATT
selects as the data source the bit pattern defined with the following
command.
BB:WIM:AOFDM:ZONE0:BURSt:PDU6:DATA:PATTErn #H3F,8
defines the bit pattern.
```

---

```
[ :SOURce<hw>]:BB:WIMax:AOFDM[:ZONE<st0>]:BURSt<ch0>:PDU<dir0>:
DATA:DSElect <Dselect>
```

The command selects the data list for the DLISt data source selection.

The lists are stored as files with the fixed file extensions \*.dm\_iqd in a directory of the user's choice. The directory applicable to the following commands is defined with the command MMEMoRY:CDIR. To access the files in this directory, you only have to give the file name, without the path and the file extension.

**Parameters:**

<Dselect> string

**Example:**

```
BB:WIM:AOFDM:ZONE0:BURSt:PDU6:DATA DLIS
selects the Data Lists data source.
MMEMoRY:CDIR '<root>\Lists\WiMAX\PDU'
selects the directory for the data lists.
BB:WIM:AOFDM:ZONE0:BURSt:PDU6:DATA:DSElect
'pdu6_wimax'
selects file pdu6_wimax as the data source. This file must be in
the directory <root>\Lists\WiMAX\PDU and have the file
extension *.dm_iqd.
```



---

**[:SOURCE<hw>]:BB:WIMax:AOFDM[:ZONE<st0>]:BURSt<ch0>:PDU<dir0>:  
DATA:PATtern <Pattern>**

The command determines the bit pattern for the PATtern selection. The maximum length is 64 bits.

**Parameters:**

<Pattern> integer  
\*RST: 0

**Example:** BB:WIM:AOFD:ZONE0:BURS2:PDUQ6:DATA:PATT #B0,1  
defines the bit pattern.

---

**[:SOURCE<hw>]:BB:WIMax:AOFDM[:ZONE<st0>]:BURSt<ch0>:PDU<dir0>:  
DLENgth <Dlength>**

Sets the data length of the PDU. The data length range is dynamic and depends on the packet size and the MAC header state.

**Parameters:**

<Dlength> float  
Range: 1 to MAX  
\*RST: MAX

**Example:** BB:WIM:AOFD:ZONE0:BURS2:HARQ4:DLEN 10  
sets the data length of the sub-burst to 10.

---

**[:SOURCE<hw>]:BB:WIMax:AOFDM[:ZONE<st0>]:BURSt<ch0>:PDU<dir0>:MAC:  
CRC:STATe <State>**

The command activates/deactivates the checksum determination. The state of the CRC can be set independently of the state of MAC header generation.

**Parameters:**

<State> 0 | 1 | OFF | ON  
\*RST: 0

**Example:** BB:WIM:AOFD:BURS2:PDU5:MAC:CRC:STAT ON  
activates the checksum determination for the specified PDU.

---

**[:SOURCE<hw>]:BB:WIMax:AOFDM[:ZONE<st0>]:BURSt<ch0>:PDU<dir0>:MAC:  
EKS <Eks>**

The command sets the EKS (Encryption Key Sequence) value in the MAC header. The payload encryption itself is not performed by the signal generator.

**Parameters:**

<Eks> float  
Range: 0 to 3  
\*RST: 0

**Example:** BB:WIM:AOFD:BURS2:PDU5:MAC:ENCR:STAT ON  
enables payload encryption.  
BB:WIM:AOFD:BURS2:PDU5:MAC:EKS 2  
sets the EKS for burst 2.

---

**[:SOURCE<hw>]:BB:WIMax:AOFDm[:ZONE<st0>]:BURSt<ch0>:PDU<dir0>:MAC:ENCRypted:STATe <State>**

The command activates/deactivates payload encryption. If activated, the EC (encryption control) field is set to 1 and the EKS (encryption key sequence) field can be set.

**Parameters:**  
<State> 0 | 1 | OFF | ON  
\*RST: 0

**Example:** BB:WIM:AOFD:BURS2:PDU5:MAC:ENCR:STAT ON  
enables payload encryption for PDU5.  
BB:WIM:AOFD:BURS2:PDU5:MAC:EKS 2  
sets the EKS.

---

**[:SOURCE<hw>]:BB:WIMax:AOFDm[:ZONE<st0>]:BURSt<ch0>:PDU<dir0>:MAC:STATe <State>**

The command activates/deactivates the checksum determination. The state of the CRC can be set independently of the state of MAC header generation.

**Parameters:**  
<State> 0 | 1 | OFF | ON  
\*RST: OFF

**Example:** BB:WIM:AOFD:BURS2:PDU5:MAC:STAT ON  
enables generation of the generic MAC header for PDU5.

---

**[:SOURCE<hw>]:BB:WIMax:AOFDm[:ZONE<st0>]:BURSt<ch0>:PDU<dir0>:MAC:TYPE <Type>**

The command specifies the MAC type. The value of the 6-bit type field is set which indicates the payload type, including the presence of subheaders.

**Parameters:**  
<Type> float  
Range: 0 to FFF  
\*RST: OFF

**Example:** BB:WIM:AOFD:BURS2:PDU5:MAC:TYPE #H3F  
sets the type field of the MAC header of PDU5.

---

```
[:SOURce<hw>]:BB:WIMax:AOFDm[:ZONE<st0>]:BURSt<ch0>:PDU<dir0>[:  
MAC]:CID <Cid>
```

The command sets the CID (Connection Control Identifier) of the medium access control layer (MAC). The CID identifies a connection to equivalent peers in the MAC of the base station and subscriber station.

**Parameters:**

```
<Cid> float  
Range: 0 to FFFF  
*RST: 0
```

**Example:** BB:WIM:AOFD:ZONE0:BURS2:PDU5:MAC:CID #H33  
sets the CID for PDU5 to 33.

---

```
[:SOURce<hw>]:BB:WIMax:AOFDm[:ZONE<st0>]:BURSt<ch0>:PMAP <Pmap>
```

(only for burst type UCD and DCD)

Determines whether the burst profile mapping is performed automatically or manually. In manual configuration, the mapping of the FEC & Modulation Type to the UIUCs/DUICs is defined by the user.

**Parameters:**

```
<Pmap> AUTO | MANual  
*RST: AUTO
```

**Example:** BB:WIM:AOFD:ZONE0:BURS2:PMAP MAN  
enables manual mapping

---

```
[:SOURce<hw>]:BB:WIMax:AOFDm[:ZONE<st0>]:BURSt<ch0>:PMAP:  
DMODulation<dir0> <Dmodulation>
```

(only for burst type DCD and manual Burst Profile Mapping)

Sets the FEC and the modulation for the selected DUIC.

**Suffix:**

```
<dir0> 0..12
```

**Parameters:**

```
<Dmodulation> MQPSKCC12 | MQPSKCC34 | M16QAMCC12 | M16QAMCC34 |  
M64QAMCC12 | M64QAMCC23 | M64QAMCC34 |  
MQPSKCTC12 | MQPSKCTC34 | M16QAMCTC12 |  
M16QAMCTC34 | M64QAMCTC12 | M64QAMCTC23 |  
M64QAMCTC34 | M64QAMCTC56  
*RST: MQPSKCC12
```

**Example:** BB:WIM:AOFD:ZONE0:BURS2:PMAP MAN  
enables manual mapping  
BB:WIM:AOFD:ZONE0:BURS2:PMAP:DMOD0 MQPSKCC12  
selects QPSK (CC) 1/2 modulation and coding scheme for  
DUIC#0

---

**[:SOURce<hw>]:BB:WIMax:AOFDm[:ZONE<st0>]:BURSt<ch0>:PMAP:  
UMODulation<dir0> <Umodulation>**

(only for burst type UCD and manual Burst Profile Mapping)

Sets the FEC and the modulation for the selected UUIC.

**Suffix:**

<dir0> 0..10

**Parameters:**

<Umodulation> MQPSKCC12 | MQPSKCC34 | M16QAMCC12 | M16QAMCC34 |  
M64QAMCC12 | M64QAMCC23 | M64QAMCC34 |  
MQPSKCTC12 | MQPSKCTC34 | M16QAMCTC12 |  
M16QAMCTC34 | M64QAMCTC12 | M64QAMCTC23 |  
M64QAMCTC34 | M64QAMCTC56  
\*RST: MQPSKCC12

**Example:**

```
BB:WIM:AOFD:ZONE0:BURS2:PMAP MAN
enables manual mapping
BB:WIM:AOFD:ZONE0:BURS2:PMAP:UMOD1 MQPSKCC12
selects QPSK (CC) 1/2 modulation and coding scheme for
UUIC#1
```

---

**[:SOURce<hw>]:BB:WIMax:AOFDm[:ZONE<st0>]:BURSt<ch0>:POWER <Power>**

The command sets the power for the selected burst in dB. To set the absolute power of a burst correctly, level reference "FCH"/"Burst" must be selected. In this mode, the output power of a burst equals Level + BurstPower.

In downlink, the preamble is transmitted with +3 dB and the FCH is transmitted with 0 dB.

In uplink, the power of the first burst is fixed to 0 dB.

**Parameters:**

<Power> float  
Range: -80.0 dB to 10.0 dB  
Increment: 0.01 dB  
\*RST: 0.0 dB

**Example:**

```
BB:WIM:AOFD:ZONE0:BURS2:POW -2dB
sets the burst power to -2 dB.
```

---

**[:SOURce<hw>]:BB:WIMax:AOFDm[:ZONE<st0>]:BURSt<ch0>:RANGing:  
ACODE?**

The command queries the number of allocated codes for OFDMA ranging.

Burst Type Ranging is available in uplink only.

**Return values:**

<> float

**Example:** `BB:WIM:AOFD:ZONE0:BURS2:RANG:ACOD`  
queries the number of allocated code.

**Usage:** Query only

**[:SOURCE<hw>]:BB:WIMax:AOFDm[:ZONE<st0>]:BURSt<ch0>:RANGing:  
OPPportunity:SIZE <Size>**

The command sets the ranging opportunity size. The opportunity size specifies the number of symbols required to transmit one CDMA ranging code.

Burst Type Ranging is available in uplink only.

**Parameters:**

<Size> float  
Range: 1 to 4  
\*RST: 1

**Example:** `BB:WIM:AOFD:ZONE0:BURS2:RANG:OPP:SIZE 2`  
sets a opportunity size of 2.

**[:SOURCE<hw>]:BB:WIMax:AOFDm[:ZONE<st0>]:BURSt<ch0>:RANGing:  
OPPportunity:SLOTcount <Slotcount>**

The command sets the number of ranging opportunity slots. The number of opportunity slots defines the length of the ranging allocation, which is OpportunitySize \* NoOfOpportunitySlots OFDMA symbols.

Burst Type Ranging is available in uplink only.

**Parameters:**

<Slotcount> float  
Range: 1 to MAX  
\*RST: 1

**Example:** `BB:WIM:AOFD:ZONE0:BURS2:RANG:OPP:SLOT 2`  
sets a number of 2 opportunity slots.

**[:SOURCE<hw>]:BB:WIMax:AOFDm[:ZONE<st0>]:BURSt<ch0>:RANGing:  
SCGCount <Scgcount>**

The command sets the number of ranging sub channel groups.

Burst Type Ranging is available in uplink only.

**Parameters:**

<Scgcount> float  
Range: 1 to 10  
\*RST: 1

**Example:** `BB:WIM:AOFD:ZONE0:BURS2:RANG:SCGC 2`  
sets a number of 2 opportunity subchannel groups.

---

**[ :SOURce<hw>]:BB:WIMax:AOFDM[:ZONE<st0>]:BURSt<ch0>:SLOT:COUNT**  
 <Count>

The command sets the number of slots for the selected burst. If the number of slots is changed, the data length is adjusted to fill the specified number of slots with data so that no padding has to be applied.

The maximum data length of 10 000 bytes defines the maximum number of symbols for a given modulation type and channel coding rate.

This command is available in uplink only.

**Parameters:**

<Count>                    integer  
                               Range:     1 to 10000  
                               \*RST:     1

**Example:**                BB:WIM:AOFD:ZONE0:BURS2:SLOT:COUN 12  
                               sets 2 slots for burst 2.

---

**[ :SOURce<hw>]:BB:WIMax:AOFDM[:ZONE<st0>]:BURSt<ch0>:STC:MODE**  
 <Mode>

The command sets the space-timing coding mode.

**Parameters:**

<Mode>                    MA2antenna | MB2antenna  
                               \*RST:     MA2antenna

**Example:**                BB:WIM:AOFD:ZONE1:BURS3:STC:MODE MA2  
                               selects space time coding mode with two antennas and matrix A  
                               in zone 1.

---

**[ :SOURce<hw>]:BB:WIMax:AOFDM[:ZONE<st0>]:BURSt<ch0>:SUBChannel[:**  
**COUNT] <Count>**

The command sets the number of subchannels for the selected burst. If the number of subchannels is changed, the data length is adjusted to fill the specified number of symbols with data so that no padding has to be applied.

The maximum data length of 10 000 bytes defines the maximum number of symbols for a given modulation type and channel coding rate.

For physical layer mode OFDMA, this command is available in downlink only.

**Parameters:**

<Count>                    integer  
                               Range:     1 to 1000  
                               \*RST:     1

**Example:**                BB:WIM:AOFD:ZONE0:BURS2:SUBC:COUN 16  
                               sets 16 subchannels for burst 2.

---

```
[ :SOURce<hw>]:BB:WIMax:AOFDM[:ZONE<st0>]:BURSt<ch0>:SYMBol[:COUNt]
<Count>
```

The command sets the number of symbols for the selected burst. If the number of symbols is changed, the data length is adjusted to fill the specified number of symbols with data so that no padding has to be applied.

The maximum data length of 10 000 bytes defines the maximum number of symbols for a given modulation type and channel coding rate.

**Parameters:**

```
<Count>          integer
                  Range:    1 to 1000
                  *RST:     9
```

**Example:**           BB:WIM:AOFD:ZONE0:BURS2:SYMB:COUN 12  
sets 12 symbols for burst 2.

---

```
[ :SOURce<hw>]:BB:WIMax:AOFDM[:ZONE<st0>]:BURSt<ch0>:TYPE <Type>
```

The command selects the burst type.

Available burst types for **downlink**: DATA | FCH | DLMap | ULMap | HARQ | DCD | UCD | SUBMap

Available burst types for **uplink**: DATA | RANGing | HARQ | FASTfeedback

**Parameters:**

```
<Type>           DATA | FCH | DLMap | RANGing | ULMap | HARQ |
                  FASTfeedback | DCD | UCD | SUBMap
                  *RST:    DATA
```

**Example:**           BB:WIM:AOFD:ZONE0:BURS2:TYPE DATA  
selects burst type DATA.

---

```
[ :SOURce<hw>]:BB:WIMax:AOFDM[:ZONE<st0>]:BURSt<ch0>:UCD:RANGing:
BOENd <Boend>
```

("only for burst type UCD")

The command sets the end value for the ranging backoff.

**Parameters:**

```
<Boend>         float
                  Range:    1 to 15
                  *RST:     5
```

**Example:**           BB:WIM:AOFD:ZONE0:BURS2:UCD:RANG:BOEN 10  
sets the end value for the ranging backoff to 10.

---

**[:SOURce<hw>]:BB:WIMax:AOFDM[:ZONE<st0>]:BURSt<ch0>:UCD:RANGing:  
BOSTart <Bostart>**

"(only for burst type UCD)"

The command sets the start value for the ranging backoff.

**Parameters:**

<Bostart>            float  
                       Range:     1 to 15  
                       \*RST:     0

**Example:**

BB:WIM:AOFD:ZONE0:BURS2:UCD:RANG:BOST 10  
 sets the start value for the ranging backoff to 10.

---

**[:SOURce<hw>]:BB:WIMax:AOFDM[:ZONE<st0>]:BURSt<ch0>:UCD:REQuest:  
BOENd <Boend>**

(only for burst type UCD)

The command sets the end value for the request backoff.

**Parameters:**

<Boend>             float  
                       Range:     1 to 15  
                       \*RST:     15

**Example:**

BB:WIM:AOFD:ZONE0:BURS2:UCD:REQ:BOEN 10  
 sets the end value for the request backoff to 10.

---

**[:SOURce<hw>]:BB:WIMax:AOFDM[:ZONE<st0>]:BURSt<ch0>:UCD:REQuest:  
BOSTart <Bostart>**

"(only for burst type UCD)"

The command sets the start value for the request backoff.

**Parameters:**

<Bostart>            float  
                       Range:     1 to 15  
                       \*RST:     0

**Example:**

BB:WIM:AOFD:ZONE0:BURS2:UCD:REQ:BOST 10  
 sets the start value for the request backoff to 10.

---

**[:SOURce<hw>]:BB:WIMax:AOFDM[:ZONE<st0>]:BURSt<ch0>:UIUC <Uiuc>**

The command sets uplink interval usage code. The UIUC is used for the UL-MAP, if generated.

This command is only available for link direction uplink.



**Parameters:**

<Uiuc> float  
 Range: 0.0 to 15.0  
 \*RST: 0.0

**Example:**

BB:WIM:AOFD:ZONE0:BURS2:UIUC 2  
 sets uplink interval usage code 2.

**[:SOURCE<hw>]:BB:WIMax:AOFDm[:ZONE<st0>]:BURSt<ch0>:ULMap:AMODE  
 <Amode>**

The command sets the UL-MAP Allocation Start Time Base. Allocation Start Time field of the UL-MAP specifies the start of the uplink subframe.

This command is available for link direction downlink only.

**Parameters:**

<Amode> DLSFend | FRAMestart  
 \*RST: DLSFend

**Example:**

BB:WIM:AOFD:ZONE0:BURS2:ULM:AMOD DLSF  
 sets the allocation start time base to DL subframe end.

**[:SOURCE<hw>]:BB:WIMax:AOFDm[:ZONE<st0>]:BURSt<ch0>:ULMap:ATIME  
 <Atime>**

The command sets the UL-MAP Allocation Start Time.

This command is available for link direction downlink only.

**Parameters:**

<Atime> float  
 Range: 0 to frame duration  
 \*RST: 0

**Example:**

BB:WIM:AOFD:ZONE0:BURS2:ULM:ATIM 4  
 sets the allocation start time to 2.

**[:SOURCE<hw>]:BB:WIMax:AOFDm[:ZONE<st0>]:BURSt<ch0>:ULMap:DCD:CID  
 <Cid>**

The command enters the value for the DCD CID. This CID (connection control identifier) is independent from the UL-Map CID and only used for the DCD.

**Parameters:**

<Cid> float  
 Range: 0 to FFFF  
 \*RST: 0xFFFF

**Example:**

BB:WIM:AOFD:ZONE0:BURS2:ULM:DCD:CID #H456  
 enters the value for the DCD CID.

---

**[ :SOURce<hw>]:BB:WIMax:AOFDM[:ZONE<st0>]:BURSt<ch0>:ULMap:DCD:STATe <State>**

The command activates/deactivates that the DCD is appended to the UL-MAP. The DCD message is transmitted with its own MAC header and CRC, included in the same burst allocation used by the UL-MAP.

**Parameters:**

<State>                    0 | 1 | OFF | ON  
 \*RST:                    OFF

**Example:**                    BB:WIM:AOFD:ZONE0:BURS2:ULM:DCD:STAT ON  
 appends the DCD to the UL-Map.

---

**[ :SOURce<hw>]:BB:WIMax:AOFDM[:ZONE<st0>]:BURSt<ch0>:ULMap:RANGing:BOENd <Boend>**

The command sets the end value for the ranging backoff.

**Parameters:**

<Boend>                    float  
 Range:                    0 to 15  
 \*RST:                    5

**Example:**                    BB:WIM:AOFD:ZONE0:BURS2:ULM:RANG:BOEN 10  
 sets the end value for the ranging backoff to 10.

---

**[ :SOURce<hw>]:BB:WIMax:AOFDM[:ZONE<st0>]:BURSt<ch0>:ULMap:RANGing:BOStArt <Bostart>**

The command sets the start value for the ranging backoff.

**Parameters:**

<Bostart>                    float  
 Range:                    0 to 15  
 \*RST:                    0

**Example:**                    BB:WIM:AOFD:ZONE0:BURS2:ULM:RANG:BOST 10  
 sets the start value for the ranging backoff to 10.

---

**[ :SOURce<hw>]:BB:WIMax:AOFDM[:ZONE<st0>]:BURSt<ch0>:ULMap:REQuest:BOENd <Boend>**

The command sets the end value for the request backoff.

**Parameters:**

<Boend>                    float  
 Range:                    0 to 15  
 \*RST:                    15

**Example:** `BB:WIM:AOFD:ZONE0:BURS2:ULM:REQ:BOEN 10`  
sets the end value for the request backoff to 10.

---

**[:SOURCE<hw>]:BB:WIMax:AOFDm[:ZONE<st0>]:BURSt<ch0>:ULMap:REQuest:  
BOSart <Bostart>**

The command sets the start value for the request backoff.

**Parameters:**

<Bostart> float  
Range: 0 to 15  
\*RST: 0

**Example:** `BB:WIM:AOFD:ZONE0:BURS2:ULM:REQ:BOST 10`  
sets the start value for the request backoff to 10.

---

**[:SOURCE<hw>]:BB:WIMax:AOFDm[:ZONE<st0>]:BURSt<ch0>:ULMap:UCD:CID  
<Cid>**

The command enters the value for the UCD CID. This CID (connection control identifier) is independent from the UL-Map CID and only used for the UCD.

**Parameters:**

<Cid> float  
Range: 0 to FFFF  
\*RST: FFFF

**Example:** `BB:WIM:AOFD:ZONE0:BURS2:ULM:UCD:CID #H456`  
enters the value for the UCD CID.

---

**[:SOURCE<hw>]:BB:WIMax:AOFDm[:ZONE<st0>]:BURSt<ch0>:ULMap:UCD:  
STATe <State>**

The command activates/deactivates that the UCD is appended to the UL-MAP. The UCD message is transmitted with its own MAC header and CRC, included in the same burst allocation used by the UL-MAP.

**Parameters:**

<State> 0 | 1 | OFF | ON  
\*RST: OFF

**Example:** `BB:WIM:AOFD:ZONE0:BURS2:ULM:UCD:STAT ON`  
appends the DCD to the UL-Map.

---

**[:SOURCE<hw>]:BB:WIMax:AOFDm[:ZONE<st0>]:BURSt[:COUNT] <Count>**

The command sets the number of active bursts in the zone/segment).

**Parameters:**

<Count> integer  
 Range: 1 to 64  
 \*RST: 1

**Example:**

BB:WIM:AOFD:ZONE0:BURS2:COUN 2  
 two bursts are sent in one frame.

**[:SOURCE<hw>]:BB:WIMax:AOFDm[:ZONE<st0>]:DLMap:BSID <Bsid>**

The command sets the 4 LSBs of the Base Station ID. Only the four least significant bits are given. The BSID is transmitted in the FCH (when set to "Auto" mode), and it is used to initialize the randomizer.

This command is available in downlink only and for DL-MAP Mode Auto (BB:WIM:AOFD:ZONE0:DLM:MODE AUTO).

**Parameters:**

<Bsid> integer  
 Range: #H0,0 to #FFFFFFFFFFFFFF,48  
 \*RST: #H0,0

**Example:**

BB:WIM:AOFD:ZONE0:DLM:BSID 2  
 the base station id is 2.

**[:SOURCE<hw>]:BB:WIMax:AOFDm[:ZONE<st0>]:DLMap:COMPRESSED:AMODE <Amode>**

The command selects the Allocation Start Time base. The Allocation Start Time field of the DL-MAP specifies the start of the downlink subframe.

If Start Time Base is set to DL Subframe End, the Allocation Start Time of the DL-MAP is set to the end of the downlink subframe + Allocation Start Time parameter set below.

When Start Time Base is set to Frame Start, the Allocation Start Time of the DL-MAP is set to the beginning of the frame + Allocation Start Time parameter set below.

**Parameters:**

<Amode> DLSFend | FRAMestart  
 \*RST: DLSFend

**Example:**

BB:WIM:AOFD:ZONE0:DLM:COMP:AMOD DLSF  
 sets the start time base to DL Subframe End.

**[:SOURCE<hw>]:BB:WIMax:AOFDm[:ZONE<st0>]:DLMap:COMPRESSED:ATIME <Atime>**

The command sets the Allocation Start Time in the DL-Map.

**Parameters:**

<Atime> float  
 Range: 0 to frame duration  
 \*RST: 0  
 Default unit: s

**Example:**

BB:WIM:AOFD:ZONE0:DLM:COMP:ATIM 2  
 sets the Allocation Start Time to 2 s.

**[[:SOURce<hw>]:BB:WIMax:AOFDm[:ZONE<st0>]:DLMap:COMPressed:STATe  
 <State>**

The command activates/deactivates that a compressed map is generated instead of a normal map.

**Parameters:**

<State> 0 | 1 | OFF | ON  
 \*RST: OFF  
 Default unit: s

**Example:**

BB:WIM:AOFD:ZONE0:DLM:COMP:STAT ON  
 generates a compressed map.

**[[:SOURce<hw>]:BB:WIMax:AOFDm[:ZONE<st0>]:DLMap:COMPressed:ULMap:  
 DSElect <Dselect>**

The command selects the UL-Map file.

**Parameters:**

<Dselect> string  
 Default unit: s

**Example:**

BB:WIM:AOFD:ZONE0:DLM:COMP:ULM:DSEL  
 'ul-map\_zone\_1'  
 selects the UL-Map file ul-map\_zone\_1.

**[[:SOURce<hw>]:BB:WIMax:AOFDm[:ZONE<st0>]:DLMap:COMPressed:ULMap:  
 STATe <State>**

The command activates/deactivates that a compressed UL-Map is appended to the DL-Map.

**Parameters:**

<State> 0 | 1 | OFF | ON  
 \*RST: OFF  
 Default unit: s

**Example:**

BB:WIM:AOFD:ZONE0:DLM:COMP:ULM:STAT ON  
 appends the compressed map to the DL-Map.

---

**[ :SOURCE<hw>]:BB:WIMax:AOFDM[:ZONE<st0>]:DLMap:DATA:DCD[:COUNT] <Count>**

The command sets the DCD Count. This value is used for the corresponding DL-MAP field in Auto mode.

This command is available in downlink only and for DL-MAP Mode Auto (BB:WIM:AOFD:ZONE:DLM:MODE AUTO).

**Parameters:**

<Count> integer  
 Range: 0 to 255  
 \*RST: 0

**Example:** BB:WIM:ZONE:AOFD:DLM:DCD 2  
 sets the DCD count to 2.

---

**[ :SOURCE<hw>]:BB:WIMax:AOFDM[:ZONE<st0>]:DLMap:DCD:CID <Cid>**

The command enters the value for the DCD CID. This CID (connection control identifier) is independent from the DL-Map CID and is only used for the DCD message.

**Parameters:**

<Cid> float  
 Range: 0 to 0xFFFF  
 \*RST: 0  
 Default unit: s

**Example:** BB:WIM:AOFD:ZONE0:DLM:DCD:CID #H456  
 enters the value for the DCD CID.

---

**[ :SOURCE<hw>]:BB:WIMax:AOFDM[:ZONE<st0>]:DLMap:DCD:STATE <State>**

The command activates/deactivates that the DCD is appended to the DL-MAP. The DCD message carries its own MAC header and CRC, but is included within the DL-MAP burst.

**Parameters:**

<State> 0 | 1 | OFF | ON  
 \*RST: OFF

**Example:** BB:WIM:AOFD:ZONE0:DLM:DCD:STAT ON  
 appends the DCD to the DL-Map.

---

**[ :SOURCE<hw>]:BB:WIMax:AOFDM[:ZONE<st0>]:DLMap:FNOFFset <Fnoffset>**

The command sets the frame number offset of the DL-MAP. This value is added to the current frame number of the sequence. The result is used as Frame Number in the DL-MAP (in Auto mode).

This command is available in downlink only and for DL-MAP Mode Auto (BB:WIM:AOFD:ZONE0:DLM:MODE AUTO).

**Parameters:**

<Fnoffset> float  
 Range: 0 to 16777215  
 \*RST: 0

**Example:**

BB:WIM:AOFD:ZONE0:DLM:FNOF 12  
 sets a frame number offset of 2 frames.

**[:SOURCE<hw>]:BB:WIMax:AOFDm[:ZONE<st0>]:DLMap:IE:STATE <State>**

The command includes/excludes the CID-Switch\_IE().

**Parameters:**

<State> 0 | 1 | OFF | ON  
 \*RST: ON

**Example:**

BB:WIM:AOFD:ZONE0:DLM:IE:STAT ON  
 includes the CID-Switch\_IE() to the DL-Map.

**[:SOURCE<hw>]:BB:WIMax:AOFDm[:ZONE<st0>]:DLMap:MODE <Mode>**

The command selects the mode for configuration of the DL map. Depending on this setting the above commands are available.

This command is available in downlink only.

**Parameters:**

<Mode> AUTO | USER

**AUTO**

The DL-MAP is filled automatically with parameters specified at different locations.

**USER**

The DL-MAP is filled with data specified under Data Source. This enables any arbitrary data to be sent with the DL-MAP burst.

\*RST: AUTO

**Example:**

BB:WIM:AOFD:ZONE0:DLM:MODE AUTO  
 The DL-MAP is filled automatically.

**[:SOURCE<hw>]:BB:WIMax:AOFDm[:ZONE<st0>]:DLMap:REPCoding  
 <Repcoding>**

The command activates/deactivates repetition coding. Setting RCO deactivates, all other settings activate repetition coding.

**Parameters:**

<Repcoding> RC0 | RC2 | RC4 | RC6  
 \*RST: RC0

**Example:**

BB:WIM:AOFD:ZONE0:DLM:REPC RC2  
 activates repetition coding.

---

**[ :SOURce<hw>]:BB:WIMax:AOFDm[:ZONE<st0>]:DLMap:SLOTcount?**

**Return values:**

<> float

**Usage:** Query only

---

**[ :SOURce<hw>]:BB:WIMax:AOFDm[:ZONE<st0>]:SCARrier:PERMutation  
<Permutation>**

**Parameters:**

<Permutation> FUSC | PUSC | AMC2X3 | SOUNDing  
\*RST: PUSC

---

**[ :SOURce<hw>]:BB:WIMax:AOFDm[:ZONE<st0>]:SUBChannel:MODE <Mode>**

The command determines if all or selected sets of subchannels are activated. The sets of subchannel to be activated are selected with command

SOUR:BB:WIM:AOFD:ZONE0:SUBC2:MAP.

**Parameters:**

<Mode> USER | ALL  
\*RST: ALL

**Example:**

BB:WIM:AOFD:ZONE0:SUBC:MODE USER  
selects user mode for selecting the activated subchannels.  
BB:WIM:AOFD:ZONE0:SUBC2:MAP ON  
activates generation of set subchannels 20 to 31.

---

**[ :SOURce<hw>]:BB:WIMax:AOFDm[:ZONE<st0>]:SUBChannel:PATTern  
<Pattern>**

The command determines the 'allocated subchannel bitmap'. The pattern is a 72 bit value.

This command is available in uplink only.

**Parameters:**

<Pattern> integer  
\*RST: #HFFFFFFFFFFFFFFFF3F,72

**Example:**

BB:WIM:AOFD:ZONE0:SUBC:PATT  
#HFFFFFFFFFFFFFFFF3F,72  
determines the allocated subchannel bitmap.

---

**[ :SOURce<hw>]:BB:WIMax:AOFDm[:ZONE<st0>]:SUBChannel:ROTation  
<Rotation>**

The command activates or deactivates the subchannel rotation.

This command is available for zone type PUSC in uplink only.



**Parameters:**

<Rotation> 0 | 1 | OFF | ON  
 \*RST: ON

**Example:**

SOUR:BB:WIM:AOFD:ZONE0:SUBC:ROT ON  
 activates the subchannel rotation.

**[:SOURCE<hw>]:BB:WIMax:AOFDm[:ZONE<st0>]:SUBChannel<ch>:MAP <Map>**

The command activates /deactivates the selected set of subchannels. There are 6 sets of subchannels available 0 = 0...5; 1 = 6...9; 2 = 10-15; 3 = 16 - 19; 4 = 20 ...25; 5 = 26 ... 29).

This command is available only in uplink and for subchannel mode user (BB:WIM:AOFD:ZONE0:SUBC:MODE USER).

**Suffix:**

<ch> 0..5

**Parameters:**

<Map> 0 | 1 | OFF | ON  
 \*RST: 0

**Example:**

BB:WIM:AOFD:ZONE0:SUBC2:MAP ON  
 activates subchannel set 2 (i.e. subchannels 6 ... 9)

**[:SOURCE<hw>]:BB:WIMax:AOFDm[:ZONE<st0>]:TYPE <Type>**

The command queries the symbol offset of the zone.

**Parameters:**

<Type> FUSC | PUSC | AMC2X3 | SOUNDing  
 \*RST: FUSC

**Example:**

BB:WIM:AOFD:ZONE:SYMB:OFFS  
 queries the symbol count offset in zone 1.

**[:SOURCE<hw>]:BB:WIMax:AOFDm[:ZONE<st0>]:UCD <Ucd>**

The command sets the value for the UCD count.

This command is available in uplink only.

**Parameters:**

<Ucd> float  
 Range: 0 to 255  
 \*RST: 0

**Example:**

BB:WIM:AOFD:ZONE0:UCD 255  
 sets the value for the UCD count to 255.

**[[:SOURce<hw>]:BB:WiMax:AOFDM[:ZONE<st0>]:ULMap:CREate <Create>**

The command saves the current UL-map. The default directory is set using command `MMEM:CDIRectory`. A path can also be specified, in which case the UL-map files in the specified directory are read. The file are stored with the extension `*.dm_iqd`.

This command is available in uplink only.

**Setting parameters:**

<Create> string

**Example:** `BB:WiMax:AOFDM:ZONE1:ULM:CRE 'ul-map_zone1'`  
save the current UL-map to the file `ul-map_zone1`

**Usage:** Setting only

## 4.7 OFDM Physical Layer Settings

The `SOURce:BB:WiMax:OFDM` system contain commands for setting the characteristics of signals with OFDM physical layer.

The commands of this system only take effect if the OFDM physical layer mode is selected:

- `SOURce:BB:WiMax:MODE OFDM`



In case of remote control, suffix counting for bursts corresponds to the suffix counting with WiMAX starting with burst 0. SCPI prescribes that suffix 1 is the default state and used when no specific suffix is specified. Therefore, burst 1 (and not burst 0) is selected when no suffix is specified.

### Suffix

**BURSt<ch0>**

Value range 0 .. 63

<code>[[:SOURce&lt;hw&gt;]:BB:WiMax:OFDM:BSID</code> .....	197
<code>[[:SOURce&lt;hw&gt;]:BB:WiMax:OFDM:BURSt&lt;ch0&gt;:CCODing:STATe</code> .....	198
<code>[[:SOURce&lt;hw&gt;]:BB:WiMax:OFDM:BURSt&lt;ch0&gt;:DATA</code> .....	198
<code>[[:SOURce&lt;hw&gt;]:BB:WiMax:OFDM:BURSt&lt;ch0&gt;:DATA:DSElect</code> .....	198
<code>[[:SOURce&lt;hw&gt;]:BB:WiMax:OFDM:BURSt&lt;ch0&gt;:DATA:PATtern</code> .....	199
<code>[[:SOURce&lt;hw&gt;]:BB:WiMax:OFDM:BURSt&lt;ch0&gt;:DIUC</code> .....	199
<code>[[:SOURce&lt;hw&gt;]:BB:WiMax:OFDM:BURSt&lt;ch0&gt;:DLEngth</code> .....	199
<code>[[:SOURce&lt;hw&gt;]:BB:WiMax:OFDM:BURSt&lt;ch0&gt;:DLMap:AMODE</code> .....	200
<code>[[:SOURce&lt;hw&gt;]:BB:WiMax:OFDM:BURSt&lt;ch0&gt;:DLMap:ATIME</code> .....	200
<code>[[:SOURce&lt;hw&gt;]:BB:WiMax:OFDM:BURSt&lt;ch0&gt;:DLMap:DCD:STATe</code> .....	200
<code>[[:SOURce&lt;hw&gt;]:BB:WiMax:OFDM:BURSt&lt;ch0&gt;:DLMap:UCD:STATe</code> .....	201
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---

### [ :SOURce<hw>]:BB:WIMax:OFDM:BSID <Bsid>

The command sets the 4 LSBs of the Base Station ID. Only the four least significant bits are given. The BSID is transmitted in the FCH (when set to Auto mode), and it is used to initialize the randomizer.

#### Parameters:

<Bsid>	float
	Range: 1 to 15
	*RST: 0

#### Example:

BB:WIM:OFDM:BSID 2  
the base station id is 2.

**[ :SOURce<hw>]:BB:WIMax:OFDM:BURSt<ch0>:CCODing:STATe <State>**

The command switches channel coding on or off. If channel coding is switched off, the bits read from the data source are directly modulated onto the carriers. Due to randomization missing, this could result in very high crest factors of the signal.

**Parameters:**

<State> 0 | 1 | OFF | ON  
\*RST: ON

**Example:**

BB:WIM:OFDM:BURS:CCOD:STAT ON  
activates channel coding for burst 1.

**[ :SOURce<hw>]:BB:WIMax:OFDM:BURSt<ch0>:DATA <Data>**

The command determines the data source for the specified bursts.

**Parameters:**

<Data> PN9 | PN11 | PN15 | PN16 | PN20 | PN21 | PN23 | DLISt | ZERO | ONE | PATTErn

**PNxx**

The pseudo-random sequence generator is used as the data source. Different random sequence lengths can be selected.

**DLISt**

A data list is used. The data list is selected with the command :BB:WIMax:OFDM:BURS:DATA:DSElect.

**ZERO | ONE**

Internal 0 and 1 data is used.

**PATTErn**

Internal data is used The bit pattern for the data is defined by the command :BB:WIMax:OFDM:BURS:DATA:PATTErn.

\*RST: PN9

**Example:**

BB:WIM:OFDM:BURS:DATA PATT  
selects as the data source for the data fields of burst 1, the bit pattern defined with the following command.  
BB:WIM:OFDM:BURS:DATA:PATTErn #H3F,8  
defines the bit pattern.

**[ :SOURce<hw>]:BB:WIMax:OFDM:BURSt<ch0>:DATA:DSElect <Dselect>**

The command selects the data list for the DLISt data source selection.

The lists are stored as files with the fixed file extensions \*.dm\_iqd in a directory of the user's choice. The directory applicable to the following commands is defined with the command MMEMoRY:CDIR. To access the files in this directory, you only have to give the file name, without the path and the file extension.

**Parameters:**

<Dselect> string

**Example:** `BB:WIM:OFDM:BURS:DATA DLIS`  
selects the Data Lists data source.  
`MMEM:CDIR '<root>\Lists\DM\IqData'`  
selects the directory for the data lists.  
`BB:WIM:OFDM:BURS:DATA:DLIS 'wimax_list1'`  
selects file `wimax_list1` as the data source. This file must be in the directory `<root>\Lists\DM\IqData` and have the file extension `*.dm_iqd`.

---

**[ :SOURCE<hw>]:BB:WIMax:OFDM:BURSt<ch0>:DATA:PATtern <Pattern>**

The command determines the bit pattern for the PATtern selection. The maximum length is 64 bits.

**Parameters:**

<Pattern> integer  
Range: #B0,1 to #B111..1,64  
\*RST: 0

**Example:** `BB:WIM:OFDM:BURS:DATA:PATT #H3F,8`  
defines the bit pattern.

---

**[ :SOURCE<hw>]:BB:WIMax:OFDM:BURSt<ch0>:DIUC <Diuc>**

The command sets the specific interval usage code. The code is used to initialize the randomizer and is transmitted in the FCH.

**Parameters:**

<Diuc> float  
Range: 0.0 to 15.0  
\*RST: 1.0

**Example:** `BB:WIM:OFDM:BURS2:DIUC 12`  
sets Interval Usage Code12 for burst 2.

---

**[ :SOURCE<hw>]:BB:WIMax:OFDM:BURSt<ch0>:DLENgth <Dlength>**

The command sets the data length in bytes. The given number of bytes is read from the data source. The total number of data bytes in the burst (before channel coding) is determined as follows:

$$\text{TotalDataBytes} = \text{DataLength} + \text{MACHeaderBytes} + \text{CRCBytes} + \text{TailByte}$$

The tail byte is only added when channel coding is switched on. The same is the case for the MAC header and CRC, they are not added when switched off. Additionally padding with 0xFF bytes is applied at the end of the data sequence to reach an integer number of OFDM symbols.

The data length determines the number of symbols and vice versa. The maximum data length of 10000 bytes defines the maximum number of symbols for a given modulation type and channel coding rate.

**Parameters:**

<Dlength> float  
 Range: 0 Bytes to 10000 Bytes  
 \*RST: 100 Bytes

**Example:**

BB:WIM:OFDM:BURS:DLEN 256  
 sets a data length of 256.

**[[:SOURce<hw>]:BB:WIMax:OFDM:BURSt<ch0>:DLMap:AMODE <Amode>**

The command selects the Allocation Start Time base. The Allocation Start Time field of the DL-MAP specifies the start of the downlink subframe.

If Start Time Base is set to DL Subframe End, the Allocation Start Time of the DL-MAP is set to the end of the downlink subframe + Allocation Start Time parameter set below.

When Start Time Base is set to Frame Start, the Allocation Start Time of the DL-MAP is set to the beginning of the frame + Allocation Start Time parameter set below.

**Parameters:**

<Amode> DLSFend | FRAMestart  
 \*RST: DLSFend

**Example:**

BB:WIM:OFDM:BURS1:DLM:AMOD DLSF  
 sets the start time base to DL Subframe End.

**[[:SOURce<hw>]:BB:WIMax:OFDM:BURSt<ch0>:DLMap:ATIME <Atime>**

The command sets the Allocation Start Time in the DL-Map.

**Parameters:**

<Atime> float  
 Range: 0 to frame duration  
 \*RST: 0

**Example:**

BB:WIM:OFDM:BURS1:DLM:ATIM 2  
 sets the Allocation Start Time to 2 s.

**[[:SOURce<hw>]:BB:WIMax:OFDM:BURSt<ch0>:DLMap:DCD:STATe <State>**

The command activates/deactivates that the DCD is appended to the DL-MAP. The DCD message carries its own MAC header and CRC, but is included within the DL-MAP burst.

**Parameters:**

<State> 0 | 1 | OFF | ON  
 \*RST: OFF

**Example:**

BB:WIM:OFDM:BURS1:DLM:DCD:STAT ON  
 appends the DCD to the DL-Map.

**[ :SOURce<hw>]:BB:WIMax:OFDM:BURSt<ch0>:DLMap:UCD:STATe <State>**

The command activates/deactivates that the UCD is appended to the DL-MAP. The UCD message is transmitted with its own MAC header and CRC, included in the same burst allocation used by the DL-MAP.

**Parameters:**

<State>                   0 | 1 | OFF | ON  
\*RST:                   OFF

**Example:**

BB:WIM:OFDM:BURS2:DLM:UCD:STAT ON  
appends the UCD to the DL-Map.

**[ :SOURce<hw>]:BB:WIMax:OFDM:BURSt<ch0>:DLMap:ULM:STATe <State>**

The command activates/deactivates that a UL-Map is appended to the DL-Map.

**Parameters:**

<State>                   0 | 1 | OFF | ON  
\*RST:                   OFF

**Example:**

BB:WIM:OFDM:BURS1:DLM:ULM:STAT ON  
appends the UL-Map to the DL-Map.

**[ :SOURce<hw>]:BB:WIMax:OFDM:BURSt<ch0>:FORMat <Format>**

Selects the modulation and channel coding rate. Channel coding includes randomization, reed solomoon coding, convoutional coding and interleaving.

For a given modulation type and channel coding rate, the data length determines the number of symbols and vice versa.

**Parameters:**

<Format>                   BPSK1D2 | QPSK1D2 | QPSK3D4 | QAM1D2X16 | QAM3D4X16 |  
QAM2D3X64 | QAM3D4X64  
\*RST:                   BPSK1D2

**Example:**

BB:WIM:OFDM:BURS:FORM QAM3D4X64  
selects modulation type 64QAM and a channel coding rate of 3.4 Msamples for burst 1.

**[ :SOURce<hw>]:BB:WIMax:OFDM:BURSt<ch0>:GAP <Gap>**

The command sets the length of the gap between the selected burst and the next burst in  $\mu$ s. The setting is only available for transmission direction uplink.

**Parameters:**

<Gap>                   float  
Range:                   0  $\mu$ s to 1 000 000  $\mu$ s  
Increment:               1  $\mu$ s  
\*RST:                   1  $\mu$ s  
Default unit: s

**Example:**            `BB:WIM:LINK UP`  
                           sets transmission direction uplink.  
                           `BB:WIM:OFDM:BURS2:GAP 0.003`  
                           sets the gap between burst 2 and 3 to 3 ms.

**[ :SOURce<hw>]:BB:WIMax:OFDM:BURSt<ch0>:MAC:CID <Cid>**

The command sets the CID (connection control identifier) of the medium access control layer (MAC). The CID identifies a connection to equivalent peers in the MAC of the base station and subscriber station.

**Parameters:**

<Cid>                    float  
                           Range:        #H0 to #HFFFF  
                           \*RST:        0

**Example:**            `BB:WIM:OFDM:BURS2:MAC:CID #HE7`  
                           sets the CID for burst 2 to 231.

**[ :SOURce<hw>]:BB:WIMax:OFDM:BURSt<ch0>:MAC:CRC:STATe <State>**

The command activates/deactivates the checksum determination. The state of the CRC can be set independently of the state of MAC header generation.

**Parameters:**

<State>                0 | 1 | OFF | ON  
                           \*RST:        OFF

**Example:**            `BB:WIM:OFDM:BURS2:MAC:CRC:STAT ON`  
                           activates the checksum determination for burst 2.

**[ :SOURce<hw>]:BB:WIMax:OFDM:BURSt<ch0>:MAC:EKS <Eks>**

The command sets the EKS (encryption key sequence) value in the MAC header. The payload encryption itself is not performed by the signal generator.

**Parameters:**

<Eks>                    float  
                           Range:        0 to 4  
                           \*RST:        0

**Example:**            `BB:WIM:OFDM:BURS2:MAC:ENCR:STAT ON`  
                           enables payload encryption.  
                           `BB:WIM:OFDM:BURS2:MAC:EKS 2`  
                           sets the EKS for burst 2.

**[ :SOURce<hw>]:BB:WIMax:OFDM:BURSt<ch0>:MAC:ENCRypted:STATe <State>**

The command activates/disactivates payload encryption. If activated, the EC (Encryption Control) field is set to 1 and the EKS (Encryption Key Sequence) field can be set.



**Parameters:**

<State> 0 | 1 | OFF | ON  
 \*RST: OFF

**Example:**

BB:WIM:OFDM:BURS2:MAC:ENCR:STAT ON  
 enables payload encryption for burst 2.  
 BB:WIM:OFDM:BURS2:MAC:EKS 2  
 sets the EKS.

**[:SOURCE<hw>]:BB:WIMax:OFDM:BURSt<ch0>:MAC:STATe <State>**

The command enables/disables generation of the generic MAC header for the selected burst.

**Parameters:**

<State> 0 | 1 | OFF | ON  
 \*RST: OFF

**Example:**

BB:WIM:OFDM:BURS2:MAC:STAT ON  
 enables generation of the generic MAC header for burst 2.

**[:SOURCE<hw>]:BB:WIMax:OFDM:BURSt<ch0>:MAC:TYPE <Type>**

The command specifies the MAC type. The value of the 6-bit type field is set which indicates the payload type, including the presence of subheaders.

**Parameters:**

<Type> float  
 Range: #H0 to #H3F  
 \*RST: #H0

**Example:**

BB:WIM:OFDM:BURS2:MAC:TYPE #H3F  
 sets the type field of the MAC header of burst 2.

**[:SOURCE<hw>]:BB:WIMax:OFDM:BURSt<ch0>:MIDamble <Midamble>**

The command activates/deactivates midamble repetition. If midamble repetition is switched on, midambles are placed into the burst with the specified interval, i.e. if 5 is selected, every 5th symbol of the burst is a midamble.

A short preamble is used as midamble when subchannelization is off or a subchannelization preamble is used in subchannelization mode. The power of the midambles is identical to the burst power.

The command is available in uplink only.

**Parameters:**

<Midamble> OFF | REP5 | REP9 | REP17  
 \*RST: OFF

**Example:** `BB:WIM:LINK UP`  
selects transmission direction uplink.  
`BB:WIM:OFDM:BURS2:MID REP9`  
the midamble is repeated each 9th symbol of burst 2.

**[:SOURCE<hw>]:BB:WIMax:OFDM:BURSt<ch0>:MODE <Mode>**

**Parameters:**

<Mode>                    NORM | DLMap | ULMap  
\*RST:                    NORM

**[:SOURCE<hw>]:BB:WIMax:OFDM:BURSt<ch0>:POWER <Power>**

The command sets the power for the selected burst in dB. To set the absolute power of a burst correctly, level reference FCH / Burst must be selected. In this mode, the output power of a burst equals Level + BurstPower.

In downlink, the preamble is transmitted with +3 dB and the FCH is transmitted with 0dB.

In uplink, the power of the first burst is fixed to 0dB.

**Parameters:**

<Power>                    float  
Range:                    -80.0 dB to 10.0 dB  
Increment:                0.01 dB  
\*RST:                    0.0 dB

**Example:** `BB:WIM:OFDM:BURS2:POW -2 dB`  
sets the burst power to -2 dB.

**[:SOURCE<hw>]:BB:WIMax:OFDM:BURSt<ch0>:PREamble:MODE <Mode>**

The command enables/disables generation of the preamble for the selected burst and selects the mode for generating the preamble. Either a long preamble or a short preamble can be activated.

The 802.16 standard requires a long preamble as frame start.

**Parameters:**

<Mode>                    OFF | LONG | SHORT  
\*RST:                    OFF

**Example:** `BB:WIM:OFDM:BURS2:PRE:MODE LONG`  
enables generation of the long preamble for burst 2.

**[:SOURCE<hw>]:BB:WIMax:OFDM:BURSt<ch0>:SYMBOL[:COUNT] <Count>**

The command sets the number of symbols for the selected burst. If the number of symbols is changed, the data length is adjusted to fill the specified number of symbols with data so that no padding has to be applied.

The maximum data length of 10 000 bytes defines the maximum number of symbols for a given modulation type and channel coding rate.

**Parameters:**

<Count> integer  
 Range: 1 to 834  
 \*RST: 9

**Example:**

BB:WIM:OFDM:BURS2:SYMB:COUN 12  
 sets 12 symbols for burst 2.

**[:SOURCE<hw>]:BB:WIMax:OFDM:BURSt<ch0>:TYPE <Type>**

The command selects the burst type.

Available burst types for downlink: DATA | ULMap | DLMap

Available burst types for uplink: DATA | RANGing

**Parameters:**

<Type> DLMap | ULMap | RANGing | DATA  
 \*RST: DATA

**Example:**

BB:WIM:OFDM:BURS2:TYPE DATA  
 selects burst type DATA.

**[:SOURCE<hw>]:BB:WIMax:OFDM:BURSt<ch0>:UIUC <Uiuc>**

The command sets uplink interval usage code.

This command is only available for link direction uplink.

**Parameters:**

<Uiuc> float  
 Range: 0.0 to 15.0  
 \*RST: 0.0

**Example:**

BB:WIM:OFDM:BURS2:UIUC 2  
 sets uplink interval usage code 2.

**[:SOURCE<hw>]:BB:WIMax:OFDM:BURSt<ch0>:ULMap:AMODE <Amode>**

The command sets the UL-MAP Allocation Start Time Base. The start time is set either relative to the DL subframe end (DLSFend) or the frame start (FRAMestart).

This command is available for link direction downlink only.

**Parameters:**

<Amode> DLSFend | FRAMestart  
 \*RST: 0

**Example:**

BB:WIM:OFDM:BURS2:ULM:AMOD DLSF  
 sets the start time base to DL Subframe End.

---

**[ :SOURce<hw>]:BB:WIMax:OFDM:BURSt<ch0>:ULMap:ATIME <Atime>**

The command sets the UL-MAP Allocation Start Time.

This command is available for link direction downlink only.

**Parameters:**

<Atime> float  
 Range: 0 to frame duration  
 \*RST: 0

**Example:** BB:WIM:OFDM:BURS2:ULM:ATIM 4  
 sets the allocation start time to 2.

---

**[ :SOURce<hw>]:BB:WIMax:OFDM:BURSt[:COUNT] <Count>**

The command sets the number of active bursts in one frame. With number of bursts = 0, a preamble only or a preamble with an FCH burst is generated.

**Parameters:**

<Count> integer  
 Range: 1 to 64  
 \*RST: 1

**Example:** BB:WIM:OFDM:BURS:COUN 2  
 two bursts are sent in one frame.

---

**[ :SOURce<hw>]:BB:WIMax:OFDM:BW <Bw>**

The command sets the channel bandwidth. The selected channel bandwidth has to be a multiple of 1.25, 1.5, 1.75, 2.0 or 2.75 MHz. The channel bandwidth determines the parameter n (sampling ratio, command SOUR:BB:WIMax:OFDM:N).

The sampling rate is derived from the channel bandwidth as follows:

$$\text{SamplingRate} = \text{floor}(n * \text{ChannelBandwidth} / 8000) * 8000$$

**Downlink:** The allowed values depend on the selected frequency band (command SOUR:BB:WIMax:OFDM:FBAN). Only discrete sets of values are available. If a new value is not allowed, the next allowed value in the direction of change is set.

**Uplink:** The full range between 1.25 and 28 MHz is available. Only discrete sets of values are available. If a new value is not allowed, the next allowed value in the direction of change is set.

**Example:** 14 MHz and 28 MHz are allowed, the current value is 14 MHz. If a new value of 15 MHz is entered it is changed to 28 MHz.

**Parameters:**

<Bw> float  
 Range: 1.25E6 to 28E6  
 \*RST: 1.75E6

**Example:** `BB:WIM:OFDM:FBAN ETSI`  
selects frequency band according to ETSI specifications.  
`BB:WIM:OFDM:BW 7E6`  
sets the channel bandwidth to 7 MHz.

---

**[:SOURCE<hw>]:BB:WIMax:OFDM:FBAND <Fband>**

The command selects the available frequency band for the carrier frequencies.

**Parameters:**

<Fband>

ETSI | MMDS | WCS | UNII | USER

**ETSI**

The frequency band as defined by the "European Telecommunications Standards Institute" applies. The range is 1.75 to 28 MHz for the channel bandwidth and 2 to 32 MHz for the sampling rate.

**MMDS**

The frequency band as defined by the "Multichannel Multipoint Distribution Service" applies. The RF frequency range is 2500 to 2686 MHz. The range is 1.50 to 24 MHz for the channel bandwidth and 1.72 to 27.52 MHz for the sampling rate.

**WCS**

The frequency band as defined by the "Wireless Communication Service" applies. It is in the 2.3 GHz band of the electromagnetic spectrum from 2305 to 2320 MHz and 2345 to 2360 MHz. The range is 2.5 to 15 MHz for the channel bandwidth and 2.88 to 17.28 MHz for the sampling rate.

**UNII**

The frequency band as defined by the "Unlicensed National Information Infrastructure" applies. It is in the 5 GHz band of the electromagnetic spectrum from 5150 to 5350 GHz and 5750 to 5825 GHz. The range is 10 to 20 MHz for the channel bandwidth and 11.52 to 23.04 MHz for the sampling rate.

**USER**

This mode is provided for choosing any other channel bandwidth / sampling rate combination. The range is 1.25 to 28 MHz for the channel bandwidth and 1.44 to 32 MHz for the sampling rate.

\*RST: ETSI

**Example:** `BB:WIM:OFDM:FBAN ETSI`  
selects frequency band according to ETSI specifications.

---

**[:SOURCE<hw>]:BB:WIMax:OFDM:FCH:CCC <Ccc>**

The command sets the configuration change count value. This value is used for the corresponding FCH field in "Auto" mode (`SOURCE:BB:WIMax:OFDM:FCH:MODE AUTO`).

**Parameters:**

<Ccc> float  
 Range: 0 to 15  
 \*RST: 0

**Example:**

BB:WIM:OFDM:FCH:CCC 4  
 sets configuration change count value to 4.

**[[:SOURce<hw>]:BB:WIMax:OFDM:FCH:DATA <Data>**

The command specifies the data source in "User" mode (SOURce:BB:WIMax:OFDM:FCH:MODE AUTO). The FCH contents are filled from the selected data source.

**Parameters:**

<Data> PN9 | PN11 | PN15 | PN16 | PN20 | PN21 | PN23 | DLISt | ZERO | ONE | PATTErn

**PNxx**

The pseudo-random sequence generator is used as the data source. Different random sequence lengths can be selected.

**DLISt**

A data list is used. The data list is selected with the command :BB:WIMax:OFDM:FCH:DATA:DSElect.

**ZERO | ONE**

Internal 0 and 1 data is used.

**PATTErn**

Internal data is used. The bit pattern for the data is defined by the command :BB:WIMax:OFDM:FCH:DATA:PATTErn.

\*RST: PN9

**Example:**

BB:WIM:OFDM:FCH:DATA PATT  
 selects as the data source for the data fields of FCH, the bit pattern defined with the following command.  
 BB:WIM:OFDM:FCH:DATA:PATT #H3F,8  
 defines the bit pattern.

**[[:SOURce<hw>]:BB:WIMax:OFDM:FCH:DATA:DSElect <Dselect>**

The command selects the data list for the DLISt data source selection.

The lists are stored as files with the fixed file extensions \*.dm\_iqd in a directory of the user's choice. The directory applicable to the following commands is defined with the command MMEMoRY:CDIR. To access the files in this directory, you only have to give the file name, without the path and the file extension.

This command is available only in "User" mode (SOURce:BB:WIMax:OFDM:FCH:MODE AUTO).

**Parameters:**

<Dselect> string

**Example:** `BB:WIM:OFDM:FCH:DATA DLIS`  
 selects the Data Lists data source.  
`M MEM:CDIR '<root>\Lists\DM\IqData'`  
 selects the directory for the data lists.  
`BB:WIM:OFDM:FCH:DATA:DLIS 'wimax_list1'`  
 selects file `wimax_list1` as the data source. This file must be in the directory `<root>\Lists\DM\IqData` and have the file extension `*.dm_iqd`.

**[[:SOURCE<hw>]:BB:WIMax:OFDM:FCH:DATA:PATTERN <Pattern>**

The command determines the bit pattern for the PATTERN selection. The maximum length is 64 bits.

This command is available only in "User" mode (`SOURCE:BB:WIMax:OFDM:FCH:MODE AUTO`).

**Parameters:**

`<Pattern>` integer  
 Range: #B0,1 to #B111..1,64  
 \*RST: 0

**Example:** `BB:WIM:OFDM:BURS:DATA:PATT #H3F,8`  
 defines the bit pattern.

**[[:SOURCE<hw>]:BB:WIMax:OFDM:FCH:FNOFFSET <Fnoffset>**

The command sets the frame number offset. This value is added to the current frame number of the sequence. After modulo 16 division, the result is used as `Frame_Number` in the FCH (in Auto mode) and is also used to initialize the randomizers.

**Parameters:**

`<Fnoffset>` float  
 Range: 0 to 15  
 \*RST: 0

**Example:** `BB:WIM:OFDM:FCH:FNOF 4`  
 sets a frame number offset of 4.

**[[:SOURCE<hw>]:BB:WIMax:OFDM:FCH:MODE <Mode>**

The command selects the mode for generating the FCH.Channel Coding of the FCH is performed both in "Auto" and "User" mode.

**Parameters:**

&lt;Mode&gt;

AUTO | USER

**AUTO**

The DLFP fields, which form the FCH, are filled automatically with parameters specified at different locations. The following mapping applies in Auto mode:

Base\_Station\_ID:

Set to the BSID value specified in the frame configuration menu.

Frame\_Number:

Set to the current frame number modulo 16. The first frame of the generated sequence has the number specified in Frame Number Offset below. For the following frames, this number will increase by 1 per frame.

Configuration\_Change\_Count:

Set to the value specified below.

Rate\_ID:

The Rate ID parameter of the first burst is set according to its modulation setting.

DIUC:

The DIUC value for the second, third and fourth burst is taken from the DIUC value in the burst table.

Preamble Present:

Set to 1 when the burst preamble is activated for the corresponding burst.

Length:

Set to the calculated number of symbols of the corresponding burst.

HCS:

The Header Check Sequence is automatically calculated.

**USER**

the FCH is filled with data specified under Data Source. This enables any arbitrary data to be sent with the FCH burst.

\*RST: AUTO

**Example:**

```
BB:WIM:OFDM:FCH:MODE AUTO
selects FCH mode AUTO.
```

```
[:SOURce<hw>]:BB:WIMax:OFDM:FCH:STATe <State>
```

The command switches the FCH on or off.

**Parameters:**

&lt;State&gt;

0 | 1 | OFF | ON

\*RST: ON

**Example:**

```
BB:WIM:OFDM:FCH:STAT OFF
switches off generation of FCH.
```



**[[:SOURce<hw>]:BB:WIMax:OFDM:FFT?**

The command queries the size of the fast fourier transform. For OFDM channels, the size is fixed to 256. For OFDMA configuration, the possible configurations of the subchannel map depend on the selected FFT size.

**Return values:**

<Fft> FFT256  
 \*RST: OFDMA FFT2048; OFDM: FFT256

**Example:**

BB:WIM:OFDM:FFT  
 queries the FFT size.  
 Response: FFT256  
 the FFT size is 256.

**Usage:** Query only

**[[:SOURce<hw>]:BB:WIMax:OFDM:FRAME:PREDefined <Predefined>**

The command selects predefined setting for the frames.

All commands concerning the frame configuration are preset

**Parameters:**

<Predefined> USER | FBPSK12SHORT | FBPSK12MID | FBPSK12LONG |  
 FQPSK12SHORT | FQPSK12MID | FQPSK12LONG |  
 FQPSK34SHORT | FQPSK34MID | FQPSK34LONG |  
 F16QAM12SHORT | F16QAM12MID | F16QAM12LONG |  
 F16QAM34SHORT | F16QAM34MID | F16QAM34LONG |  
 F64QAM23SHORT | F64QAM23MID | F64QAM23LONG |  
 F64QAM34SHORT | F64QAM34MID | F64QAM34LONG

**USER**

The settings for the frame can be defined by the user.

**F...**

Predefined settings for receiver testing are selected. The parameter includes the modulation, the channel coding rate and the test message type (long, short or middle). See IEEE 802.16-2004, section 8.3.11 for details.

\*RST: USER

**Example:**

BB:WIM:LINK UP  
 selects transmission direction uplink.  
 BB:WIM:OFDM:FRAM: PRED FBPSK12LONG  
 selects predefined settings with BPSK modulation, channel coding 1 / 2 and long test message.

**[[:SOURce<hw>]:BB:WIMax:OFDM:FRAME[:NUMBer] <Number>**

The command selects the frame number of the uplink frame in which the UL map that specifies the uplink burst was transmitted.

This command is available in uplink only.

**Parameters:**

<Number> float  
 Range: 0 to 15  
 \*RST: 0

**Example:**

```
BB:WIM:LINK UP
selects transmission direction uplink.
BB:WIM:MODE OFDM
selects OFDM physical layer mode.
BB:WIM:OFDM:FRAM 15
selects frame number 15.
```

**[[:SOURce<hw>]:BB:WIMax:OFDM:N?**

The command queries the factor n (sampling ratio). The sampling ratio is determined by the channel bandwidth (see parameter "Channel Bandwidth").

**Return values:**

<> N8D7 | N86D75 | N144D125 | N316D275 | N57D50 | N28D25

**Example:**

```
BB:WIM:OFDM:N
queries the factor n.
Response: "N8D7"
the factor n is 8/7.
```

**Usage:**

Query only

**[[:SOURce<hw>]:BB:WIMax:OFDM:POWER:REFerence <Reference>**

The command selects the level reference.

**Parameters:**

<Reference> BURSt | PREamble

**BURSt**

The instrument's level setting refers to the mean power of FCH or bursts with a burst power setting of 0 dB. To obtain the absolute burst power value, the burst power value has to be added to the level value.

**PREamble**

The instrument's level setting refers to the preamble, which is FCH / Burst power + 3dB.

\*RST: BURSt

**Example:**

```
BB:WIM:OFDM:POW:REF BURSt
the instruments level setting refers to the mean power of FCH or
bursts with a burst power setting of 0 dB.
```

**[ :SOURce<hw>]:BB:WiMax:OFDM:PREamble:MODE <Mode>**

The command activates/deactivates the generation of a frame preamble. Either a long preamble or a short preamble can be activated. The 802.16 standard requires a long preamble as frame start in the downlink.

**Parameters:**

<Mode>                    OFF | LONG | SHORT  
 \*RST:                    LONG

**Example:**

BB:WiMax:OFDM:PRE:MODE SHOR  
 enables generation of a short preamble for the frame.

**[ :SOURce<hw>]:BB:WiMax:OFDM:SRATe <Srate>**

The command sets the sampling rate. The sampling rate is related to the channel bandwidth by the parameter n:

$$\text{SamplingRate} = \text{floor} (n * \text{ChannelBandwidth} / 8000) * 8000$$

**Downlink:**

The value range depends on the selected frequency band (command [ :SOURce<hw>]:BB:WiMax:OFDM:FBAND). Only discrete sets of values are available. If a new value is not allowed, the next allowed value in the direction of change is set.

**Uplink:**

The full range between 1.44 and 32 MHz is available. Only discrete sets of values are available. If a new value is not allowed, the next allowed value in the direction of change is set.

**Example:**

16 MHz and 32 MHz are allowed, the current value is 16 MHz. If a new value of 17 MHz is entered it is changed to 32 MHz.

**Parameters:**

<Srate>                    float  
 Range:                    1.44E6 to 32E6  
 Increment:                0.001E6  
 \*RST:                    2E6

**Example:**

BB:WiMax:OFDM:SRAT 2E6  
 sets a sampling rate of 2 MHz.

**[ :SOURce<hw>]:BB:WiMax:OFDM:SUBchannel:INDEX <Index>**

The command selects the subchannel index in subchannelization mode. The subchannel index determines the set of used subcarriers according to table 213 of IEEE 802.16-2004 standard.

**Parameters:**

<Index> SUBC1 | SUBC2 | SUBC3 | SUBC4 | SUBC5 | SUBC6 | SUBC7 |  
 SUBC8 | SUBC9 | SUBC10 | SUBC11 | SUBC12 | SUBC13 |  
 SUBC14 | SUBC15 | SUBC16 | SUBC17 | SUBC18 | SUBC19 |  
 SUBC20 | SUBC21 | SUBC22 | SUBC23 | SUBC24 | SUBC25 |  
 SUBC26 | SUBC27 | SUBC28 | SUBC29 | SUBC30 | SUBC31  
 \*RST: SUBC16

**Example:**

BB:WIM:OFDM:SUBC:IND SUBC4  
 selects subchannel set 4 to be used.

**[[:SOURce<hw>]:BB:WIMax:OFDM:SUBChannel[:COUNT] <Count>**

The command selects the number of subchannels für OFDM configurations.

Selection 16 (all) deactivates subchannelization and activates all possible carriers. The values 1, 2, 4 and 8 activate only a part of the available subcarriers, unused carriers are blanked.

**Parameters:**

<Count> SC1 | SC2 | SC4 | SC8 | SC16  
 \*RST: SC16

**Example:**

BB:WIM:OFDM:SUBC:COUN SC4  
 selects 4 subchannels to be used.

**[[:SOURce<hw>]:BB:WIMax:OFDM:TGTB <Tgtb>**

The command selects the ratio of guard period to symbol period. This value sets the length of the cyclic prefix in fractions of the symbol period.

**Parameters:**

<Tgtb> TGTB1D4 | TGTB1D8 | TGTB1D16 | TGTB1D32  
 \*RST: TGTB1D4

**Example:**

BB:WIM:OFDM:TGTB TGTB1D8  
 sets a ratio of 1 to 8.

**[[:SOURce<hw>]:BB:WIMax:OFDM:UCD <Ucd>**

The command sets the value for the UCD count.

This command is available in uplink only.

**Parameters:**

<Ucd> float  
 Range: 0 to 255  
 \*RST: 0

**Example:**

BB:WIM:OFDM:UCD 255  
 sets the value for the UCD count to 255.

---

**[ :SOURCE<hw> ] : BB : WIMax : OFDM : ULMap : CREate <Create>**

The command saves the current UL-map. The default directory is set using command `MMEM:CDIRectory`. A path can also be specified, in which case the UL-map files in the specified directory are read. The file are stored with the extension `*.dm_iqd`.

This command is available in uplink only.

**Setting parameters:**

<Create>                    string

**Example:**                    `BB:WIM:OFDM:ULM:CRE 'ul-map_zone1'`  
saves the current UL-map to the file `ul-map_zone1`.

**Usage:**                    Setting only

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