

R&S® CMW270 Wireless Connectivity Tester

The IEEE 802.16e Mobile WiMAX™ and non-cellular expert



R&S®CMW270

Wireless

Connectivity Tester

At a glance

The R&S®CMW270 is the ideal test solution for integrated wireless communications solutions in laptops, netbooks, game consoles, data cards and wireless headsets, for example. It is a tailored subset within the R&S®CMW500 product family¹⁾. Besides Mobile WiMAX™, the R&S®CMW270 includes generator and analyzer functionality for standards such as WLAN, FM Stereo and Bluetooth® as well as for GPS and broadcast technologies.

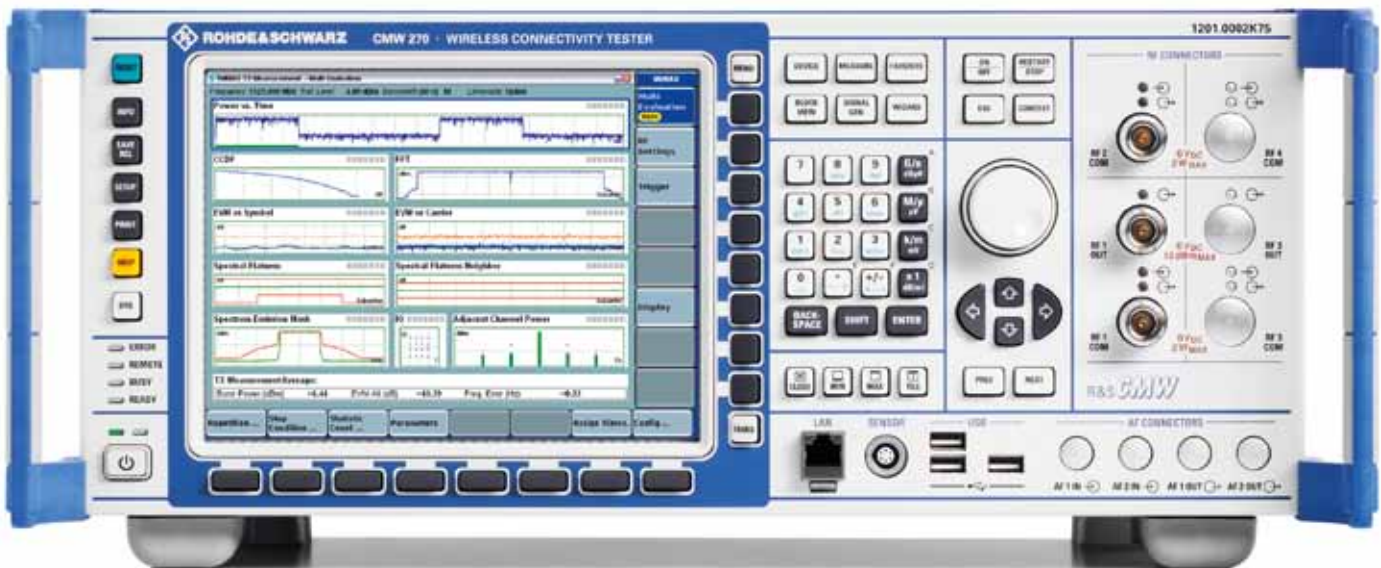
The R&S®CMW270 was developed to meet the specific requirements in R&D, production, quality assurance, service and network interoperability testing (IOT) – with a single, tailorable instrument. It is an ideal choice for demanding performance tests and measurements in labs and production – from IP application testing under fully controlled network conditions with a MIMO base station emulator to high-speed RF and baseband alignment with dual-tester configuration.

The scalability of the R&S®CMW270 is a vital feature that helps to reduce test costs. Multitechnology, multi-antenna and parallel-test applications can be combined as desired and are easy to expand.

Key facts

- Continuous frequency range up to 6 GHz
- Multiple standard RF measurements for WiMAX™, WLAN, FM Stereo and Bluetooth®
- General-purpose ARB generation for WiMAX™, WLAN, Bluetooth®, FM Stereo, GPS and broadcast technologies
- Mobile WiMAX™ base station emulator with MIMO support for matrix A, matrix B and collaborative
- Simultaneous uplink burst measurements during signaling connection, PER/BER and message analyzer
- IP-based end-to-end test for Mobile WiMAX™ performance verification up to the theoretical limits of 36 Mbit/s
- Dual-tester concept with R&S®Multi-Evaluation List mode for speed and cost-optimized production

¹⁾ For R&S®CMW500 platform overview, see PD 5214.2833.12 and www.rohde-schwarz.com.



R&S®CMW270

Wireless

Connectivity Tester

Benefits and key features

Cost-saving all-in-one concept

- ▮ Configurable range of functions and standards replaces multiple-instrument test setups and saves space and money
- ▮ Synergies in product development cycle
- ▮ Error tracking from end user to production and development

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Ready for future requirements

- ▮ Modular design – easy expansion with additional hardware and software options
- ▮ Future-ready RF parameters
- ▮ Scalable RF resources
- ▮ Configurable baseband and signaling units

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IP application testing under fully controlled network conditions

- ▮ Simple setup and control under reproducible test conditions
- ▮ Maximized WiMAX™ data throughput and simultaneous in-depth analysis of MAC and PHY layers
- ▮ Multipath propagation for MIMO applications with minimal hardware expenditure in the lab
- ▮ Automated performance and sensitivity measurements for R&D and benchmarking

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Use in the development of Mobile WiMAX™ devices

- ▮ Mobile WiMAX™ base station emulator to verify network entry and functional performance under fully controlled network conditions
- ▮ Verification of RF parameters in signaling or non-signaling mode
- ▮ Message analyzer for realtime tracing, logging and examination of WiMAX™ air link

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High flexibility for production, quality assurance and service

- ▮ Signal analysis and signal generation for RF alignment and verification of Mobile WiMAX™ and non-cellular standards
- ▮ Increased test depth through optional Mobile WiMAX™ signaling
- ▮ Dedicated R&S®CMWrun sequencer software tool meets all needs for executing test sequences in R&D, quality assurance and production

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Significantly reduced test costs: RF alignment up to ten times faster

- ▮ Short measurement times due to innovative Rohde&Schwarz test concept: R&S®Smart Alignment and R&S®Multi-Evaluation List mode
- ▮ Dual-tester configuration for simultaneous testing of two wireless devices
- ▮ Automated alignment and verification of Mobile WiMAX™ and WLAN (Wi-Fi) chipsets
- ▮ Minimum operating costs due to state-of-the-art selftest concept

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Reduced operating costs

- ▮ Selectable calibration interval of either 12 or 24 months

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From pre-sale to service. At your doorstep.

- ▮ Worldwide network of Rohde&Schwarz experts in over 70 countries

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Cost-saving all-in-one concept

Configurable range of functions and standards replaces multiple-instrument test setups and saves space and money

The R&S®CMW270 architecture combines Mobile WiMAX™ signaling, multitechnology signal analyzers, generators and RF power meters in a single instrument. The tester's scalability enables users to optimize the R&S®CMW270 for their specific test applications in R&D, production or service. The all-in-one architecture ensures maximum test performance combined with minimum footprint and optimum power consumption.

Multiple technologies

- WiMAX™
- WLAN
- Bluetooth®
- FM Stereo
- GPS
- Broadcast technologies

All functions can be controlled locally via the easy-to-operate graphical user interface (GUI) or remotely via LAN or GPIB using SCPI. The R&S®CMW270 is a turnkey solution that allows users to start testing immediately after delivery. This saves valuable learning time and reduces training costs.

Synergies in product development cycle

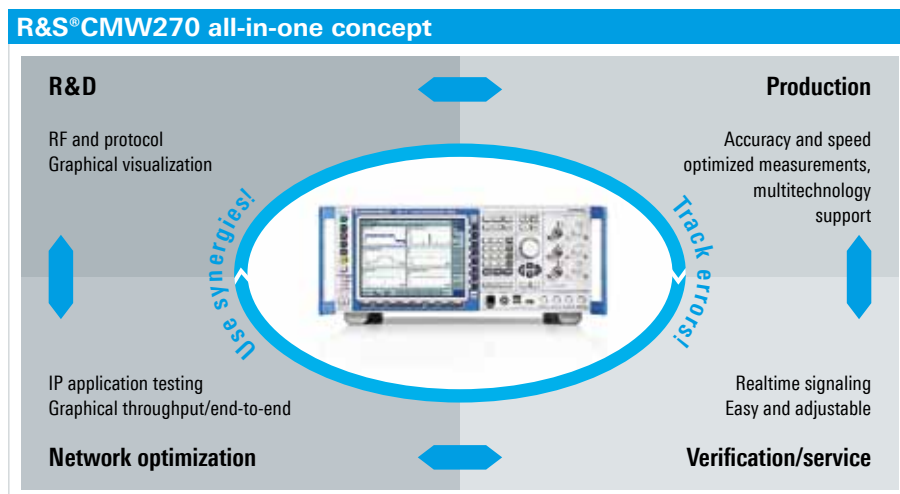
The continuously growing complexity of the products to be developed and ever faster time-to-market demands require optimal utilization of synergies between R&D and production. The R&S®CMW270 offers precisely these synergy effects which speed up product launches, allow resources to be used more efficiently and reduce costs.

The combination of RF measurement and MAC layer analysis functionalities in conjunction with a Mobile WiMAX™ base station emulator in a single instrument makes it possible to create an initial prototype in development efficiently and economically. Developmental approaches can be directly implemented in production. Due to the instrument's modular structure, the functional range of the R&S®CMW270 can be tailored from high-speed measurements in production to detailed error analyses in development, which saves costs.

Optionally, the R&S®CMW270 can be configured as a dual tester. This configuration provides dual test resources so that two wireless devices can be tested simultaneously, which doubles the output of the production line.

Error tracking from end user to production and development

The consistent concept also proves its value in service and quality assurance. Hardware and design errors can be easily detected across layer boundaries using the R&S®CMW270 measurement and analysis functions. Together with the R&S®CMWrun sequencer software tool, the R&S®CMW270 meets all needs for executing test sequences in quality assurance. Automated measurement reports in line with international quality standards allow easy error tracking.



Ready for future requirements

Modular design – easy expansion with additional hardware and software options

The extremely high scalability, test speed, and measurement accuracy of the R&S®CMW270 translate into minimum test costs.

Future-ready RF parameters

Two independent transmit and receive paths in the frequency range up to 6 GHz and a transmit bandwidth of 80 MHz/receive bandwidth of 40 MHz make the R&S®CMW270 perfect for today's and tomorrow's requirements. A high output dynamic range of 128 dB and sensitive inputs reduce the need for external amplifiers or attenuators.

Scalable RF resources

Depending on the application, one or two RF paths consisting of an RF converter and a frontend are used. The frontend enables the direct connection of wireless devices with complex RF architecture.

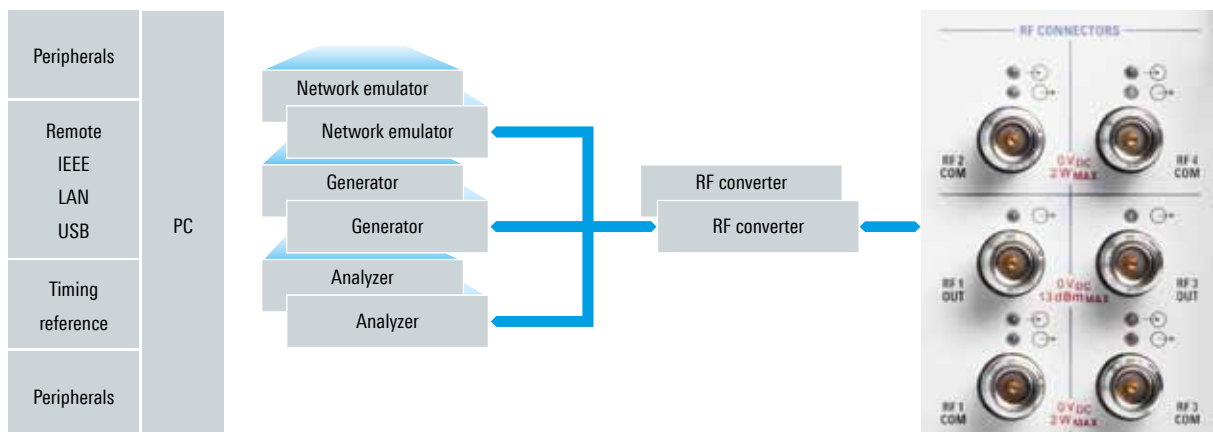
The R&S®CMW270 is therefore fit for the following tests:

- Tests of MIMO-capable DUTs
- Parallel test of two DUTs using the same or different wireless technology
- Parallel test of two technologies in one DUT

Configurable baseband and signaling units

A maximum of two analyzer modules combined with ARB baseband generators are used in the non-signaling mode. In addition, multiple signaling units can be integrated to provide the network emulation for signaling.

Block diagram of the R&S®CMW270



IP application testing under fully controlled network conditions

Mobile WiMAX™ in line with IEEE 802.16 enables wireless Internet access at high data rates. Network operators and end users alike require maximum data throughput for typical IP-based applications such as the following:

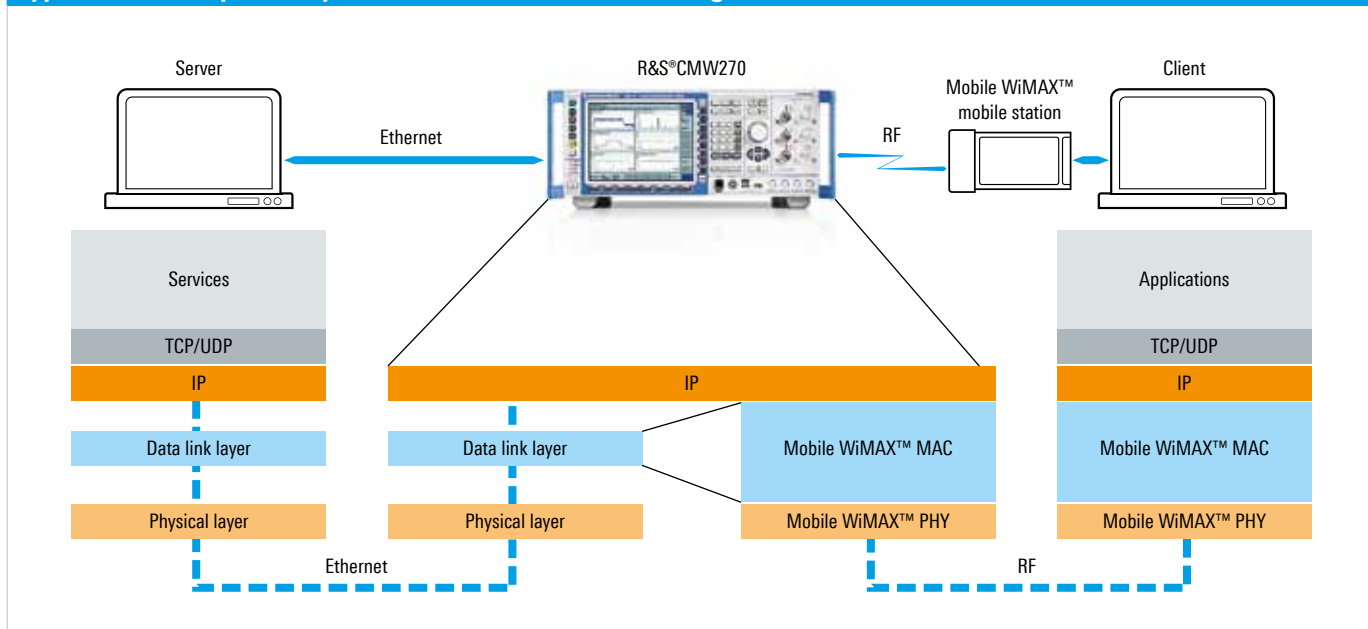
- ▀ Web browsing
- ▀ Video streaming
- ▀ FTP file transfer
- ▀ Performance tests
- ▀ VoIP

The R&S®CMW270 provides an easy-to-configure and reliable solution for IP application testing.

Simple setup and control under reproducible test conditions

A typical test setup consists of a network server that processes and sends IP data of wireless broadband applications via Ethernet to the R&S®CMW270, which is equipped with the R&S®CMW-KA700 application enabler as well as the R&S®CMW-B660 and R&S®CMW-B661 options. The tester operates as a configurable WiMAX™ base station emulator and transmits the data packages over the air interface to the DUT. The client running on the DUT decodes and displays the received data streams. The capability to modify PHY and MAC layer parameters and to generate test cases that simulate a realistic Mobile WiMAX™ network makes it faster and easier to detect and locate the source of a performance limitation.

Typical test setup and layer model for end-to-end testing of Mobile WiMAX™ mobile stations

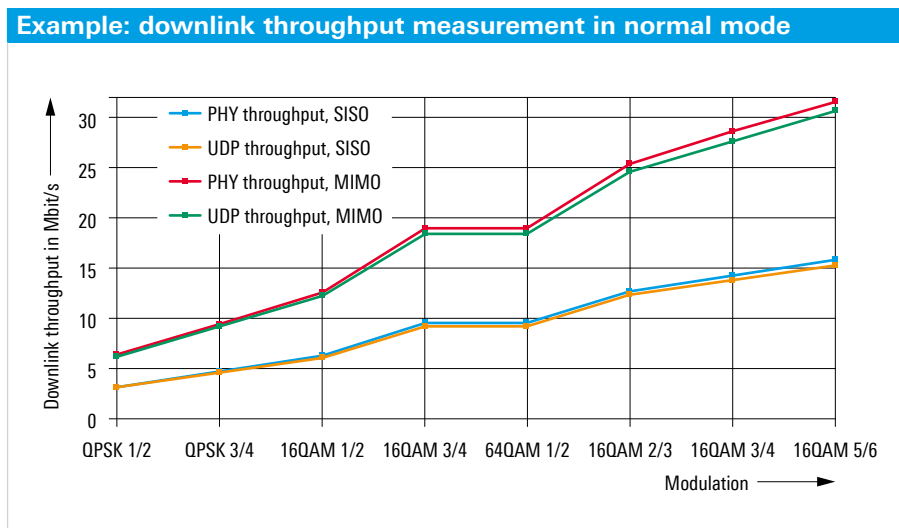


Maximized WiMAX™ data throughput and simultaneous in-depth analysis of MAC and PHY layers

By using the R&S®CMW270, engineers can optimize the performance of their mobile station designs. The achievable data rate is basically determined by the capacity of the interfaces involved. To discover possible throughput limitations, communications data handling between the base station and the mobile station must be carefully evaluated. Only application-based testing allows the full functionality of a mobile station to be verified.

The test equipment must measure the real data throughput of the device under test (DUT). In this process, the test equipment must not itself limit the measurable data throughput. The R&S®CMW270 is the ideal solution for extended end-to-end (E2E) performance tests and enables throughput measurements up to the physical limit with SISO and MIMO configurations. It combines extensive E2E tests with simultaneous in-depth analysis of MAC and PHY layers. Significant RF parameters, including EVM and spectral flatness, are measured in parallel, saving time and resources.

By utilizing the repeated broadcast information overhead, an optimized mode can be selected in order to determine the maximum IP downlink performance of a DUT. Thus, the UDP downlink throughput can even be increased above 36 Mbit/s on a common Mobile WiMAX™ channel (10 MHz bandwidth, 35:12 DL/UL ratio, MIMO matrix B).



Multipath propagation for MIMO applications with minimal hardware expenditure in the lab

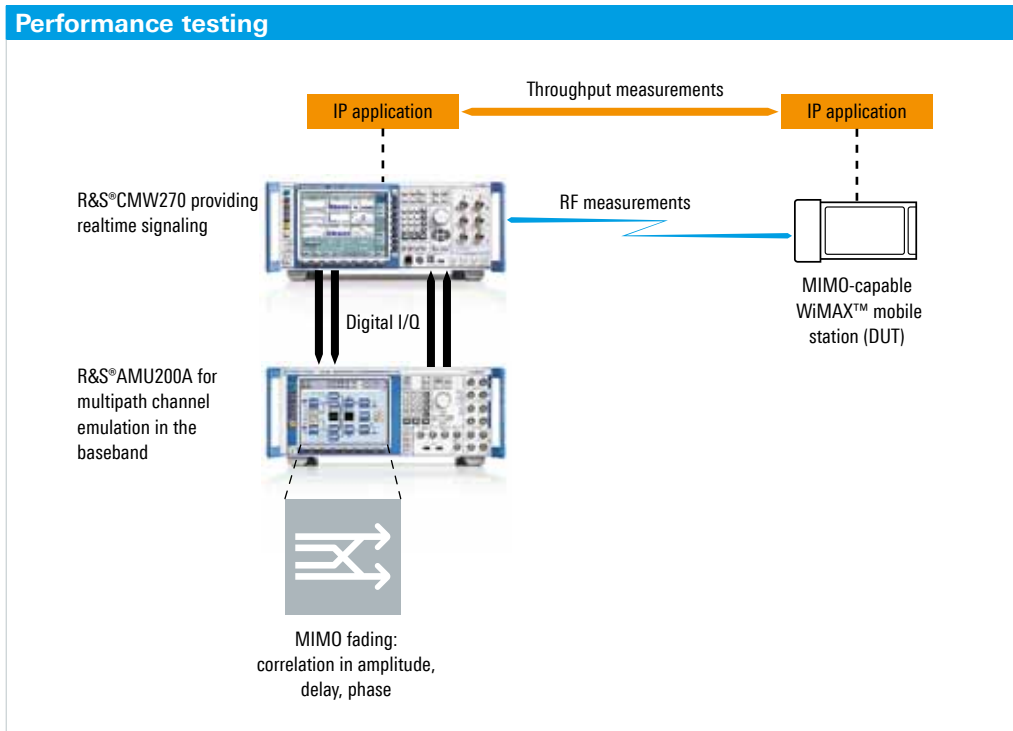
MIMO in particular requires the testing of mobile stations under real-world multipath propagation conditions to exploit its full benefits. The achievable data throughput is an important criterion for network operators selecting end-user equipment.

Moreover, communications data handling between the base station and the mobile station must be carefully evaluated to discover possible throughput limitations. Effects resulting from channel fading have significant impact on the overall performance of the system.

To perform test cases under lab conditions, a cost-intensive test setup using a base station in combination with an RF fader would be required. The servicing, programming and configuration of a base station is especially complex for use in R&D applications and results in significant expenses for the engineers.

The combination of an R&S®CMW270 and an R&S®AMU200A simplifies receiver performance testing under fading conditions. This powerful, convenient and cost-effective two-box solution represents a lab-based alternative to cost-intensive field measurements and complicated RF-faded lab setups. Equipped with additive white Gaussian noise (AWGN) and realtime fading options, the test setup offers a full range of fading profiles and noise levels to reliably simulate real-world transmission conditions for receiver performance testing of MIMO-capable mobile stations. The ability to adjust the parameters of WiMAX™ MIMO configurations to the user's individual needs provides maximum flexibility. This includes matrix A or matrix B operation.

Furthermore, the Rohde&Schwarz test instruments are connected via the digital I/Q interface. This avoids power calibration of multiple RF paths, which would be required in a setup consisting of a real base station and an RF fading module.



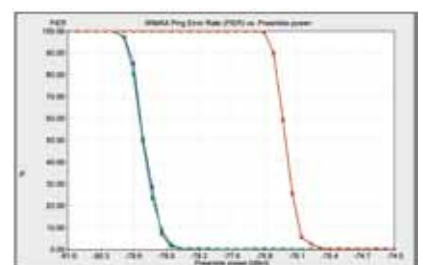
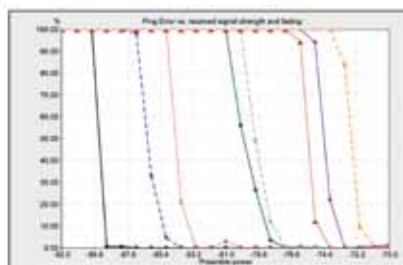
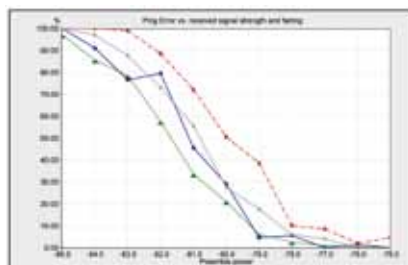
Automated performance and sensitivity measurements for R&D and benchmarking

The evaluation of IP performance as well as sensitivity measurements taking into account all transmission-relevant channel and signaling parameters requires a significant test effort in terms of time and technology. The R&S®CMWrun-based R&S®CMW-KT100 option automates the measurements, which last several hours, and significantly simplifies the test configuration by including the R&S®AMU200, controlling the IP data stream and preconfiguring the setting parameters.

The following measurements can be automated:

- Throughput measurements under fading conditions
 - Verification of spatial multiplexing
 - Maximum throughput measurement via connection-less protocol
 - As a function of modulation and coding scheme (MCS)
 - As a function of receive level
 - UDP throughput
- Sensitivity measurements under fading conditions
 - Measurement of actual sensitivity
 - Verification of space-time block coding method (transmit diversity)
 - Measurement of actual sensitivity at IP level using ICMP echo request packets (ping error rate)
 - As a function of MCS
 - As a function of receive level

Typical graphical results and measurement reports of R&S®CMW-KT100



Measurement Report	
Support Info:	CMWrun-based R&S®CMW-KT100
Test Plan:	...
Test Case:	...
Test Setup:	...
Test Results:	...
Summary:	...

Test Item	Unit	Value	Unit	Value	Unit	Value
Received Signal Strength	dBm	-75.0	dBm	-75.0	dBm	-75.0
Received Signal Strength	dBm	-75.0	dBm	-75.0	dBm	-75.0
Received Signal Strength	dBm	-75.0	dBm	-75.0	dBm	-75.0
Received Signal Strength	dBm	-75.0	dBm	-75.0	dBm	-75.0
Received Signal Strength	dBm	-75.0	dBm	-75.0	dBm	-75.0

Use in the development of Mobile WiMAX™ devices

Mobile WiMAX™ base station emulator to verify network entry and functional performance under fully controlled network conditions

The Mobile WiMAX™ base station emulator integrated in the R&S®CMW270 allows the full functionality of a mobile station to be tested as if operated in a real network. It offers the following benefits:

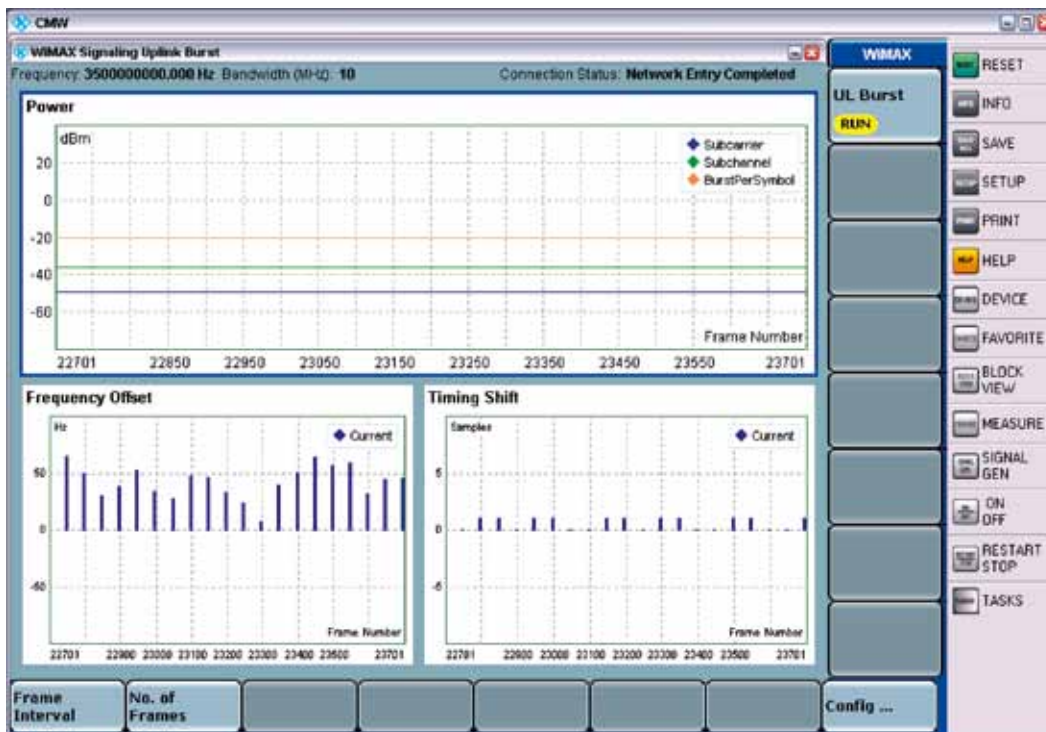
- Easy-to-handle control interface
- Complete control over RF settings, burst configuration, modulation and coding
- On-the-fly changes
- Automatable

The R&S®CMW-KS701 option provides extended SISO R&D features (second PUSC, FUSC, AMC, CQICH) allowing the WiMAX™ network to be optimized in terms of system capacity and throughput.

The combination of the R&S®CMW-KS700 and R&S®CMW-KS701 options provides the following test functions:

- Uplink burst measurements to determine timing shift, frequency offset and power
- Test of synchronization, initial ranging, registration and connection setup

Uplink burst measurements offer the unique possibility to continuously track the characteristics of relevant physical parameters in realtime. Handover, ranging and power-control scenarios can thus be evaluated in real-life operation for the first time. In the past, this could only be done partially, even when using complex setups.



- ▮ Readout of MAC layer-related information received from the DUT
- ▮ Packet error rate (PER) tests after connection, with a configurable data stream transmitted in the downlink with different modulation modes and coding rates
- ▮ Mobile station power control tests in open and closed loop mode
- ▮ Channel quality tests using the channel quality information channel (CQICH)
- ▮ Analysis of channel reports received from the DUT
- ▮ Logging and analysis of WiMAX™ traffic parameters

The R&S®CMW-KS702 option of the R&S®CMW270 enables the second signaling channel for testing MIMO (2x2) applications and automatically activates the space-time coding matrix A and spatial multiplexing matrix B downlink channel configurations and collaborative uplink MIMO for additional traffic burst transmission.

Verification of RF parameters in signaling or non-signaling mode

The R&S®CMW-KM701 option provides detailed graphical views for gaining insight into the properties of the measured signal and thus extends the scalar results of the R&S®CMW-KM700 WiMAX™ Multi-Evaluation measurement for R&D applications.

Further helpful tools are:

- ▮ Measure on exception
- ▮ Stop on limit fail
- ▮ Markers
- ▮ Automatic adoption of signaling parameters

The measurements can be performed in non-signaling mode with any desired WiMAX™ uplink or downlink signal. Plus, the “combined signal path” scenario allows RF measurements with signaling provided by the base station emulator to analyze the RF performance of a Mobile WiMAX™ station in real-life operation. All results are correlated, since they are generated from the same sampled data. The R&S®CMW-KM701 option is the ideal extension for all manually controlled measurement tasks as well as for common benchtop applications in R&D.

R&S®Multi-Evaluation: WiMAX™ TX measurements.



Message analyzer for realtime tracing, logging and examination of WiMAX™ air link

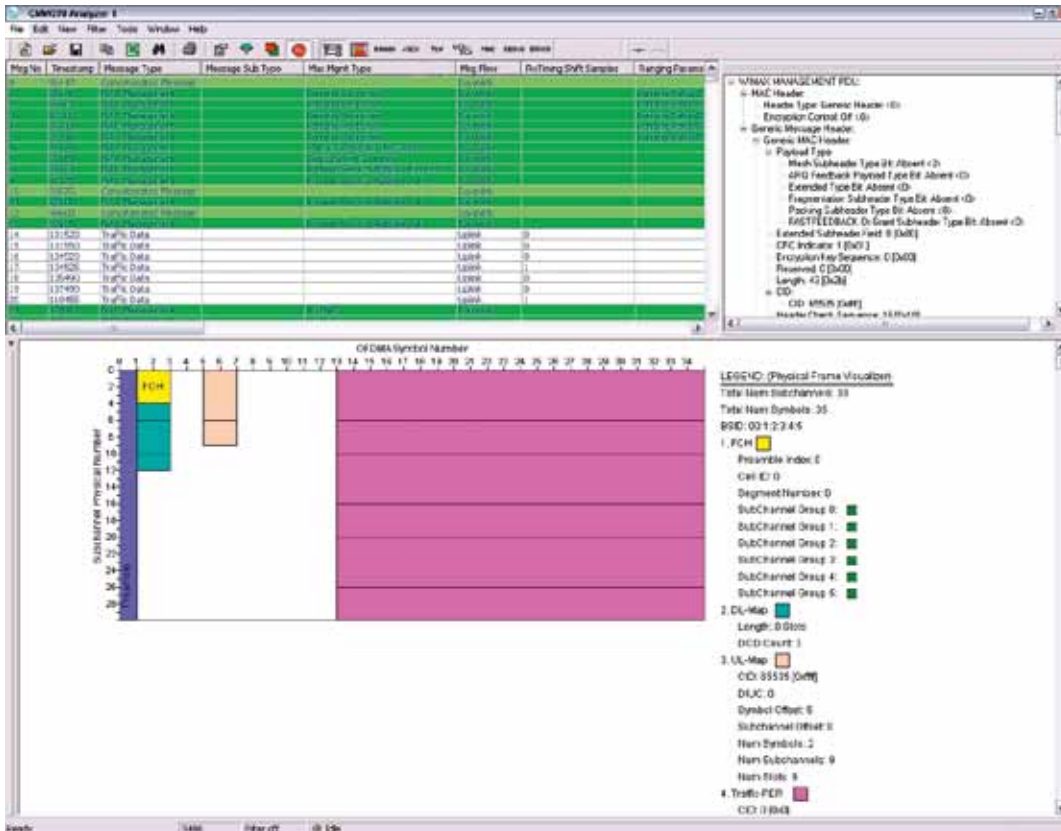
Extensive realtime analysis of the Mobile WiMAX™ MAC layer is possible online with the R&S®CMW-KT700 message analyzer option. At the click of a button, this option allows the analysis of the recorded WiMAX™ communications in parallel with PHY layer and IP applications.

The user benefits from simultaneous recording and analysis in textual form or down to bit level. In addition to the message logger's tabular display of the MAC messages, the message analyzer provides the following customized views:

- Message decoder window
- ASCII and binary view
- Visualization of downlink and uplink subframe structures in downlink and uplink map messages
- DCD/UCD decoder

Report generation and postprocessing of the evaluation results are possible due to a logging mechanism for all data displayed in a message log file.

R&S®CMW-KT700 message analyzer option with customized views.



High flexibility for production, quality assurance and service

Signal analysis and signal generation for RF alignment and verification of Mobile WiMAX™ and non-cellular standards

The R&S®CMW270 generates and measures all uplink and downlink parameters essential for WiMAX™ mobile station, femto cell and WiMAX™ base station production lines. The R&S®CMW270 allows users to implement the concept of a lean production line from start to finish: A single measuring instrument covers all RF test requirements.

Analyzer

- ▀ Flexible RF power meter with List mode for fast calibration of TX power steps (basic function)
- ▀ Vector signal analyzer with WiMAX™ measurement personality (R&S®CMW-KM700) for analyzing downlink and uplink bursts of Mobile WiMAX™ devices
- ▀ Vector signal analyzer providing TX verification for additional non-cellular standards, e.g. WLAN and Bluetooth®

Generator

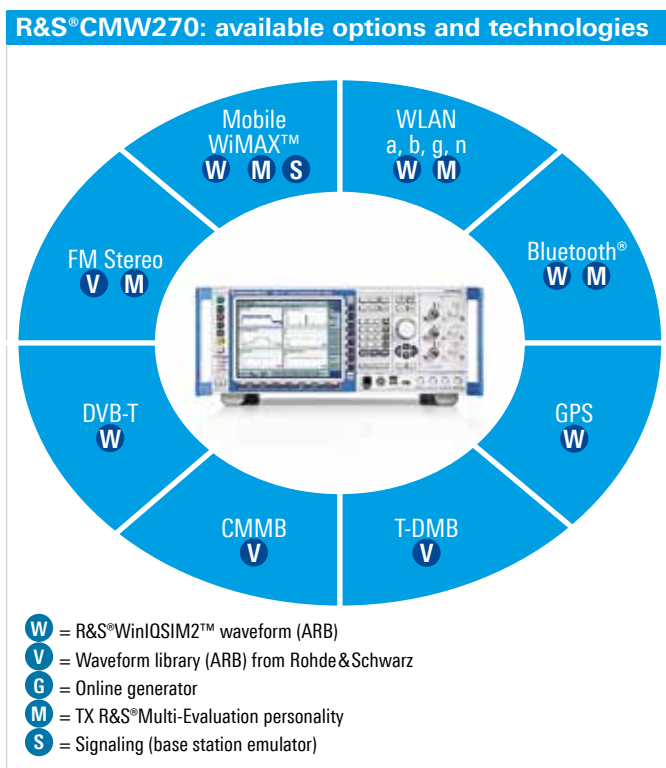
- ▀ CW generator with List mode for fast RX calibration (basic function)
- ▀ Vector signal generator based on ARB + realtime baseband generator board (R&S®CMW-B110A option)
- ▀ ARB mode: modulation using precalculated waveforms stored in the ARB memory
- ▀ R&S®WinIQSIM2 waveform creation tool supporting different technologies (e.g. R&S®CMW-KW700 option for WiMAX™), alternatively user-specific waveforms created with MATLAB® for example

Multiple technologies

- ▀ WiMAX™
- ▀ WLAN
- ▀ Bluetooth®
- ▀ FM Stereo
- ▀ GPS
- ▀ Broadcast technologies

By integrating multiple technologies into a single test instrument, the R&S®CMW270 keeps pace with the trend toward integrated wireless communications solutions in laptops, netbooks, smart phones and game consoles. Especially in production and service, this approach

- ▀ significantly reduces handling effort
- ▀ minimizes risk of damage resulting from multiple adaptations
- ▀ simplifies adaptation to fluctuating production needs
- ▀ minimizes investments for test equipment



Increased test depth through optional Mobile WiMAX™ signaling

To check the correct functioning of a Mobile WiMAX™ mobile station at the end of the production line, it is advisable to verify the full functionality of the mobile station under real-world application conditions. To do so, the R&S®CMW270 provides a basic signaling functionality. Equipped with the R&S®CMW-KS700 option, it offers an easy-to-configure and reliable alternative to real base stations or golden devices, which require complicated configuration or complex calibration of the radio section in order to maintain signal quality. The R&S®CMW-KS700 option includes a message logger for recording WiMAX™ traffic parameters, and monitors and records communications during the network entry process. Traceability requirements in line with international standards such as ISO 9001 can be easily met with the R&S®CMW270.

Realtime signaling allows users to test the full functionality of a mobile station as if used in a real Mobile WiMAX™ network, e.g. synchronization, ranging and registration. In parallel, the RF parameters of the WiMAX™ mobile station in the physical layer (PHY) and the protocol functions in the MAC layer can be verified under realistic conditions.

Automated test setup: R&S®CMW270 with R&S®CMW-KS700 option controlled by the R&S®CMWrun sequencer software tool.



Significantly reduced test costs: RF alignment up to ten times faster

Ongoing technological innovation and the ever-rising number of frequency bands that must be supported increase the complexity of state-of-the-art wireless devices. The test effort multiplies, and production costs rise. For these reasons, finding new, time-saving alignment approaches is essential. Rohde&Schwarz offers a significant reduction in test times compared to conventional methods by means of the R&S®Multi-Evaluation TX measurements and the R&S®Smart Alignment concept. The R&S®CMW270 all-in-one architecture with built-in analyzer and generator provides the fastest possible transmit-receive interaction and is the optimum solution for time-critical tests in production.

Short measurement times due to innovative Rohde & Schwarz test concept: R&S®Smart Alignment and R&S®Multi-Evaluation List mode

The R&S®CMW270 measures all TX and RX parameters essential for producing Mobile WiMAX™ mobile stations. To reduce test time, the R&S®CMW-KM700 software option enables the simultaneous analysis of a wide range of TX measurements by using the R&S®Multi-Evaluation concept. Different evaluations (power, modulation quality, spectrum, etc.) are related to an identical set of sampled data. This approach not only increases the test speed in comparison with purely sequential data capturing and evaluation but also ensures greater test depth. This results in a more detailed and coherent overview of the transmitter functions, since all measured parameters are correlated.

Preconfigured identical test sequences in the DUT and in the tester minimize the volume of communications inside the test system, which is the bottleneck in conventional approaches.

The R&S®Smart Alignment concept provides the following benefits:

- Fully automatic frequency and level switching with general-purpose RF generator and power meter in List mode
- R&S®Multi-Evaluation List mode for fast transmitter verification
- Simultaneous transmitter and receiver alignment, if supported by the DUT
- Extensive trigger functions for analyzer and generator
- Statistical evaluation included

This enables comparable testing and speeds up mass production.

Dual-tester configuration for simultaneous testing of two wireless devices

The R&S®CMW270 can optionally be configured as a dual tester. This configuration provides dual test resources so that two devices can be tested simultaneously. This approach saves valuable floor space in the production hall. The high test speed achieved by the R&S®Multi-Evaluation List mode, the support of parallel tests and the high measurement accuracy of the R&S®CMW270 considerably increase throughput in production and result in higher quality of the final products.

Automated alignment and verification of Mobile WiMAX™ and WLAN (Wi-Fi) chipsets

Rohde&Schwarz provides software for the automated alignment and verification of Mobile WiMAX™ and WLAN (Wi-Fi) chipsets for applications in production and service. The software combines instrument and DUT control as well as report generation and is easily integrated into the production environment for faster time to market. It includes quick and easy-to-use test cases in line with the specifications of the chipset vendors. Rohde&Schwarz collaborates with leading chipset manufacturers in order to provide speed-optimized and efficient solutions tailored to the individual chipsets.

Due to its all-in-one concept, the R&S®CMW270 wireless connectivity tester supports not only Mobile WiMAX™ and WLAN (Wi-Fi), but also the most important non-cellular technologies such as GPS, FM Stereo and Bluetooth®. This concept significantly reduces equipment costs and handling times during the production of multitechnology devices.

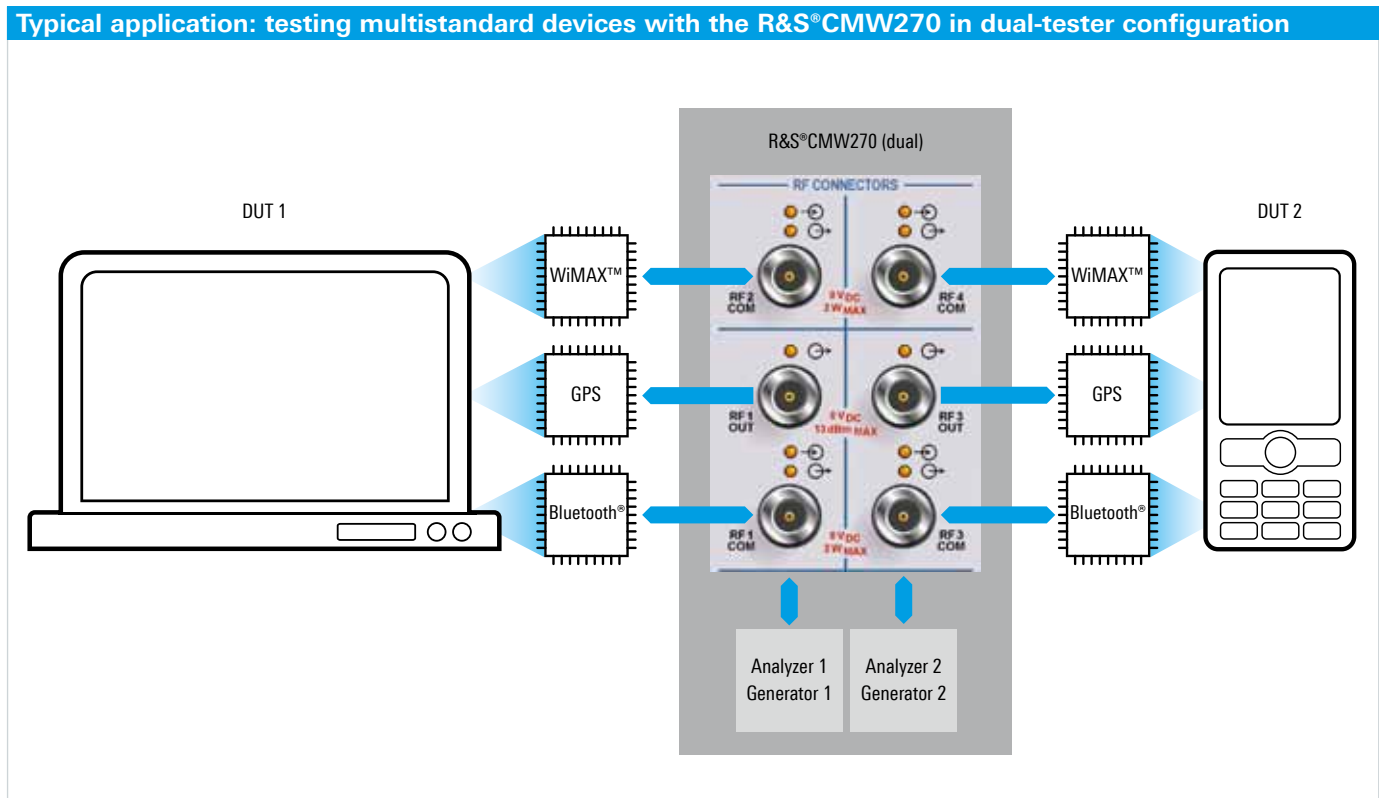
Benefits

- Fast, accurate and repeatable alignment and verification of multistandard devices
- Quick and easy adaptation to customer requirements
- Faster time to market and shorter production ramp-up
- One single platform for testing multitechnology devices
- Faster production due to reduced handling times and speed-optimized measurements

Minimum operating costs due to state-of-the-art selftest concept

The R&S®CMW270 offers extensive selftests at the system and module level to ensure that the communications between internal modules are not interrupted and that hardware modules work properly. Selftests are primarily intended for service purposes and are not needed during normal operation. Examples: voltage diagnostic test, memory test, address line test, download test, EEPROM test.

The user can determine the status of the R&S®CMW270 without having to disassemble the tester. The ability to directly locate errors in the case of increased DUT failure rates reduces the downtime of the production system.



Reduced operating costs

Selectable calibration interval of either 12 or 24 months

Users can optimize costs to achieve high absolute accuracy or minimum test and measurement operating costs.

R&S®CMW270 RF level uncertainty

12-month calibration interval:

- Analyzer < 0.50 dB
- Generator < 0.60 dB

24-month calibration interval:

- Analyzer < 0.70 dB
- Generator < 0.80 dB

R&S®UCS universal calibration system.



From pre-sale to service. At your doorstep.

Worldwide network of Rohde & Schwarz experts in over 70 countries

The Rohde & Schwarz network in over 70 countries ensures optimum on-site support by highly qualified experts. User risks are reduced to a minimum at all stages of a project:

- Solution finding/purchase
- Technical start-up/application development/integration
- Training
- Operation/calibration/repair



R&S®CMW-KM700 measurement personality

- | Burst power
- | Time mask
- | Crest factor
- | Subcarrier power
- | Center frequency error
- | Error vector magnitude (unmodulated)
- | I/Q offset/imbalance
- | Gain imbalance
- | Quadrature error
- | Sample clock error
- | Spectral flatness (neighbor)
- | Occupied bandwidth
- | Adjacent channel power
- | Spectrum emission mask

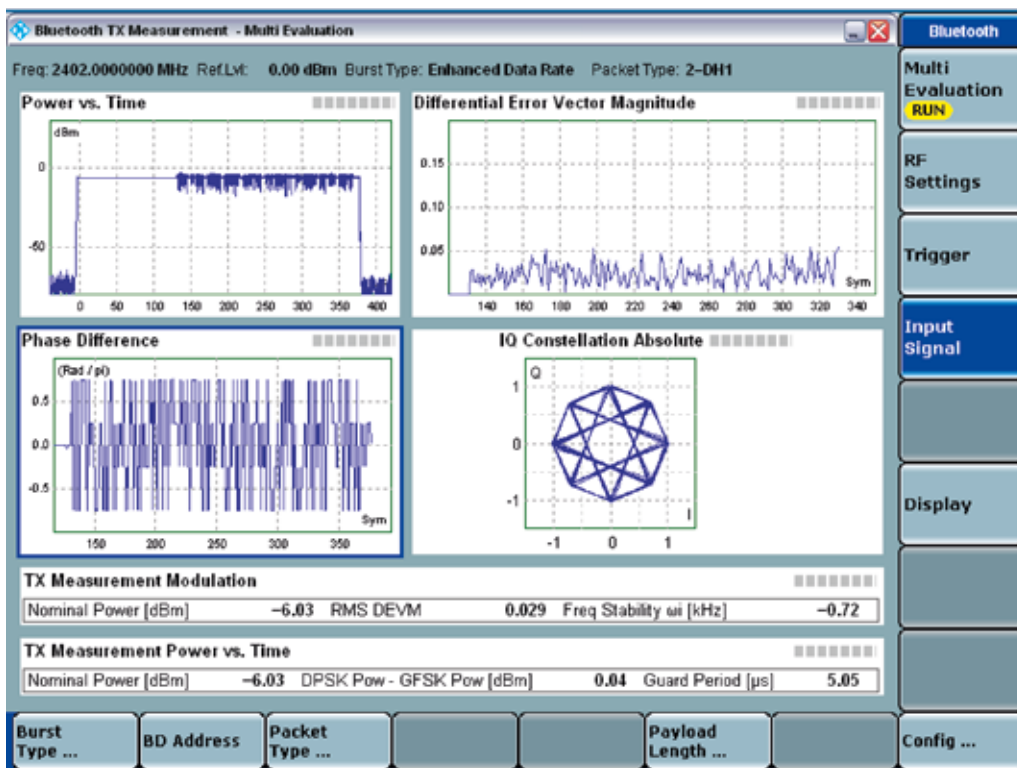


Mobile WiMAX™ TX measurement
– R&S®Multi-Evaluation.

Bluetooth®

R&S®CMW-KM610 measurement personality

- Nominal power
- Frequency accuracy (basic rate)
- Frequency drift (basic rate)
- Frequency deviation (basic rate)
- Frequency stability ω_i (enhanced data rate)
- Frequency stability $\omega_{0\max}$ (enhanced data rate)
- Delta error vector magnitude (enhanced data rate)



Bluetooth® TX measurement
– R&S®Multi-Evaluation.

IEEE 802.11a/b/g (WLAN)

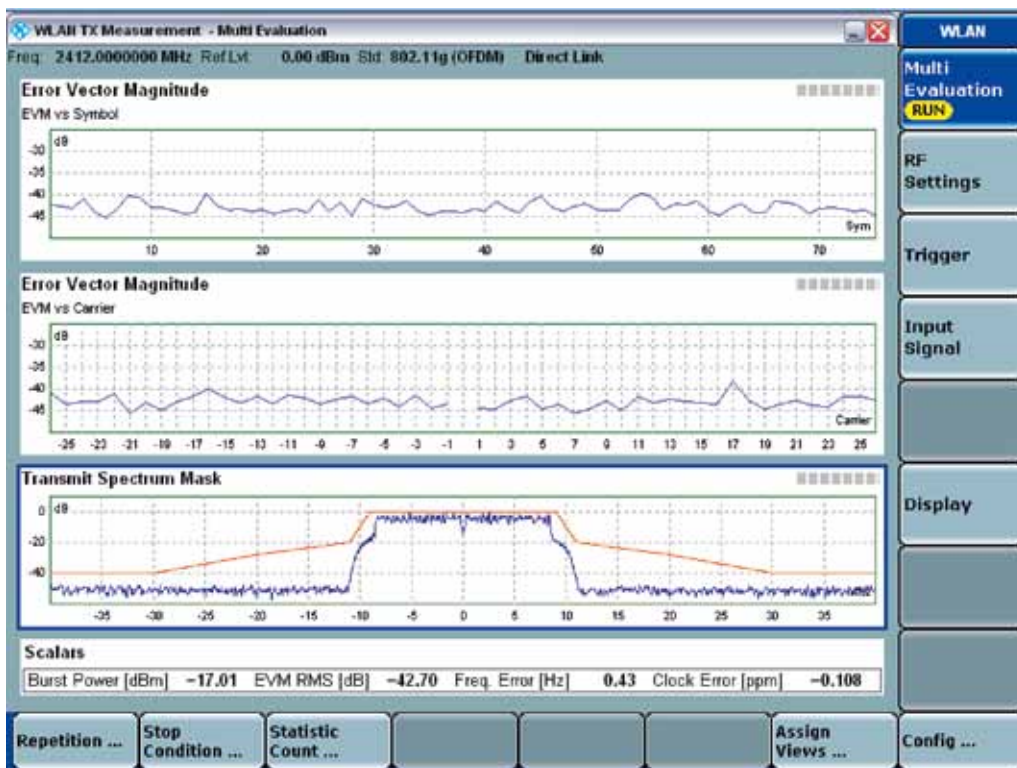
R&S®CMW-KM650 measurement personality

- ▮ Burst power
- ▮ Error vector magnitude (IEEE 802.11b/g DSSS analysis mode)
- ▮ Error vector magnitude (IEEE 802.11a/g OFDM analysis mode)
- ▮ Center frequency error
- ▮ Chip clock error (IEEE 802.11b/g DSSS analysis mode)
- ▮ Symbol clock error (IEEE 802.11a/g OFDM analysis mode)

IEEE 802.11n extension

R&S®CMW-KM651 measurement personality

- ▮ Burst power
- ▮ Error vector magnitude
- ▮ Center frequency error
- ▮ Symbol clock error
- ▮ I/Q errors



WLAN TX measurement
– R&S®Multi-Evaluation.

FM Stereo

R&S®CMW-KM645 measurement personality

- ▮ RF carrier power
- ▮ Center frequency error
- ▮ Multiplex deviation
- ▮ Pilot deviation
- ▮ Pilot frequency error
- ▮ Audio left/right deviation
- ▮ THD
- ▮ THD+N
- ▮ SINAD
- ▮ SNR

The screenshot displays the 'FM Stereo Radio Measurement - Multi Evaluation' window. The main display area is divided into three sections: RF Carrier Results, RF Modulation Results, and AF Modulation Results. The RF Carrier Results section shows Carrier Power at -10.64 dBm and Carrier Freq. Error at -0.01 Hz. The RF Modulation Results section shows Pilot Deviation at 6.75 kHz, Audio Left Deviation at 67.81 kHz, Audio Right Deviation at 67.91 kHz, and Pilot Frequency Error at 0.00 Hz. The AF Modulation Results section shows Signal Quality, THD, THD+N, SINAD, and SNR for both Left and Right channels at 1000 Hz. The interface includes a 'RUN' button, 'RF Settings', 'Display', and 'Config...' buttons. At the bottom, there are buttons for 'Repetition ...', 'Stop Condition ...', 'Statistic Count ...', 'Assign Views ...', and 'Config...'.

RF Carrier Results (Cur.)	
Carrier Power	-10.64 dBm
Carrier Freq. Error	-0.01 Hz
Multiplex Deviation, ± Peak / 2	73.87 kHz
Multiplex Deviation, + Peak	73.90 kHz
Multiplex Deviation, - Peak	-73.84 kHz
Multiplex Deviation, RMS	47.97 kHz

RF Modulation Results (Cur.)	
Pilot Deviation, RMS * SQRT2	6.75 kHz
Audio Left Deviation, ± Peak / 2	67.81 kHz
Audio Right Deviation, ± Peak / 2	67.91 kHz
Pilot Frequency Error	0.00 Hz

AF Modulation Results (Cur.)		
Signal Quality	Left @ 1000 Hz	Right @ 1000 Hz
THD [%]	0.015	0.017
THD [dB]	-76.33	-75.58
THD + N [%]	0.266	0.266
SINAD [dB]	51.51	51.49
SNR [dB]	51.52	51.50

FM Stereo measurements
– R&S®Multi-Evaluation.

Specifications in brief

Specifications in brief		
Frequency		
Frequency range	R&S®CMW270	70 MHz to 6 GHz
Max. frequency drift	R&S®CMW270 base unit	$\pm 1 \times 10^{-6}$
	with R&S®CMW-B690A option (OCXO extension)	$\pm 5 \times 10^{-9}$
	with R&S®CMW-B690B option (highly stable OCXO extension)	$\pm 5 \times 10^{-9}$
RF generator		
RF output level range	continuous wave (CW) RF1 OUT, WiMAX™ band 1	-130 dBm to +8 dBm
Output level uncertainty	in temperature range +20°C to +35°C, no overranging, output level > -120 dBm	< 0.6 dB (12-month calibration interval) < 0.8 dB (24-month calibration interval)
IF bandwidth		70 MHz
RF analyzer		
RF input level range	continuous power (CW) RF1 COM, RF2 COM	-84 dBm to +34 dBm
Level uncertainty	in temperature range +20°C to +35°C	< 0.5 dB (calibration interval 1 year) < 0.7 dB (calibration interval 2 years)
IF bandwidth		40 MHz
Arbitrary waveform generator (with R&S®CMW-B110A option)		
Arbitrary waveform files	maximum sample length	256 Msample
Sample rate	maximum	100 MHz
Memory size		min. 1 Gbyte
Mobile WiMAX™ parameters		
Digital standard		IEEE 802.16e
Physical layer mode		OFDMA, TDD
Bandwidth		3.5 MHz, 5 MHz, 7 MHz, 8.75 MHz, 10 MHz
Frame duration		5 ms
FFT size		512, 1024
Modulation modes and coding rates		BPSK, QPSK 1/2, QPSK 3/4, 16QAM 1/2, 16QAM 3/4, 64QAM 1/2, 64QAM 2/3, 64QAM 3/4, 64QAM 5/6
MAC support		IEEE 802.16e, base station emulation
General data		
Dimensions	W × H × D	465.1 mm × 197.3 mm × 517.0 mm (18.31 in × 7.77 in × 20.35 in) (19" 1/1, 4 HU, 450)
Weight	with typical options	approx. 18 kg (approx. 39.68 lb)
Interfaces		LAN 1 × 100 Mbit/s 1 × 1000 Mbit/s
	with R&S®CMW-B612A option	IEEE 488.2
		4 × USB 2.0 1 × USB 1.1
	for external monitor	DVI-D

Glossary

Term	Explanation
ACLR	Adjacent channel leakage ratio
ACP	Adjacent channel power
Alignment	Calibration of wireless devices in production
All-in-one architecture	Complete, highly integrated compact solution with assured measurement accuracy and optimum handling
ARB	Arbitrary waveform generator functionality
ARB generator mode	Baseband generator mode where the modulation is implemented by means of precalculated waveforms stored in the ARB memory
ARB + realtime baseband generator module	Generator module that supports not only the classic ARB mode but also the generation of complex modulated signals in realtime
BB	Baseband
BER	Bit error ratio
Calibration	Wireless device production stage during which the transmit power steps and the RSSI steps are measured and compared to reference values. The correction factors obtained are stored in the wireless device. Other common designations: phasing, tuning, alignment
CW	Continuous wave
DSP	Digital signal processor
Dual-tester configuration	Device configuration including two analyzers and two generators for the simultaneous testing of two wireless devices
DUT	Device under test
DVI	Digital video interface
EMC	Electromagnetic compatibility
EVM	Error vector magnitude
GPRF	General-purpose radio frequency
GPRF List mode	Lists containing predefined levels and frequencies for GPRF generator/power meter test sequences
GUI	Graphical user interface
HW	Hardware
Loop BER test in non-signaling mode	Method for verifying the RX performance of a wireless device. The test is carried out in non-signaling mode. The measuring instrument sends a bit pattern to the DUT and compares the pattern returned by the DUT with the original bit pattern. The result of this comparison yields the bit error ratio
ME	Magnitude error
MMI	Man machine interface
OBW	Occupied bandwidth
Path correction	Method of increasing the measurement accuracy by taking into account the influence of frequency, temperature and level on the RF attenuation of the measurement path
PE	Phase error
PRBS	Pseudo random bit sequence
Press & Go	Turnkey, highly automated test functionality that is available at the press of a button
R&S®Multi-Evaluation	Transmitter measurement concept where different parameters of identical raw data are measured and evaluated
R&S®Smart Alignment	Alignment concept where predefined identical test sequences in the DUT and in the tester reduce the data volume in the test system and significantly shorten the test time
R&S®Multi-Evaluation List mode	R&S®Smart Alignment method; fast TX verification based on predefined test sequences
RF	Radio frequency
RMC	Reference measurement channel
RSSI	Receiver signal strength indication
RX	Receiver
SEM	Spectrum emission mask
Single-ended BER test	Modern approach to receiver verification where the stimulating signal is provided by the measuring instrument and the BER is calculated in the DUT
Single-tester configuration	Device configuration for testing a single wireless device
SW	Software
Verification	Wireless device production stage during which the most important transmit and receive parameters are checked after calibration
VSA	Vector signal analyzer
VSG	Vector signal generator

Ordering information

Designation	Type	Order No.
Base unit		
Wireless Connectivity Tester	R&S®CMW270	1201.0002K75
R&S®CMW270 Basic Assembly, mainframe, 70 MHz to 3.3 GHz	R&S®CMW-PS272	1202.9303.02
R&S®CMW270 Front Panel without Display/Keypad, H600C	R&S®CMW-S600C	1201.0102.04
R&S®CMW270 Front Panel with Display/Keypad, H600D	R&S®CMW-S600D	1201.0102.05
RF Frontend, basic functionality, H590A	R&S®CMW-S590A	1202.5108.02
Baseband Interconnection, fixed link, H550A	R&S®CMW-S550A	1202.4801.02
Baseband Interconnection, flexible link, H550B	R&S®CMW-S550B	1202.4801.03
Extended Frequency Range, 3.3 GHz to 6 GHz, per TRX	R&S®CMW-KB036	1203.0851.02
Hardware options		
Baseband Generator, H110A	R&S®CMW-B110A	1202.5508.02
Extra Baseband Measurement Unit, H100A	R&S®CMW-B100A	1202.8607.02
Signaling Unit Universal (SUU), H200A	R&S®CMW-B200A	1202.6104.02
WiMAX™ Signaling Module, H270A	R&S®CMW-B270A	1202.6504.02
OCCO, basic stability, H690A	R&S®CMW-B690A	1202.5908.02
OCCO, high stability, H690B	R&S®CMW-B690B	1202.6004.02
IEEE Bus Interface, single-port, H612A	R&S®CMW-B612A	1202.5608.02
IEEE Bus Interface, dual-port, H612B	R&S®CMW-B612B	1202.5708.02
Option Carrier, H660A	R&S®CMW-B660	1202.7000.02
Ethernet Switch, H661A	R&S®CMW-B661	1202.7100.02
Digital Video Interface (DVI), H620A	R&S®CMW-B620A	1202.5808.02
4 Digital I/Q Interfaces, ports 1 to 4, H510A	R&S®CMW-B510	1202.8007.02
Extra RF Converter (TRX), H570B	R&S®CMW-B570B	1202.8659.02
Extra RF Frontend, basic functionality, H590A	R&S®CMW-B590A	1202.8707.02
Software options		
WiMAX™ IEEE 802.16e, TX measurement	R&S®CMW-KM700	1202.6604.02
WiMAX™ IEEE 802.16e, advanced TX measurement	R&S®CMW-KM701	1202.6610.02
WiMAX™ IEEE 802.16e, basic signaling	R&S®CMW-KS700	1202.6704.02
WiMAX™ IEEE 802.16e, advanced signaling	R&S®CMW-KS701	1202.6710.02
WiMAX™ IEEE 802.16e, MIMO 2x2, generic signaling	R&S®CMW-KS702	1202.6640.02
WiMAX™ IEEE 802.16e, message analyzer, online	R&S®CMW-KT700	1202.6804.02
WiMAX™ IEEE 802.16e, enable R&S®WinIQSIM2™ waveforms for ARB	R&S®CMW-KW700	1203.1358.02
WiMAX™ IEEE 802.16e, enable IPv4 data interface	R&S®CMW-KA700	1202.6904.02
FFT Spectrum Analyzer	R&S®CMW-KM010	1203.5953.02
Enable R&S®WinIQSIM2™ Waveforms, additive white Gaussian noise (AWGN)	R&S®CMW-KW010	1204.9000.02
TX Measurement, I/Q versus slot	R&S®CMW-KM011	1203.0800.02
TX Measurement, R&S®Multi-Evaluation List mode (MELM)	R&S®CMW-KM012	1203.4457.02
WLAN IEEE 802.11a/b/g, TX measurement	R&S®CMW-KM650	1203.1658.02
WLAN IEEE 802.11n SISO, TX measurement	R&S®CMW-KM651	1203.9159.02
WLAN IEEE 802.11a/b/g, enable R&S®WinIQSIM2™ waveforms for ARB	R&S®CMW-KW650	1203.1258.02
WLAN IEEE 802.11n, enable R&S®WinIQSIM2™ waveforms for ARB	R&S®CMW-KW651	1203.9259.02
Bluetooth® BR/EDR, TX measurement	R&S®CMW-KM610	1203.6350.02
Bluetooth® BR EDR, enable R&S®WinIQSIM2™ waveforms for ARB	R&S®CMW-KW610	1203.6408.02
FM Stereo, TX measurement	R&S®CMW-KM645	1204.8804.02
Waveforms, FM Stereo	R&S®CMW-KV645	1204.8956.02
GPS, enable R&S®WinIQSIM2™ waveforms for ARB	R&S®CMW-KW620	1203.6008.02
DVB, enable R&S®WinIQSIM2™ waveforms for ARB	R&S®CMW-KW630	1203.6050.02

Designation	Type	Order No.
T-DMB, waveforms for ARB, video/audio content	R&S®CMW-KV634	1204.8004.02
MediaFLO™, waveforms for ARB, video/audio content	R&S®CMW-KV636	1204.8056.02
CMMB, waveforms for ARB, video/audio content	R&S®CMW-KV638	1204.8104.02
R&S®CMWrun sequencer software tool, optional		
R&S®CMWrun Sequencer Software Tool, general purpose	R&S®CMW-KT051	1203.4157.02
R&S®CMWrun Sequencer Software Tool, WiMAX™ IEEE 802.16e	R&S®CMW-KT057	1203.4205.02
R&S®CMWrun Sequencer Software Tool, IP performance measurements	R&S®CMW-KT100	1207.3355.02

PC-based R&S®CMW applications and tools

Designation	Type	Order No.
PC-Based R&S®CMW Applications	R&S®CMWPC	1201.0002K90
Mandatory		
USB Smart Card for PC-based R&S®CMW applications	R&S®CMW-S089A	1202.7900.02
Optional		
R&S®CMWrun Sequencer Software Tool, general purpose	R&S®CMW-KT051	1203.4157.02
R&S®CMWrun Sequencer Software Tool, WiMAX™ IEEE 802.16e	R&S®CMW-KT057	1203.4205.02
R&S®CMWrun Sequencer Software Tool, IP performance measurements	R&S®CMW-KT100	1207.3355.02
WiMAX™ IEEE 802.16e, message analyzer, offline	R&S®CMW-KT701	1202.6810.02

System requirements	
Processor	min. 1300 MHz (x86)
Memory	min. 256 Mbyte
HDD space	min. 80 Mbyte
Operating system	Windows XP, Service Pack 2, 32 bit
Software	Microsoft .net framework 2.0 or later

Note: Before ordering, the application has to be defined. For instrument-based licensing, the serial number of the R&S®CMW270 is required. For PC-based licensing, the serial number of the R&S®CMWPC smart card is required.

For data sheet, see PD 5213.8880.22 and www.rohde-schwarz.com.

For R&S®CMW500 platform overview, see PD 5214.2833.12 and www.rohde-schwarz.com.

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- | Continuous improvement in environmental sustainability
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Certified Quality System
ISO 9001

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