

R&S® TS8970

Mobile WiMAX™ RCT

RX/TX test system in line with WiMAX™ MRCT test specification



R&S®TS8970 Mobile WiMAX™ RCT

At a glance

The R&S®TS8970 is the reference tool of choice for the RF characterization of Mobile WiMAX™ products.

Many of the WiMAX Forum® Designated Certification Labs (WFDCL) successfully rely on the R&S®TS8970 in their certification work. The test system has also become a lab favorite in the pre-certification of products at manufacturers of WiMAX™ infrastructure and mobile stations. Owing to the complexity of the simulation of MIMO channels, the R&S®TS8970 is also frequently used in the WiMAX™ R&D lab.

The R&S®TS8970 enables users to test either a Mobile WiMAX™ base station (BS), a Mobile WiMAX™ mobile station (MS) or a combined system with BS/MS switch-over. The test cases offered reflect the current version of the WiMAX Forum® Mobile WiMAX™ Radio Conformance Test (MRCT) specification.

As test requirements and specifications get adapted, the latest versions of the test cases are provided online for the R&S®TS8970. After the first year, they are made available by concluding an optional maintenance contract.

The R&S®PASS user interface is already familiar to many test engineers because it is also implemented in the market-leading R&S®TS8950 certification system for GSM and WCDMA.

Key facts

- The R&S®TS8970 was developed in response to a request for proposals from the WiMAX Forum®
- Frequency range from 2 GHz to 6 GHz or optionally from 400 MHz to 6 GHz, prepared for future Mobile WiMAX™ profiles in the 700 MHz and 1.8 GHz band classes
- BS and MS test cases can be run using the same system
- Unsurpassed measurement accuracy and highly detailed result reports
- Minimization of downtime owing to two-year calibration interval ¹⁾ for the system and its components

¹⁾ Does not apply in ISO 17025-certified environments (one-year interval).



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R&S®TS8970 Mobile WiMAX™ RCT

Benefits and key features

Combining the features of market-leading products from Rohde & Schwarz

- ▮ R&S®AMU200A baseband signal generator and fading simulator
- ▮ R&S®SMU200A vector signal generator
- ▮ R&S®FSL spectrum analyzer
- ▮ R&S®FSQ vector signal analyzer
- ▮ R&S®NRP power meter
- ▮ R&S®PASS user interface
- ▮ R&S®TS-EX-IQ2 baseband digital combiner unit

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Future-ready concept

- ▮ Orthogonal frequency division multiplex access (OFDMA) methods
- ▮ Multi-antenna transmission and/or reception (MIMO technology)
- ▮ Upgradeable to cover 3GPP Long Term Evolution (LTE)

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From pre-sale to service. At your doorstep.

Worldwide network of local Rohde & Schwarz experts in over 70 countries:

- ▮ System support worldwide
- ▮ Hotline service
- ▮ Repair service
- ▮ Software service
- ▮ Report database
- ▮ Calibration service
- ▮ After-warranty service

▷ [page 6](#)

Long calibration intervals and built-in RFC routines maximize uptime and contribute to very high accuracy

A full 12 months is the recommended calibration interval for the R&S®TS8970. However, every component in the test system is specified for a two-year or longer calibration cycle. This permits many R&S®TS8970 users¹⁾ to determine the optimum calibration period based on individual requirements. The ultimate customer benefit of this long calibration interval is an absolute minimum in downtime.

Combining the features of market-leading products from Rohde & Schwarz

The R&S®TS8970 Mobile WiMAX™ certification system combines the features of the following market-leading Rohde & Schwarz products:

R&S®AMU200A baseband signal generator and fading simulator

The R&S®AMU200A combines versatile realtime I/Q sources and a cost-effective multichannel fading simulator in one box. Two of these instruments are used for generating wanted and unwanted signals as well as for generating standard-compliant channel simulation.

R&S®SMU200A vector signal generator

The R&S®SMU200A is a state-of-the-art wideband instrument with multistandard capabilities. Two of these instruments are used to convert baseband signals to the RF and to generate superimposed noise.

R&S®FSL spectrum analyzer

The R&S®FSL is implemented as an RF converter in the R&S®TS8970. Moreover, R&S®TS8970 users can see the incoming signal on the display of the R&S®FSL (signal monitor function).

R&S®FSQ vector signal analyzer

The R&S®FSQ combines the characteristics of the R&S®FMU36 baseband signal analyzer and the R&S®FSU spectrum analyzer – the industry reference in spectrum analysis – in one box. In the R&S®TS8970, the R&S®FSQ handles all RF measurements with the exception of bit error ratio and calibration of path and level.

R&S®NRP power meter

The R&S®NRP is the first product of its kind that features all measurement functionality in the sensors, i.e. a base unit is not necessary. In the R&S®TS8970, the R&S®NRP-Z11 sensor handles level and path calibration.

R&S®PASS user interface

The R&S®PASS user interface is designed with convenience in mind. Operator and measurement errors are reduced by means of automatic functions for full path calibration up to the DUT RF input(s) or a simple sanity check. R&S®PASS is also used in the market-leading R&S®TS8950 GSM/WCDMA certification system. Therefore, R&S®TS8950 users can also operate the R&S®TS8970 without further training.

Miscellaneous

Optional DKD calibration

All of the above instruments can optionally also be provided with DKD calibration, allowing them to be traced directly to standards in the international calibration hierarchy.

Switching units

The components of the systems are interconnected by means of the R&S®TS-EX-IQ2 baseband digital combiner unit and the R&S®ISSCU-2x2 RF switching unit, with connections to the R&S®NRP and the DUT also included. The R&S®ISSCU-2x2 is available in two models (see common data, page 12).

Signaling sources

The signaling source in the configuration for BS tests is a mobile station emulator (MSE). In the configuration for MS tests, it is a base station emulator (BSE). In the MS/BS test system, it is a combined unit (BMSE).

Multi-DUT testing

Since Mobile WiMAX™ devices are now widely used, both manufacturers and test houses are able to sequence tests on a large number of devices. Adding the R&S®OSP open switch and control platform to the R&S®TS8970 rack facilitates multi-DUT regression testing or comparative evaluation.



Rear view of the R&S®OSP with three module slots and Ethernet interface for direct connection to a PC or for integration into an Ethernet network.

Future-ready concept

Virtually all future wireless communications and broadband wireless technologies that are currently under discussion and that are already in the standardization process share specific technological features:

Orthogonal frequency division multiple access (OFDMA) methods

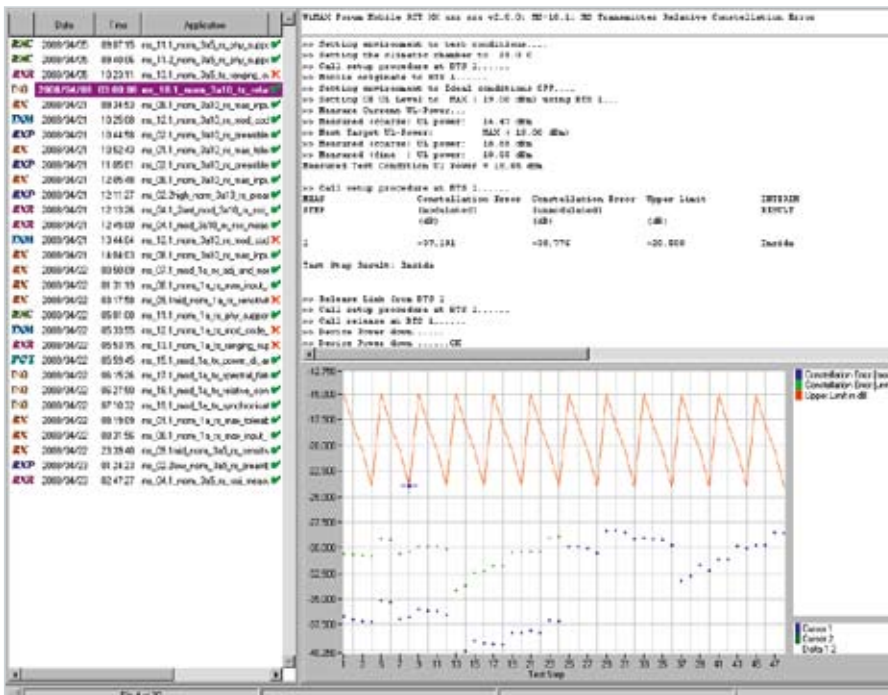
With OFDMA transmission technology, multiple signals are transmitted simultaneously on a large number of carriers that are spaced at precise frequency intervals. OFDMA benefits include higher spectral efficiency, resilience to RF interference and reduced requirements with regard to power control accuracy. For a MIMO application, the critical benefit of OFDMA is its inherent robustness against fast multipath fading.

OFDMA methods are an essential part of almost all new transmission methods that are in the planning or implementation phase. The generators and analyzers in the R&S®TS8970 allow users to enable standards not based on IEEE 802.16e-TDD by means of key codes. The structure of the R&S®PASS user interface allows users to program their own test scenarios for further OFDM-based wideband applications.

Rohde & Schwarz will announce possible expansions of the R&S®TS8970 in this direction as soon as it becomes apparent that the corresponding wireless standards such as LTE can gain a foothold on the market.

Multi-antenna transmission and/or reception (MIMO technology)

Earlier generations of mobile communications systems concentrated on manipulating the usage of both frequency and time to maximize data throughput. The variations caused by multiple signal paths were regarded as a disadvantage ("fading") to be minimized. With the benefits of today's higher computing power, multiple-input, multiple-output (MIMO) antenna technology deliberately uses multiple signal paths to transmit data more reliably and/or to increase data throughput. The R&S®TS8970 permits the simulation of 2x2 MIMO scenarios as defined in the MRCT specification and is prepared for higher order MIMO.



The R&S®PASS user interface with the result of an MS-18.1 test run. The graphical display shows the maximum permissible constellation error at the top and the measured constellation error for modulated and unmodulated subcarriers at the bottom.

From pre-sale to service. At your doorstep.

System support worldwide

- Test systems are located and supported today in Canada, China, Israel, Japan, Korea, Spain, Taiwan, the United Kingdom, and the USA (and the list keeps growing)
- Three fully equipped, independent teams are available for on-site system calibrations worldwide

Hotline service

- Availability of a team of designated system specialists
- Access to system specialists for reference systems that mirror exact customer configurations
- Availability of local and regional call center services

Repair service

The repair service includes the following:

- Repair of the system hardware
- Access to a common pool of spare parts and loan units
- Related travel and transport costs
- On-site repair by local service technician if possible
- Escalation procedure

The Rohde & Schwarz global service network



Software service

The software service includes the following:

- Bug fixes and minor enhancements
- Implementation of changes in line with the applicable recommendations
- Delivery of updated software including documentation on the system download database at Rohde & Schwarz, which can be accessed by the customer via the Internet
- If applicable, revalidation of the supplied software (to be performed by an accredited test house)

Problem report service

- Very popular shared database application
- Access to the Rohde & Schwarz problem report (PR) database for R&S®TS89xx customers, simultaneously forwarded to Rohde & Schwarz local service and Rohde & Schwarz headquarters
 - ▷ [Short response times worldwide](#)
- Analysis of the PRs and proposal of possible solutions, tests on Rohde & Schwarz reference systems in Munich
 - ▷ [Fast analysis of problems](#)
- Administration of PRs, visibility (anonymized) for the FAQ section

Calibration service

- On-site calibration of the complete test system
- Disassembly, calibration and re-assembly performed by a specialized and experienced team
- Accreditation in line with EN ISO/IEC 17025
- Calibration certificate in line with EN ISO 9001
- Optional DKD calibration traceable to national/international calibration standards
- Shortest possible system downtime; typically only one week for a full calibration of a test system and all of its components
- No packing and transport of the test system necessary

The accuracy of level measurements and the path compensation for signal routing right to the DUT terminal is referenced to the intelligent R&S®NRP-Z11 USB power sensor.



Test cases for the certification of base stations

The R&S®TS897EBS1 test case bundle contains the following Wave 1 test cases:

New reference	Test case designation	Ping	MAC-CRC	AMC	MIMO	CRC
BS transmitter tests						
BS-07.1	BS transmit modulation and coding	● ¹⁾	EBS2 ²⁾			
BS-08.1	BS transmit cyclic prefix, symbol timing and frame duration timing					
BS-09.1	BS transmit preambles					
BS-10.1	BS transmit power range					
BS-11.1	BS transmit spectral flatness			EBS2 ²⁾		
BS-12.1	BS transmit relative constellation error			EBS2 ²⁾		
BS receiver tests						
BS-01.1	BS receive maximum tolerable signal	● ¹⁾	EBS2 ²⁾			● ¹⁾
BS-03.1	BS receive ranging support					
BS-04.1	BS receive adjacent and non-adjacent channel selectivity	● ¹⁾	EBS2 ²⁾			● ¹⁾
BS-05.1	BS receive maximum input level on-channel reception tolerance	● ¹⁾	EBS2 ²⁾			● ¹⁾
BS-06.1	BS receive sensitivity	● ¹⁾	EBS2 ²⁾			● ¹⁾
BS performance tests						
BS-13.1	BS synchronization					
BS-14.1	BS receive and transmit HARQ					
BS-16.1	BS receive/transmit switching gap	● ¹⁾	EBS2 ²⁾			

The R&S®TS897EBS2 test case bundle contains the following Wave 2 Phase 1 test cases:

New reference	Test case designation	Ping	MAC-CRC	AMC	MIMO	CRC
BS transmitter tests						
BS-19.2	BS transmit MIMO processing				EBS2 ²⁾	
BS receiver tests						
BS-18.2	BS receive collaborative MIMO		EBS2 ²⁾		EBS2 ²⁾	

¹⁾ Feature is part of the R&S®TS897EBS1 functionality.

²⁾ The properties MAC-CRC, AMC and CRC are mandatory only in the Wave 2 version of these test cases. They may be set to active if the R&S®TS897EBS2 option is installed on the R&S®TS8970.

Test cases for the certification of mobile stations

The R&S®TS897EMS1 test case bundle contains the following Wave 1 test cases:

New reference	Test case designation	Ping	ACK/NACK	AMC	MIMO	CRC
MS transmitter tests						
MS-12.1	MS transmit modulation and coding, cyclic prefix and frame duration timing	● ³⁾		EMS2 ⁴⁾		
MS-13.1	MS transmit ranging support					
MS-15.1	MS transmit power dynamic range					
MS-16.1	MS transmit closed and open loop power control					
MS-17.1	MS transmit spectral flatness			EMS2 ⁴⁾		
MS-18.1	MS transmit relative constellation error					
MS-19.1	MS transmit synchronization					
MS receiver tests						
MS-01.1	MS receive maximum tolerable signal	● ³⁾	EMS2 ⁴⁾			
MS-02.1	MS receive preambles DL					
MS-04.1	MS receive RSSI measurements					
MS-05.1	MS receive PCINR measurements					
MS-07.1	MS receive adjacent and non-adjacent channel selectivity	● ³⁾	EMS2 ⁴⁾			
MS-08.1	MS receive maximum input signal	● ³⁾	EMS2 ⁴⁾			
MS-09.1	MS receive sensitivity	● ³⁾	EMS2 ⁴⁾	EMS2 ⁴⁾		EMS2 ⁴⁾
MS-11.1	MS receive PHY support for handoff					
MS performance tests						
MS-10.a1	MS transmit HARQ					
MS-10.b1	MS receive HARQ	● ³⁾	EMS2 ⁴⁾			
MS-20.1	MS transmit/receive switching gap					

The R&S®TS897EMS2 test case bundle contains the following Wave 2 Phase 1 test cases:

New reference	Test case designation	Ping	ACK/NACK	AMC	MIMO	CRC
MS transmitter tests						
MS-24.2	MS transmit collaborative MIMO				EMS2 ⁴⁾	
MS receiver tests						
MS-02.2	MS receiver preambles full band					
MS-06.2	MS receiver pilot-based ECINR measurement					
MS-11.2	MS receiver PHY support for inter-FA handoff					
MS-22.2	MS receiver MIMO processing				EMS2 ⁴⁾	

³⁾ Feature is part of the R&S®TS897EMS1 functionality.

⁴⁾ The properties AMC, ACK/NACK and CRC are mandatory only in the Wave 2 version of these test cases. They may be set to active if the R&S®TS897EMS2 option is installed on the R&S®TS8970.

Applications

R & D/QA

The R&S®TS8970 is used primarily in R&D (research and development) and QA (quality assurance) by manufacturers of mobile stations and infrastructure for Mobile WiMAX™. Here, it is used in the following cases: development of new RF modules, system integration of baseband and RF modules, regression tests following new firmware releases or to ensure or enhance the quality of existing products at the time delivered.

Pre-compliance

Along with its role in QA testing, the R&S®TS8970 is also used in pre-certification. The focus here is the initial or repeated testing for compliance with all minimum requirements set forth in the MRCT specification. The objective is to ensure that the DUT smoothly passes all tests on first run when performed by a WFDC. As a result, the turn-around time and costs of the official certification will be optimized.

Static Parameters Test Step Parameters

	1	2	3	4	5	6	7
Enabled	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Fading Profile	None	None	None	None	None	None	None
Int1 Signal	1 WiMAX	1 WiMAX	1 WiMAX	1 WiMAX	1 WiMAX	1 WiMAX	1 WiMAX
Int1 Frequency in MHz	3.0000	-3.0000	3.0000	-3.0000	18.0000	-18.0000	18.0000
Int1 Level in dBc	11.0	11.0	4.0	4.0	30.0	30.0	23.0
Int1 Offset in samples	3500	3500	3500	3500	3500	3500	3500
Temperature	Normal	Normal	Normal	Normal	Normal	Normal	Normal
Voltage	Normal	Normal	Normal	Normal	Normal	Normal	Normal
Minimum # Samples	30000	30000	30000	30000	30000	30000	30000
Cyclic Prefix Ratio	1/8	1/8	1/8	1/8	1/8	1/8	1/8
DL Level (DUT) Type	Rel. Min.	Rel. Min.	Rel. Min.	Rel. Min.	Rel. Min.	Rel. Min.	Rel. Min.
DL Level (DUT) Value in dB	3.00	3.00	3.00	3.00	3.00	3.00	3.00
DL Level Reference type	16e TD Zone Power	16e TD Zone Power	16e TD Zone Power	16e TD Zone Power	16e TD Zone Power	16e TD Zone Power	16e TD Zone Power
UL Level (DUT) Type	Open Loop	Open Loop	Open Loop	Open Loop	Open Loop	Open Loop	Open Loop
DL Freq Type	Band Mid	Band Mid	Band Mid	Band Mid	Band Mid	Band Mid	Band Mid
UL Freq Type	Band Mid	Band Mid	Band Mid	Band Mid	Band Mid	Band Mid	Band Mid
DL Mod. Scheme B1	16QAM 3/4	16QAM 3/4	64QAM 3/4	64QAM 3/4	16QAM 3/4	16QAM 3/4	64QAM 3/4
UL Modulation Scheme	QPSK 1/2	QPSK 1/2	QPSK 1/2	QPSK 1/2	QPSK 1/2	QPSK 1/2	QPSK 1/2
Preamble Type B1	16e	16e	16e	16e	16e	16e	16e
Payload Message	72-S16QAM	72-S16QAM	12-S64QAM	12-S64QAM	72-S16QAM	72-S16QAM	12-S64QAM
Packet Rate in Hz	200	200	200	200	200	200	200
Max erroneous packets [ping]	147	147	147	147	147	147	147
Max erroneous packets [ack]	141	141	141	141	141	141	141

The R&S®RS-PASS user interface: If you click a test case in the list at the left, the associated test steps together with their parameters will be displayed in the pane at the right. Every test step within the selected test case can be enabled or disabled with a click.

Certification

The R&S®TS8970 was originally developed in response to a request for proposals from the WiMAX Forum®. Today it is the most widely used RCTT at WFDCs to perform Mobile WiMAX™ RF certification.

In certification, the R&S®TS8970 is complemented by the R&S®TS8977 for regulatory requirements tests (RRT) on Mobile WiMAX™ devices. Please refer to the R&S®TS8977 WiMAX™ regulatory test system data sheet (PD 5214.0176.32) for the FCC 47CFR, part 27 regulation and R&TTE certification test cases in line with ETSI EN 302 544-2 and EN 302 623. The R&S®TS8977 uses the same R&S®PASS user interface and test sequencer as the R&S®TS8970, both systems are identical in operation and results output, which is a major user benefit.

Output of a test case

```
Test Case      : MS 09.11LOW STEP 15 1A RX SENSITIVITY
Test Method   : WIMAX Receiver
Executable File : WIMAXSRReceiver.exe V7.42.05.00
TC Parameter File : d:\rs-pass ts8970 v7.42\to\wimax_16_1a\ms_09.11low_step
15_1a_rx_sensitivity.par
Parameter Version : \\main\br_ts897x_v7.5x\3 (ID: 74074cab)
Description   : WIMAX Forum Mobile RCT XX xxx xxx v2.0.0: MS-09.1: MS
Receiver Sensitivity

Test conducted : 2008/07/29 12:59:08
SW Version Common : V10.1910 (12)
SW Version Application : V7.54 (12)
System Type      : TS8970
System Name     : TS8970_16e_Ref_Val
System Identity : SS
System Site     : R&S
System Location : Munich
User Name      : TS8970 Validation User
Workstation    : RS-494HGEBRVD18
Operator       : MANUELA
System Config  : TESTSYSTEM

Operator Parameters : MANUELA
    User Comment : User Standard Setup
    Trace Report Level : Tracing Off
    RFC Accuracy Class : Highest accuracy conf. to TC spec.
    Allow Expired RFC Data : Off
    Skip Resetting All Devices : Off
    Stop on Expired RFC Data : On
    'Save Device Log' Mode : Off
    Application Wait Mode : Normal
    Continue Testcase after 'Outside' : On
.
.
< Results of Test Steps 1 to 14 are clipped >
.
Test Step Parameters : STEP 15
    Fading Profile : ITU Veh A
    Fading Speed : 60.0 km/h
    Inti Signal : None
    Temperature : Normal
    Voltage : Normal
    Minimum # Samples : 10000
    Cyclic Prefix Ratio : 1/8
    DL Level (DUT) Type : Value
    DL Level (DUT) Value : -73.39 dBm
    DL Level Reference type : 16e TD Zone Power
    UL Level (DUT) Type : Open Loop
    Second DL Burst : False
    DL Freq Type : Band Lo
    UL Freq Type : Band Lo
    DL Mod. Scheme B#1 : 64QAM 1/2
    UL Modulation Scheme : QPSK 1/2
    Granted BW for UL in bytes : 650
    Preamble Type B#1 : 16e
    Payload packet size (ping) : 16
    Payload packet size (ack/nack) : 46
    Packet Rate : 200 Hz
    Max erroneous packets (ping) : 1000
    Max erroneous packets (ack/nack) : 1000
    DL freq : 2304500000 Hz
    UL freq : 2304500000 Hz
```

Seite 1

```
>>> Establishing primary link to MS from BSE 1....
>>> Writing to BTS 1.....
>>> Reading from BTS 1.....
>>> Setting environment to Ideal conditions ON....
>>> Waiting 1 seconds after voltage change...
>>> Device Power up .....
>>> Device Power up .....OK
>>> Writing to MS/SS1.....
>>> Setting environment to Ideal conditions OFF....
>>> Call setup procedure at BTS 1.....
>>> Mobile originates to BTS 1.....
>>> Setting environment to Ideal conditions OFF....
>>> Setting Fading (ITU Veh A) ON at BTS 1....
>>> Setting environment to test conditions....
>>> Setting the climatic chamber to 25.0 C

INTERIM      Samples      Errors          PER          Error Limit
INTERIM
STEP        (# )          (# )          (%)          (# )
RESULT
1           1003           3           0.299         1000
Inside
2           2203           9           0.409         1000
Inside
3           3203           11          0.343         1000
4           4403           15          0.341         1000
Inside
5           5403           16          0.296         1000
Inside
6           6603           16          0.242         1000
Inside
7           7603           16          0.210         1000
Inside
8           8803           20          0.227         1000
Inside
9           10000          20          0.200         1000
Inside

Test Step Result: Inside
>>> Setting Fading (ITU Veh A) OFF at BTS 1...
>>> Release Link from BTS 1
>>> Call setup procedure at BTS 1.....
>>> Call release at BTS 1.....
>>> Device Power down.....
>>> Device Power down .....OK
.
.
< Results of Test Steps 16 to end of test case are clipped >
.
Test ended : 2008/07/29 16:26:25
Test duration : 03:27:17

-----
-- Restrictions/Comments -----
- The RFC value which expires first is still valid for 330 day(s).
-----

Final Verdict : Passed

-----
```

Seite 2

The output of a test case is highly detailed and logs various kinds of data for certification. Parametric output is made available in comma-separated notation (*.csv format) for easy import into further processing tools and in parallel as text file. The text output shown here consists of the header of the test case MS-09.1 file, results from test step 15 of the RX sensitivity test case, and the final verdict across all test steps.

Specifications in brief

The R&S®TS8970 RF conformance test system complies with the requirements stipulated in V2.2.1 of the MRCT specification for the test cases described in this document.

Specifications are applicable for a calibrated R&S®TS8970 system under normal operating conditions after RF calibration and two hours of warm-up at ambient temperature.

The performance of the R&S®TS8970 is based on the technical specifications¹⁾ of the individual instruments and components within the system. The uncertainties for the R&S®TS8970 system are described in the document "R&S®TS8970_2_Uncertainty_Calculations".

The uncertainty is calculated and made available individually for each test case. The values listed apply at the DUT port(s) of the R&S®TS8970.

They have been calculated in line with the following:

- Guide to the Expression of Uncertainty in Measurement (GUM) – produced by ISO/TAG4/WG3 (1995)
- ETSI TR 100 028-1 V1.4.1 (2001-12)
- ESTI TR 102 273-1-1 V1.2.1 (2001-12)
- Application Note (1GP43) – Program for Measurement Uncertainty Analysis with Rohde & Schwarz Power Meters

Overview of technical specifications for devices used in the system		
R&S®FSL	Spectrum Analyzer	PD 0758.2790.22
R&S®FSQ	Vector Signal Analyzer	PD 0758.0945.22
R&S®FSQ-K92/-K93/-K94	WiMAX™, WiBro Application Firmware	PD 5214.1289.22
R&S®NRP	Power Meter in R&S®SMART SENSOR TECHNOLOGY	PD 0757.7023.21
R&S®SMU200A	Vector Signal Generator	PD 0758.0197.22
R&S®AMU200A	Baseband Signal Generator and Fading Simulator	PD 5213.7954.22
R&S®SMU200A, R&S®SMATE200A, R&S®SMJ200A, R&S®AMU200A	Digital Standards for R&S®SMU200A, R&S®SMATE200A, R&S®SMJ200A, R&S®AMU200A	PD 5213.9434.22
R&S®OSP	Open Switch and Control Platform	PD 5213.9928.22 (data sheet) PD 5214.1437.12 (product brochure)
R&S®TS-EX-IQ2	Baseband Digital Combiner Unit	PD 5214.1766.22

Common data		
Overall frequency range	depends on type of ISSCU2X2 ordered	400.0 MHz to 6.0 GHz or 2.0 GHz to 6.0 GHz
Maximum DUT cable loss		3.5 dB
DUT TX1/RX1 and DUT TX2/RX2		
Maximum output power		0 dBm (PEP) ²⁾
Maximum input power		+43 dBm
Nominal source impedance		50 Ω
VSWR (max.) in 50 Ω system	f ≤ 3 GHz	1.2:1
	3 GHz < f ≤ 6 GHz	1.3:1
Connectors		precision N, female
DUT TX		
Maximum input power		+43 dBm
Nominal input impedance		50 Ω
Connector		precision N, female
Reference		
Maximum output power		-10 dBm (PEP) ²⁾
Nominal source impedance		50 Ω
VSWR (max.) in 50 Ω system	f ≤ 3 GHz	1.2:1
	3 GHz < f ≤ 6 GHz	1.3:1
Connector		precision N, female
Interfaces		
Remote control		Ethernet, USB, RS-232-C
Reference rubidium frequency output		10 MHz

Operating data

Mains power supply and consumption		
Phase		2 × single phase (L + N + PE)
Voltage		115 V to 230 V ± 6%
Frequency		47 Hz to 63 Hz
Circuit breaker, rating		2 × 16 A
Circuit breaker, type		C
Mains connector		2 × CEE7 (Schuko)
Consumption		max. 3.5 kVA

General data

Environmental conditions		
Storage temperature range		0°C to +40°C
Operating temperature range		+23°C ± 3°C
Operating temperature after RF calibration ^{3) 4)}		±2°C around temperature during RFC
Relative humidity, non-condensing		20% to 80%
Electrical safety ⁵⁾		
Measurement equipment		IEC 1010-1, EN 61010 part 1, VDE 0411 part 1
IT equipment		IEC 950, EN 60950/VDE 0805
EMC		
Emission		EN 55011 group I class B/EN 55022 class B
Immunity		EN 61326/EN 55011
Dimensions	(W × H × D)	1200 mm × 2000 mm × 800 mm (47.2 in × 78.7 in × 31.5 in)
Weight		approx. 500 kg (1102 lb), depending on specific configuration

¹⁾ See table "Overview of technical specifications for devices used in the system".

²⁾ PEP = peak envelope power.

³⁾ Air conditioning is strongly recommended.

⁴⁾ The performance of RF calibration (RFC) on a yearly basis is recommended. RFC is independent of the requirement to perform individual device calibrations.

⁵⁾ The protective conductor current for instruments must not exceed 3.5 mA. When several instruments are integrated into a test system, this limit value may be exceeded. In this case, make sure that the system is additionally grounded or is connected only via an IEC 60309-compliant connector.

Ordering information

The R&S®TS8970 can be used throughout the entire frequency range of 0.4/2 GHz to 6 GHz. The WiMAX Forum® specifies certification profiles in various band classes (carrier frequency range). These profiles are combinations of band classes and parameters taken from the IEEE 802.16 base specification, from which Mobile WiMAX™ originated. Please ask your Rohde&Schwarz partner about profiles currently available. The following band class profiles are available at present:

Profile name	Designation	Description	Type	Order No.
MP01	WMF Band Class Certification Group 1A Wave 1	Signaling and Measurement Support for WiMAX Forum® Band Class Certification Group 1A Wave 1	R&S®TS897P1A	1507.6140.02
MP01	Profile 1A 8.75 MHz Extension to Wave2 ¹⁾	Profile 1A 8.75 MHz Extension to Wave2	R&S®TS897Q1A	1507.6157.02
MP02	WMF Band Class Certification Group 1B/10 MHz Wave 1	Signaling and Measurement Support for WiMAX Forum® Band Class Certification Group 1B Wave 1 at 10 MHz Bandwidth	R&S®TS897P1B1	1507.6140.03
MP02	Profile 1B 10 MHz Extension to Wave2	Profile 1B 10 MHz Extension to Wave2	R&S®TS897Q1B1	1507.6157.04
MP02	WMF Band Class Certification Group 1B/5 MHz Wave 1	Signaling and Measurement Support for WiMAX Forum® Band Class Certification Group 1B Wave 1 at 5 MHz Bandwidth	R&S®TS897P1B5	1507.6140.07
MP02	Profile 1B 5 MHz Extension to Wave2	Profile 1B 5 MHz Extension to Wave2	R&S®TS897Q1B5	1507.6157.03
MP05	WMF Band Class Certification Group 3A/10 MHz Wave 1	Signaling and Measurement Support for WiMAX Forum® Band Class Certification Group 3A Wave 1 at 10 MHz Bandwidth	R&S®TS897P3A1	1507.6140.04
MP05	Profile 3a 10 MHz Extension to Wave2	Profile 3a 10 MHz Extension to Wave2	R&S®TS897Q3A1	1507.6157.05
MP05	WMF Band Class Certification Group 3A/5 MHz Wave 1	Signaling and Measurement Support for WiMAX Forum® Band Class Certification Group 3A Wave 1 at 5 MHz Bandwidth	R&S®TS897P3A5	1507.6140.08
MP05	Profile 3a 5 MHz Extension to Wave2	Profile 3a 5 MHz Extension to Wave2	R&S®TS897Q3A5	1507.6157.07
MP09	WMF Band Class Certification Group 5LA Wave 1	Signaling and Measurement Support for WiMAX Forum® Band Class Certification Group 5LA Wave 1	R&S®TS897P5LA	1507.6140.05
MP09	Profile 5LA Extension to Wave2	Profile 5A Extension to Wave2	R&S®TS897Q5LA	1507.6157.10
MP10	WMF Band Class Certification Group 5LB Wave 1	Signaling and Measurement Support for WiMAX Forum® Band Class Certification Group 5LB Wave 1	R&S®TS897P5LB	1507.6140.06
MP10	Profile 5LB Extension to Wave2	Profile 5B Extension to Wave2	R&S®TS897Q5LB	1507.6157.12
MP12	WMF Band Class Profile 5LC Wave 1	Signaling and Measurement Support for WiMAX Forum® Band Class Profile 5LC Wave 1	R&S®TS897P5LC	1507.6140.09
MP12	Profile 5LC Extension to Wave2	Profile 5C Extension to Wave2	R&S®TS897Q5LC	1507.6157.15

Designation	Type	Order No.
Software options for the R&S®TS8970		
Test Case Bundle BS for IEEE 802.16-2005 Wave 1	R&S®TS897EBS1	1074.5754.02
Test Case Bundle BS for IEEE 802.16-2005 Wave2 Phase 1	R&S®TS897EBS2	1507.6270.02
Test Case Bundle MS for IEEE 802.16-2005 Wave 1	R&S®TS897EMS1	1074.5760.02
Test Case Bundle MS for IEEE 802.16-2005 Wave2 Phase 1	R&S®TS897EMS2	1507.6270.04

¹⁾ Subject to release.

System components

Designation	Type	Order No.
1 x R&S®FSQ8, R&S®FSQ26, R&S®FSQ40 with the following options		
IEEE 802.16-2004/Cor1-2005, IEEE 802.16e-2005 OFDMA, WiMAX™, WiBro Application Firmware	R&S®FSQ-K93	1300.8600.02
WiMAX™ IEEE 802.16e MIMO Application Firmware	R&S®FSQ-K94	1308.9770.02
19" Adapter, 4 HU, 1/1 for Rohde&Schwarz design 2000 enclosure	R&S®ZZA-411	1096.3283.00
2 x R&S®FSL6 with the following options		
Additional Interfaces, video/IF output, power meter	R&S®FSL-B5	1300.6108.02
RF Pre-amplifier, gain 20 dB	R&S®FSL-B22	1300.5953.02
Adapter, 3 HU, 3/4 for Rohde&Schwarz design 2000 enclosure with shock protection	R&S®ZZA-S334	1109.4487.00
1 x R&S®NRP-Z11 with the following options		
USB Adapter (Passive) for R&S®NRP-Z sensors, power supply via USB	R&S®NRP-Z4	1146.8001.02
2 x R&S®SMU200A with the following options		
Frequency Range 100 kHz to 6 GHz for 1st RF path	R&S® SMU-B106	1141.8803.02
Baseband Generator with ARB (16 Msample) and Digital Modulation (Realtime)	R&S®SMU-B11	1159.8411.02
Baseband Main Module (factory installation only)	R&S® SMU-B13	1141.8003.04
Baseband Input (analog/digital)	R&S®SMU-B17	1142.2880.02
Rear Panel Connectors for 1st RF Path (can be retrofitted)	R&S®SMU-B81	1159.9001.02
19" Rack Adapter, 4 HU, 1/1 for Rohde&Schwarz design 2000 enclosure	R&S®ZZA-411	1096.3283.00
2 x R&S®AMU200A with the following options for each		
2 x Baseband Generator with ARB (16 Msample) and Digital Modulation (Realtime)	R&S®AMU-B11	1402.5400.02
2 x Baseband Main Module (factory installation only)	R&S®AMU-B13	1402.5500.02
Fading Simulator	R&S®AMU-B14	1402.5600.02
Fading Simulator Extension	R&S®AMU-B15	1402.5700.02
2 x Baseband Inputs (analog/digital)	R&S®AMU-B17	1402.5900.02
2 x Digital Baseband Output	R&S®AMU-B18	1402.6006.02
I/Q Rear Connectors	R&S®AMU-B81	1402.6858.02
Digital Standard GPS	R&S®SMU-K44	1161.0566.02
Digital Standard GPS	R&S®AMU-K44	1402.6406.02
2 x Digital Standard IEEE 802.16	R&S®AMU-K49	1402.7002.02
Additive White Gaussian Noise	R&S®AMU-K62	1402.7202.02
MIMO 2x2 Fading	R&S®AMU-K74	1402.9857.02
19" Rack Adapter, 4 HU, 1/1 for Rohde&Schwarz design 2000 enclosure	R&S®ZZA-411	1096.3283.00

System quotations and consulting

All system quotations are prepared individually to meet your exact needs. For a quotation, please contact your Rohde&Schwarz sales partner.

If you already have one or more of the measuring instruments listed in the table and wish to expand your system to create an R&S®TS8970, this can usually be done without any problem. Your Rohde&Schwarz sales partner will be glad to assist you.

To find your nearest Rohde&Schwarz representative, visit

www.sales.rohde-schwarz.com

Service you can rely on

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About Rohde & Schwarz

Rohde & Schwarz is an independent group of companies specializing in electronics. It is a leading supplier of solutions in the fields of test and measurement, broadcasting, radiomonitoring and radiolocation, as well as secure communications. Established more than 75 years ago, Rohde & Schwarz has a global presence and a dedicated service network in over 70 countries. Company headquarters are in Munich, Germany.

Environmental commitment

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

Certified Quality System
ISO 9001

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