Система тестирования мобильных сетей TS-ITS100

Архангельск (8182)63-90-72
Астана (7172)727-132
Астрахань (8512)99-46-04
Барнаул (3852)73-04-60
Белгород (4722)40-23-64
Брянск (4832)59-03-52
Владивосток (423)249-28-31
Волгоград (844)278-03-48
Вологда (8172)26-41-59
Воронеж (473)204-51-73
Екатеринбург (343)384-55-89
Иваново (4932)77-34-06
Ижевск (3412)26-03-58
Иркутск (395)279-98-46
Казань (843)206-01-48
Калининград (4012)72-03-81
Калуга (4842)92-23-67
Кемерово (3842)65-04-62
Киров (8332)68-02-04
Краснодар (861)203-40-90
Красноярск (391)204-63-61
Курск (4712)77-13-04
Липецк (4742)52-20-81
Магнитогорск (3519)55-03-13
Москва (495)268-04-70
Мурманск (8152)59-64-93
Набережные Челны (8552)20-53-41
Нижний Новгород (831)429-08-12
Новокузнецк (3843)20-46-81
Новосибирск (383)227-86-73
Омск (3812)21-46-40
Орел (4862)44-53-42
Оренбург (3532)37-68-04
Пенза (8412)22-31-16
Пермь (342)205-81-47
Ростов-на-Дону (863)308-18-15
Рязань (4912)46-61-64
Самара (846)206-03-16
Санкт-Петербург (812)309-46-40
Саратов (845)249-38-78
Севастополь (8692)22-31-93
Симферополь (3652)67-13-56
Смоленск (4812)29-41-54
Сочи (862)225-72-31
Ставрополь (8652)20-65-13
Сургут (3462)77-98-35
Тверь (4822)63-31-35
Томск (3822)98-41-53
Тула (4872)74-02-29
Тюмень (3452)66-21-18
Ульяновск (8422)24-23-59
Уфа (347)229-48-12
Хабаровск (4212)92-98-04
Челябинск (351)202-03-61
Череповец (8202)49-02-64
Ярославль (4852)69-52-93

Киргизия (996)312-96-26-47
Россия (495)268-04-70
Казахстан (772)734-952-31

https://rohdeschwarz.nt-rt.ru || rwz@nt-rt.ru

R&S®TS-ITS100 RF Conformance Test System

At a glance

The R&S®TS-ITS100 is an integrated test system for testing IEEE 802.11p conformity and the performance of user equipment.

All IEEE 802.11p capable user equipment must demonstrate conformity with the applicable regional standards in the frequency ranges it covers. This includes, for example, the ETSI standard EN 302571 in Europe, the IEEE 802.11-2012 standard in the USA and the ARIB standard in Japan. The automotive industry is currently defining tests that go beyond the requirements of such statutory regulations to verify the performance of this user equipment under field-like conditions. Special test and measurement methods and equipment are required to satisfy these test requirements. The R&S®TS-ITS100 RF conformance test system covers all these use cases and fulfills all test requirements.

The R&S®CONTEST sequencer software, which was developed especially for RF conformance test systems, supports the measurements. R&S®CONTEST can be used to create fully automatic test procedures. In addition to many useful tools, it offers comprehensive analysis capabilities for evaluating the tests and summarizes the test results in well-structured reports. The R&S®CONTEST graphic user interface's drag-and-drop function makes it easy to put together the desired test cases to form a test plan.

The R&S®OSP-ITS switch matrix automatically switches all paths required for the test, including any necessary filters. This means the complete test can be run without any manual interaction.

Thanks to its compact size (with or without a rack), the R&S®TS-ITS100 can be used throughout the entire value chain – from development to precompliance and compliance testing.

Key facts

- Fully automatic tests for reproducible test results
- Outstanding measurement accuracy
- Fast test runs
- Flexible, convenient and intuitive user interface
- No programming knowledge required to generate customized test plans

R&S®TS-ITS100 RF Conformance Test System

Benefits and key features

Complete coverage of worldwide test requirements

- Complete coverage of regulatory test requirements
  - RF conformance tests for the EU
  - RF conformance tests for the USA and Japan
- Complete coverage of industry performance tests
  - RF performance tests in line with the C2C-CC basic system profile, white paper on Antenna Characterization & Wireless Performance Aspects

▷ page 4

Simple operation with R&S®CONTEST

- Convenient online report generator
- Summary report generator
- Test report manager and analyzer
- External database access
- Performance evaluation mode

▷ page 5

Full automation for high efficiency

- R&S®OSP-ITS switching module
- Support for multiple antennas
- Filters for out-of-band tests
- Manufacturer-specific plug-ins for user equipment

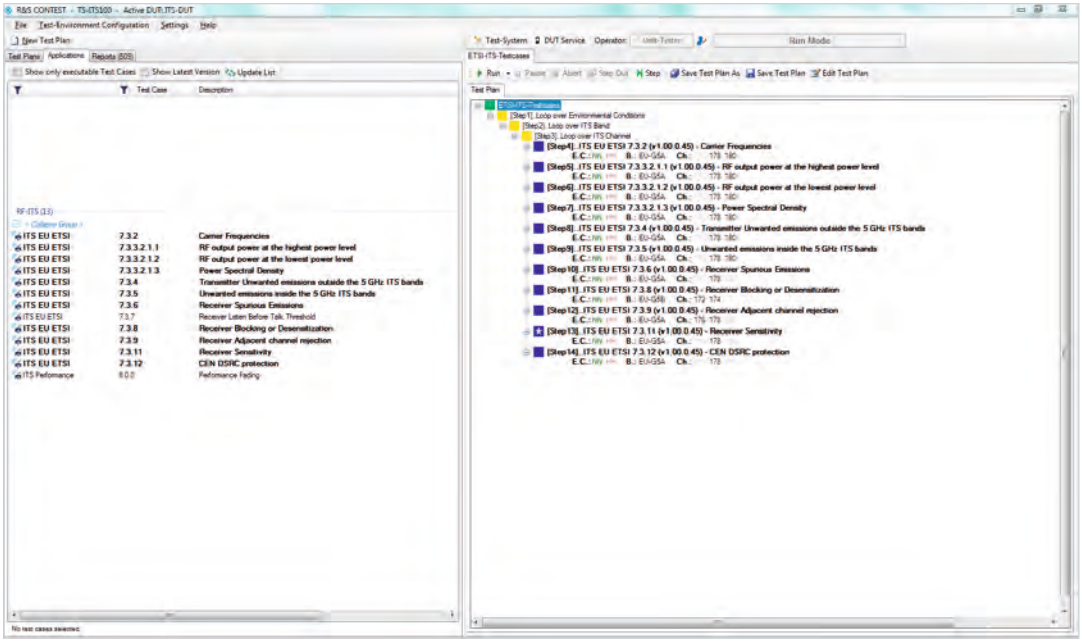
▷ page 7

A secure investment and an expert partner

- Future-ready platform
- Low cost of ownership
- Excellent service

▷ page 8

The R&S®CONTEST graphical user interface (GUI) makes it easy to operate the R&S®TS-ITS100. The screenshot shows the R&S®CONTEST GUI with an ITS test plan.



Complete coverage of worldwide test requirements

Complete coverage of regulatory test requirements

RF conformance tests for the EU

The R&S®TS-ITS100 covers the test cases defined in the ETSI EN 302571 harmonized European standard for the frequency range from 5855 MHz to 5925 MHz in line with the table below.

RF conformance tests for the USA and Japan

In its ARIB STD-T109 standard, the Japanese Association of Radio Industries and Businesses (ARIB) has defined test cases in the 700 MHz band for intelligent transportation systems.

For the USA, the Institute of Electrical and Electronics Engineers (IEEE) describes the physical layer of IEEE 802.11 systems in the IEEE 802.11-2012 standard. Test requirements for 802.11p modules can be derived from this description. The R&S®TS-ITS100 will successively support these regional conformity tests and test requirements. Other regions will be supported as soon as the relevant test specifications become available.

Complete coverage of industry performance tests

RF performance tests in line with the C2C-CC basic system profile, white paper on Antenna Characterization & Wireless Performance Aspects

Satisfying the regulatory test requirements ensures that the 802.11p user equipment functions properly within the available spectrum and does not interfere with adjacent services in the spectrum. It is not necessary to verify this by testing the quality and reliability (performance) of the 802.11p user equipment.

Performance tests are required, however, to ensure reliable operation of 802.11p user equipment in motor vehicles that are moving and therefore in constantly changing environments. The CAR 2 CAR Communication Consortium (C2C-CC), a consortium of companies from the automotive industry, is currently defining performance tests that take fading into consideration. The R&S®TS-ITS100 fully covers these test requirements as well.

RF conformance tests in line with ETSI EN 302571 (EU)

Test case		ITS-G5A (5875 MHz to 5905 MHz)	ITS-G5B (5855 MHz to 5875 MHz)
7.3.2	Carrier frequencies	•	
7.3.3.2.1.1	RF output power at the highest level	•	
7.3.3.2.1.2	RF output power at the lowest level	•	
7.3.3.2.1.3	Power spectral density	•	
7.3.4	Unwanted emissions outside the 5 GHz ITS band	•	
7.3.5	Unwanted emissions inside 5 GHz ITS band	•	
7.3.6	Spurious emissions	•	
7.3.7	Listen before talk (LBT) threshold		•
7.3.8	Blocking or desensitization		•
7.3.9	Adjacent channel rejection	•	
7.3.11	Sensitivity	•	
7.3.12	CEN DSRC protection	•	

Simple operation with R&S®CONTEST

The R&S®CONTEST test software provides fully automatic execution of test cases, powerful analysis of test reports and comprehensive high-level summary reports.

Convenient online report generator

Test case reports are generated online during test execution. They combine text and configurable graphics. The graphical output is updated in realtime to reflect the current progress of a test case. The final graphical result is stored in a single HTML document together with the text. Graphics are also saved separately as JPEG files for user convenience.

Summary report generator

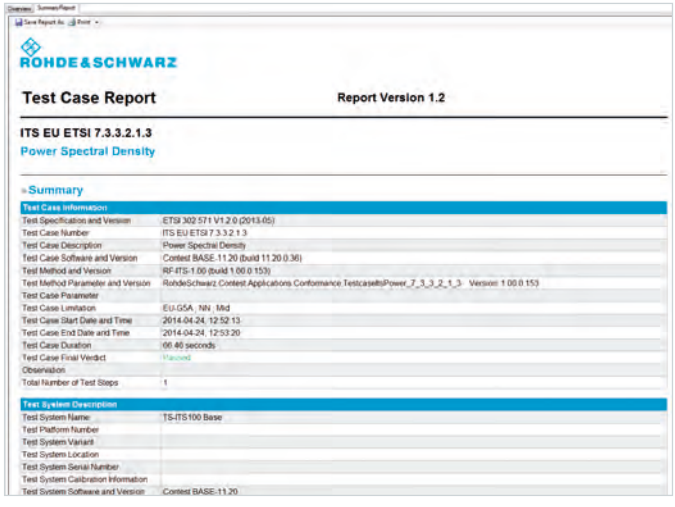
The high-level summary report provides a hierarchical overview of complex test projects. The top level shows basic information about PASS/FAIL verdicts and runtimes of test cases. Detailed information about the test procedures is available through hyperlinks in this XML document. This allows the user, for example, to jump directly to the online report of a test case that ended with a FAIL result.

Test report manager and analyzer

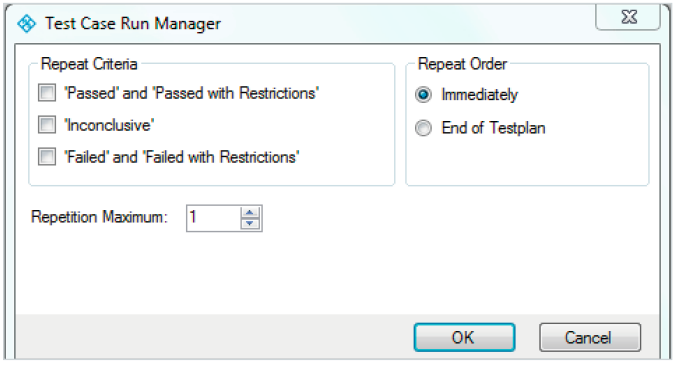
This tool allows the user to analyze R&S®CONTEST reports for RF, RRM and PQA applications. The report manager can display test case execution overviews, online reports and summary reports. A powerful filter function facilitates the evaluation of comprehensive test report collections. Comments can be added to the report text. A convenient zoom function is available for the graphics. Graphics features include a speech bubble comment function that can also be used for the graphical measurement output. In addition, the report analyzer has a set of statistical tools that supports postprocessing of test results, e.g. to graphically analyze the performance of a DUT with different software versions over time.

Online report after test case run with PASS verdict.

Summary report.



Run and repeat function helps maximize system utilization.



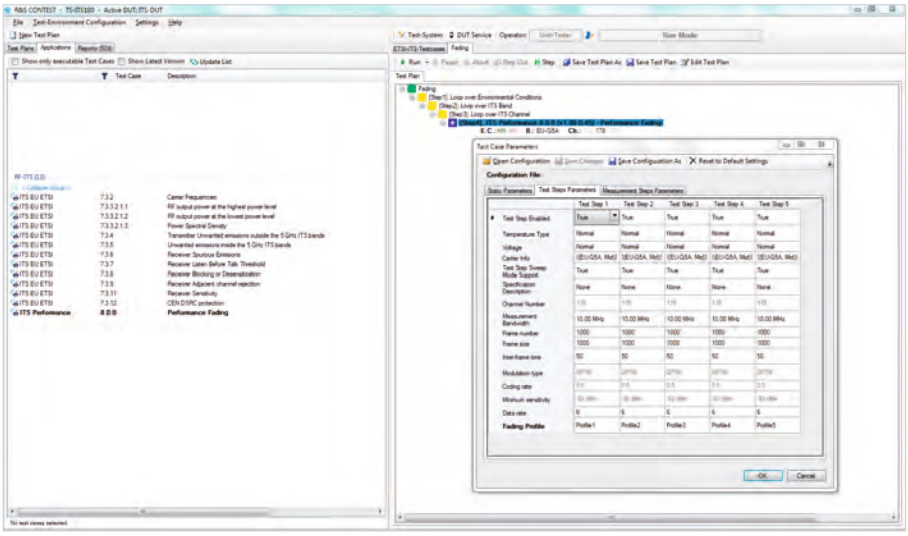
External database access

Selected test case results from the report manager can be copied to an external database (PostGreSQL is supported, other databases on request). Test results can therefore be managed from a central server, and the test report explorer can be used by any user in the company network.

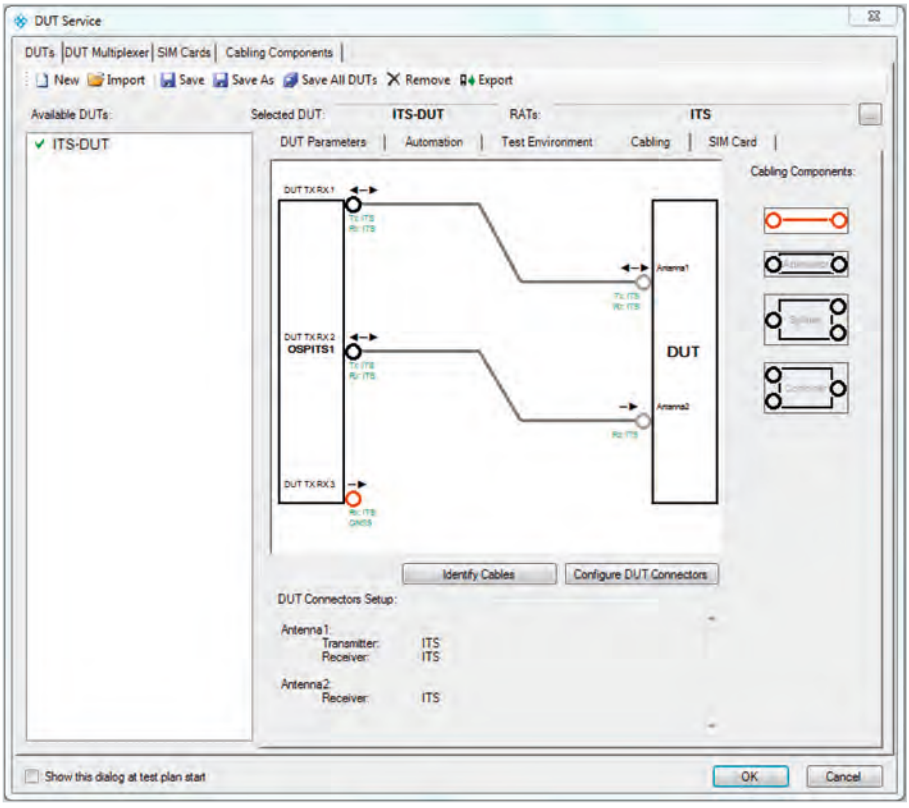
Performance evaluation mode

The performance evaluation mode allows user-controlled modification of test parameters in conformance test cases. This mode is ideal for evaluating the margin of safety an implementation under test has with respect to minimum conformance requirements.

Performance evaluation mode allows users to change parameter values.



R&S®CONTEST provides high flexibility for DUT handling, including graphical connection of the DUT to the test system.



Full automation for high efficiency

R&S®OSP-ITS switching module

The R&S®TS-ITS100 test system includes the R&S®OSP-ITS switching module. This module makes it possible to automatically switch all paths required for the measurements – for precise, reproducible measurement results. No manual intervention is required during the measurements.

Support for multiple antennas

The antenna switch and combiner inside the R&S®OSP-ITS enables the R&S®TS-ITS100 to test 802.11p user equipment with up to two antennas.

Filters for out-of-band tests

Several of the defined conformity tests require the measurement of out-of-band emissions. Filters are needed during these measurements. Depending on the desired regional coverage, these filters can be integrated into the R&S®OSP-ITS.

Manufacturer-specific plug-ins for user equipment

offers manufacturer-specific plug-ins to control the DUT during the test run. The plug-ins allow
users to automatically adjust certain operating modes on the DUT and to read out parameters for display in test reports.

The R&S®OSP-ITS switching module as part of the R&S®TS-ITS100 test system.

A secure investment and an expert partner

Future-ready platform

The R&S®TS-ITS100 test system is prepared to handle future features of the intelligent transportation system (ITS) technology. is constantly imple-menting new functions that are made available to users in the form of upgrades. As an active contributor to standard-ization bodies, helps promote the devel-opment of wireless technologies. This knowledge and ex-perience are incorporated into the company's products.

Low cost of ownership

- User-friendly R&S®CONTEST tools
- Upgradeability for future features
- Scalable configurations

Excellent service

 offers full-range service for test systems. As the original equipment manufacturer, provides the most qualified, responsive and thorough service available. Customer care is especially important, which is why offers services tailored to meet the needs of customers:

- problem report database ensures quick response times
- Short system downtimes thanks to spare instruments pool
- High availability of loan units
- Excellent support by experienced system specialists

First-hand service.

After warranty service

The after warranty service supplements the standard warranty services of to satisfy the high demand for maximum system availability, optimum perfor-mance and efficiency.

Problem report service

- Access to the problem report database
- Analysis of the problem reports and test logs, including tests on reference test systems
- Solution suggestions

Hotline service

- Dedicated support engineer available to answer all questions related to system hardware, software, functionality and handling

Repair service

- Repair of system hardware – if possible on site
- Access to pool of DKD/DAkkS calibrated loan units
- Escalation procedure for providing additional resources if problems arise during repair
- Travel and transport costs

Proactive on-site customer visits by system support specialists

- System performance optimization
- Face-to-face consultation to maximize system utilization
- Up-to-date information on the latest software enhancements
- Collecting of requests for new features

Software service

The software service includes enhancements of purchased features and ensures compliance with the latest revisions of industry-standard specifications.

- Implementation of changes in line with relevant test specifications
- Revalidation of relevant test cases (performed by approved test laboratories)
- Bug fixes and minor enhancements
- Delivery of software updates, including documentation

Calibration service

The calibration service ensures that system parameters are checked at the recommended system calibration intervals.

- Calibration by an accredited calibration laboratory in line with EN ISO/IEC 17025 and DIN EN ISO 9001
- Recommendation of system-specific calibration intervals
- Traceability of calibration results in line with national and international standards
- Calibration certificates and service reports
- On-site calibration (accredited and factory standard) for minimum downtime

reference systems make it possible to reproduce problems that occur in customer systems.

Specifications in brief

Data sheets of instruments used in the system

Instrument	Order No.
R&S®FSV Signal and Spectrum Analyzer	PD 3606.7982.22
R&S®SMW200A Vector Signal Generator	PD 3606.8037.22
R&S®NRP-Z81 Power Meter (R&S®NRP Power Meter Family)	PD 5213.5539.22
R&S®NGMO1 Single Channel Analyzer/Power Supply	PD 0757.6579.21

Specifications in brief

Common data		
Overall frequency range	depends on specific device configuration	9 kHz to 18 GHz
Maximum DUT cable loss		6 dB at 18 GHz, 5 dB at 12.75 GHz, 3.8 dB at 6 GHz
R&S®OSP-ITS switching module		
DUT TX/RX 1, DUT TX/RX 2, DUT RX3	RF output power (≤ 6 GHz)	≥ –16 dBm (RMS)
DUT TX/RX 1, DUT TX/RX 2	max. RF input power	≤ +33 dBm (RMS)
	max. input DC level	0 V DC
	nominal source impedance	50 Ω
	max. VSWR, f ≤ 6 GHz	1.4:1
	max. VSWR, 6 GHz < f ≤ 12.75 GHz	1.8:1
	max. VSWR, 12.75 GHz < f ≤ 18 GHz	2.0:1
	connector	SMA, female
General data		
Environmental conditions	operating temperature range	+20 °C to +26 °C
	storage temperature range	0 °C to +40 °C
	operating temperature range after RF calibration (RFC) [1), 2)]	±2 °C around temperature during RFC
	damp heat	max. 80 % relative humidity, constant at operating temperature, max. 50 % relative humidity, constant at +40 °C
Electrical safety	EU: Low Voltage Directive 2006/95/EC	in line with EN 61010-1
Electromagnetic compatibility	EU: EMC Directive 2004/108/EC	in line with ▪ EN 61326-1 (industrial environment) ▪ EN 61326-2-1 ▪ EN 55011 class A ▪ EN 61000-3-2 ▪ EN 61000-3-3
Dimensions	W × H × D	approx. 600 mm × 1980 mm × 800 mm (23.6 in × 78.0 in × 31.5 in)
Weight	depends on specific configuration	approx. 290 kg (639 lb)

[1)] Air conditioning is strongly recommended.
[2)] RF calibration should be performed annually; RF calibration is independent of the requirement to perform device calibration.