Система тестирования мобильных сетей TS-LBS

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
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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
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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

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R&S®TS-LBS Location Based Services Test System

At a glance

The R&S®TS-LBS is a test system for testing GNSS and network-based location based services (LBS). It fulfills all requirements for LBS development, conformance and carrier acceptance testing for GSM, WCDMA and LTE devices. The R&S®TS-LBS test system can be configured for testing A-GNSS and network-based (OTDOA/eCID) location technologies in user equipment (UE) and chipsets.

The R&S®TS-LBS is an all-in-one test system for location based services. It provides complete LBS test coverage from R&D through conformance. The R&S®TS-LBS covers all major wireless 3GPP standards (GSM, WCDMA, LTE) and addresses modern positioning technologies (A-GNSS, OTDOA/eCID, control plane and user plane).

The R&S®TS-LBS is a fully automated conformance test system supporting validated protocol conformance and minimum performance test cases in design, precertification and type approval environments. With the flexible, multitechnology R&S®CMW500 network emulator and the R&S®SMBV100A GNSS simulator at the core of the system, the R&S®TS-LBS is a scalable solution that can be adapted to any LBS test application.

Key facts

- Support for all positioning technologies: assisted global navigation satellite systems (A-GNSS), cellular-based technologies (OTDOA/eCID)
- Support for all 3GPP technologies: GERAN, WCDMA/HSPA and LTE FDD/TDD
- Support for all positioning protocols: RRC, RRLP, LPP, SUPL 1.0 and 2.0
- Protocol conformance testing and minimum performance testing for LBS
- Over the air (OTA) performance testing together with R&S®TS8991 system
- Addressing of all test phases: development, preconformance, conformance, carrier acceptance test plans

Applications

- Conformance and certification testing
- Design verification
- Pre-launch evaluation
- Carrier acceptance testing
- Mobile application testing
- Regression testing
- Benchmarking
- Performance analysis
- Research and development

R&S®TS-LBS NetOp for carrier acceptance test plans including fading.

Scalability and upgradability to address all LBS test requirements

The R&S®TS-LBS provides a cost-effective entry point to LBS testing, offering scalable and flexible test systems suitable for applications ranging from development to automated conformance and carrier acceptance testing of LBS enabled GSM, WCDMA and LTE devices.

R&S®TS-LBS Compact
This system version focuses on A-GNSS testing. It provides test capabilities for protocol conformance and minimum performance testing for A-GNSS (A-GPS, A-Glonass, A-BeiDou) positioning technologies. Built on the R&S®CMW500, this solution supports all major 3GPP radio access technologies (GSM, WCDMA, LTE).

Integration into other solutions The R&S®TS-LBS can also be integrated into an existing system or R&S®CMW500 – a convenient way to add LBS testing.

R&S®TS-LBS Advanced
This system version provides complete test coverage for all LBS technologies, from A-GNSS to network-based positioning technologies (OTDOA/eCID). It supports the entire LBS test cycle, from R&D to type approval.

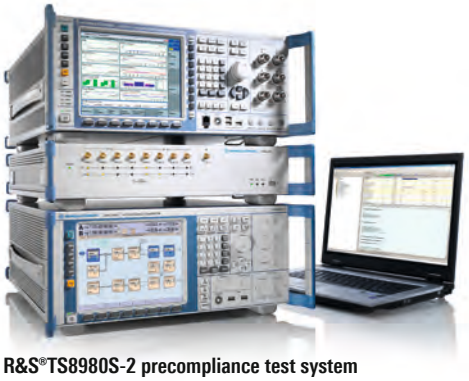
The R&S®TS-LBS Advanced system can also be scaled to address test requirements beyond LBS, such as test-ing RRM and PQA performance. The system addresses multiple test requirements for UE and chipsets for all 3GPP radio access technologies.

Overview of R&S®TS-LBS test system family

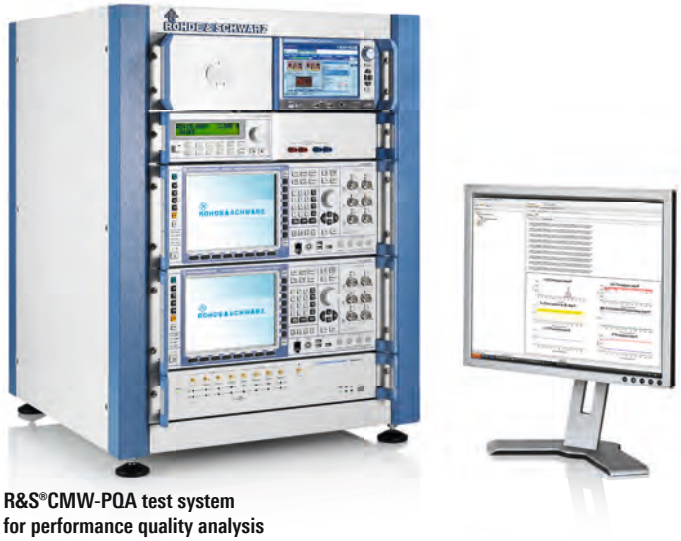
R&S®TS-LBS test system

R&S®TS-LBS Compact test system;
including carrier acceptance testing

R&S®TS-LBS Advanced test system;
including carrier acceptance testing



R&S®TS8980S-2 precompliance test system



R&S®CMW-POA test system
for performance quality analysis

Covering all needs from R&D to conformance and carrier acceptance testing

Test solution for the entire LBS test cycle

The R&S®TS-LBS is a test solution that addresses the entire LBS test cycle from R&D to conformance and carrier acceptance testing. There is no need for multiple test platforms or signaling solutions. The R&S®TS-LBS is built on the R&S®CMW500, providing leading-edge and future-viable capabilities and performance.

The R&S®TS-LBS addresses a wide range of users, including chipset/UE developers, carrier acceptance test labs and GCF/PTCRB validation houses. It is an all-in-one solution that addresses all LBS test requirements.

Research and development testing

R&D test features include:

- Margin search
- User-defined scenarios
- Parameter evaluation mode (PEM)
- U-plane and C-plane transport mechanisms
- LPP, RRLP, RRC protocol support

Conformance testing

Support for 3GPP and OMA protocol conformance and minimum performance testing, including:

- LPP, RRLP, RRC protocol conformance
  - 37.571-2
  - 34.123
  - 51.010-1
- GSM, WCDMA, LTE minimum performance
  - 37.571-1
  - 51.010-1
- OMA SUPL 2.0 protocol conformance
  - LPP
  - RRLP
  - RRC

Carrier acceptance testing

The R&S®TS-LBS covers carrier acceptance testing, extending LBS test coverage beyond the industry standards' test plans. The system covers test requirements from:

- AT&T
- Verizon Wireless
- T-Mobile

The R&S®TS-LBS provides complete LBS test coverage through all phases

A-GNSS minimum performance	LBS protocol conformance	Network-based positioning OTDOA/eCID	Carrier acceptance	A-GNSS OTA	LBS hybrid	LBS development features	Field-to-lab
LTE A-GNSS	OMA SUPL 2.0 TTCN3	LTE FDD OTDOA eCID	Verizon test plan	Verizon LTE GPS	LTE A-GNSS OTDOA	Margin search, PEM, sweep mode	Recording and playback, GPS, Glonass, BeiDou
WCDMA A-GNSS	LTE LPP FDD/TDD C-plane	LTE TDD OTDOA eCID	AT&T test plan	CTIA 3.2 LTE A-GNSS	LTE A-GNSS hybrid	LBS receiver testing, GPS, Glonass, BeiDou	
GSM A-GNSS RRLP	WCDMA RRC C-plane	Interband OTDOA	T-Mobile test plan				
	GSM RRLP C-plane	CA OTDOA	NTT CoCoMo test plan				

Field-to-lab record and replay solution

Bringing real-world scenarios to the lab

The record and replay solution brings the real world to the lab. It simply and efficiently captures complex, real-world GNSS signal scenarios and replays them in the lab with high fidelity. Once the GNSS RF data is recorded, the captured environment can be played back repeatedly in the lab to test a large number of devices. This saves travel and engineering costs. The recording and replay solution effectively improves performance and quality of the devices under test and reduces test time. The same recorded environment can be used for R&D, type approval and certification. R&S®TS-LBS units are reused for recording and playback.

Powerful and flexible

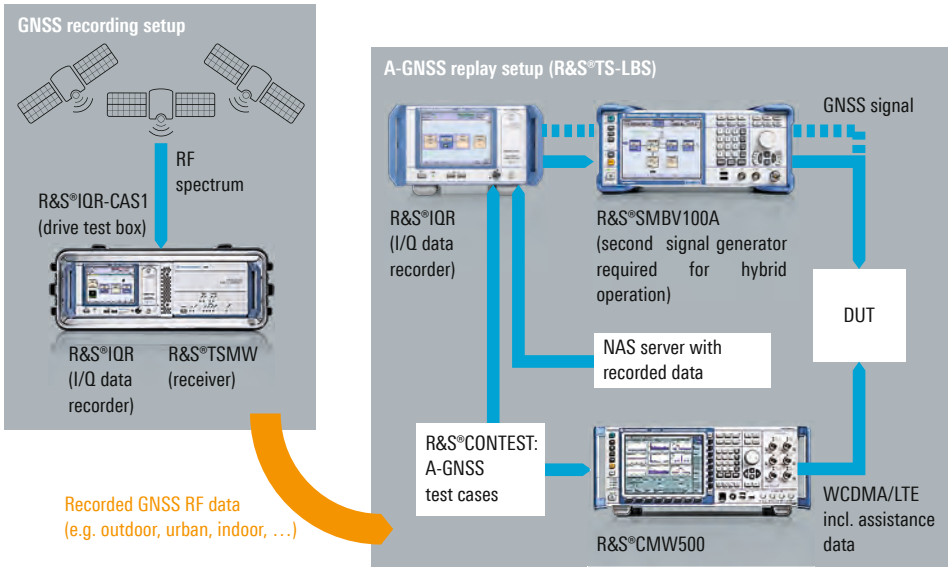
The record and replay solution is powerful and flexible:

- Support of recording and playback of GPS, Glonass, BeiDou and SBAS satellites
- Flexible frequency settings for recording
- Removable solid state disk (SSD)
- Portable recording
- Independent recording and playback setups
- Reuse of recording setup for playback
- Same software suite for recording and playback
- Recording of moving scenarios
- 16-bit quantization
- Hybrid (GNSS and network-based) recording and playback
- Replay including E911 mandate requirements

Testing made easy

- Reduce travel and project costs and test time
- Improve performance and quality
- Transfer real-world scenarios to the lab
- Use the same recorded environment for R&D, type approval and certification
- Reproducible, comparable test environments in the lab
- Continuous recording and replay with unprecedented high fidelity
- Reuse of R&S®TS-LBS units for recording and playback

A-GNSS record and replay solution

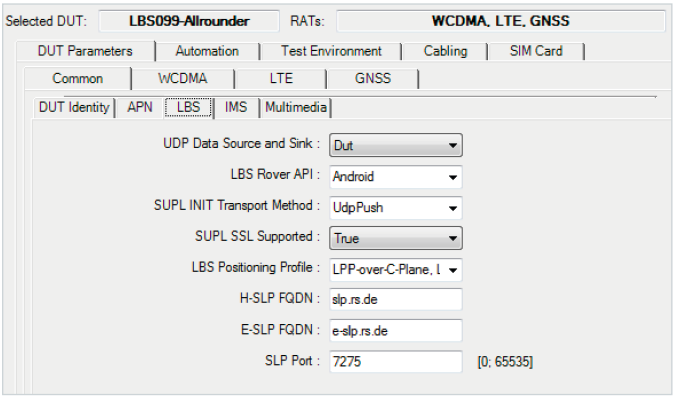


High usability from starting up to reporting

Flexible, easy-to-use R&S®CONTEST graphical user interface

R&S®CONTEST, with its flexible, easy-to-use GUI, is the standard software platform used in test systems such as the R&S®TS8980FTA, R&S®TS-RRM, R&S®TS-LBS and R&S®CMW-PQA. R&S®CONTEST is used to create and execute test sequences, loops and test plans from test cases. It also generates test reports that the user can organize and manage as desired. While executing test cases and test plans, the software continuously displays messages and call flows, providing the user with an instant overview of test results. The parameter evaluation mode (PEM), margin search, user defined scenarios, generic record and replay and E911 functions and the R&S®CMWmars multi-functional logfile analyzer make it possible to configure the test environment as required for a given task.

R&S®CONTEST provides high flexibility for LBS specific DUT settings.

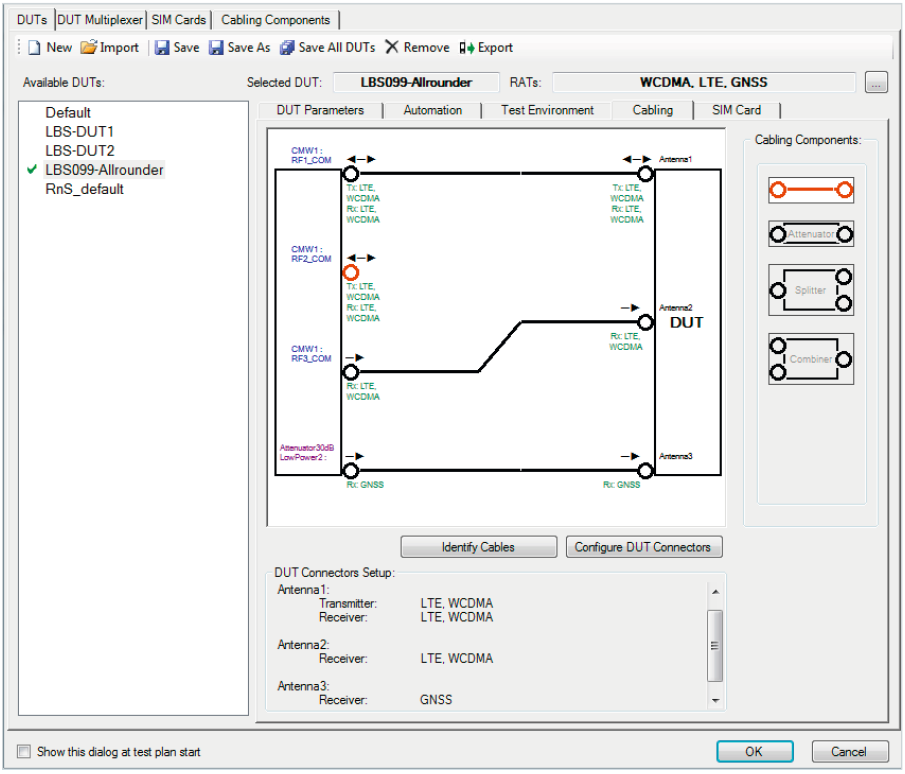


Convenient DUT configuration, graphical configuration of antenna

The DUT service functions make it easy to configure basic DUT parameters in just a few steps:

- Select transport mechanism (C-plane or U-plane)
- Select transmission protocol, e.g. LPP, RRLP or RRC
- Configure antenna, DUT parameters, test environment and SIM card parameters
- Select programmable power supply and a automation manager for fully automated testing
- Execute fully automatic path calibration routines that run with minimum manual intervention and without any extra equipment

R&S®CONTEST allows flexible, convenient DUT configuration, including graphical configuration of DUT connections to the test system.



Easy creation of test sequences und test plans

Users can drag and drop test cases into sequences and/or loops to generate test plans. Parameters are conveniently configured on the GUI.

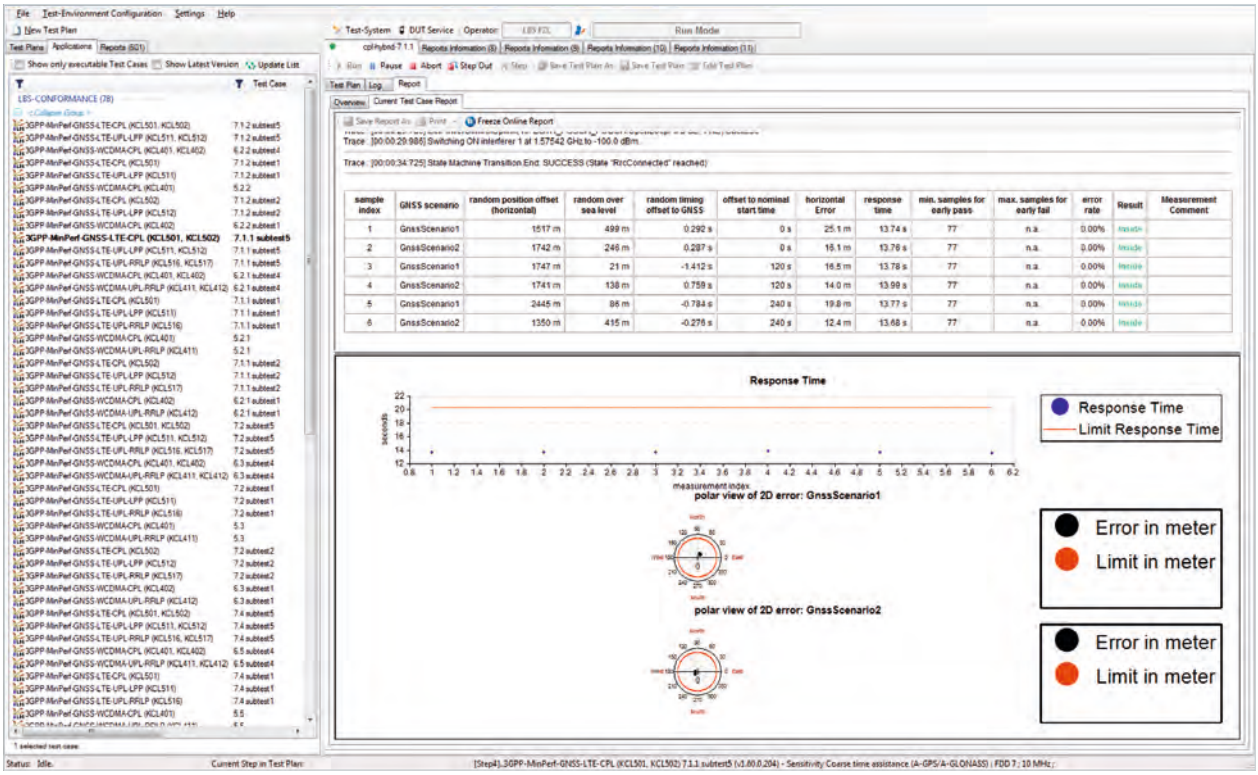
- Easy creation of test plans, test sequences and test loops using the drag and drop function
- Easy setting of parameters for complete test sequences and test plans
- Easy reloading and repetition of test plans and test sequences

Fully automatic execution of test sequences und test plans

Test sequences and test plans are executed fully automatically at the press of a button. Test plans and test sequences can be stored, reloaded and repeated as required.

- Start test plan or test sequence by pressing the “Run” button
- The test plan or test sequence is executed fully automatically
- The software automatically generates a realtime report with continuous activity status and pie diagram
- Final results are stored in graphical and text form in a single HTML file
- Result graphics are also saved as JPEG files for user convenience
- LBS specific features include X-Y plot of horizontal error and response time plot per measurement, as well as full logging and decoding of LBS messages

Flexible, easy-to-use R&S®CONTEST graphical user interface.



Powerful tools and functions

Efficient use of test system through automation

The test system offers functions for the automated configuration and execution of test sequences and test plans, significantly speeding up LBS testing. The automation manager enables automated DUT configuration and control, minimizing manual inter-vention during test runs. Automated power supply control can be activated for automatic UE hard reset. Fully auto-matic path calibration routines can be run with minimum manual intervention and no extra equipment.

Convenient online report generator

Test case reports are generated online during test execution. They include both text and configurable graphics. Graphical results are updated in realtime to indicate the progress of a test case. Final graphical results and text are stored in a single HTML file. The graphics are also saved separately as JPEG files.

Summary report generator

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

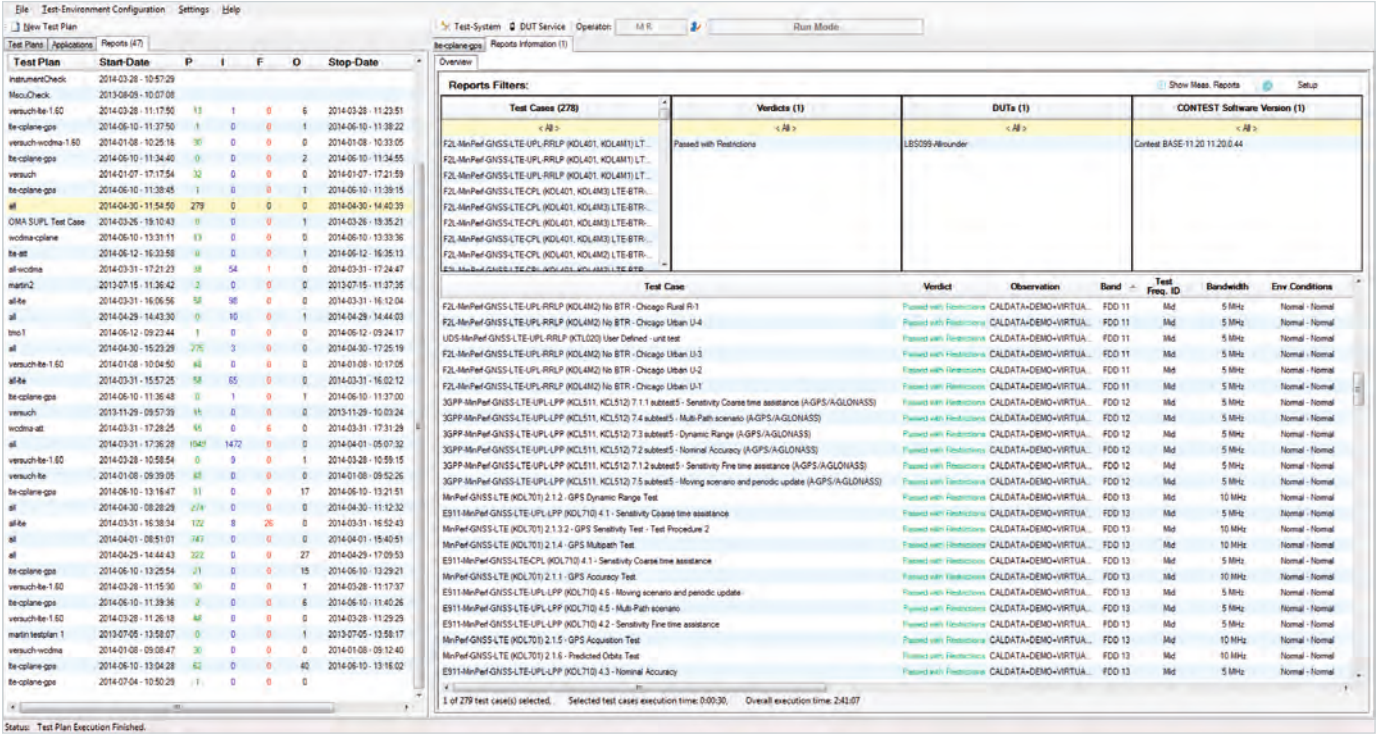
Report manager and analyzer

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 a detailed analysis of result graphics. Graphical features include a speech bubble comment function that can also be used for the graphical results. In addition, the report analyzer offers a set of statistical tools that support post-processing of results, e.g. to graphically analyze the performance of a DUT over time as software versions change.

External database access

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

Report manager with powerful filters, facilitating evaluation of test report collections.

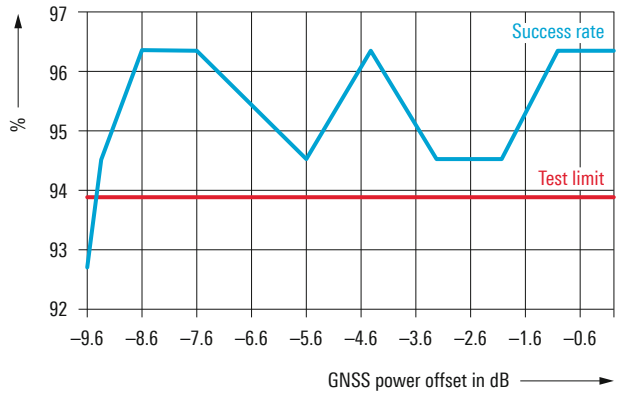


Support for LBS development

Powerful functions support LBS development:

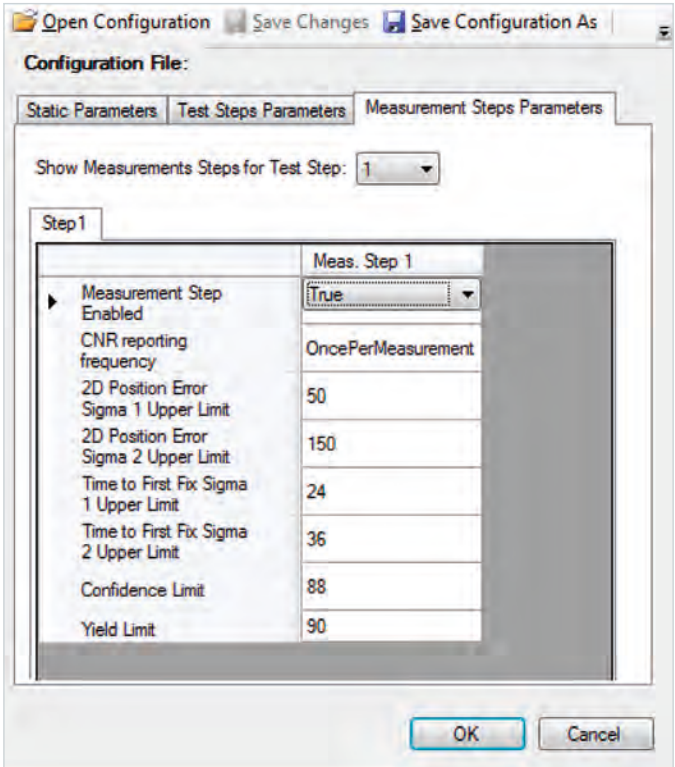
- Parameter evaluation mode (PEM) for easy modification of critical LBS-related parameters
- Margin search for fast assessment of performance of an LBS device, with smart algorithms to determine how well a device passes a specific test or where the failure point is
- User-defined scenarios for generating and executing user-specific GNSS scenarios
- E911 R&D function for modifying 3GPP test cases for GNSS and OTDOA/eCID
- Generic record/replay solution for recording and replaying user-defined test environments
- Debugging capabilities, including breakpoints and step-by-step execution
- Use of R&S®CMWmars multifunctional logfile analyzer for analyzing messages

Margin search

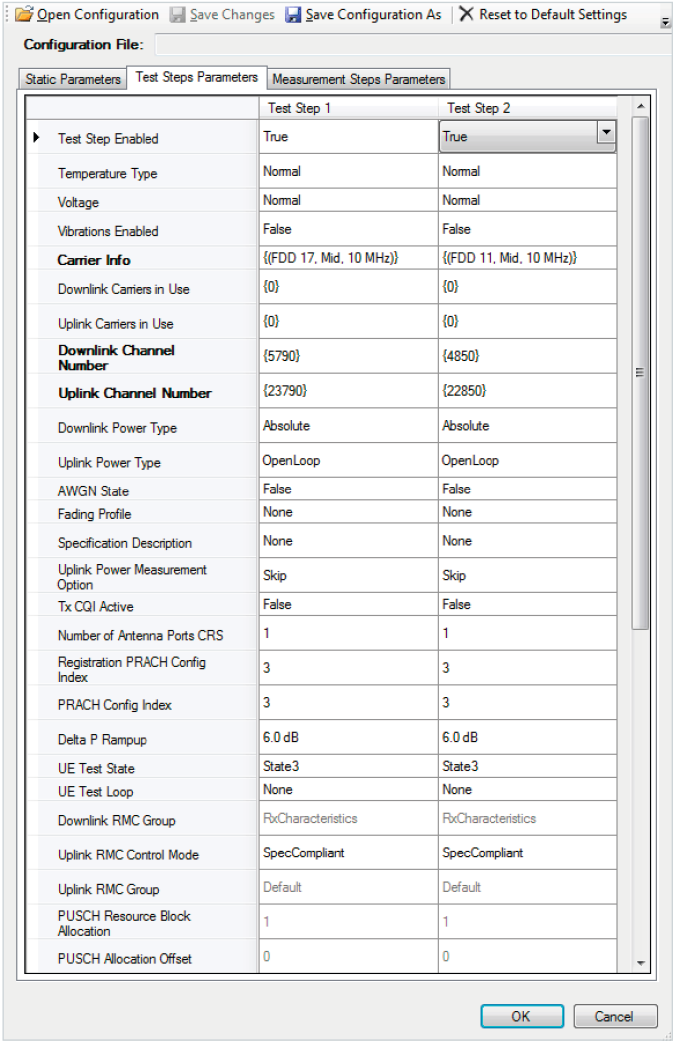


Margin search is completed successfully; margin is 9.3 dB

R&S®CONTEST R&D measurement step parameters (parameter evaluation mode – PEM).



R&S®CONTEST R&D test step parameters (parameter evaluation mode – PEM).



Customized solutions with GNSS simulator in R&S®SMBV100A

Ready for future GNSS standards

The market for GNSS has grown steadily over the last few years. With new satellite systems such as the Chinese BeiDou and the Indian IRNSS being developed and existing systems modernized, the variety of available satellite systems, signals and applications will continue to grow.

The powerful R&S®SMBV100A hardware platform coupled with the very generic software architecture of the GNSS solution enable the R&S®SMBV100A to support satellite standards beyond GPS, Glonass, Galileo and BeiDou, making it a very safe investment for the future.

Numerous GNSS options

Users can choose from a variety of options to generate LBS test scenarios with the R&S®TS-LBS.

GPS

R&S®SMBV-K44 option

- Simulation of up to six GPS satellites with civilian codes (C/A codes) at frequencies L1 and L2
- Static mode and localization mode
- User-definable almanac file (SEM/YUMA) with real navigation data
- User-definable location and start time
- Automatic configuration of GPS scenario with optimum satellite constellation
- Unlimited simulation time with automatic, on-the-fly exchange of satellites
- Dynamic, realtime power control for the individual satellites
- Hybrid GNSS satellite constellations with up to six satellites

Assisted GPS

R&S®SMBV-K65 option

- Support of predefined and user-defined A-GPS test scenarios
- Generation of A-GPS assistance data for predefined and user-defined scenarios
- Fully user-defined configuration of GPS navigation message (manually or via import of RINEX ephemeris files)

GNSS enhanced

R&S®SMBV-K92 option

- WGS84 waypoint interface and import of NMEA waypoints
- Import of Google Earth and Google Maps .xml files
- East-north-up (ENU) 2D vector trajectory interface (line, arc) for automatic waypoint generation
- Motion interface for dynamics input (velocity vector or velocity magnitude) in ENU and WGS84

GNSS simulator in the R&S®SMBV100A.

- Predefined waypoint files for land vehicles, ships, aircraft and spacecraft
- Predefined and user-defined vehicle description files for land vehicles, ships, aircraft and spacecraft
- Smoothing of waypoints using vehicle description files
- Hardware-in-the-loop (HIL) realtime feeding of vehicle motion data (position, velocity, acceleration, jerk)
- Configurable HIL streaming rate of up to 100 Hz
- HIL execution synchronous to 1 pps; 10 ms system response delay and applied prediction algorithms
- User-definable multipath
- Configurable atmospheric models
- Configurable system time transformation parameters
- Configurable leap second simulation

Glonass

R&S®SMBV-K94 option

- Simulation of up to six Glonass satellites (FDMA) with civilian codes (C/A codes) at frequencies L1 and L2
- Static mode and localization mode
- User-definable almanac file (.agl) with real navigation data
- User-definable location and start time
- Automatic configuration of Glonass scenario with optimum satellite constellation
- Unlimited simulation time with automatic, on-the-fly exchange of satellites
- Dynamic, realtime power control for the individual satellites
- Hybrid GNSS satellite constellations with up to six satellites

Assisted Glonass

R&S®SMBV-K95 option

- Support of predefined and user-defined A-Glonass test scenarios
- Generation of A-Glonass assistance data for predefined and user-defined scenarios
- Fully user-defined configuration of Glonass navigation message (manually or via import of RINEX ephemeris files)

GNSS extension to 12 satellites

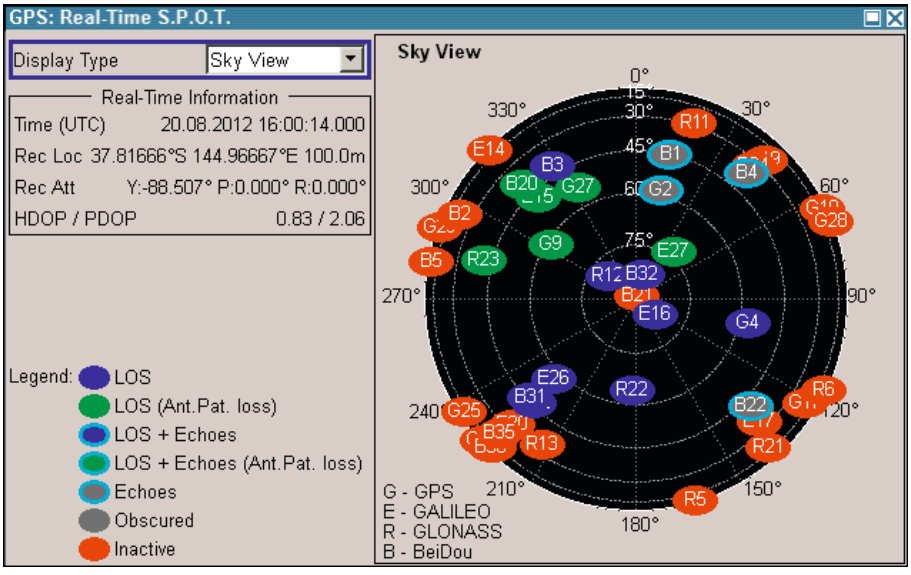
R&S®SMBV-K91 option

- Simulation of civilian codes (C/A codes) from up to 12 GNSS satellites

BeiDou

R&S®SMBV-K107 option

- Simulation of up to six BeiDou satellites at frequency B1
- Static mode and localization mode
- User-definable almanac file with real navigation data
- D1 and D2 navigation messages for MEO/IGSO and GEO satellites
- User-definable location and start time
- Automatic configuration of BeiDou scenario with optimum satellite constellation
- Unlimited simulation time with automatic, on-the-fly exchange of satellites
- Dynamic, realtime power control for the individual satellites
- Hybrid GNSS satellite constellations with up to six satellites



Simulation of a hybrid GPS/Glonass/Galileo/BeiDou constellation including signal obscuration and multipath propagation.

Specifications in brief

Specifications in brief		
Supported technologies		
Navigation	satellite systems (GNSS)	GPS, Glonass, BeiDou, A-GPS, A-Glonass, A-BeiDou
	network-based positioning	OTDOA, eCID
	hybrid solutions	A-GPS + Glonass, A-GPS + OTDOA/eCID
Technologies	C-plane, U-plane	RRC, RRLP, LPP, SUPL 2.0
	network standards	GSM/EGPRS, WCDMA/HSPA, LTE FDD/TDD
General data		
Power supply	rated voltage	120 V AC or 230 V AC
	rated frequency	50 Hz to 60 Hz
	rated power consumption	max. 350 VA
Environmental conditions	storage temperature range	0 °C to +40 °C
	operating temperature range	+20 °C to +26 °C
	relative humidity, noncondensing	20 % to 80 %
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	465.1 mm × 352.3 mm × 517.0 mm (18.31 in × 13.87 in × 20.35 in)
Weight	depending on test system configuration	approx. 25.9 kg (approx. 57.4 lb)

Data sheets of instruments used in the system	
Instrument data sheet	**Order No.**
R&S®CMW500 Wideband Radio Communication Tester	PD 5213.9211.22
R&S®SMBV100A Vector Signal Generator	PD 5214.1114.22
R&S®I/Q Data Recorder	PD 5214.4394.12

Relevant standards	
Standard	**Description**
34.123	3GPP 3G positioning test plans
36.355	LTE positioning protocol (LPP)
37.571-1	3GPP LTE/WCDMA minimum performance positioning test plan
37.571-2	3GPP LTE/WCDMA protocol conformance positioning test plan
51.010-1	3GPP GSM positioning test plans