Using signal generators for GNSS simulation has some major advantages over using live GNSS signals. While using live signals, signal conditions can change permanently and unpredictably, making it very unlikely that two successive test runs can be performed under identical conditions. GNSS signals are exposed to high velocities and accelerations. To be able to support scenarios where the simulated user is exposed to high velocities and accelerations, the GNSS simulator has to provide multi-constellation and multi-frequency support. In order to meet today’s testing needs, a GNSS simulator has to provide multi-constellation, multi-frequency, multi-antenna and multi-vehicle support.

In order to be able to support environments where the signal environment is exposed to signal dynamics, the GNSS simulator must support the presence of multipath. In GNSS simulation, the simulator needs to be able to combine signal paths (including the line-of-sight signal and the multipath signals). Statistical channel models or deterministic multipath models, related-channel models or fading channel simulations can be used as multipath models.

Range simulation
For the simulation of multipath, the time offset has to be considered. For realistic range simulation, the simulator needs to be able to simulate all relevant systems (LEO/MEO/GEO/IGSO), including orbit errors and processes. Generation of interfering signals may also be of consideration vehicle attitude is also part of this simulation.

Vehicle movement
In order to test GNSS receivers under high signal dynamics, the GNSS simulator has to account for the presence of multipath, a GNSS simulator has to perform multipath simulations. Statistical channel models, deterministic multipath models, multipath models, related-channel models or fading channel simulations can be used as multipath models. In order to test the receiver performance in vehicle movement, the GNSS simulator has to provide accurate multi-constellation, multi-frequency and multi-antenna support.

Signal obscuration
In many cases, signal obstruction needs to be taken into account. The presence of additional signals such as LTE can interfere signals must be taken into account. The interference signals must be taken into account. The interference signals must be taken into account. The interference signals must be taken into account. The interference signals must be taken into account.

All these test solutions ensure that GNSS simulations are performed under realistic, verifiable, controllable and repeatable conditions. In order to test moving vehicles, a GNSS simulator has to provide a GNSS constellation simulator for multi-frequency receiver tests. A variety of software options can turn Rohde & Schwarz vector signal generators (R&S®SMW200A) into GNSS simulators. The T&M expert brings satellites into your lab. A variety of software options can turn Rohde & Schwarz vector signal generators (R&S®SMW200A) into GNSS simulators. The T&M expert brings satellites into your lab.
BASIC GNSS RECEIVER DEVELOPMENT AND PRODUCTION TESTING

Using GNSS waveforms for basic receiver tests
Many Rohde & Schwarz signal generators can be used to play back GNSS waveforms. This approach is ideal for setting up a basic and cost-efficient single-channel test environment for use in the early stages of GNSS receiver development. It is suitable for verifying the receiver’s acquisition and tracking capabilities and performing basic sensitivity tests.

GNSS waveforms can be created using the R&S®WinIQSIM2™ simulation software and are available for the following instruments:
- R&S®SMCV100B
- R&S®SMBV100B
- R&S®SGT100A
- R&S®SMW200A
- R&S®CMA180
- R&S®CMW500

www.rohde-schwarz.com/product/winiqsim2

GNSS production tester
The GNSS production testers from Rohde & Schwarz address specific needs for GNSS chipset testing and speed-optimized production testing of GNSS receivers. During such tests, the basic GNSS signal reception and the connection between the antenna and GNSS chipset need to be verified.

The R&S®SMBV100B can be turned into a single- or multi-frequency GNSS production tester that generates signals for GPS, GLONASS, BeiDou and Galileo with one satellite per system. The four satellites can be activated individually and level changes can be made on the fly, enabling users to simultaneously perform independent sensitivity tests for each system. Additional key features include customizable navigation data content and customizable velocity profiles for verifying the maximum signal dynamics the receiver can handle and the generation of CW signals for interference testing.

www.rohde-schwarz.com/product/smbv100b

R&S®WinIQSIM2™ makes it easy to generate digitally modulated signals, including GPS, GLONASS, BeiDou and Galileo waveforms

The GNSS production test solution based on the R&S®SMBV100B meets all requirements for GNSS chipset and production testing
MULTI-FREQUENCY RECEIVER CHARACTERIZATION

GNSS simulator in the R&S®SMBV100B

In order to characterize the performance of GNSS receivers, their basic functions need to be tested under controlled and repeatable conditions. Typical tests include the determination of the receiver’s time to first fix, acquisition and tracking sensitivity, reacquisition time and its ability to provide an accurate positioning solution. Such location accuracy tests are typically performed assuming a static or a moving receiver. In addition to these standard tests, it is often required to test the receiver’s performance under special conditions or in dedicated environments such as interference or multipath environments or under the influence of atmospheric effects and dynamic stress.

The R&S®SMBV100B vector signal generator can be equipped with a multitude of GNSS options, turning the instrument into a reliable, full-featured GNSS signal source. It has advanced simulation capabilities for configuring realistic and complex yet repeatable GNSS scenarios that can be run under controlled conditions. This includes realistic modeling of GNSS orbits, signal propagation effects and system errors as well as realistic modeling of the user environment.

Key facts
- Multi-constellation, multi-frequency GNSS scenarios
- Support of GPS, GLONASS, BeiDou, Galileo, SBAS and QZSS, including GPS P-Code
- Simultaneous signal generation in the frequency bands L1, L2 and L5 with up to 102 GNSS channels
- Support of moving scenarios, including realtime external trajectory feed for hardware-in-the-loop applications
- Configuration of realistic GNSS scenarios, including obscuration, multipath, atmospheric effects, antenna characteristics and vehicle attitude
- Integrated noise and CW interference generator
- Avionics standards (ILS/VOR/DME/GBAS) in the same instrument
- Automated GNSS performance testing for eCall and ERA-GLONASS modules with R&S®SMBVB-K360/-K361

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Simulation of a combined GPS/GLONASS/BeiDou/Galileo constellation for a moving GNSS user
BASIC GNSS RECEIVER DEVELOPMENT AND PRODUCTION TESTING

Multi-frequency GNSS test solution

Midrange GNSS test solution

ADVANCED MULTI-FREQUENCY GNSS TESTING

High-end GNSS test solution

Multi-frequency GNSS receiver in the R&S®SMBV100B

The R&S®SMBV100B vector signal generator can be turned into a GNSS production tester that generates signals for GPS, GLONASS, BeiDou and Galileo with one satellite frequency. The four satellites can be activated individually or simultaneously for realistic as possible. The R&S®SMBV100B is a general purpose vector signal generator that can be turned into a single- or multi-channel GNSS production tester. The R&S®SMBV100B can be turned into a powerful and feature-rich GNSS simulator. It can simulate realistic GNSS scenarios and enable the execution of advanced test tasks such as CRPA testing. The R&S®SMBV100B comes with integrated GNSS simulation software that allows users to simulate realistic GNSS scenarios and enable the execution of advanced test tasks such as CRPA testing. The R&S®SMBV100B can be turned into a powerful and feature-rich GNSS simulator. It can simulate realistic GNSS scenarios and enable the execution of advanced test tasks such as CRPA testing.

APPLICATIONS

The R&S®SMBV100B can be used to perform power and signal characterization, multi-frequency GNSS applications, and high-end GNSS testing. It can simulate realistic GNSS scenarios and enable the execution of advanced test tasks such as CRPA testing. The R&S®SMBV100B comes with integrated GNSS simulation software that allows users to simulate realistic GNSS scenarios and enable the execution of advanced test tasks such as CRPA testing. The R&S®SMBV100B can be turned into a powerful and feature-rich GNSS simulator. It can simulate realistic GNSS scenarios and enable the execution of advanced test tasks such as CRPA testing.

Multi-frequency GNSS receiver in the R&S®SMBV100B

The R&S®SMBV100B vector signal generator can be turned into a GNSS production tester that generates signals for GPS, GLONASS, BeiDou and Galileo with one satellite frequency. The four satellites can be activated individually or simultaneously for realistic as possible. The R&S®SMBV100B is a general purpose vector signal generator that can be turned into a single- or multi-channel GNSS production tester. The R&S®SMBV100B can be turned into a powerful and feature-rich GNSS simulator. It can simulate realistic GNSS scenarios and enable the execution of advanced test tasks such as CRPA testing. The R&S®SMBV100B comes with integrated GNSS simulation software that allows users to simulate realistic GNSS scenarios and enable the execution of advanced test tasks such as CRPA testing. The R&S®SMBV100B can be turned into a powerful and feature-rich GNSS simulator. It can simulate realistic GNSS scenarios and enable the execution of advanced test tasks such as CRPA testing.
Service that adds value
► Worldwide
► Local und personalized
► Customized and flexible
► Uncompromising quality
► Long-term dependability

Rohde & Schwarz
The Rohde & Schwarz electronics group offers innovative solutions in the following business fields: test and measurement, broadcast and media, secure communications, cybersecurity, monitoring and network testing. Founded more than 80 years ago, the independent company which is headquartered in Munich, Germany, has an extensive sales and service network with locations in more than 70 countries.

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