GSS9790

Multi-Output Multi-GNSS RF Constellation Simulator System

Supporting over the air (OTA) angle of arrival (AOA) testing

Generating multiple single channel signals for broadcast into anechoic chambers

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Multi-Output Multi-GNSS RF Constellation, Simulator System

For over the air (OTA) testing of antennas and devices where angle of arrival (AOA) needs to be represented, or as part of real-world time-synchronised indoor GNSS implementation.

Spirent's GSS9790 Multi-Output, Multi-GNSS RF Constellation Simulator System is a development of the world's most advanced GNSS Constellation Simulator, the GSS9000.

The GSS9790 is a unique solution providing the core element for GNSS applications that require a test system that can be used in both conducted (lab) and radiated/OTA (chamber) conditions.

Significantly reducing the need to perform expensive field trials, it provides an accurate, repeatable, and controllable tool—free of the constraints and security vulnerabilities associated with operational or field-test environments.

The GSS9790 is a full GNSS RF Constellation Simulator, offering total user control over the satellite orbital definitions, propagation and environmental conditions, signal and data information, accurately modeling satellite trajectories according to the user-defined simulation location, date, and time.

When operated with Spirent's SimGEN™ control software, the user equipment under test behaves as if it were receiving RF signals from real satellites, reporting manoeuvres and trajectories according to the simulation input.

Standard features enabled by the simulation control and scenario definition software, SimGEN™, include simulation of multipath reflections, terrain obscuration, antenna reception gain patterns, differential corrections, trajectory generators for land, air, sea and space vehicles, and comprehensive error generation and system modelling. The product also accepts user-supplied trajectories, either from a file or in real-time via a remote control interface. This enables testing of hardware-in-the-loop (HIL) applications and supports ultra-low latency and high update rates—all whilst maintaining the full performance specification.

The GSS9790 is ideal for testing any application that requires independent access to the RF signals from each of the simulated GNSS satellites.

Complete System Testing

The GSS9790 can be used as the signal generator attached to multiple transmission antennas installed in an anechoic chamber. The antennas are spatially distributed to present the appropriate arrival vectors of the simulated satellite signals at the antenna site. Interference sources can also be located anywhere in the chamber to represent different test environments.

By mounting the antenna on a rate table that replicates the attitude changes of the simulated device, a comprehensive evaluation of all aspects of the receiving system can be achieved in a secure environment, free from unintentional interference (both incoming and outgoing), and free from external observation.

Again, using an anechoic chamber with radiating antennas, the GSS9790 can provide spatial signal diversity for testing items such as GNSS-equipped personal devices through the actual antenna. Items such as reflectors, signal attenuators (a dummy human head for example) can be physically placed adjacent to the unit under test to emulate real-world environments.

The GSS9790 Solution

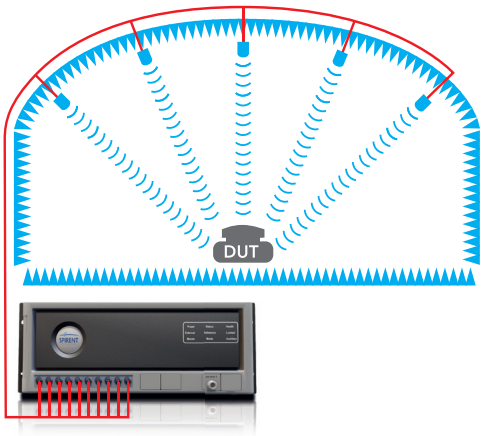
The GSS9790 is essentially a modified variant of Spirent's GSS9000 multi-GNSS simulator platform.

A GSS9790 system consists of 1, 2, or 3 Signal Generator Chassis and a dedicated C50r Host Unit running Spirent's SimGEN™ scenario definition and simulation control software.

Output Modes

Individual Output Mode

In individual output mode a signal representing each satellite is available from each of the 10 outputs. In an OTA application the individual outputs are connected to transmit antennas located around the anechoic chamber ceiling representing the approximate sky positions of the transmitting GNSS satellites, with the DUT located at the centre (focal point) of the chamber.



Composite Output Mode

In composite output mode the GSS9790 operates as a standard GNSS constellation simulator. All GNSS signals are presented to the single RF output representing the physical phase centre point of the sky-interface of a GNSS device's antenna.

Test Scenario Enviroment

SimGEN™ GNSS Test Scenario Definition and Control Software

The GSS9790 is controlled by SimGEN™ running on the C50r Host. Spirent's SimGEN™ software suite is the world's most capable and advanced GNSS simulation software and provides an extensive range of simulation features that can be used to configure and define the required test scenario.

- Fully automatic and propagated generation of precise satellite orbital data, ephemerides and almanac
- Proven models for authentic simulation
- Multiplicity of mechanisms for applying declared and undeclared errors and modifications to navigation data, satellite clocks and orbits
- SimREMOTE: Comprehensive simulation control and 6-DOF trajectory delivery capability
- Data logging and streaming of signal, time, control, vehicle and trajectory data over a variety of interfaces in real-time and to file
- Range of models for multipath reflections
- Terrain obscuration models
- Independent satellite/channel signal power control
- Signal modulation and code control
- Vehicle personalities and motion modelling for aircraft, spacecraft, marine vessels and land vehicles
- Antenna reception gain and phase patterns
- Satellite transmit antenna pattern control
- Clock g-sensitivity
- Antenna lever arm effects
- INS aiding data
- Ionosphere and Troposphere effects including ionospheric scintillation
- DGPS corrections
- Pseudorange ramps (for RAIM testing)
- Coherent and non-coherent Interference and noise modelling (with optional GSS7765 Interference Simulation System)
- Leap-second and week roll-over event testing
- Antenna Reception Patterns (Gain and Phase)—since the real antenna is part of the test
- Vehicle motion—unless the DUT antenna can be mounted on a rate table that is driven consummate with the SimGEN™ scenario vehicle attitude dynamics
- Multipath definition—if the DUT antenna has Direction Of Arrival capability—since transmit antenna locations are fixed

SimGEN™ scenario

Supported Signals

Constellation	Frequency
GPS	L1, L2, L5
SBAS	L1, L5
QZSS	L1, L2, L5, L6
Galileo	E1, E5, E6
GLONASS	L1, L2
BeiDou-2	B1, B2
NavIC/IRNSS	L5

RF Outputs

- 1 or 2 composite outputs, per simulator chassis, for co-axial test applications
- 10 individual outputs, per GNSS constellation carrier frequency, for anechoic chamber test applications

The system supports field-upgrade to increase the number of outputs.

Channels

- Up to 16 satellites simultaneously simulated at each carrier at the composite output(s), for co-axial test applications
- One satellite signal at one carrier at each individual output, for anechoic chamber test applications

The system supports field-upgrade to increase the number of independent outputs.

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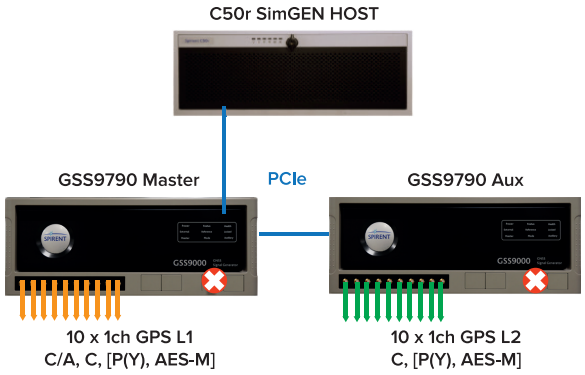
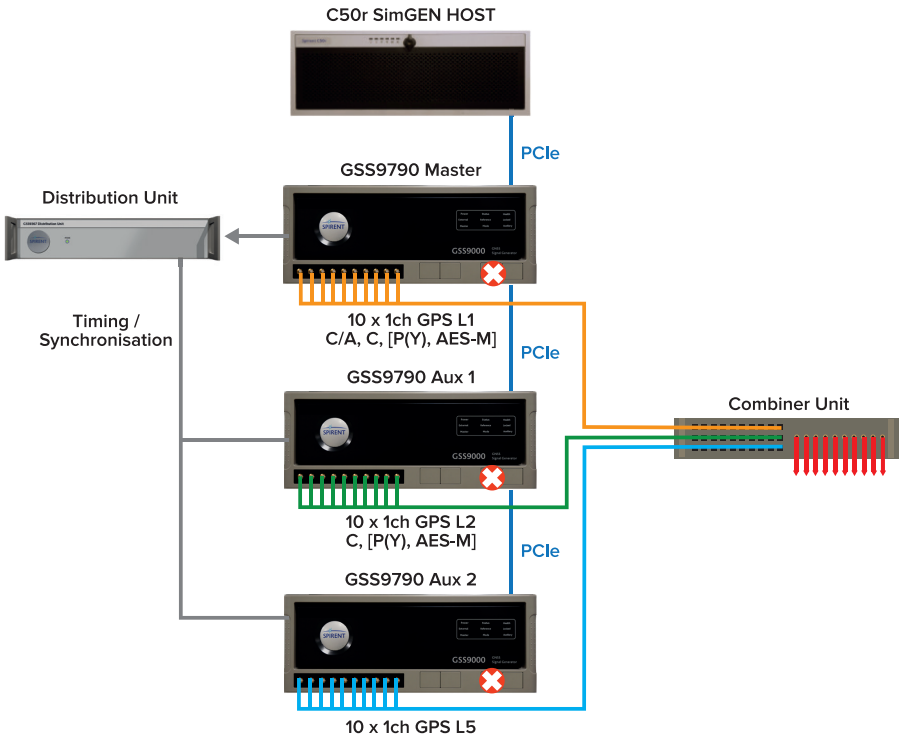
Example Configurations:

GPS L1 x 10 channels + GPS L2 x 10 channels with classified signals



GPS L1 x 10 channels + GPS L2 x 10 channels + GPS L5 x 10 channels with classified signals, 10-way combined



Capability and Performance–Key Attributes

- Up to 1000Hz Simulation Iteration Rate (SIR) and Hardware Update Rate (HUR)
- 10 outputs per chassis, plus composite output
- 0.3mm RMS Pseudorange Accuracy
- <0.005 Rad RMS Phase Noise
- 120,000 m/s Relative Velocity, 192,600 m/s^2 Relative Acceleration, 890,400 m/s^3 Relative Jerk (full specification maintained under these dynamics)
- Highly flexible configurations selectable via a 'cabinet' of licence keys
- Complete portability of Spirent SimGEN™ scenarios
- In-field upgradeability of principal GNSS functionality and capability
- On-the-fly re-configuration of constellation and signal configurations

Contact Us

For more information, call your Spirent sales representative or visit us on the web at www.spirent.com/ContactSpirent.

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