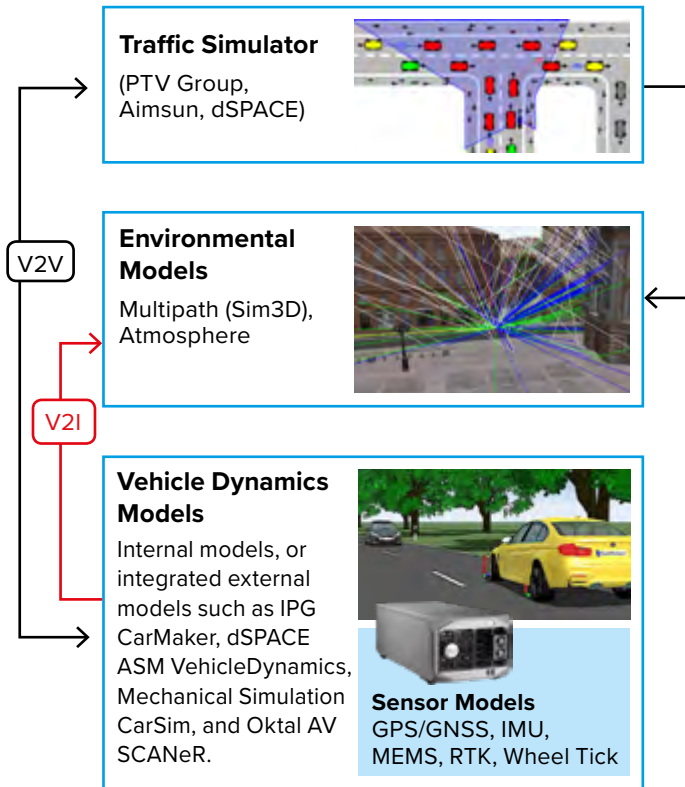


Sensor fusion testing using HiL simulation

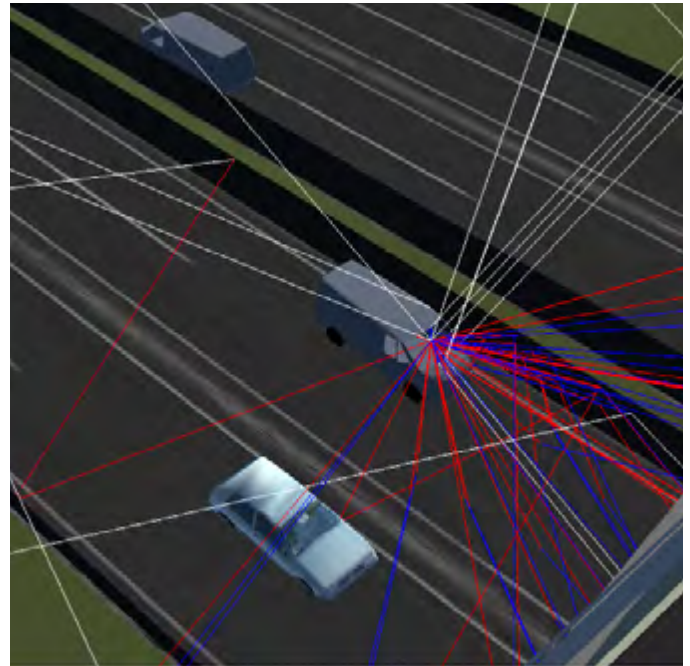
Hybrid positioning and sensor fusion often require extensive testing to ensure the various data inputs are correlated accurately under real-world conditions. With the ever-increasing number of test cases required for exhaustive verification, field testing only is no longer an option. Therefore, simulation is the key - but for it to be of any real use it must be as realistic as possible.



Realistic 3D models

GNSS positioning and navigation can be degraded in urban environments by multipath, and the error can increase considerably if not properly compensated. The use of 3D models is becoming the preferred solution in recreating a realistic obscuration and multipath environment, as it enables greater flexibility and accuracy in both antenna position and signal propagation.

However, this solution comes with a certain degree of complexity - an accurate 3D model is required to simulate the obscuration of the GNSS signal, and a good propagation model is needed to generate phenomena like reflection and diffraction.

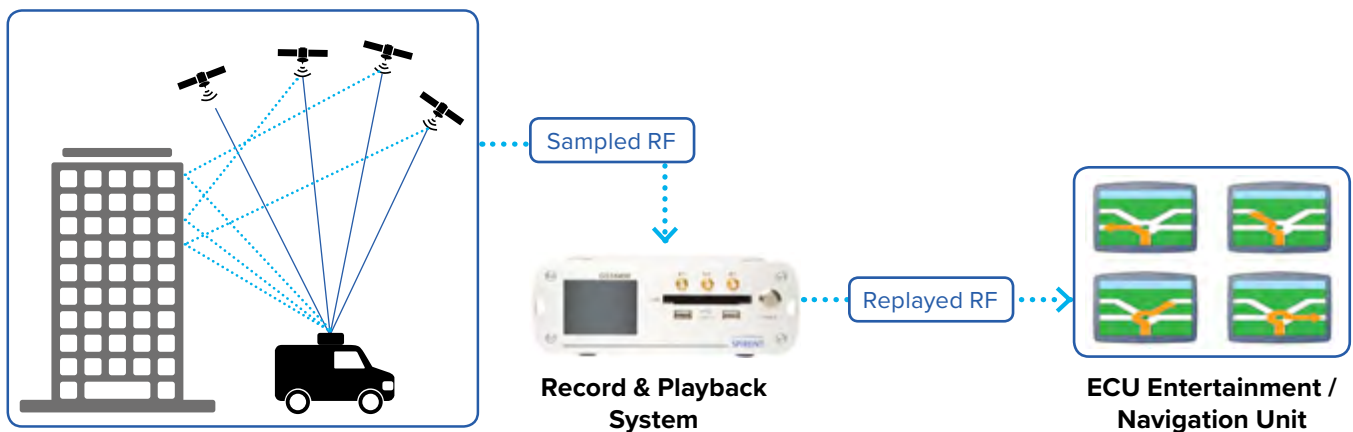


Capturing the Real-World RF Environment

Because of the slow and expensive nature of field testing, there is a powerful argument for replacing a significant proportion of it with an RF Record & Playback solution.

This can enable high-fidelity recording of real-world environments, bringing them into the lab for repeatable testing.

- Record GNSS signals, Cellular (LTE), and WiFi
- Capture obscuration, multipath, diffraction, and interference - accurately
- Record IMU and CANoe data
- Replay in the the lab to assist ADAS development or IVS testing



GNSS Vulnerabilities Testing

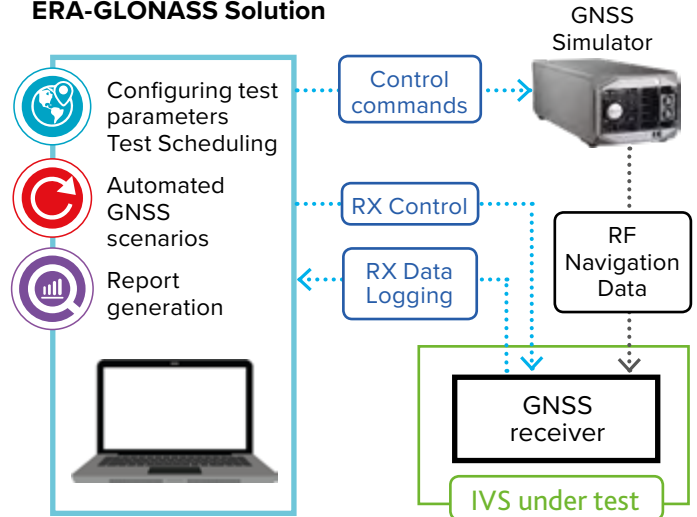
The low power of GNSS signals on Earth and the widely disclosed GNSS signal format bring vulnerabilities of signal jamming, atmospheric (scintillation and space weather), and location or time spoofing. It is very important to both understand and test against these threats to improve the resilience of the system.



eCall & ERA-GLONASS Testing

To ensure test quality and efficiency, eCall and ERA-GLONASS component test regimes must be both highly controlled and flexible. The challenge for IVS manufacturers and integrators lies in creating a test bed to run all tests required in the specifications – from setting up the appropriate simulators and other test equipment, to writing the test scripts, running the tests on the IVS unit, and recording the results.

Automated eCall / ERA-GLONASS Solution



GSS7000

To test repeatably and reliably you'll need a high accuracy simulator. Spirent's GSS7000 is available with 3 different levels of software – SimGEN™ / SimREPLAYplus™ / SimTEST – and offers all current and future signals.

- Multi-GNSS / multi-frequency simulation
- MEMS simulation - including 3D inertial MEMS output plus odometry and heading rate gyros
- Low latency for real-time Integration with third party trajectory providers, including (but not limited to) dSPACE SCALEXIO & ASM VehicleDynamics / IPG CarMaker / Mechanical Simulation CarSim / Otkal AV SCANer
- RTK message simulation

- Integration with Vector CANoe
- Rack mountable and remote controllable
- Source of timing with PPS and 10 MHz signals
- SimROUTE for generation of road matched trajectories including elevation
- Compatible with Spirent V2X Emulator



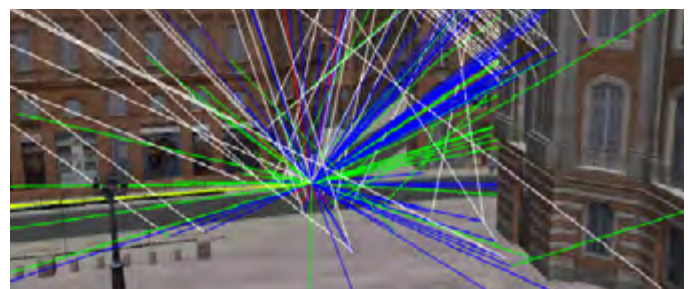
Sim3D

Sim3D is a unique system for simulating GNSS propagation in a true to life synthetic environment. Different realistic environments can be modelled – e.g. urban, deep urban, dense forest, or highways.

Sim3D can:

- Provide realism in simulation
- Reduce reliance on field testing
- Enable simulation of edge test cases
- Simulate real life environments – including pedestrian motion, traffic, and position of DUT in the vehicle

- Easily integrate with HiL setups to provide realistic multipath simulation



GSS6450

The Spirent GSS6450 is the world's smallest high bit depth RF record and playback device, and can offer:

- 3 independent RF ports
- Record and playback:
 - Multi-GNSS / multi-frequency / LTE / Wi-Fi
 - Up to 4 cameras
 - CANoe



Professional Services & eCall Test Suite for PNT TestBench

Developed with direct feedback from the Joint Research Centre, Spirent's new automated eCall Test Suite is a turnkey solution for ensuring your in-vehicle system (IVS) is compliant with Annex VI of the eCall regulation.

- All required test cases for Annex VI are executed sequentially
- Device under test is automatically controlled through remote commands - whilst logging the data it generates
- Results are analysed and reported instantaneously
- Automatically assigned Pass/Fail based on regulation requirements

eCall testing and ERA-GLONASS testing are also available as Professional Services from Spirent.

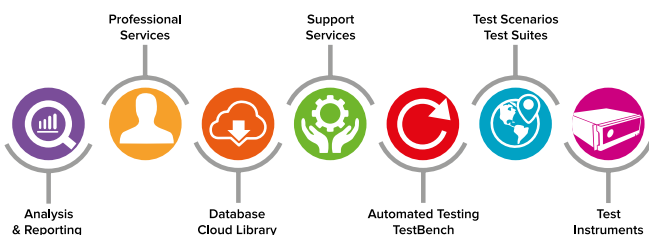


GSS7725 and GSS200D

Understand, generate, and protect against RF interference. Whether you are designing or integrating a positioning module for automotive applications, testing against different types of GNSS interference is a key consideration.

Spirent has extensive expertise in vulnerabilities testing with:

- GSS200D: Interference detection and analysis solution
- GSS7725: Interference playback system



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