The Spirent Advantage

With experience amassed over twenty years of supporting GNSS development, Spirent is the only choice for comprehensive performance and support.

Spirent offers:
- Comprehensive features as standard, built up over 20+ years of development
- High fidelity simulation across the full dynamic range
- Top quality systems, backed by regional support network
- An assurance of continued investment in new GNSS technologies and systems
- Tailored solutions available to support special applications and configurations

Standard features enabled by SimGEO include simulation of multipath reflections, terrain obstructions, antenna reception gain patterns, differential corrections, trajectory generators for land, sea, and comprehensive error generation and system modeling. Also supplied as standard is a low-latency, high-rate hardware-in-the-loop capability.

Documentation and Reference Table

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World leader in GNSS test and simulation systems

Assessment of Navigation Performance in Vehicles

Navigation systems are subject to a number of limitations and sources of error which can degrade their usefulness. Delays in position availability or unflagged errors in position can severely limit the usefulness of the system. Before a navigation system can be deployed to market there are a number of key assessments required to ensure that it will perform its task acceptably. Qualitative assessment of accuracy, time to first fix (TTFI) or integrity requires a systematic, planned approach to testing.

Live Sky Trials

One way of assessing system performance is live-sky testing or field trials. Whilst this may seem an obvious way of testing a navigation system there are a number of known to consider:
- How do you establish an accurate reference position to enable accuracy to be measured?
- With the satellites constantly moving, how can you be assured that you have tested in all representative geometric situations (i.e. DOP values)?
- If a problem occurs it may be difficult to attribute the problem to an identified cause.
- Tests will be: (a) difficult to repeat and (b) impossible to repeat exactly due to the constantly changing satellite constellation and uncontrolled environmental factors.

For some, live-sky testing will always have a place as the final proof that the system works. But what’s missing is the control and repeatability required for a useful means of determining performance and improvements during development.

This is the challenge addressed by simulation.
Simulated vehicle motion can be developed using the vehicle trajectory models built into the Spirent’s simulator controller software (SimGEN) or imported from files saved by other applications or derived from data logged during real journeys or previous trials. Because Spirent’s SimAuto operates in real time without the need to pre-compute scenarios, it is even possible to use motion generated in another application such as a car simulator. This allows testing with a driver in the loop if human factors are being explored.

In simulated lab testing the signals from a variety of sensors are reproduced by the Spirent simulator system. RF from the GPS antenna, wheel ticks from the ABS, speed signals from odometer sensors and heading signals from gyro sensors are coherently generated by the simulator and fed into the unit under test in place of the live signals.

Where inertial sensors are built into the unit under test it can be difficult to inject the simulated test signals. If required the UUT can be mounted on a turntable driven by Spirent’s SimAuto application. In this way the built-in sensors are directly stimulated with motion consistent with the simulated GPS signals.

Vehicle Navigation
In Vehicle Navigation Systems (IVNS) are increasingly relied upon by individuals, commercial organisations and emergency services. They are expected to be accurate and instantly available. However, the underlying satellite navigation technology is subject to numerous sources of impairment leading to delays in establishing position or position errors.

Sources of impairment for GNSS systems
- Signal blocking by buildings, structures and terrain
- Local, on-vehicle obscuration from door pillars, roof and other vehicle structure
- Multipath errors where reflected signals confuse ranging
- Multipath effects where reflected signals confuse ranging measurements
- Signal attenuation due to obstructions in the transmission path
- Deliberate or accidental RF interference
- GNSS system errors
- Intrinsic receiver errors
- GNSS RF Signal
- Spirent’s most capable range of simulators, the Vehicle Speed Signal (e.g. VSS or odometer)
- Running the same powerful software as the GSS8000
- GNSS systems errors
- Heading sensors
- GPS signals to provide a complete test environment for integrated navigation systems.

Additional Sensors used include:
- Heading sensors
- Compasses or magnetometers
- Accelerometers
- Gyros
- Wheel pulses (e.g. ABS)
- Vehicle Speed Signal (e.g. VSS or odometer)

Spirent Test Systems
- GSS8000: Spirent’s most capable range of simulators, the GSS8000 series covers multiple constellations and signals. Running SimGEN for Windows® a simulator from the GSS8000 series can form the heart of a fully functional, multi-sensor simulator system. Extensive control of the simulated constellation and propagation errors make the GSS8000 with SimGen Spirent’s most powerful option for researchers and developers of multi-constellation GNSS systems. The GSS8000 is compatible with a wide range of sensor system extensions including SimAuto and the GSS7765.
- GSS5450: Running the same powerful software as the GSS8000 (SimGen for Windows®), the GSS5450 is ideal for users working exclusively with GPS L1 C/A and SBAS signals. The GSS5450 is compatible with SimAuto and other Spirent system extensions.
- STR4500: The STR4500 and the controlling application, SimPLEX provides a test solution targeted at GPS L1 C/A only applications. A reduced functionality replay only version using the SimPLEX application is available which can be a cost effective option where multiple repeats of a fixed test scenario is required such as in production test or QP.
- SimAuto: Emulated signals from additional motion sensors such as wheel ticks and gyroes are provided by SimAuto. The SimAuto option is available on any Spirent system running Spirent’s SimGEN for Windows® software suite such as the GSS5450 and GSS6560. Fully integrated with SimGEN, SimAuto allows parameters such as wheel track, wheel base, wheel ticks, odometer pulse rate & dead band to be set and saved to a vehicle personality file for future use. Emulated dead-reckoning sensor outputs are precisely coordinated with the RF GPS signals to provide a complete test environment for integrated navigation systems.

GSS7765: The effect of noise and interference effects can be explored using the GSS7765 Interference Simulator, an optional extension for any Spirent simulator running SimGen. The system is fully supported by SimGen with interference sources integrated into the test scenario. Extensive control of interference types and dynamics are provided.