

# Testing the Future of Positioning, Navigation & Timing

Spirent Solutions for PNT Technology Developers

## What's inside:

- o GNSS System & Market Trends
- o Spirent Products – Latest News
- o Special Solutions
- o Support and Professional Services



## Multi-Frequency Record & Playback Systems

Multiple new features are available on Spirent's record and playback system, GSS6425.

### Multi-Frequency Multi-GNSS Operation

Sample multiple frequencies simultaneously, capturing standard and precise positioning signals.

### BeiDou-2 B1, B2, B3 Support

Available now.

### Galileo E1 + E6 Support

The GSS6425 is available with ultra-wide bandwidth per frequency to capture multi-frequency Galileo signals.

### Multiple Video Streams

Capture video easily using regular Webcams directly via USB

## CAN BUS

Capture automotive CAN BUS signals in synchronization with GNSS and video signals.

### Recording Data in the Field



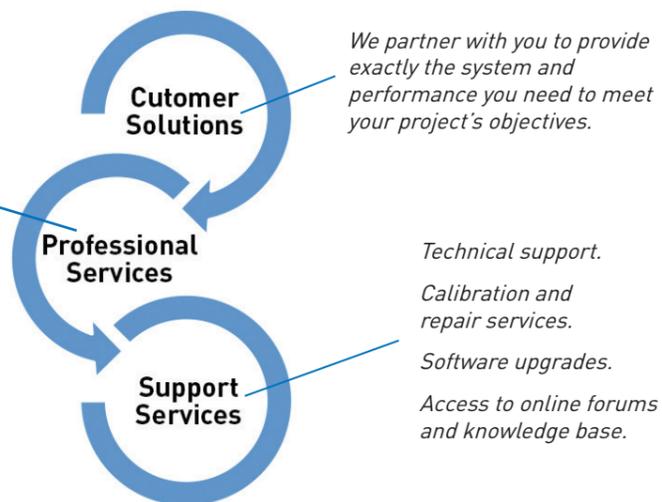
## Coexistence Testing

Did you know Spirent offers Wi-Fi, Bluetooth and even NFC (near-field communication) test systems? If you have needs in these areas please contact us.

## Spirent Special Solutions & Services

Spirent's expertise and knowledge is available to help you meet your project and business objectives. Spirent offers a range of special solutions, professional services and support services to help you benefit from nearly 30 years of experience in navigation and positioning test.

As well as training packages, we offer implementation services where we work with you directly to get you up and running. We can also integrate your other systems with Spirent equipment.



## SALES AND INFORMATION

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## GNSS System & Market Trends

### How vulnerable is your GNSS?

More and more we rely on GNSS in our daily lives, professionally and personally. We also rely on GNSS in ways that most people are scarcely aware of, for example in the timing of critical infrastructure and financial transactions.

Yet, as far back as 2001, the US Department of Transport's Volpe report warned that "the GPS signal is subject to degradation and loss through attacks from hostile interests". Since then there have been many well publicised examples of interference and spoofing.

Not all receivers are created the same and will exhibit widely varying performance when presented with interference and/or spoof signals.

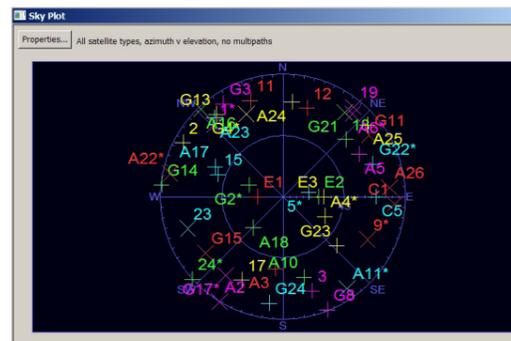
At Spirent we see our role in two ways:

- Providing test tools that can evaluate performance and resilience of a system;
- Sharing expertise and insights gained from our perspective as a trusted provider of test systems to the industry.

Spirent has a range of interference and spoofing test systems, please see the next page for some examples. We even offer test systems to optimise antenna performance and to test integrated GPS/inertial navigation systems whether in the air or on the ground.

### Multi-GNSS

Multi-GNSS refers to the use of not only GPS but also combinations of other signals from existing and planned navigation systems including GLONASS, BeiDou, Galileo, QZSS and IRNSS.



A very crowded sky!  
sky plot showing multi GNSS test.

Multi-GNSS now has an unstoppable momentum, and with good reason. Some key advantages of using multi-GNSS:

- **Improved availability** particularly in areas with a restricted sky view
- **More resilience** due to diversity of signals, orbits and frequencies
- **Compliance with legislation** – some jurisdictions mandate use of local systems in certain cases.

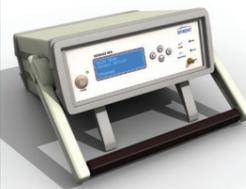
All Spirent systems support multi-GNSS operation (requires appropriate licences and/or hardware).

### When Simulation is Not Good Enough

We at Spirent grew up on simulators, right from the early days of GPS. We have continually invested to maintain our reputation of deep capability coupled with leading quality and signal fidelity.

However sometimes, simulator testing is not quite enough. Simulators are great at generating representative signals to allow controlled, progressive testing. A different approach is needed, however, to bring the "real world", in all its complex richness, into the lab.

This is where record and playback systems come in. "RPS" systems enable sampling the noise at the relevant GNSS frequency band(s). This approach captures the GNSS signals in all their richness, including real multipath and signal degradations, interference and so on.



Spirent's RPS systems have some unique attributes and are designed to make live-to-lab testing easy and effective.

### Scintillation

GNSS signals are subject to degradation, including scintillation effects, as they pass through the atmosphere which is being disturbed by solar radiation. It's possible to test scintillation effects in a Spirent simulator – we have recently worked with Bath University in the UK to enable observed scintillation effects to be represented in the lab.

## Spirent Products - Latest News

### Taking Simulation to a New Level

- **Ultimate Flexibility**
- **Supreme Performance**
- **Comprehensive Capability**



Spirent's new GSS9000 multi-frequency multi-constellation simulator has arrived, designed to set a new standard in GNSS testing.

### Ultimate Flexibility

- Dynamically reconfigurable constellations and signals
- In-field upgrades
- Compatible with existing Spirent test cases and remote motion/control command sets
- Future-proof for foreseeable advances in GNSS technology

### Supreme Performance

- Leading fidelity and accuracy
- 1000Hz RF signal iteration rate
- Low latency
- High dynamic performance
- Calibrator built-in

### Comprehensive Capability

- The most capable system available
- Fully featured SimGEN™ scenario definition & control suite
- 160 signal channels and >500 multipath channels per chassis
- Single or multi-RF outputs
- Classified signal (GPS, Galileo) support
- Interference, spoofing, inertial options

### Test Resilience to Spoofing in the Lab

Hoax or spoofing attacks work by mimicking genuine GNSS signals. The intent is that target receivers do not recognise they are being attacked and continue to operate "normally" but provide false position or time information.

Spirent offers a unique tool, SimSAFE™, that works with Spirent simulators to generate a range of sophisticated spoofing attacks. In addition, SimSAFE™ also includes a monitoring receiver to aid evaluation of mitigation strategies.



### Test GNSS Performance in the Presence of Interference Signals

Spirent offers a range of approaches to generate interference signals.

#### GSS7765 Interference Test System

Provides flexible coherent control of multiple interference sources with GNSS simulation.

#### Ground-Based Transmitters

Position multiple in-band interference sources in the test scenario to assess susceptibility of a receiver to intentional or unintentional interference. Spirent's powerful gain & phase antenna pattern modelling can be used in conjunction with this method.

#### Chamber-Based Approach

Unique Spirent solution with one RF output for each satellite. Can be used in a chamber with interference sources. Zoned (dynamic) or traditional approaches are available.