Keysight and Syntony CRPA-Enabled GNSS Receiver Test Solution

Live Multi-RF GNSS Signals to Emulate Contested Position, Navigation, and Timing (PNT) Environments

GNSS Simulator that Grows with Your Needs

The Keysight GNSS Controlled Reception Pattern Antenna (CRPA) test solution is built on Custom Off-the-Shelf (COTS), instrument grade test equipment providing calibrated and repeatable emulations.

The Syntony Constellator™ simulates all GNSS constellations, ionosphere, and troposphere models plus required attenuation, movement and Doppler shift with changing jamming and spoofing scenarios. The resultant composite signaling environment is streamed from the Constellator™ optically as digital I/Q data into the Keysight VXG-C vector signal generator, which upconverts them to the multiple CRPA antenna feeds at GNSS L- and S-band RF frequencies.
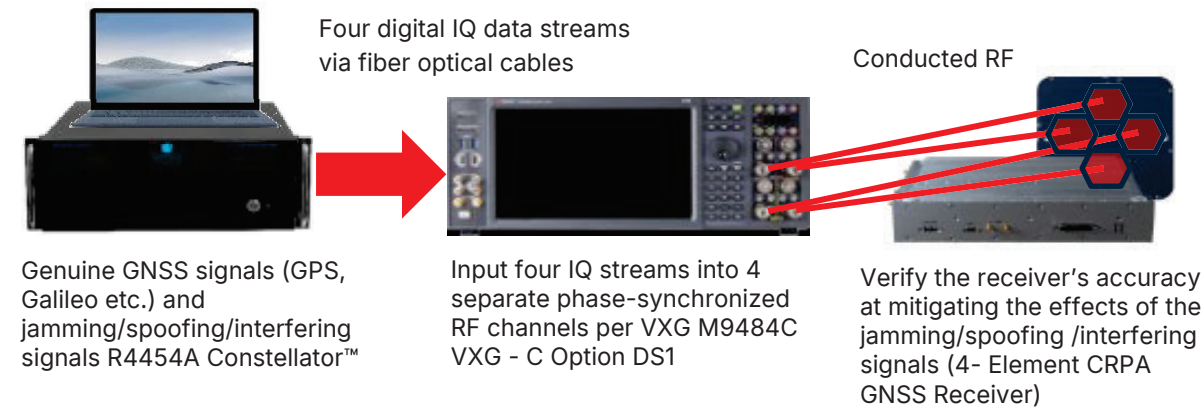
Each VXG-C supports four time-aligned, phase-coherent RF outputs in a single chassis, using Keysight's proprietary direct digital synthesis architecture. Users can synchronize multiple Syntony Constellator™ and Keysight VXG-C chassis to support up to 32 wideband, high dynamic range RF channels. The recommended frequency configuration for the VXG-C for GNSS CRPA testing is 6 GHz frequency coverage and 500 MHz of bandwidth; and can be extended to 1 GHz bandwidth if L- and S-band emulation coverage is required simultaneously. The VXG-C can optionally cover frequencies of up to 110 GHz and provide signal bandwidths as wide as 5 GHz, providing the flexibility to address a wide range of signal generation use cases covering analog and digital communications and electronic warfare.

Figure 1. Shown above is an example system including optional 4-channel CRPA receiver (as the DUT)

![Keysight logo]

Summary

CRPA receivers provide an important enhancement to the robustness of GNSS based PNT systems. Keysight's unique approach combines Syntony Constellator's™ powerful real-time GNSS signal calculation capabilities and VXG-C's industry-leading RF signal generation capability to enable high complexity, high-channel-count CRPA receiver testing. This fully integrated, calibrated, and compact four RF channels in 9U signal generation solution helps you develop robust CRPA test and evaluation environments both in the lab and on the range.

Four digital IQ data streams via fiber optical cables

Conducted RF

Genuine GNSS signals (GPS, Galileo etc.) and jamming/spoofing/interfering signals R4454A Constellator™

Input four IQ streams into 4 separate phase-synchronized RF channels per VXG M9484C VXG - C Option DS1

Verify the receiver's accuracy at mitigating the effects of the jamming/spoofing /interfering signals (4- Element CRPA GNSS Receiver)

Configuration in Brief

Model	Function	Description
Syntony Constellator™ Keysight Model R4454A	Provides dynamic GNSS constellation emulation, jamming and GNSS spoofing signals at digital I/Q baseband User friendly GUI and real-time scenario generation supports high channel count CRPA testing	Data Sheet: Keysight R4454A Constellator™ | Keysight Real-time, multi-constellation, multi-frequency, multi-antenna GNSS constellations with up to 1200 L1C/A equivalent signals
VXG-C Vector Signal Generator Keysight Model M9484C	Upconverts I/Q data to RF for full real-time GNSS emulation for mono- and multi-channel CRPA GNSS receivers Optioned with 1 GHz BW RF channels, supports all GNSS bands on a single RF output	Data Sheet: M9484C VXG & V3080A Phase-coherent RF channels with relative phase repeatability of 0.0001 degree Up to 80 dBi on a single output, 154 dBi with combined outputs

™ Constellator is a trademark of Syntony, FR.