Constellator

Multi-constellation GNSS simulator

Control Your Sky

The expansion of GNSS Constellations and Satellite Based Augmentations Systems has provided receiver developers and integrators with more options– and more complexity – than ever before.

Growing satellite fleets and SBAS enhancements on several continents provide opportunities to push receiver performance (from TTFF to accuracy and stability) to unequaled levels. All the while, navigation security and vehicle automation objectives make integrating position and velocity information an even more crucial component of overall system success.

But more constellations, more frequencies, more modulations and more codes make developing and testing tomorrow's receiver a more demanding task.. And, for some applications, the risks of jamming and spoofing during the service life of a receiver are higher than ever and require developing and testing of complex remediation strategies.

- Extensible up to 400 channels delivering high quality satellite signals on up to 6 distinct frequencies
- Receiver trajectories with extreme dynamics
- Hardware-in-the-loop testing at 0,1 to 1000 Hz refresh rates
  - Full time and location control
  - Extensive simulation options
  - Background noise, interference & jamming. Spoofing (2 units)
  - Atmospheric propagation errors
  - Satellite errors
  - Multipath and obscuration
  - On-the-fly scenario modifications

That is why Syntony created Constellator. Designed to test receivers against the demands of the future, it matches top-end processing performance and RF quality with utmost flexibility in simulation control.

Corner cases. In addition to performing fair weather tests, Constellator was designed to subject receivers to suboptimal conditions, extreme situations and combinations of errors difficult to access in real world tests. All of it finely controlled and indefinitely repeatable.

A team-player. Constellator is compatible with other best in class test solutions to provide the GNSS component in end-to-end system tests, including with hardware in the loop.

A future-proof investment. The core of Constellator is its software, ensuring that no matter what new constellations, satellites and codes the future brings, it will be able to handle them. Most of functional upgrades will then be software-only.

Affordable TCO. Hardware maintenance, calibration, and support at affordable prices, providing to Constellator a quick ROI, and transforming it into a profitable investment

Standard and Kythnos version: Kythnos version is proposed as entry product, without any option other than the signals and constellations.

Constellator's GUI allows fine-grained control over every aspect of the simulation and provides real-time feedback at run-time.

Constellator can be delivered in different form factors, all remotely accessible via Ethernet.

Constellator

Specifications

SIMULATION

Constellations & Signals

GPS	L1 C/A; L1 C; L1P(Y); L2C; L2P(Y); L5
GALILEO	E1; E5A; E5B; E6
IRNSS	L5 & S
GLONASS	L1OF; L1OC; L2OF; L2OC; L3OC
BEIDOU	B1I; B1C, B2a, B3I
SBAS	L1 (EGNOS; GAGAN; WAAS ...)
Other signals or features	Military codes GBAS, DGPS, etc;

Performance

Channels extension	More than 200 channels
RF Channels	Up to 6 independent
HWIL Refresh Rate	0,1 Hz to 1000 Hz
Pseudorange Accuracy	<1 mm

SIMULATOR

Connectivity

RF Output Connector	N female
Int. 10MHz Reference Output	BNC female
Ext. 10MHz Reference Input	BNC female
Network Connector	RJ45
Other	PPS in, PPS out, Trig in, Trig out

Hardware Specifications

Size (W x H x D) in mm	430 x 88 x 510
Weight	12 kg
Input Voltage Range	100 to 240 V AC +/-10%
Input Frequency Range	50 to 60 Hz +/- 5%
Power Consumption	110W
Operating Temp. Rang	+5°C to +45°C
Storage Temp. Range	-20°C to +55°C

RF FRONT END

RF Output

Frequency Range	1100 MHz to 1610 MHz and from 2450 to 2550 MHz
RF Bandwidth	80 MHz
RF Power (@50 Ohm)	From -30 to -90 dBm
Output VSWR	< 1.3
Supported VSWR	∞ (permanent)

RF Quality

Harmonic Spurious	< -65 dBc min
Non-harmonic Spurious	< -55 dBc (SF dependent)
RMS Jitter	104 fs
Group Delay Variation	< 15ns @ BW = 55 MHz
Group Delay Stability	< 10ps/°C @ BW = 55 MHz
Phase Noise	$<5.10^{-3}$

Synthesizer - Internal 10MHz Reference

Signal	Sinus
Stability	5.10^{-9} from +10°C to +40°C
Aging	0.2 ppb/day and 10 ppb/year
Allan Variance (1s)	$2x10^{-12}$

Synthesizer - Internal 10MHz Reference Output

Signal	Sinus
Impedance	50 Ohm
Level	6 dBm

Simulation and Modeling Capabilities

Receiver trajectories. Includes 4 spatial reference frames and trajectory editors for ground, marine, aerial and spatial motion as well as an import facility

Hardware-in-the-loop capability (option). The Constellator receives receiver position updates from the test-rig in real time and generates corresponding GNSS signals and messages with a negligeable latency up to 1000 times per second

Noise, interference and signal jamming (option). Constellator can generate continuous waveforms, narrowband and wideband interference as well as pulsed interference (e.g. DME, JTIDS and Radar)

Atmospheric errors. Propagation issues can be simulated at individual signal level with different models provided for ionosphere and troposphere (incl. NeQuick, Kobluchar, dry/wet models and mapping functions)

(option) Rich built-in multipath options range from simple modifications of the direct signal (delay, attenuation, doppler shift and phase) to ground bounce and statistical multipath models

(option) Terrain obscurations. User defined

Receiver antenna modelization (gain patterns, orientation, placement)

Satellite error (options) modeling options include orbital errors, onboard clock errors, satellite electronics (front-end) defects, satellite dysfunctions and signal fade, disappearance and "evil waveform" incidents

SYNTONY GNSS

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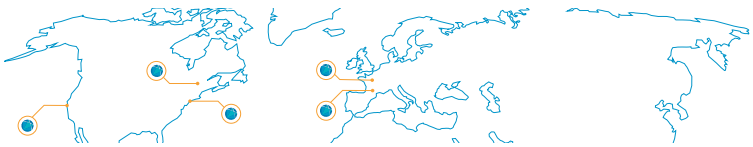

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syntony-gnss.com