



Constellator™

multi-constellation & multi-frequency GNSS Simulator

The flagship GNSS simulator that grows with your needs

For DESIGN, VALIDATION and PRODUCTION

The history of Constellator™ started more than 20 years ago with the first simulator for Galileo. Its singularity lies in the tight coupling of SDR (Software Defined Radio) and state-of-the-art RF Analog front-end.

Today, RTGS4 represents Syntony's 4th generation of simulators. It has been designed to meet the highest requirements in terms of fidelity, performance, flexibility and ease of use at an affordable cost.

Powerful & High-Fidelity

- ▶ Realtime, Multi-constellation and Multi-frequency
GPS, Galileo, GLONASS, QZSS, IRNSS/NavIC, BeiDou, Xona LEO PNT, SBAS, Encrypted signals.
- ▶ Powerful with up to 1 200 L1C/A equivalent signals
Use Constellator to its full potential with 80, 240, 600 or up to 1 200 signals.
- ▶ From simple trajectories to complex extreme dynamics
Create trajectories in seconds, on earth, in the air or even in space.
- ▶ Hardware-in-the-loop with zero effective latency
Even with 6 DoF, up to 1 000 Hz iteration rate.

Extremely configurable for advanced simulations

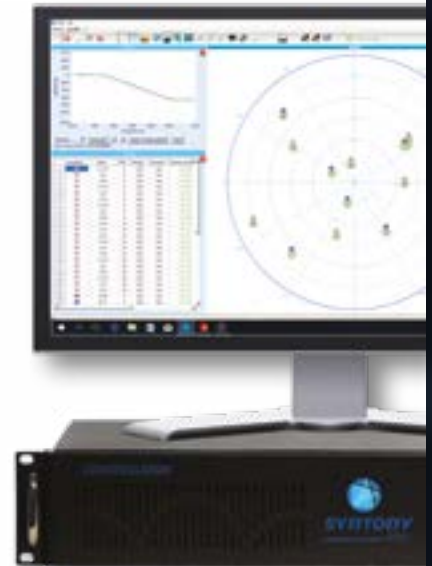
- ▶ Rich multipath and terrain obscuration, with one click presets
Leverage our library of customizable models (urban, suburban, highway...).
- ▶ Advanced troposphere & ionosphere 3D models
UNB, Klobuchar, Nequick, Customizable grid.
- ▶ On the fly scenario modifications & extensive simulation options
Easily test the effect of errors in satellite position, clock and messages.
- ▶ Leverage extensive testing reports in realtime as a source of truth data
Leverage 25+ environment variables and 20+ variables per satellite in view.
- ▶ Ready for interference, jamming and spoofing tests
Use one or multiple simulators for advanced integrity tests, even for CRPA.

Easy to setup and use

- ▶ Simple local or remote control & quick integration
User-friendly GUI or control via commands.
- ▶ Smooth hardware setup, ready for multi-antenna or multi-receiver
Interfaces: 10 MHz Clock reference (IN & OUT), triggers, PPS IN & OUT.
- ▶ Extensive documentation, scenario library available & local support
User guides, ICD, Python script examples & .xls tools for data structure.

Built to evolve with your testing requirements

- ▶ Software-defined-radio architecture allowing remote updates
Most of new signals and features are software updates only.
- ▶ Do you need a specific feature? We are flexible & can build it custom.
Space agencies & industry leaders already benefit from our custom services.



SPACE & DEFENSE



AVIATION



TELECOM & 5G



AUTOMOTIVE



SIMULATION

Constellations & Signals

| | |
|---------------------------|--|
| GPS | L1C/A, L1C, L2C, L5, L1P(Y), L2P(Y) |
| Galileo | E1, E5a, E5b, E6HAS |
| GLONASS | L1OF, L1OC, L2OF, L2OC, L3OC |
| QZSS | L1C/A, L1C, L2C, L5 |
| IRNSS/NavIC | L5, S |
| BeiDou | B1I, B1C, B2a, B3I |
| Xona LEO PNT | L-Band, C-Band |
| SBAS | L1, L5 (EGNOS, WAAS, GAGAN, MSAS, SDCM, SNAS) |
| Other signals or features | IRNSS RS and other encrypted signals (PRS, L1P(Y), L2P(Y), M-Code) through PRN Link Option |

Performance

| | |
|-------------------------------|-------------------------------------|
| NEW Channels extension | Up to 1200 equivalent L1C/A signals |
| RF Channels | Up to 7 independent RF outputs |
| HWIL Refresh Rate | up to 1 000 Hz |
| Pseudorange Accuracy | <1 mm for all bands simultaneously |

SIMULATOR

Connectivity

| | |
|------------------------------|--|
| RF Output Connector | 3xSMA Mono-Band and up to 2xN female Multi-Band (standard front panel and optional back panel) |
| Int. 10 MHz Reference Output | BNC female |
| Ext. 10 MHz Reference Input | BNC female |
| External Trigger In/Out | BNC female, TTL Level, 5V DC, Configurable Timing & Pulse widths |
| PPS in, PPS out | BNC female, 1Hz rate, PPS-In 5 Volts, PPS-out 3 Volts, +/- 5 ns from RF output |
| GUI/Network Connector | RJ45 (1Gb/s) |
| Dedicated HWIL Connector | RJ45 (1 Gb/s) |
| PRN Link | RJ45 (10 Gb/s) |



HARDWARE

| | |
|---|--|
| Input Voltage Range | 100 to 240 V AC +/-10% |
| Input Frequency Range | 50 to 60 Hz |
| Power Consumption | 120 W |
| Operating Temp. Rang | 0 °C to +50 °C |
| Storage Temp. Range | -20 °C to +70 °C |
| Relative Humidity (Operating/Storage/Transit) | 10-93%, @ 40 °C, non condensing |
| Operating altitude | 5000 m |
| Shock (according to EN 60068-2-27) | Operating: 15 G 11 ms duration Non-operating: 30 G 11 ms duration |



RF FRONT END

RF Output

| | |
|---------------------------|--|
| Frequency Range | From 1 100 MHz to 1 610 MHz and from 2 450 to 2 550 MHz |
| RF Bandwidth | 20 up to 25 MHz |
| RF Power (@50 Ohm) | From -55 to -110 dBm 0.1 dB resolution +/- 0,1 dB Power Accuracy |
| RF Signal Level (Jamming) | +0 up to +130 J/S with signal (S) reference power at -130dB. |

| | |
|----------------|---------------|
| 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 10 MHz 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 10 MHz Reference Output

| | |
|-----------|--------|
| Signal | Sinus |
| Impedance | 50 Ohm |
| Level | 6 dBm |

| | Standard Dynamics | Extended Dynamics |
|--------------|-------------------|-------------------|
| Altitude | <100 km | No limitation |
| Acceleration | No limitation | No limitation |
| Velocity | < 600 m/s | No limitation |
| Jerk | No limitation | No limitation |



| | |
|---------------------------------------|--|
| Vibration (according to EN 60068-2-6) | Operating: 10-150 Hz: 1G/3 axis Non-operating: 10-150 Hz: 2G/3 axis |
| MTBF | > 50.000 hrs |



2U

430 x 88 x 510 mm
17 x 3,5 x 20 in

12 kg / 26.5 lb



4U

430 x 177 x 472 mm
17 x 7 x 18.5 in

20 kg / 44 lb

Whether the objective of your GNSS appliance is to protect critical infrastructures and/or become a business driver, RTGS4 is speeding up your time to market by saving time, money and testing efforts.

Each instrument comes with 1 Multi RF output and 3 Mono RF outputs, simulating up to 80, 240, 600 and up to 1 200 L1C/A equivalent signals.

More RF outputs can be added to RTGS4-14 and 24 units, up to 16 RF outputs or more.

Base configurations

| PRODUCTION | | VALIDATION | | HIGH-END R&D | |
|--|--|--|---|--------------|--|
|  |  |  |  | | |
| RTGS4-02 | RTGS4-12 | RTGS4-14 | RTGS4-24 | | |
| <ul style="list-style-type: none"> Standard 2U unit 80 signals Constellator Simulation Software 2 Constellations, 2 Bands | <ul style="list-style-type: none"> Standard 2U unit up to 240 signals Constellator Simulation Software (Signals & Bands to be added individually) | <ul style="list-style-type: none"> Standard 4U unit up to 600 signals Constellator Simulation Software (Signals & Bands to be added individually) | <ul style="list-style-type: none"> Standard 4U unit up to 1200 signals Constellator Simulation Software (Signals & Bands to be added individually) | | |

Constellator's singularity lies in the **tight coupling of SDR (Software Defined Radio) and state-of-the-art RF Analog front-end**. Top-end processing performance and superior RF quality are now met into a COTS appliance with utmost flexibility in simulation control.

Options

| | |
|----------------------------------|---|
| RTGS4_Constellations | GPS, Galileo, GLONASS, QZSS, IRNSS/NavIC, Beidou, Xona LEO PNT |
| RTGS4_Bands | L1, L2, L5, S-Band, L1C, L2C, L1P, L2P, C-Band |
| RTGS4_SBAS | L1, L5 (EGNOS, WAAS, GAGAN, MSAS, SDCM, SNAS) |
| RTGS4_Dynamic Trajectory Replay | User-defined precise trajectory input (binary format) - conversion tools included |
| RTGS4_HWIL | Hardware-in-the-loop feature supporting real time vehicle trajectory data (receiver position, dynamic and attitude from the test-rig in real time) up to 1 000 times per second (1 000 Hz refresh rate, zero-effective latency) |
| RTGS4_Space | All Space trajectories configuration (Keplerian parameters, or initial position and velocity), Altitude > 100 km, Earth-tangent masking, dedicated Space 3D ionospheric models, GNSS transmitting antenna gain patterns, specific for each signal & satellites, to model side lobes (Extended Dynamic option mandatory) |
| RTGS4_Ext.Dynamics | Dynamics limits extended for simulated trajectories > 600 m/s (requires Export Licence) |
| NEW RTGS4_Jamming | 1 to 10 fixed jammers simulation: each of them simulating from 1 to 10 interferences such as: CW, Pulsed-CW, Spectrum-matching noise & pseudo-« White noise » (BPSK100), White Gaussian Noise |
| NEW RTGS4_Spoofing | Up to 10 spoofing sources including all GNSS signals filters and multiple configurations including the simulated position (static), RF power, delays, trajectory for each transmitter |
| NEW RTGS4_Signal Advanced | Real time control of low-level parameters signals (power, delay, phase, and their drifts), up to 1000 times per second. Can be used to model all sorts of multipath, clock bias, drifts or noise, scintillation, radio occultation |
| RTGS4_PRN Link | Input card for encrypted signals (GPS-L1P(Y), L2P(Y), IRNSS RS or any other encrypted signal on demand) |
| NEW RTGS4_CRPA | Controlled radiation pattern antenna (CRPA) simulation up to 16 elements |

The future of navigation is software

Since 2015, Syntony has become a leader in the GNSS industry. Syntony offers unique location solutions allying Software-Defined Radio (SDR) and state-of-the-art RF Analog front-end.

Easy to setup and use, the Syntony solutions are built to evolve with our clients needs, and inherit from 20 years of R&D and collaboration with space agencies and industry leaders.

For more information

Visit our website:
syntony-gnss.com

Contact us:
contact@syntony.fr



Follow us:



Syntony Offices



TOULOUSE - PARIS - NEW YORK - MONTREAL



Safety Certifications
EN/IEC 61010-1:2010
ROHS, 2011/65/EU
NRTL UL 62368-1
CB IEC 62368-1

Emissions
EN 61326-1:2013
FCC Part 15 : 2016 – Verification
(Section 2.902 47 CFR)