

GSG-7 Advanced GNSS Simulator

High Performance and Capability Made Easy



Advanced Performance Made Easy

GSG-7 is the newest positioning, navigation, and timing test solution offered through Orolia's family of Skydel-based simulators. It delivers the highest standard of Global Navigation Satellite System (GNSS) signal testing in an easy-to-use, turnkey, small form factor.



GSG-7 features high-end performance with a 1000 Hz simulation iteration rate, high dynamics, real-time synchronization, and simulation of all-in-view satellite signals.

The GSG-7 is ideal for development and integration projects that require high performance and an increased number of constellation licenses and satellites in view for a single antenna or trajectory.

GSG-7 supports multi-constellation and multi-frequency GNSS simulations. Powered by our industry-leading Skydel simulation engine, GSG-7 can be programmed to simulate operations with all current and future GNSS signals.

GSG-7 can also incorporate proprietary signals with a comprehensive SDK, which allows the generation of even the most sensitive signals.

GSG-7: High Capability. Software-defined

GSG-7 is revolutionizing the GNSS simulation industry with its easy-to-use, advanced simulation capabilities, extraordinary flexibility and rapid development cycles. Using the robust and innovative 1000Hz Skydel software engine and commercial-off-the-shelf (COTS) software-defined radios (SDRs), GSG-7 easily outperforms the competition. It can accommodate nearly any configuration to conduct system testing and simulation.

GSG-7 Benefits

- Flexible software-defined platform
- Future proof design
- Includes all GNSS constellations
- Robust, integrated automation
- Easy and powerful HIL integration
- User-defined waveforms
- Supports aerospace simulations:
 - Ultra-high dynamics trajectories
 - High iteration rates
 - Orbit simulations

The SDR format means that maintenance and customization are not only easier, but more affordable than other options on the market. The GSG-7 delivers precision and performance for your critical programs. Orolia ensures reliability and can help accelerate your system's time to market or deployment.

Powerful Automation

The unique and modern architecture of the Skydel simulation engine provides an extensive application program interface (API) to configure and control all aspects of the simulator. The open-source client API is available in a wide range of programming languages such as Python, C#, C++ and LabVIEW. Moreover, all human and machine interactions with the simulator can be recorded and exported as executable python scripts, which greatly simplifies the work of test engineers who want to automate or expand the simulator's capabilities.

Scalable Platform

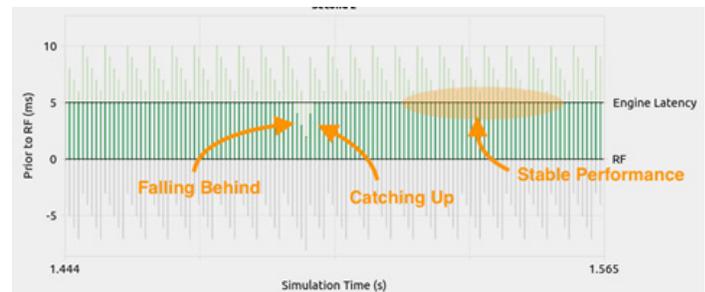
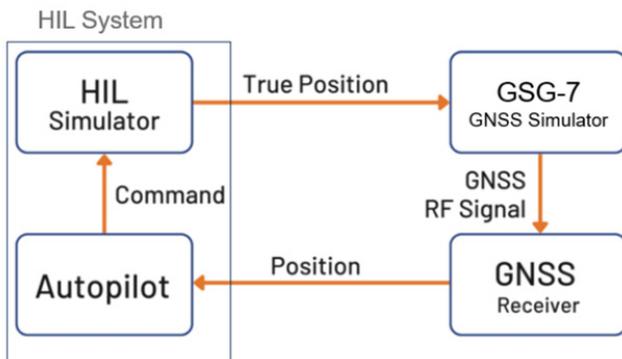
Use the GSG-7 alone or in combination with other Skydel-powered simulators like the GSG-8 or Wavefront and Anechoic test solutions. The consistency of Skydel software between solutions ensures the portability of scenarios across systems.

GSG-7 Key Features

- All-in-view satellites simulation
- 1000Hz simulation iteration rate
- Low-latency HIL
- Live sky time synchronization
- On-the-fly scenario reconfiguration
- 6 Degrees of Freedom (DoF) receiver trajectories
- Flexible licensing
- In-field upgradability
- High-end performance (precision, resolution, ultra-high dynamic motion)
- Simulate hundreds of satellites in real-time using off-the-shelf graphics cards (GPU)
- Comprehensive and intuitive API (Python, C# and C++ open-source client)
- IQ file generation and playback
- Scalable and highly flexible architecture using software-defined radios

Advanced Hardware-in-the-Loop

Advanced HIL was designed to dramatically reduce the GSG-7's integration time within a complex environment. With a simple, yet powerful API, built-in performance monitoring tools, and an industry-leading zero-effective latency, the GSG-7 ensures the best performance in even the most stringent applications.



Above: Skydel real-time monitoring

Signal Propagation and Errors Simulation

- Multipath and standard models
- Additive pseudorange ramps
- Satellite clock error modification
- Navigation message errors
- Multiple ionospheric/tropospheric models
- Antenna pattern models
- Relativistic effects
- Pseudorange/ephemeris errors

Signals

- GPS: L1-C/A, L1C, L1-P, L2-P, L2C, NavIC L5
- GLONASS: G1, G2
- Galileo: E1, E5a, E5b, E5AltBOC, E6HAS
- BeiDou-2: B1, B2
- BeiDou-3: B1C, B2a
- QZSS: L1-C/A, L1S, L2C, L5, L5S
- SBAS L1/L5: WAAS, EGNOS, MSAS, GAGAN, SDCM
- Custom signals

Signal Specifications

- Maximum bandwidth (per radio) 100 MHz
- Pseudorange accuracy - $\pm 0.001\text{m}$
- Pseudorange rate - $\pm 0.001\text{m/s}$
- Inter-channel bias - zero
- Spurious transmission < -65 dBc
- Harmonics < -50 dBc
- Phase noise: < 0.003 rad RMS
- Signal Dynamics
 - Maximum relative velocity: 1,500,000 m/s
 - Maximum relative acceleration: No limits
 - Maximum relative jerk: No limits
- 1000 Hz iteration rate
- RF Signal Level (GNSS)
 - Power accuracy: +/- 0.5dB
 - Output reference power: -80 to -50 dBm, 0.1dB resolution*
 - Dynamic range (relative to reference power):
 - 45 to +30 dB
 - Total range: -125 to -20 dBm

Skydel Plugins

- SKY-PLG-IMU – Inertial sensors emulation.
- SKY-PLG-RTK – RTCM message generation via virtual basestation.
- SKY-PLG-SDK – Plugin SDK allows the creation and integration of custom plugins for Skydel.

Ordering Information

The GSG-7 is available in three configurations:

One Software Defined Radio (SDR) generates the GNSS signals up to the 100 MHz band., whereas the three SDR configuration covers the entire GNSS spectrum (L1, L5, L2, E6). In addition, the GPU provides signal generation processing power, with 150 to 225 signals (depending on signal complexity) generated simultaneously.

Base Configurations

- GSG-711 – GNSS Simulator with 1 RF band and 1 GPU
- GSG-721 - GNSS Simulator with 2 RF bands and 1 GPU
- GSG-731 - GNSS Simulator with 3 RF bands and 1 GPU

Included with Instrument

- Quickstart Guide
- SMA-SMA RF Cable

Optional Features

- SKY-HIL – Hardware-in-the-loop mode allows input of vehicle trajectory information in real-time.
- SKY-EXLI – Extended Limits allows simulation of vehicle speeds greater than 600m/s.
- SKY-IQFILE – IQ File, allows saving of generated IQ data to file
- SKY-CSI – Custom signal injections, allows real-time simulation of user-defined GNSS signals (custom modulation and navigation message).

Physical Specifications

Certifications

Safety:

- EN/IEC 61010-1:2010
- ROHS2, 2011/65/EU Emissions:
- EN 61326-1:2013
- EN 55011:2009/A1:2010
- FCC Part 15 Subpart B Class A, ICES-003 Issue 6
- AS/NZ CISPR 32:2015
- EN61000-3-2:2014, EN61000-3-3:2013

Compliance:**Interfaces**

- RF output: N-Type
- 10 MHz output: BNC
- 1 PPS output: BNC
- 10 MHz input: BNC
- 1 PPS input: BNC
- Antenna input: SMA
- HDMI, USB, Ethernet ports
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Dimensions

- Size: 2U
- Weight: 11.5 kg (25 lbs) estimated
- Width: 48 cm (19 in)
- Depth: 41 cm (16 in) in estimated
- Height: 9 cm (3.5 in)

Environmental

- Temperature – +0C to +30C (operating), -15C to +50C non-condensing @ 12,000m (storage)
- Humidity 10% to 70% (non-condensing)

Power

- Line voltage – 100-240VAC, 50-60Hz
- Power consumption – 400W

Oscillator Performance

- Frequency accuracy: < 100 ppb
- Recommended warm-up time: 30 min
- Minimum operational warm-up time: 5 min

Warranty and Support

All systems are provided with a three year hardware warranty and 1-year software support. Software support includes software updates, email and phone support, as well as application support.

Ext Warranty – Extends Hardware warranty over 3-years

SKY-SSUP – Extends Software support