ELECTRONICS & DEFENSE

GSG-8 ADVANCED GNSS SIMULATOR

Ultra-High Performance with Unmatched Flexibility

Advanced GNSS Simulation, Made Easy.

GSG-8 is the newest positioning, navigation, and timing test solution offered through Safran's GSG family of simulators. It was developed to deliver the highest standard of Global Navigation Satellite System (GNSS) signal testing and sensor simulation performance in an easy to use, upgradable and scalable platform.

GSG-8 features high-end performance with a 1000 Hz simulation iteration rate, high signal capacity, high dynamics, real-time synchronization, and simulation of all-in-view satellite signals. Advanced GNSS jamming and spoofing options allow the creation of benign and threat scenarios required to meet the needs of mission-critical applications. GSG-8 is ideal for any development or integration project that requires sophisticated simulation capabilities in any simulated environment from any point on earth, and beyond.

GSG-8 supports multi-constellation, multi-frequency GNSS simulation and advanced threat scenarios, including jamming, spoofing and repeater simulation. Powered by our industry-leading Skydel simulation engine, GSG-8 can be programmed to simulate operations with all current and future GNSS signals – including LEO constellations.

The ability to simulate multiple synchronized trajectories through multiple instances of the Skydel simulation engine allows testing of complex GNSS systems, such as:

- Differential GNSS, such as Real-time Kinematics (RTK)
- Receiver spoofing mitigation evaluation
- Multi-antenna vehicles
- Attitude measurements
- Simple or complex arrays of GNSS receivers

GSG-8 can also incorporate encrypted or proprietary signals with a comprehensive SDK, which allows signal generation of even the most sensitive signals.

Safran Electronics & Defense is with you every step of the way, building in the intelligence that gives you a critical advantage in observation, decision-making and guidance.

SAFRAN

GSG-8 Benefits

- 1600+ signals
- Flexible software defined platform
- Truly future proof
- Ultra-high dynamics
- Advanced jamming and spoofing options
- All GNSS constellations including LEO
- Powerful Automation
- Aerospace Simulation
- User-defined waveforms

GSG-8: Scientific Precision. Software Defined.

GSG-8 is revolutionizing the GNSS simulation industry with its easy to use, advanced simulation capabilities, extraordinary flexibility and rapid development cycles. With a robust and innovative 1000Hz software engine and commercial-off-the-shelf (COTS) software-defined radios (SDRs), GSG-8 easily outperforms the competition. It can accommodate unlimited configurations to conduct system testing and simulation, and its SDR format makes maintenance and customization much easier and more affordable than other options. Trust GSG-8 to deliver precise results for your critical programs. Safran can help ensure reliable performance and accelerate your system's time to market or deployment.

Powerful Automation

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

Scalable Platform

The Skydel simulator engine provides a flexible and scalable architecture to cover larger and more complex applications to test controlled reception pattern antennas (CRPA). Ask Safran about Wavefront and Anechoic test solutions using the Skydel simulator engine.

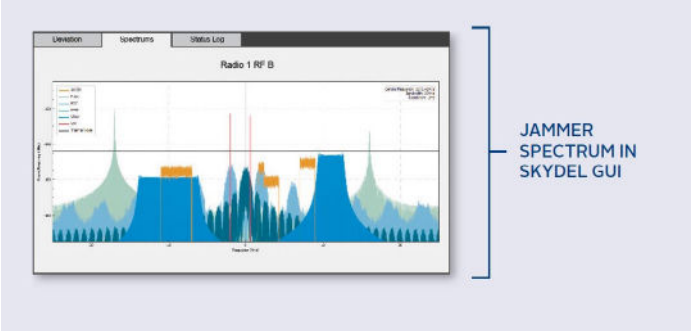
Technical Specifications

GSG-8 Key Features

- All-in-view satellites simulation
- 1600+ signals
- 1000Hz simulation iteration rate
- Low-latency HIL
- Live sky time synchronization
- RTK
- Custom signals
- 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 including LEO constellations
- Multi-vehicle simulation
- Comprehensive and intuitive API (Python, C# and C++ open source client)
- Scalable and highly flexible architecture using software-defined radios
- IQ file generation and playback

Advanced Jamming and Spoofing

- In-band and out-of-band jamming signals with no additional hardware
- Spoofing for all licensed GNSS signals
- Set power level, interference signal type, spoofing signals, location, antenna pattern and trajectory for each transmitter
- Complete jamming and spoofing control through the Skydel GUI and/or API
- GSG-8 calculates the necessary parameters based on transmitter location: Power levels, distance and time-of-flight



Signal Propagation and Errors Simulation

- Multipath
- 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(Y), L2-P(Y), L2C, L5
- NavIC: L1, L5
- Galileo: E1, E5a, E5b, E5 AltBOC, E6HAS, PRS (restricted signals)
- BeiDou-2: B1, B2
- BeiDou-3: B1C, B2a, B3I
- QZSS: L1-C/A, L1 C/B, L1S, L2C, L5, L5S
- GLONASS: G1, G2
- SBAS (L1/L5): WAAS, EGNOS, MSAS, GAGAN, SDCM
- Xona: PULSAR XL
- Custom signals

Signal Specifications

- Pseudorange Accuracy - ± 0.001m
- Pseudorange Rate - ± 0.001m/s
- Inter-channel bias - zero
- Spurious transmission < -45 dBc
- Harmonics < -45 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
- RF Signal Level (Jamming): +0 to +110 J/S (with signal
- (S) reference power at -130dBm)

Skydel Plugins

- SKY-PLG-RTK – RTCM message generation via virtual basestation.

Ordering Information

An RF output generates one of the following: upper band GNSS signals, lower band GNSS signals, interference signals (including jamming or spoofing), or additional antennas or vehicles (with SKY-MULTI). A GPU provides signal generation processing power, and an additional GPU allows more signals to be generated simultaneously.

Base Configurations

- GSG-811 – GNSS Simulator with 1 RF Output and 1 GPU
- GSG-821 - GNSS Simulator with 2 RF Outputs and 1 GPU
- GSG-831 - GNSS Simulator with 3 RF Outputs and 1 GPU
- GSG-842 - GNSS Simulator with 4 RF Outputs and 2 GPUs

Included with Instrument

- Getting Started Guide
- 4-to-1 RF Combiner, SMA
- SMA-SMA RF Cables (1 per output)
- RF Attenuators, SMA, 20dB, 30dB
- DC Block, SMA

Optional Features

- **SKY-HIL** – Hardware-in-the-loop mode, allows input of vehicle trajectory information in real-time.
- **SKY-IQFILE** – IQ File, allows saving of generated IQ data to file.
- **SKY-MULTI** – Multiple Instances, allows use of separate RF outputs for individual simulations (Ex. RTK Base and Rover). Minimum of 2 RF outputs required.
- **SKY-ADVJAM** – Advanced Jamming simulation, allows creation of jamming transmitters defined by their location (fixed and dynamic), antenna pattern, signals, and power levels. Minimum of 2 RF outputs required.
- **SKY-ADVSP** – Advanced Spoofing simulation, allows creation of spoofing transmitters defined by their location (fixed and dynamic), antenna pattern, spoofing signals, and power levels. SKY-ADVJAM and a minimum of 2 RF outputs required.
- **SKY-CSI** – Custom signal injections, allows real-time simulation of user-defined GNSS signals (custom modulation and navigation message).
- **SKY-PLG-SDK** – Plugin SDK allows creation and integration of custom plugins for Skydel.

General Specifications

Certifications

Safety

- EN/IEC 61010-1:2010
- ROHS2, 2011/65/EU

Emisions

- 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

Dimensions

- Size: 4U
- Weight: 39.6 lbs. (18 kg)
- Width: 19 in (48cm)
- Depth: 16 in (40.6cm)
- Height: 7 in (18cm)

Enviromental

- 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

All systems are provided with a one year hardware warranty and software support. Software support includes software upgrades, email and phone support, and application support.

SKY-SSUP – Extends or renews warranty and support. Priced per year.

POWERED BY TRUST

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November 6, 2024