



GNSS Simulation in Real-Time for High-End-Applications

Products and systems relying on GNSS-technology for positioning and/or timing have to be tested for ensuring a reliable, safe operation before putting them into operation. As the possibilities for comprehensive testing in real life are very limited, the use of a GNSS simulation system is the perfect option for ensuring a high coverage of test scenarios, efficient execution of many test cases, having in mind the requirement to standardize and repeat tests.

With **XPLORA Pro** system integrators, governmental authorities and GNSS equipment manufacturers and users can harden their GNSS-based infrastructure or equipment against interference.

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| Supported GNSS signals | GPS: L1 C/A, L2C, L5 Galileo: E1 B/C, E5a-I/Q, E5b-I/Q GLONASS: G1 C/A, G2 C/A BeiDou: B1, B2 SBAS: L1 C/A |
| Bandwidth | up to 120 MHz per RF output |
| Constellation update rate | up to 250 Hz |
| Resolution | up to 2 x 16 bit (complex I/Q) |
| Number of real-time channels | up to 208 (depending on selected signal components) |
| Simulation | Satellite orbits based on generation ephemeris or orbit integration Satellite clock model Atmospheric delays Ionospheric delay models: Klobuchar, Nequick-Gal, IONEX Tec Maps Tropospheric delay models: Saastamoinen, Hopfield, GPT2w Multipath models (statistical and deterministic) Noise models for all delays customizable and highly (bit-true) reproducible Antenna gain pattern and obstruction mask IF signal parameters including RFFE simulation User-configurable navigation message Receiver movement simulation (input through GUI, user file or API) Simulation of multiple receivers within one simulation |
| Accuracy between RF1, RF2 | Lower than 100µs |
| Reference accuracy | OCXO $\pm 5 \times 10^{-8}$ ageing per year $< \pm 1 \times 10^{-8}$ temperature stability 10 min warm-up time |
| Power level | Maximum power output: +20 dBm typical Resolution: 0.1 dB Uncertainty: ± 0.5 dB: +10 dBm – -50 dBm Range: ± 1.0 dB: below -50 dBm Dynamic range: -134 dBm – +20 dBm (peak); <75 dB typical |
| Spectral purity | Harmonics $f > 30$ MHz: < -30 dBc at +10 dBm Harmonics $f < 30$ MHz: < -40 dBc at +10 dBm Non harmonics > 30 MHz: < -75 dBc typical Non harmonics < 30 MHz: < -80 dBc typical |
| Simulation of hardware in the loop HIL | 250Hz, 100Hz, 50Hz, 10Hz, Latency to RF output < 2ms |
| Simulation of receiver antenna | Gain |
| Logging capabilities | Time related parameters Simulated vehicle trajectory parameters Receiver antenna parameters Satellite trajectory parameters Satellite transmit antenna parameters Received signal parameters |
| Usability | Designed for GNSS simulation in real-time for high-end applications |

XPLORA Pro is a GNSS simulator that is capable of generating all public GNSS signals and frequencies available today. It offers direct RF signal playback in real-time or alternatively digital IF baseband signal generation. Additionally, simulation of GNSS receiver observables is available.

The simulator capabilities can be adjusted in terms of features to meet the user requirements exactly by offering optional signals, frequency bands and simulation of interference and multiple receivers.

A GNSS simulator for all your needs – testing and validating GNSS hardware, research or satellite constellation simulation.

Benefit from quickly created simulations and parameters that can be adjusted down to the smallest detail for more complex test scenarios.

Configure satellite orbits, navigation-messages and change simulation parameters on-the-fly or in a hardware-in-the loop setup.

Improve your interference and spoofing countermeasures and mitigation strategies by using highly detailed signal simulations.



XPLORA Pro provides a rich set of core features:

- Orbit simulation for all GNSS freely customizable
- Accurate models for atmospheric delays – Ionosphere and Troposphere
- Receiver movement by defining position, velocity, acceleration and receiver attitude
- Unlimited number of simulated receivers and antennas
- Modelling of user-defined antenna characteristics and antenna arrays
- Multipath modelling
- Navigation message simulation based on GNSS ICDs or customized user-defined message formats
- In-depth GNSS interference simulation in the form of jamming and spoofing
- Real-time modification of scenario parameters during simulation runtime via API or GUI
- Graphical user interface or command line interface



XPLORA Pro

XPLORA Pro offers a multi-channel high-performance platform for complex and versatile GNSS testing in one complete system. **XPLORA Pro** is modular, functional and intuitive and enables GNSS simulation for novices and experts alike.

Enjoy **XPLORA Pro**'s simulation capabilities

- Test under laboratory environment and simulate the GNSS signals realistically with a lot of impacts that affect the GNSS measurements in real life
- Control all parameters for a realistic and authentic GNSS signal environment
- Precisely repeat all tests
- Benefit from the real-time input interface for HIL (Hardware-in-the-loop)

Making **XPLORA Pro** the perfect solution for highly sensitive professional applications requiring real-time simulation of GNSS, jamming and spoofing signals, as well as for testing systems requiring HIL (Hardware-in-the-loop) scenarios.

Get in touch with us to learn how to optimize your resources and time in development, qualification and certification of GNSS equipment and GNSS applications!

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