



RTG2

Real-Time GNSS Generator

RTG2 is a GNSS signal Generator which simulates realistic GNSS RF signals taking into account the current and future GNSS Constellations.

RTG2 is able to entirely simulate one or many constellations (GPS, Galileo, GLONASS or Compass) including satellite based augmentation systems such as WAAS/EGNOS.

The generator is entirely configurable (troposphere and ionosphere effects, simulated receiver trajectory, etc) through a user friendly interface accessible through a web browser.

RTG2 is highly flexible and scalable, offering hardware and software upgrades for capability extensions.



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PRODUCT OVERVIEW

- RTG2 is versatile in term of use: RTG2 can be used as a “classical” GPS L1C/A constellation simulator, but can also be used as a multiple constellation simulator (GLONASS, GALILEO, SBAS, etc) in order to help developers and testers of all kind of GNSS systems. Moreover, the option to broadcast the signal or to write the digitalized signal in a file allows the user to isolate RF issues from receiver issues. Finally, the complete set of configuration tools and parameters offered brings to RTG2 a first class coverage of user needs.
- RTG2 is compliant: RTG2 offers full compatibility with published ICDs for all signals proposed, from the signal processing aspect (orbitography, pseudorange computation, propagation models, receiver trajectory model) to the RF generation (signal purity, stability, phase noise, etc).
- Realism of the simulations: RTG2 is able to reproduce errors such as the ionosphere, troposphere, clock, orbit, interference, multipath... in order to generate a very realistic signal.
- RTG2 is unique: The RTG2 product can be delivered with an optional module to achieve a multipath environment simulation corresponding to a user-defined 3D realistic model, implementing ray-tracing techniques. Such real-time of realistic 3D environment computation does not exist in any other product on the market.

BENEFITS

- Powerful, highly configurable, user friendly
- Can be monitored and controlled through remote access via an Ethernet connection
- Reduced initial investment: the lowest price available worldwide in its highest performance class
- Possibility to modify parameters during execution time
- Scalability: system can be hardware (modularity) or software (licensing) upgraded after delivery in order to improve the functionalities following your needs
- Easily used to test receivers either in laboratory (development) or in production
- Large choice of GNSS signals and constellations (depending on product version)
- Compatible with the Silicom GNSS product suite
- Exceptional hardware reliability
- World-wide support through the SILICOM international partner network

KEY FEATURES

CONSTELLATION

- Date, time management
- Choice of signals to generate among the following signals:
 - GPS L1C/A, L2C, L5, L1C
 - Galileo E1 (b and c), E5a and E5b or E5 (data and pilot), E6
 - GLONASS G1 and G2
 - Custom signals (Military, future signals, ...)
- Generate the local augmentation systems (EGNOS, QZSS, WAAS or Custom geostationary satellites)
- Navigation messages as defined in the ICDs



- Determine constellation from almanac or ephemeris (Yuma, RINEX)

PROPAGATION CHANNEL

- Possibility to generate a “perfect” signal or a signal affected by environmental errors
- Interference source generation (option):
 - Ionosphere, Troposphere errors (multiple models are available)
 - Orbital and satellite clock errors
 - Satellite frontend effects (filtering, clock error, etc)
 - Satellite blanking and/or fading
 - Satellite dysfunctions
 - Evil wave
 - Continuous Wave
 - Narrowband and Wideband interference
 - Pulsed interference: DME, JTIDS and Radar (option)
 - Simple multipath simulation (editor defined)
 - Option: Multipath ground environment simulation corresponding to a user-defined 3D realistic model

TRAJECTORIES

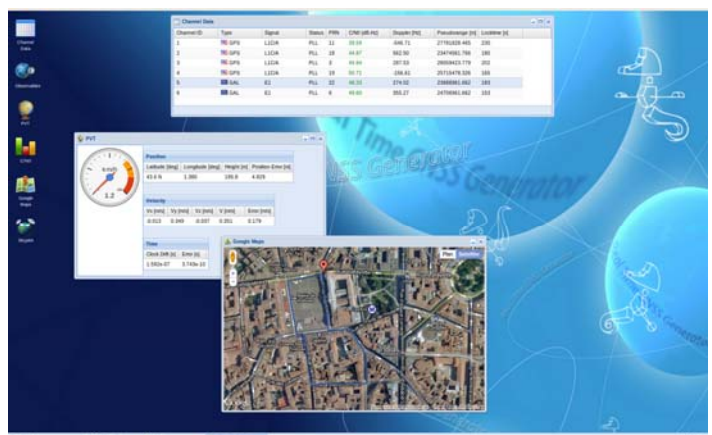
- Predefined or “on the fly” user trajectory commands
- 2D and 3D trajectories
- Simple trajectories editor through the input set (acceleration vector, date and duration of application of this vector), which produces a really realistic trajectory.
- Option: Spaceborn trajectory and environment simulation

PARAMETER SET AND DATA ANALYSIS

- All parameters can be defined independently (orbit, clock, antenna, elevation mask, ...)
- Used through a Graphical User Interface with remote Ethernet access (via single terminals running only a browser)
- Interactive monitoring and control of current simulation
- Graphical display of most accessible parameters
- Export of many logs and observables

HARDWARE CONFIGURATION

- Number of channels (SV*signal) from 1 to 36 in the standard product (extendable to more than 100 upon request)
- Generation start can be externally triggered (Ethernet or TTL in option)
- Up to 3 carriers per product, allowing 3 GNSS frequencies simultaneous generation
- “Hardware in the loop” option, with real time input of the trajectory of the receiver



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SPECIFICATIONS

The RTG2 product exists in several versions defined as following:

- 🌐 -A version including up to 3 RF channel using the SILICOM SiFen-G-RF stage.
- 🌐 A pure digital version.

GENERAL

- 🌐 **Connectivity**
 - RF Output connector N female
 - Internal 10 MHz reference output BNC female
 - External 10 MHz reference input BNC female
 - Network connector RJ45
 - Media connector USB
- 🌐 **General specifications**
 - Size (W × H × D) 565 × 210 × 585 mm
 - Weight 49 kg
 - Input voltage range 100V to 240V AC ±10%
 - Input frequency range 50 Hz to 60 Hz ±5%
 - Power consumption 110 W
- 🌐 **Environmental**
 - Operating temperature range +10°C to +40°C
 - Storage temperature range -20°C to +55°C

CHARACTERISTICS

- 🌐 Pseudorange precision better than 1mm
- 🌐 Interchannel Carrier Alignment better than 1mm
- 🌐 L1C/A PVT Measured accuracy +/-5cm (6 Sat)

Nb. PVT Accuracy Measurement highly depends on the receiver quality. Our characterization has been made with SORGA Software Receiver (SILICOM Product).

SIFEN-G OVERVIEW

- 🌐 **RF output**
 - Frequency range From 1100 MHz to 1610 MHz
 - Bandwidth 120 MHz

- RF power (@ 50 Ohm) From -50 to -90 dBm
- Optional RF power (@ 50 Ohm) From -110 to -150 dBm
- Output VSWR < 1.3
- Supported VSWR ∞ (permanent)
- 🌐 **RF Quality**
 - Level resolution +/- 0.1dB
 - Level precision +/- 0.5 dB
 - Synthesis step 1.5 Hz
 - Harmonious spurious < -65dbc min
 - Non-harmonious spurious < -55 dbc (SF dependent)
 - RMS Jitter 104 fs
 - Group delay variation <15 ns @ BW = 55 MHz
 - Group delay stability <10 ps/°C @ BW = 55 MHz

- 🌐 **Synthesiser**
 - Internal 10 MHz reference:
 - Signal Sinus
 - Stability 5×10^{-9} from +10°C to +40°C
 - Allan variance 1s 2×10^{-12}
 - Aging 0.5 ppb/day and 50 ppb/year

Internal 10 MHz reference output:

- Signal Sinus
- Impedance 50 Ohm
- Level 6 dBm

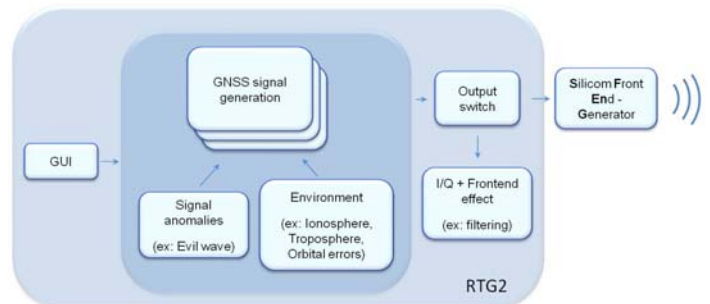
External 10 MHz reference input:

- Signal Sinus
- Impedance 50 Ohm
- Level From +0 to +10 dBm

- 🌐 **Digital Input**
 - Digital generic interface LVDS
 - Samples format I/Q
 - Bit quantization up to 8 bits I + 8 bits Q
 - Input Sampling frequency From 1 to 200 MHz
 - Input voltage 3.3 V
 - Connector VHDCI



OVERALL ARCHITECTURE



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EXAMPLES OF USE

- 🌐 GNSS receivers development, benchmark, characterization:
 - Ionosphere, Troposphere, Dynamics effects
 - PVT accuracy, precision and reliability
 - Structural device perturbations
 - GNSS receivers production

DOMAINS OF APPLICATION

- 🌐 Local, Public Regulated Service (PRS)
- 🌐 Navigation: terrestrial, air, maritime and railway (onboard Vehicle)
- 🌐 Research:
 - Precise positioning
 - Indoor localization
 - Testing of algorithms with new signals (not broadcast yet)

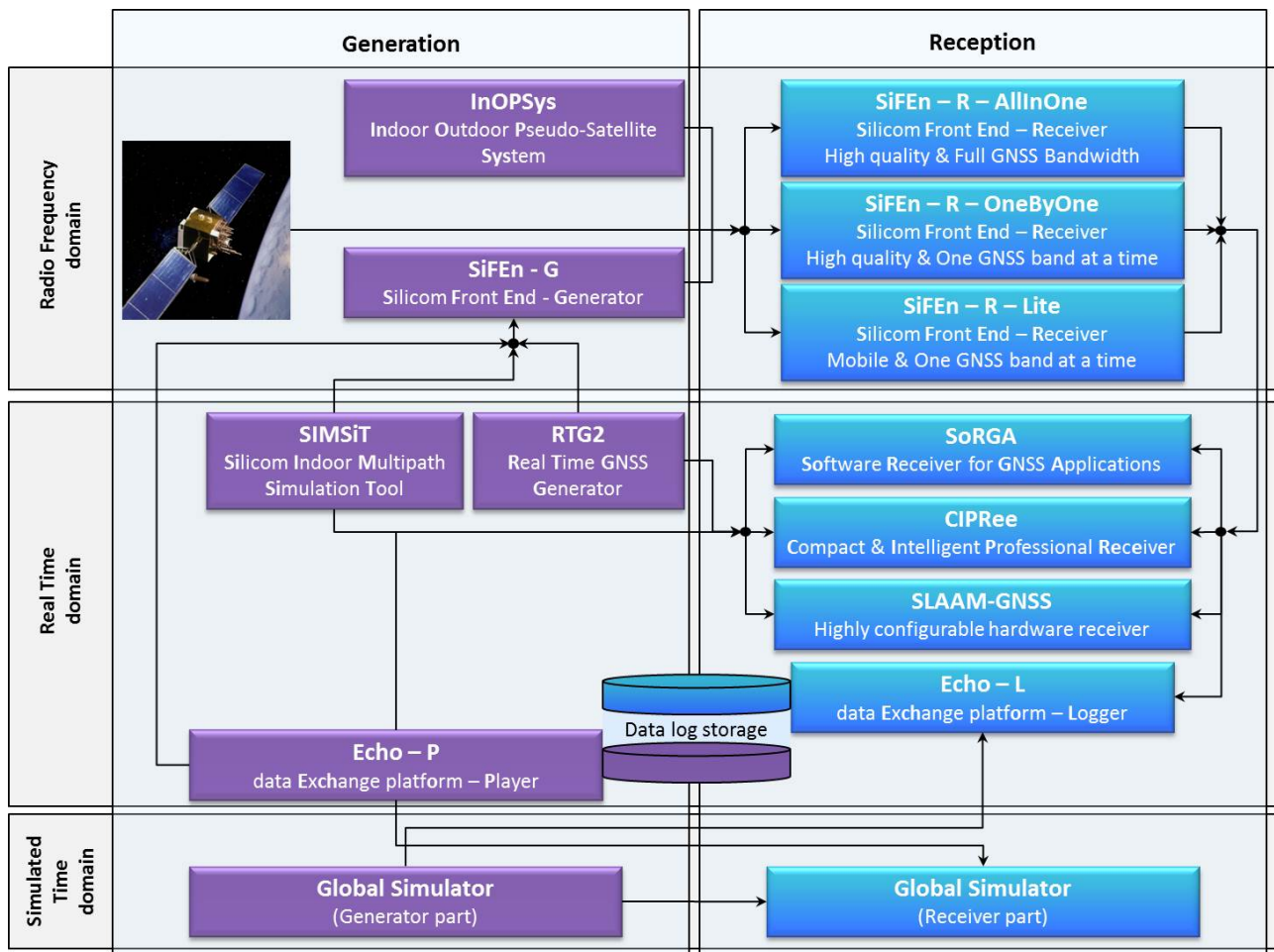
Multipath mitigation algorithms testing

- 🌐 Training / Teaching
- 🌐 Other applications
 - Reflectometry
 - Geodesy
 - Geography
 - Topography, ...

SERVICES PROVIDED BY SILICOM

- 🌐 Specific GNSS implementation
- 🌐 Customization for dedicated systems
- 🌐 Support (on-site, hotline, web)
- 🌐 Training

SILICOM GNSS SUITE



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