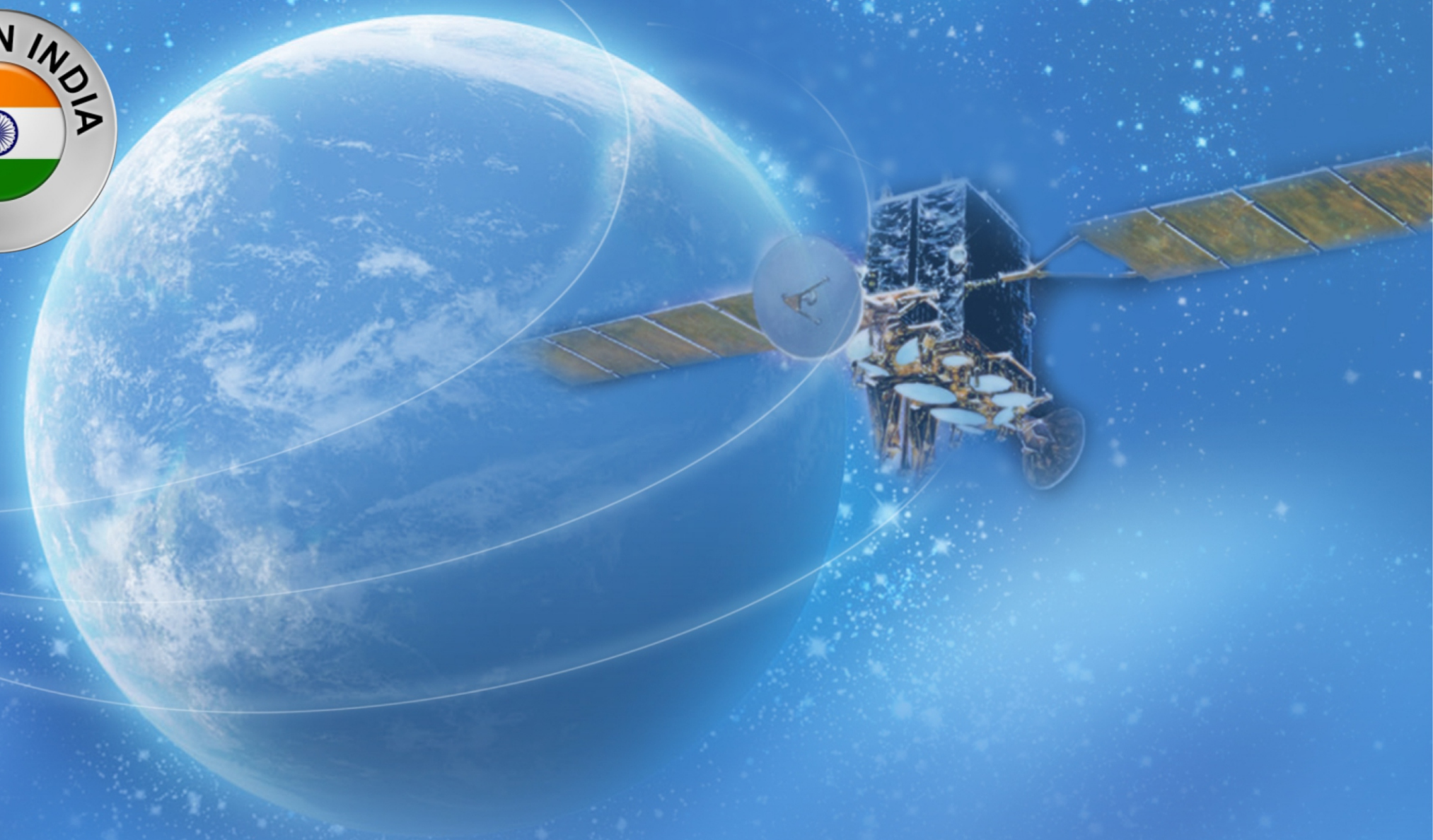




Accord Software & Systems Private Limited



SIMAC6 - Accord's Indigenous GNSS Simulator

Many Constellations, One Solution

P/N : 1505900



*Specifications are subject to change without notice. Please contact us for more details.

Accord Software & Systems Private Limited
72 & 73, 2nd floor,
K.R. Colony, Domlur Layout,
Bangalore - 560 071, INDIA.

Tel: +91 - 80 2535 0105/0136 /0138
Fax: +91 - 80 2535 2723
Email: ibd@accord-soft.com
Website: www.accord-soft.com

June 2022
Rev 1.0



Features

- ❖ Dual-frequency GNSS simulator
- ❖ HILS/Hardware update rate support upto 10 ms
- ❖ Supports profiling of receiver performance using receiver NMEA output
- ❖ Selection of single/multiple channels of GNSS constellations
- ❖ Flexibility for configuring all/some of the channels for SVIDs of any constellation
- ❖ High dynamics simulation
- ❖ Supports DGNSS corrections
- ❖ Capable of multipath simulation
- ❖ Navigation data modeling
- ❖ Supports waypoint navigation
- ❖ Supports all types of vehicle simulation via motion commands or user motion/NMEA files
- ❖ Comprehensive datalogging
- ❖ Supports error modeling for RAIM tests
 - ◆ Fixed Doppler offset
 - ◆ Step error
 - ◆ Ramp error
- ❖ Multiple options for signal impairments
 - ◆ Ionosphere
 - ◆ Troposphere
 - ◆ Clock noise
- ❖ User defined spreading code configuration



Specification*



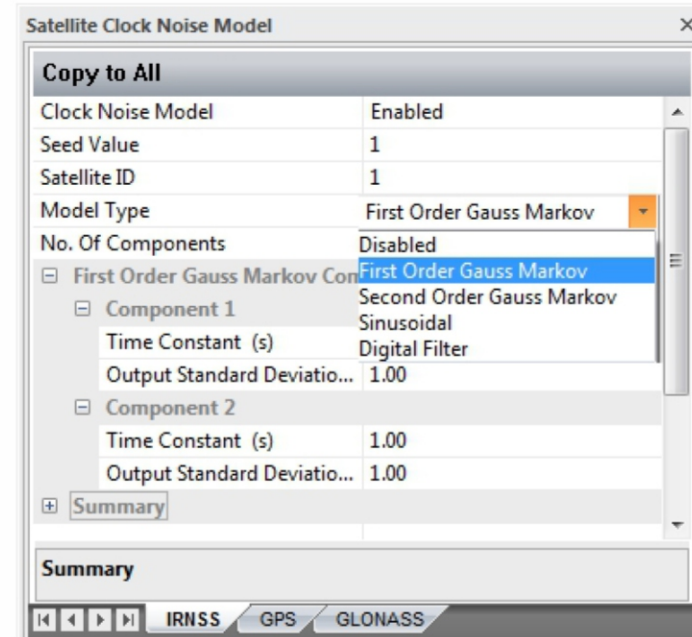
Vehicle Types

- Stationary user
- User motion trajectory definition in ASCII file
- Pre-defined models
- User-defined commands (Straight, Turn, Accelerate, Climb, Spin, Great circle, Waypoints) to simulate land vehicle, aircraft, space and missile vehicle types



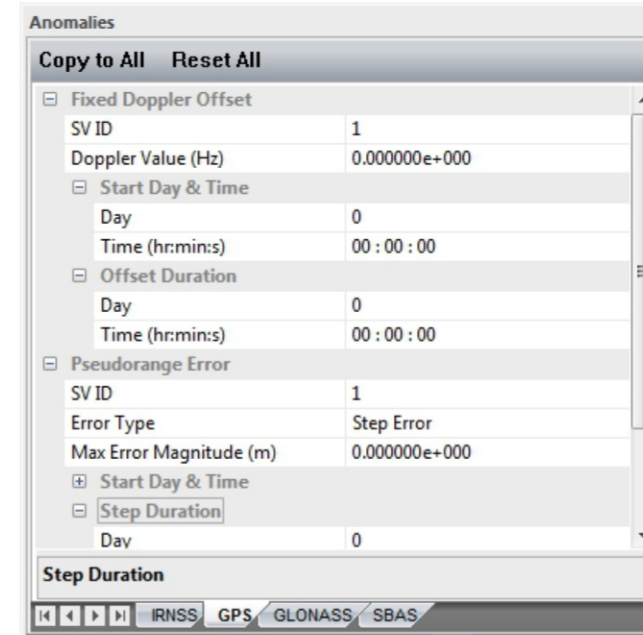
Satellite Clock Degradation

- Intentional Satellite Clock Degradation Models
 - Digital filter
 - Deterministic sinusoidal
 - Gauss-Markov first and second order



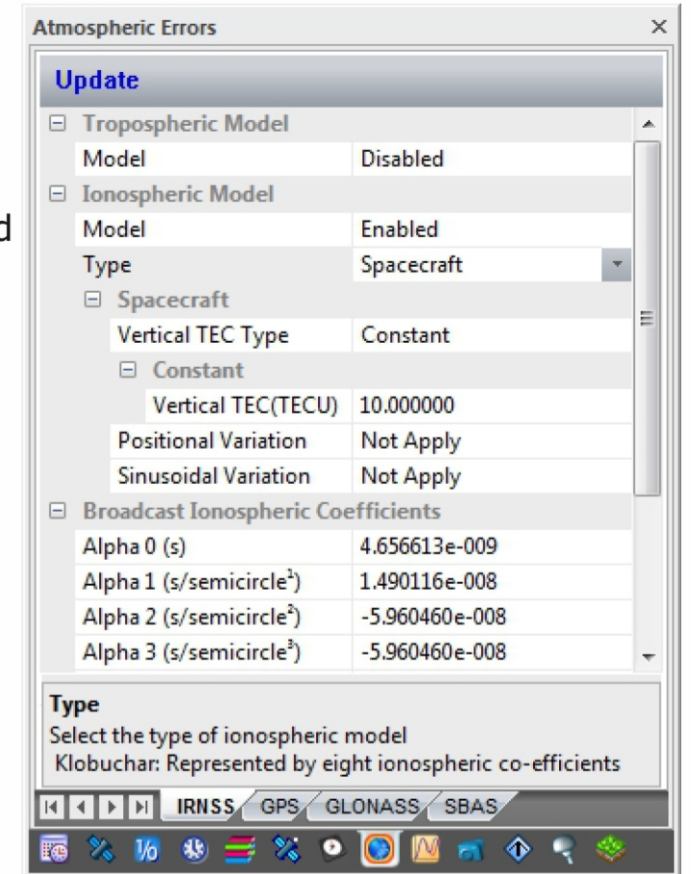
Anomalies

- Fixed Doppler offset
- Step error
- Ramp error



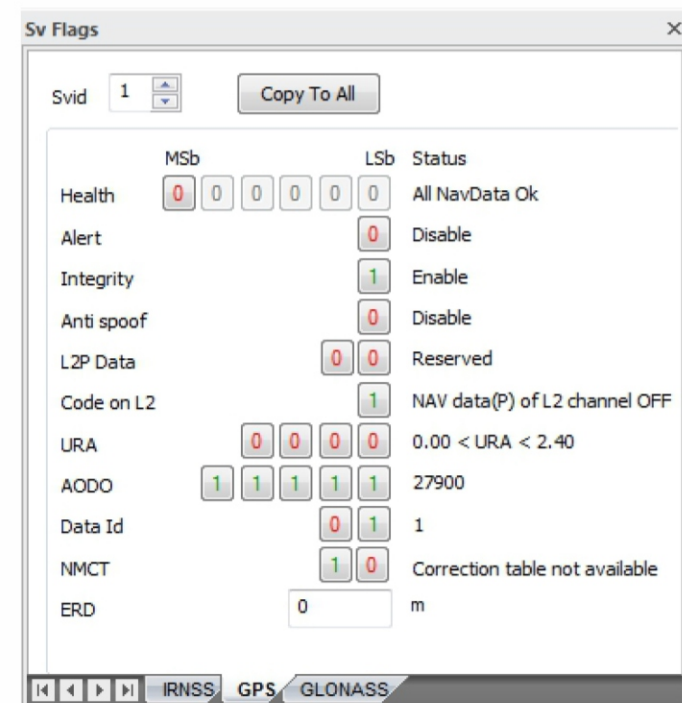
Atmospheric Impairments

- Ionospheric Delay Models
 - Klobuchar as defined in GPS-SIS-ICD
 - Grid-based model as defined in DO-229D
 - IRNSS Grid-based model as defined in IRNSS-SIS-ICD
 - Provision to support user defined Klobuchar coefficients
 - User configured model
 - Constant TEC model
 - Spacecraft Iono model
 - Galileo Ne-Quick
- Tropospheric Delay Model as defined by
 - RTCA06
 - RTCA98
 - Saastamainen
 - Hopfield
 - Modified Hopfield
 - UNB



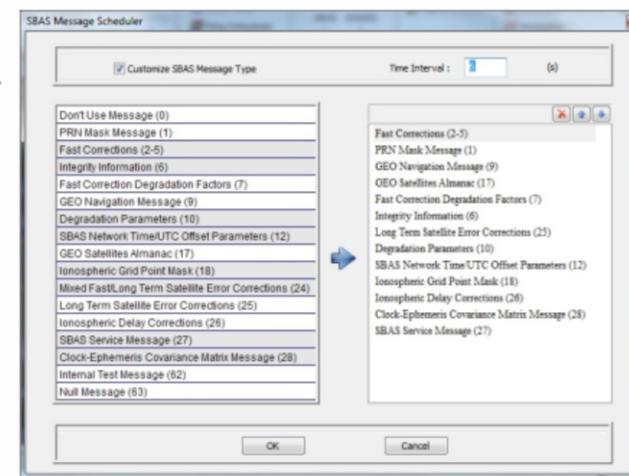
Navigation Messages

- Provision to specify satellite health data fields
- Provision for scheduling the different types of messages as per the SIS-ICD
- Provision to load Ephemeris and Almanac data using YUMA and RINEX file
- Provision for navigation data modeling.



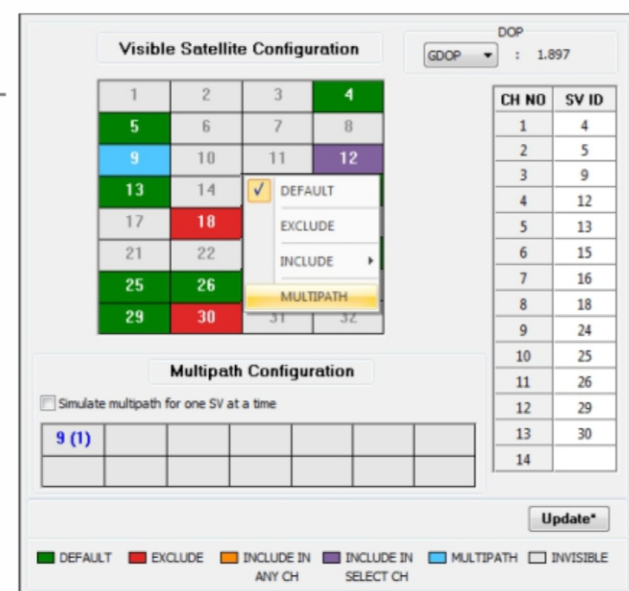
SBAS Configuration

- User configurable SBAS message types



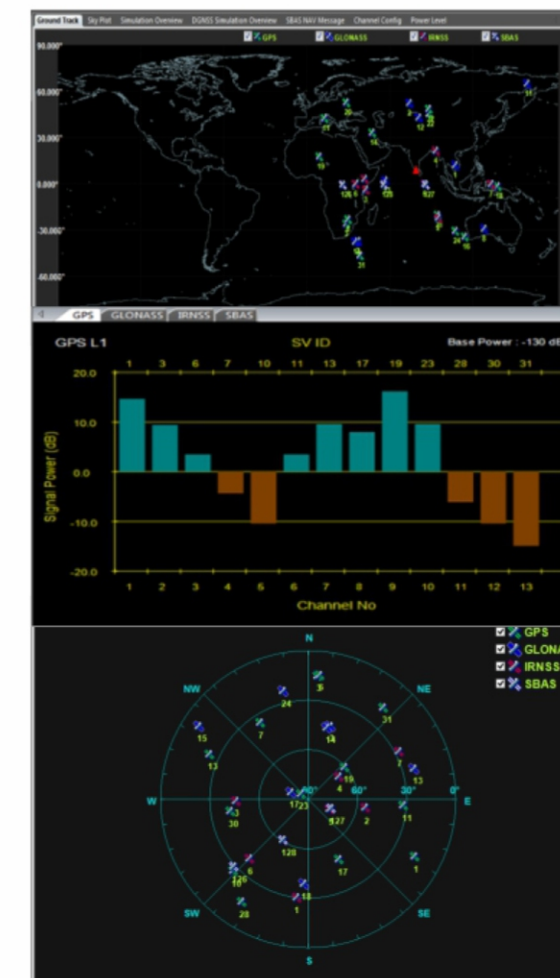
Multipath

- Configuration of four multipath channels per satellite
- Simulation of the following in each multipath channel
 - Attenuation
 - Doppler shift
 - Code delay
 - Carrier phase offset



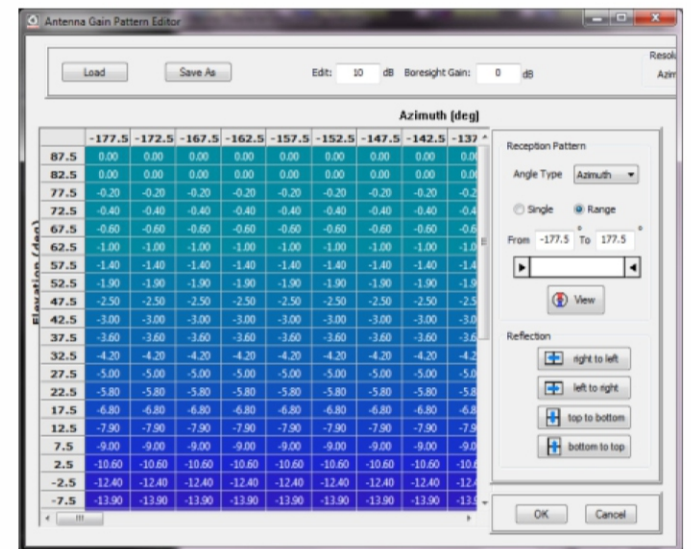
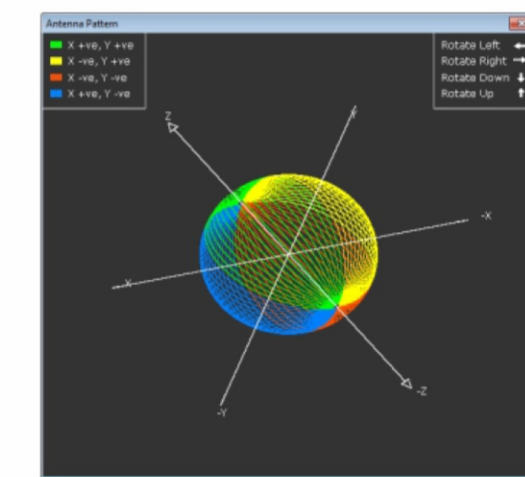
Output Display/ Data Logging

- Graphical and textual data display at 1 Hz
- Receiver Error Plots using NMEA message from receiver
 - Vehicle position and altitude
 - Satellite position
 - Navigation data
 - Received signal information parameters
 - Simulation data in NMEA format



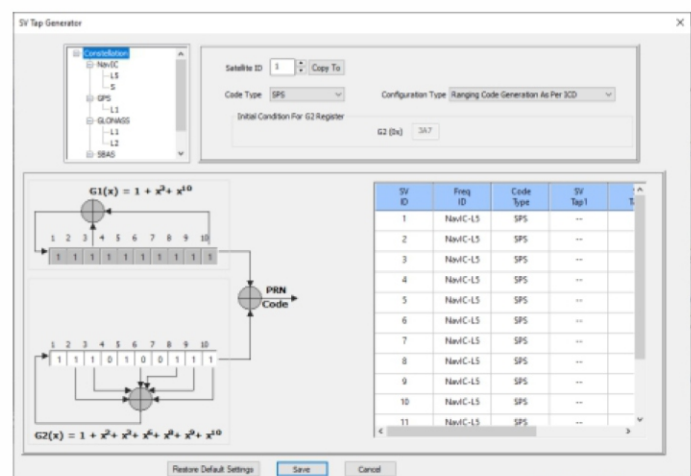
Antenna Pattern Modeling

- Antenna placement
- Antenna orientation
- Antenna reception pattern



Spreading Code

- Gold codes as defined in SIS-ICD of the respective constellations
- Provision for defining PN sequence using
 - User defined tap points
 - User defined G2 initial state



Specification*

Signal Power Levels

- Nominal signal level for all bands @ Main RF port -130 dBm
- Nominal signal level for all bands @ Calibration RF port >50 dB
- Dynamic range w.r.t nominal signal level ±20 dB
- Resolution 0.1 dB
- Power Accuracy ±0.5 dB

Signal Accuracy

- Master clock stability ±5 x 10⁻¹⁰ (long term)
- Pseudo range 1 mm (RMS)
- Pseudo range rate 1 mm/s (RMS)
- Interchannel bias Zero

Operating Specifications

- Operating temperature 0° to 50° C
- Storage temperature -40° to +60° C
- Operating humidity 40% to 90% RH @ 40° C
- Storage humidity 20% to 90% RH @ 40° C
- Electrical power supply 230 V AC, 50 Hz

Modulation and Data Encoding Scheme

- BPSK, BOC
- FEC encoder (1/2 rate)
- Interleaver
- 50 Hz, 100 Hz, 250 Hz NAV data rate

Dynamic Limits

- Relative velocity ±20000 m/s
- Relative acceleration ±1500 m/s²
- Relative jerk ±15000 m/s³
- Altitude 18 km (Up gradable to 500 km)

Mechanical Specification

Part	Dimension (WxDxH) (mm)	Weight (kg)	Power (W)
Signal Generation Unit	760 x 490 x 180	<25	<100

RF Update Rate

- User configurable update rates of 10 Hz, 100 Hz

Interfaces

- Main RF output * Coaxial N-type female
- Calibration RF output * Coaxial N-type female
- SYNC 1PPS OUT * Coaxial BNC Socket
- External reference input (10 MHz Sinusoid) * Coaxial BNC Socket
- Internal reference output (10 MHz Sinusoid) * Coaxial BNC Socket
- External trigger input * Coaxial BNC Socket
- 1Gbps Ethernet LAN RJ-45
- DGNSS (RS-232) 9-pin 'D' Socket

Signal Purity

- Harmonics < -40 dBc
- Spurious < -40 dBc
- Phase noise < 0.02 rad

* All ports are 50 Ω

GNSS Constellations

Band	Service	Constellation	Channels	Center Frequency (MHz)	Bandwidth (MHz)
L5	SPS	IRNSS	11	1176.450	±12
		GPS	16	1176.450	±12
		SBAS	4	1176.450	±10.23
S	SPS	IRNSS	11	2492.028	±8.25
L1	C/A	GPS L1	16	1575.420	±10.23
		GLONASS L1	14	1602.000	±5
		GALILEO E1	16	1575.420	±12.27
		BEIDOU B1	19	1561.098	±8
		QZSS L1	4	1575.420	±10.23
	SBAS	WAAS, GAGAN, MSAS, EGNOS L1	4	1575.420	±10.23
L2	CM/CL C/A	GPS L2	16	1227.600	±15
		GLONASS L2	14	1246.000	±6
		GALILEO E5	16	1191.795	±20
		BEIDOU B2	19	1207.140	±8

Hardware-In-Loop Simulation (HILS)

