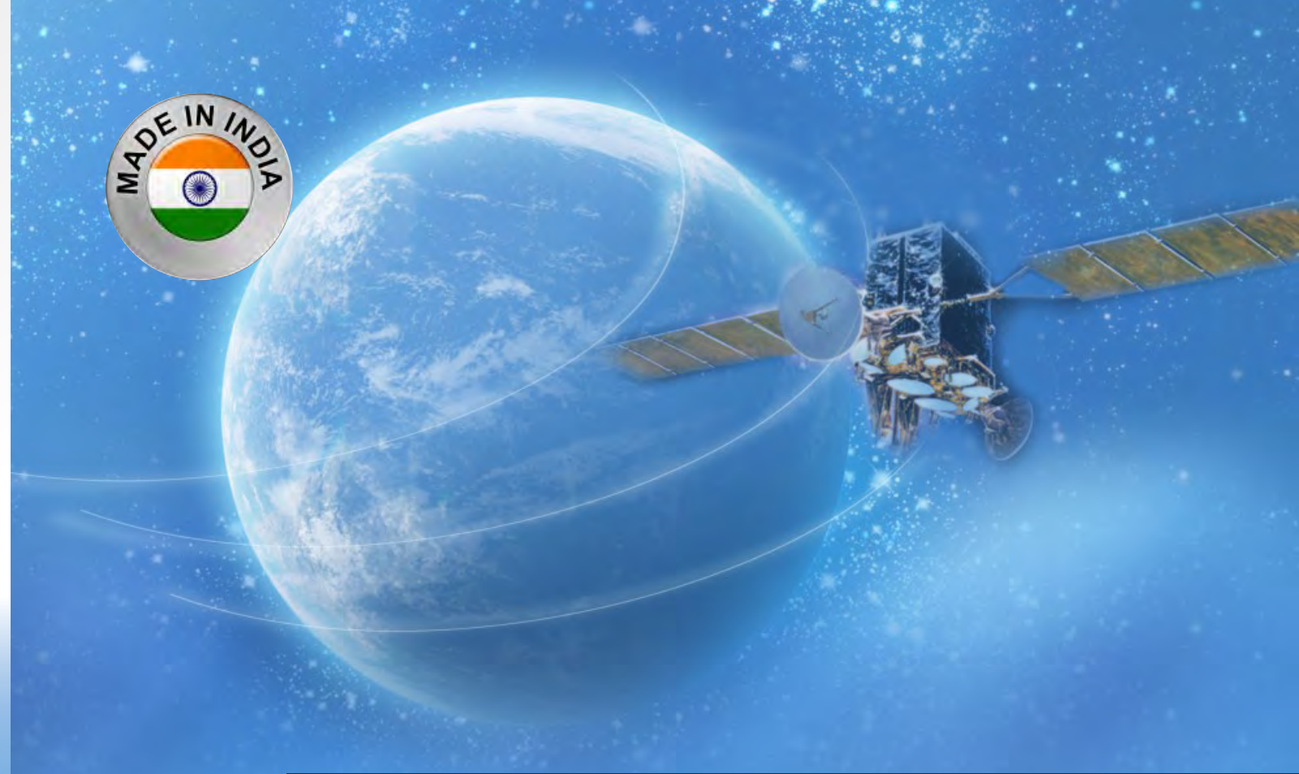
ACCORD

Inspired to be innovative

Accord Software & Systems Private Limited



SIMAC6 - Accord's Indigenous GNSS Simulator

Many Constellations, One Solution

*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

Apr 2018
Rev 1.1

ACCORD

Inspired to be innovative

Features

- Dual-frequency IRNSS simulator
- HILS/Hardware update rate support upto 10 ms
- Supports profiling of receiver performance using receiver NMEA output
- Supports RINEX, NMEA output messages
- 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
- Spreading code configuration
  - User defined
  - File loading

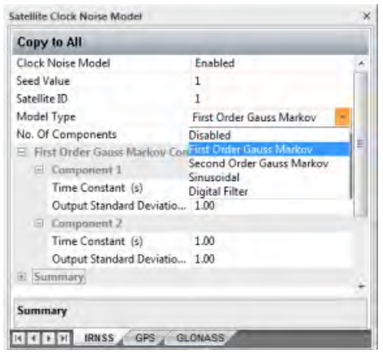
Specification*

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 and missile vehicle types

Satellite Clock Degradation

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

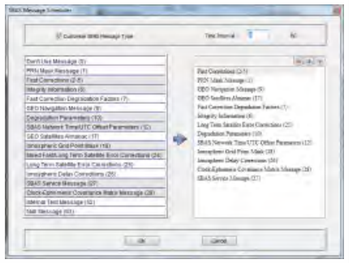


Navigation Messages

- 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

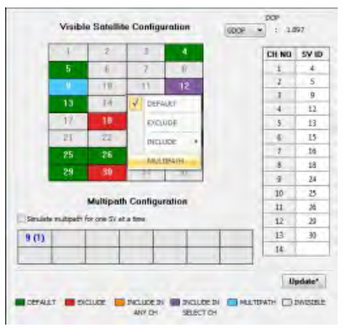
SBAS Configuration

- 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

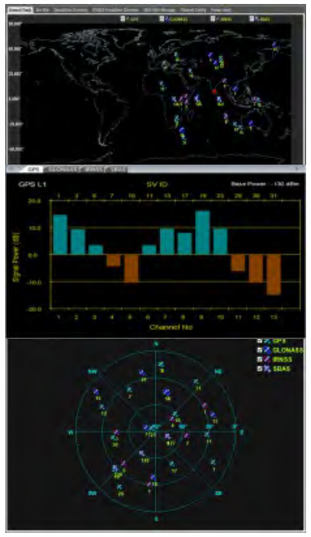


Anomalies

- Fixed Doppler offset
- Step error
- Ramp error

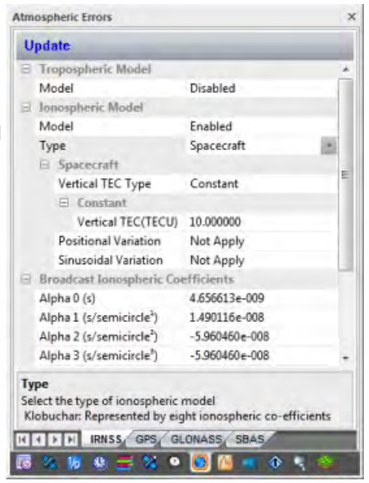
Output Display/ Data Logging

- Graphical and textual data display at 1 Hz
- Receiver Error Plots using NMEA message from receiver
- Output simulation data in RINEX/NMEA format
- File logging for off-line processing
  - Vehicle position and altitude
  - Satellite position
  - Navigation data
  - Received signal information parameters



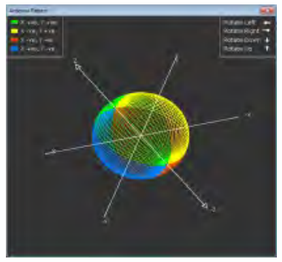
Atmospheric Impairments

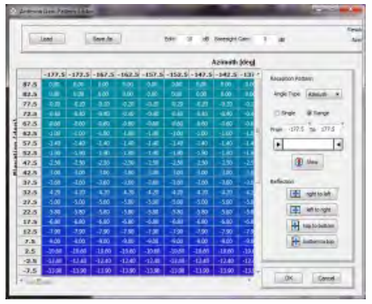
- Ionospheric Delay Models
  - Klobuchar as defined in GPS-SIS-ICD
  - Grid-based model as defined in DO-229D
  - IRNSS Grid-based model as defined in IRNSS-SIS-ICD
  - Provision to support user defined Klobuchar coefficients
  - User configured model
  - Constant TEC model
  - Spacecraft Iono model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



Antenna Pattern Modeling

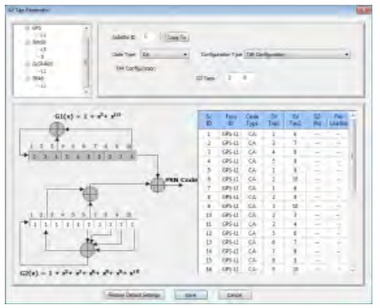
- Antenna placement
- Antenna orientation
- Antenna reception pattern





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
- File loading option



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

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	+10° to +40° 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/s^2
✦ Relative jerk	±15000 m/s^3

Mechanical Specification

Part	Dimension (WxDxH) (mm)	Weight (kg)	Power (W)
✦ Signal Generation Unit	482 x 545 x 266	<21	65

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
✦ Diagnostic port	25-pin 'D' Socket
✦ 10/100 Mbps Ethernet LAN	RJ-45
✦ DGNSS (RS-232/RS-422)	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 GPS	11 16	1176.450 1176.450	±12 ±12
S	SPS	IRNSS	11	2492.028	±8.25
L1	C/A	GPS L1 GLONASS L1 GALILEO E1 BEIDOU B1	16 14 16 19	1575.420 1602.000 1575.420 1561.098	±10.23 ±5 ±12.276 ±8
	SBAS	WAAS, GAGAN, MSAS, EGNOS L1	3	1575.420	±10.23
L2	CM/CL	GPS	16	1227.6	±15

Hardware-In-Loop Simulation (HILS)