

PNS

Precision Navigation Simulator



The PNS multi-GNSS Simulator portfolio is built on 15 years heritage in hardware development for the satellite navigation market. Based on the cornerstones of flexibility, fidelity, performance and reliability the PNS simulator sets new standards in the field of GNSS signal simulation.

Providing the perfect test solutions, the PNS is fully capable of multi-constellation, multi-frequency simulations for a wide range of test scenarios used in research and development of GNSS receivers, including aviation, maritime and other navigation applications.

Key features

- GPS L1/L2/L5, Galileo E1/E5/E6, GLONASS L1/L2, BeiDou B11/B21/B3
- GNSS Augmentation – WAAS, EGNOS, GAGAN, MSAS, SDCM
- Vehicle Defined Motion Trajectories
- User Loaded Trajectory File
- Up to 128 LOS channels + 512 multipath channels
- Up to 4 RF outputs per single device
- Multi-Device capability as Master-Slaves-System
- Multi User and Multi Antenna
- Antenna Gain / Phase Pattern (Rx/Tx)
- Multiple Error Models: Ionospheric, Tropospheric, Ramp, Satellite Clock Error, Multipath
- Flexible Configuration using GUI / Remote Commands
- High Frequency Stability and Signal Purity
- Phase Synchronized Modules
- Simulation rate up to 1000 Hz
- CE compliant
- **3 years warranty**

Hardware Capability

Product	PNS-„4HU“	PNS-„6HU“
Hardware Capability		
Max RF-Outputs	2	4
Module Slots	4	8
Number of Channels	128	256
Multipath Channels	512	1024
Multi Constellation	yes	yes
Module Capability		
Total LOS Channels	32	
Frequency Bundles	4	
Channels (per bundle)	8	
Multipath Channels (per channel)	4	
Frequency Ranges (per bundle)	1110-1450 MHz 1500-1950 MHz 2050-2540 MHz	
Dimension: WxHxD (without connectors, feed and handle)	447.5 x 177.8 x 400.5 mm ³	447.5 x 266.7 x 500 mm ³ (approx.)
Temperature Range	0 °C ... 40 °C	
Mains Power Input	100 ... 240 V AC, 47-63 Hz	
Mains Power Consumption	MAX.: 350 W	MAX.: 650W

Optional: Additional plug-in PNS Signal Modules

Noise Generator	
Noise Density	-173 dBm/Hz to -120 dBm/Hz
Resolution	0.1 dB
Accuracy	±0.3 dB
Bandwidth	500 MHz in L-band

Interfaces

Interface	IN	OUT
Trigger	BNC female	BNC female
PPS	BNC female	BNC female
10 MHz Reference	BNC female	BNC female
Sync	SMA female	SMA female
Monitor		2 * SMA female
bidirectional		
Ethernet	2 * RJ-45	

Signal Specifications

Power Levels	
Signal Power Range	-173 dBm to -90 dBm (optional up to -75 dBm)
Possible Power Range	100 dB
Resolution	0.01 dB
Linearity Over Power Range	< 0.1 dB
Absolute Accuracy	±0.3 dB
Signal Accuracy	
Velocity	1460000 m/s
Acceleration	667000 m/s ²
Jerk	6600000 m/s ³
Pseudorange	< 1 mm
Pseudorange Rate	< 1 mm/s
Inter-Channel Bias	0 mm
Harmonics	< -40 dBc
Spurious	< -40 dBc
Phase Noise	< 0.005 rad RMS
Frequency Stability	< ±5x10 ⁻⁸ (optional < ±5x10 ⁻¹⁰)

Supported GNSS Systems

Full coverage of all existing GNSS-Systems:

System	Frequency Band	Supported Signals
GPS	L1	C/A Code, P-Code (Open Service), L1C
	L2	C/A Code, P-Code (Open Service), L2C
	L5	I, Q
Galileo	E1	Open Service data
	E5	E5a Data/Pilot E5b Data/Pilot
	E6	CS Data/Pilot
GLONASS	G1	C/A Code, P-Code (Open Service)
	G2	C/A Code, P-Code (Open Service)
BeiDou	B1	B1-I
	B2	B2-I
	B3	B3
SBAS (WAAS, EGNOS, MSAS, GAGAN,SDCM)	L1	C/A Code
	L5	I, Q
IRNSS	L5	Standard Positioning Service
QZSS	L1	C/A Code, L1C
	L2	L2C
	L5	I, Q

Signal Commanding and Generation

Hardware-In-The-Loop Ready	
Trajectory Dynamics Update Rate	up to 1000 Hz
Position Calculation Update Rate	> 120 MHz
Software/Hardware Latency	< 30 ms
Remote User Position Input	Ethernet stream

Software Features

Multi-Antenna Simulation	2 / 4 (Depended on available outputs)
Multi-User Simulation	2 / 4 (Depended on available outputs)
Differential GNSS	on request
Trajectory Shapes	
Static	yes
Circles	Speed, radius
Rectangle	3GPP, TS 25.171
Figure of 8	Speed, radius
Load (user defined)	yes
Constellation Formats Supported	RINEX, YUMA, AGL, SEM
Signal Propagation and Errors Simulation	
Ionospheric Model	Klobuchar
	Klobuchar BeiDou
	MOPS RTCA DO-229D Grid
	NeQuick
	BeiDou Grid
Tropospheric Model	Saastamoinen
	MOPS RTCA DO-229D
Multipath	Fixed offsets
	Ground reflector
	Generic reflector (user defined)
Ramp Error	Slope, hold duration
Satellite Clock Error	Sinusoidal
	Recursive Digital Filter
	Gauss Markov 2 nd order

Software Control Flexibility

The PNS software consists of a Graphical User Interface (GUI) and a Simulation Core (SimCore). These two blocks can be run on either the same PC or on different PC's.

The GUI provides the capability to configure and visualize multiple simulations in parallel. Each SimCore handles one single simulation and can be connected to any PNS hardware unit.

