



LEORIX GNSS Receiver

Multi-Constellation, Single-Frequency, LEO

LEORIX, the Beyond Gravity multi-constellation (GPS, GALILEO) single-frequency GNSS Receiver for LEO applications provides an excellent on-board real-time navigation solution accuracy of below one meter.

Key features

- Selective RF-filter and low-noise amplifier for improved performance
- Accurate force model-based orbit propagator
- Advanced Kalman filtering and single-frequency ionospheric correction allow for high on-board navigation performance
- Flexible acquisition and tracking concept providing:
 - Single frequency signal processing of up to 12 satellites
 - Sliding search window for minimized acquisition times
 - Doppler-based loop aiding
- Configurable data rate per measurement type
- Autonomous start-mode determination for minimized time-to-first-fix
- Powerful parameter interface supports changes in standby and operational mode
- Additional data products provide excellent visibility of receiver internals
- Low mass and power consumption

Supported GNSS Signals

Based on dedicated RF- and Mixed-Signal ASICs as well as the AGGA-4 ASIC, LEORIX is able to use the following signals:

- GPS C/A on L1
- Galileo E1 B/C

Time-to-first-fix

- Warm start < 90 s
- Cold start < 15 min GPS; <40 min GALILEO

Data products

- Navigation solution based on GPS/GALILEO constellations
- PPS signal synchronized to GPS/GALILEO second
- Carrier phase measurements for each tracked signal
- Code phase measurements for each tracked signal
- Support data:
 - Tracking state
 - GDOP
 - Carrier to noise (C/N) measurement of each tracked signal
 - Noise measurements of the RF down-conversion chain
 - Satellites in view status
 - Satellite navigation message

Physical / environment

Electronic box:

- Size: 280x240x81 mm; weight: 3.0 kg
- Operating temperature: -30°C to +60°C (qualification level)
- Minimum switch-on temperature: -40°C (qualification level)
- Radiation: suitable for orbits between 300 and 1500km, any inclination
- Power consumption: 15 W avg.

Antenna (recommended for LEO):

- Patch Excited Cup antenna
- Size: 144 mm, h: 36,5 mm; weight: 215 g

Interfaces

- TC/TM: MIL-STD-1553B or UART (RS-422) or SpaceWire
- PPS output nom/red/test (RS-422)
- Primary power input 28 V unregulated
- ON/OFF high level command interface or autostart upon voltage application
- Thermistor TM interfaces
- External USO input available

On-board navigation solution accuracy

- Position: 1.0 m 3D rms
- Velocity: 2 mm/s 3D rms
- Time offset 1PPS (1σ): < 50 ns (typ. 25ns)

Programs / heritage

Beyond Gravity has delivered more than 90 flight models of GNSS receivers to customers in Europe, USA, Middle East and Asia. Some example missions:

- SWARM (ESA)
- Sentinel-1, Sentinel-2 and Sentinel-3 A/B satellites (Copernicus)
- Sentinel-1, Sentinel-2 and Sentinel-3 C/D
- Sentinel-6/Michael Freilich A/B (NASA/ESA)
- Earthcare (ESA/JAXA)
- ICESat-2 (NASA)
- PACE (NASA)
- OSAM-1 (NASA)
- Biomass (ESA)
- FLEX (ESA)
- KOMPSAT-6, -7 (KARI)
- CAS-500 (KARI/KAI)
- WSF-M (Ball Aerospace)