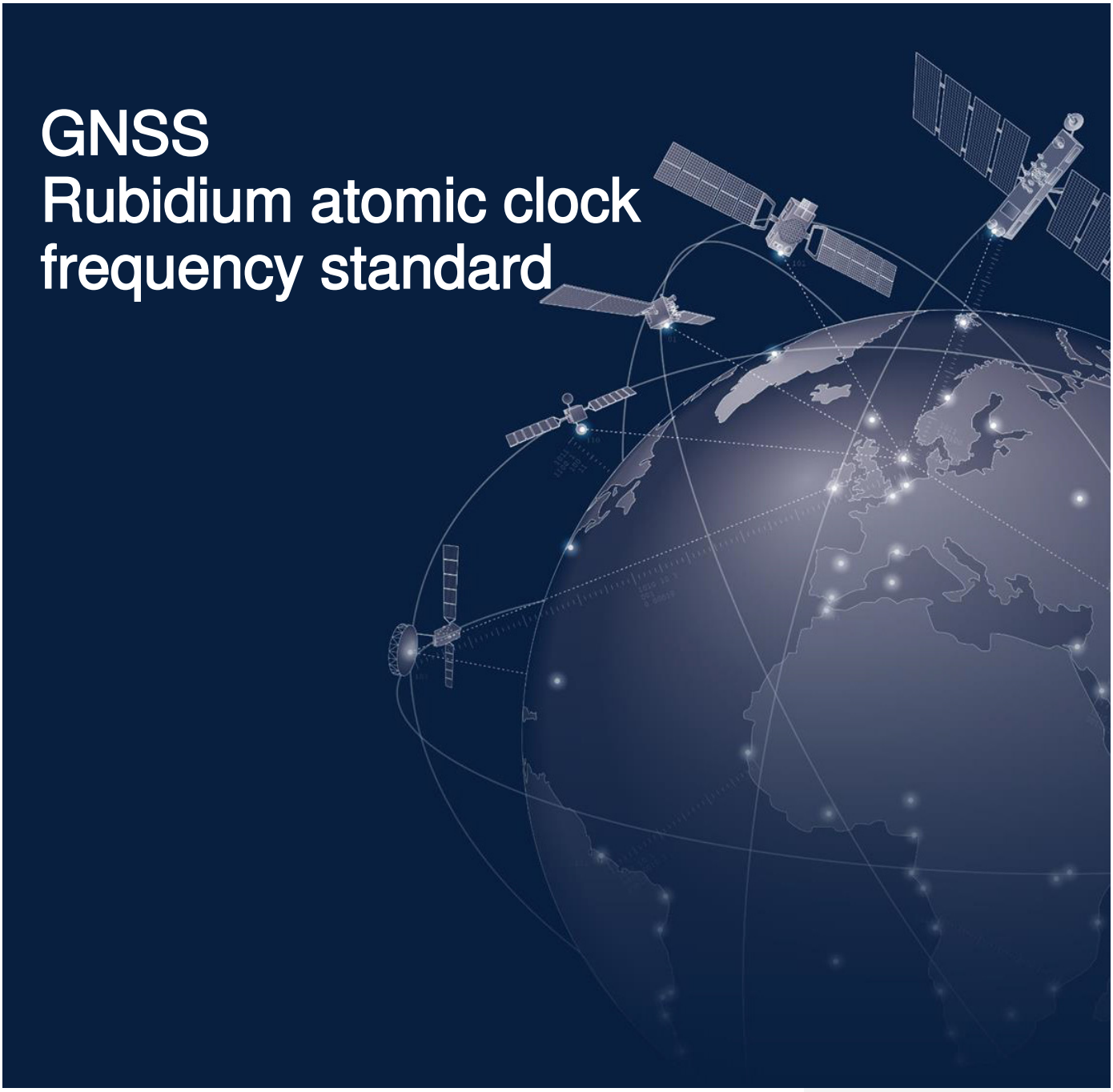
北斗邦泰
BDSTAR TIME

GNSS
Rubidium atomic clock frequency standard



Full GNSS reception
High-performance rubidium atomic clock
paired with an ultra-stable crystal oscillator

BDPNT.COM

GNSS Rubidium atomic clock frequency standard

T710

Cesium clock-grade GNSS-tamed rubidium atomic clock and ultra-stable crystal oscillator combination

Feature

+ Built-in high-performance rubidium atomic clock and OCXO
+ Automatic Calibration of Rubidium Clock Frequency Using GNSS
+ Highly sensitive GNSS concurrent reception to adapt to the harsh global environment
+ Supports Full GNSS: GPS/QZSS、GLONASS、BeiDou、GALILEO
+ Cesium-clock-level, rubidium atomic clock and temperature-controlled crystal oscillator combined frequency standard
+ Daily average accuracy <5E-13
+ 1s\10s\100s\ Stability 3E-12
+ Supports 8 channels of 10 MHz low-noise isolated sine wave output
+ Supports 6 channels of 10 MHz square wave output
+ Provides 2 channels each of 5 MHz and 1 MHz low-noise sine wave output
+ Built-in high-performance rubidium atomic clock, 24-hour deviation of 200 ns;
+ Advanced anti-jamming and anti-spoofing detection algorithms
+ Support external 1PPS input
+ Relative to UTC time accuracy reaches nanosecond level
+ MTBF > 100000 hours

Application

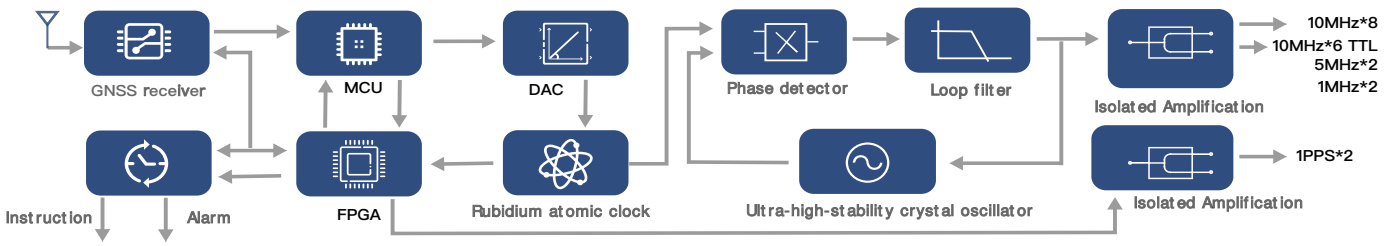
+ Used in metrological calibration, deep-space exploration, and radar communications

Overview

The T710 GNSS Rubidium Atomic Frequency Standard primarily consists of a high-precision timing GNSS receiver, a high-performance rubidium atomic clock, a low-phase-noise locked crystal oscillator, a control module, and a low-noise amplifier module. By integrating digital phase-locking technology, it combines the long-term stability of GNSS, the low aging characteristics of rubidium atomic clocks, and the high short-term stability and low phase noise of crystal oscillator (OCXO), resulting in an innovative low-phase-noise, high-precision atomic frequency standard that excels in both long-term and short-term stability and offers high accuracy. When locked to GNSS, its 10 MHz frequency stability matches that of standard cesium clocks, providing excellent value for money.

The T710 GNSS rubidium atomic frequency standard outputs a 1PPS signal, which is derived by frequency division of the rubidium atomic clock signal and is synchronized with the UTC time output by GNSS. Compared to the raw GNSS 1PPS, the frequency-divided pulse has been smoothed to eliminate the effects of fluctuations and jumps in the raw pulse, thereby providing a reproducible UTC time reference. When GNSS signals are lost or abnormal, the device intelligently detects the issue and automatically switches to rubidium atomic clock time-keeping mode, continuously providing a highly stable time and frequency signal. The device software employs multiple anti-interference detection and identification algorithms developed by BDSTAR TIME to detect signal anomalies caused by interference and malicious attacks on GNSS signals. It can be flexibly configured with various clock signal outputs.

The T710 GNSS rubidium atomic frequency standard features a 2U half-width chassis design and can output 10 MHz sine and square waves, 5 MHz and 1 MHz sine waves, 1PPS, and TOD information (optional support for multiple 100 MHz, 90 MHz, 80 MHz, and IRIG-B outputs). It is widely applicable in fields such as radar, communications, metrology and calibration, power systems, electronic countermeasures, and aerospace telemetry and control.



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Output

Output frequency: 10MHz, Number of channels: 8, BNC, Standard sine wave, Range 12±1dBm, 50Ω

Clock accuracy: ≤1E-12, After 48 hours of operation, the GNSS enters a locked state with an average accuracy of 24 hours.

Short-term stability: < 3E-12/1s
< 2E-12/10s
< 6E-13/100s
< 1E-12/ day (GNSS locked)

Phase noise: ≤ -95dBc/Hz @1Hz
≤ -130dBc/Hz @10Hz
≤ -145dBc/Hz @100Hz
≤ -155dBc/Hz @1kHz
≤ -158dBc/Hz @10kHz

Distortion:
Harmonic: ≤-45 dBc
Non-harmonic: ≤-80 dBc

Output frequency: 10 MHz, 6 channels, BNC, square wave TTL signal, 50 Ω

optional Opt-15:

Output frequencies: 2 channels each at 5 MHz and 1 MHz; specifications identical to those for the 10 MHz frequency.

1PPS: 4 channels, BNC, TTL level, 50Ω

Synchronization accuracy: Better than 20 ns

Pulse width: 100 ms

Rise time: <10 ns

Jitter: <1 ns

When GNSS is locked, the 1PPS is synchronized with GNSS

When GNSS is unlocked, the 1PPS is maintained by the local clock

1PPS input: 1 channel, TTL level

Physical and Environmental Parameters and Dimensions

2U chassis: 213 × 92 × 332 mm

Power Supply: 220V ±20%, 47 Hz to 63 Hz

Operating Temperature: -10°C to +55°C (main unit); -40°C to +75°C (antenna)

Storage Temperature: -45°C to +85°C

Humidity: 95% non-condensing

Power Consumption: 50W

Weight: 3 kg

GNSS receiver

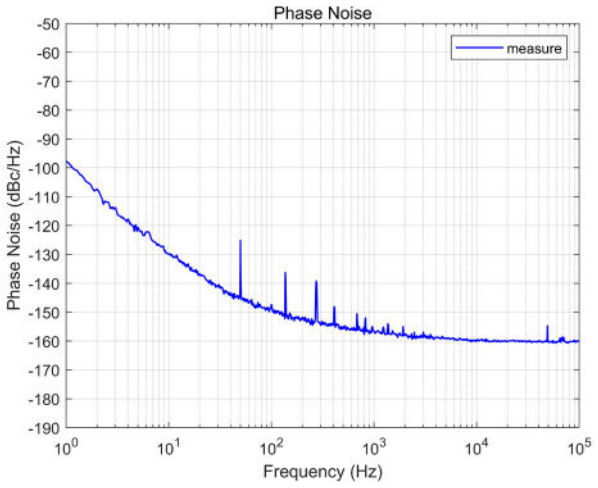
Receiver Type: 72-channel professional timing-grade GPS/QZSS L1 C/A, GLONASS L10F, BeiDou B1, SBAS L1 C/A: WAAS, EGNOS, MSAS, GAGAN, Galileo E1B/C

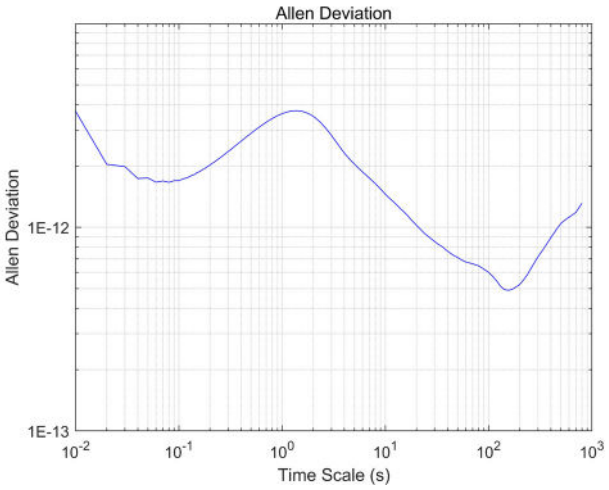
Data Update Rate: Up to 4 Hz for parallel GNSS

Positioning Accuracy: 2.5 m CEP; Cold Start: 28 s; Assisted Cold Start: 2 s;

Timing Accuracy: 20 ns

Sensitivity: Tracking and Navigation: -166 dBm; Cold Start: -157 dBm;





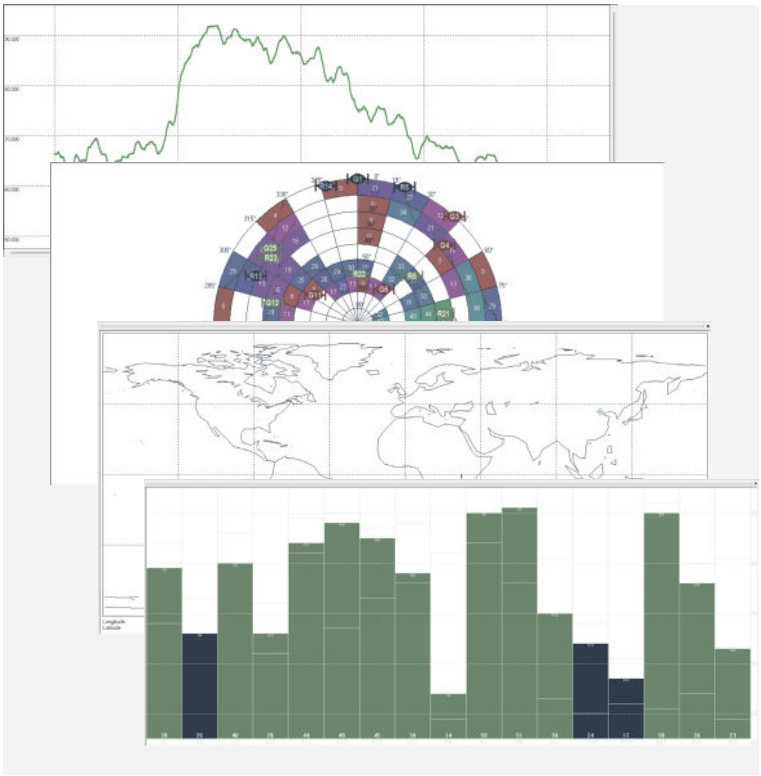
T710 front view

T710 back view

Software Performance

GNSS Monitoring Software

u-center is an advanced GPS/GNSS monitoring software that provides a multifunctional interface for real-time monitoring and optimization of satellite receiver performance. The Recent Chart View provides dynamic charts displaying metrics such as positioning accuracy and speed; the Recent Histogram Views show the statistical distribution of signal strength and positioning errors; the Sky View graphically displays the positions of satellites in the sky and their system types; and the Satellite Signal Strength View presents the signal quality of each satellite in bar chart form. These features make u-center a powerful tool for evaluating and adjusting the performance of GPS/GNSS receivers.



Optional

Opt-H

Low-noise 10 MHz output

Stability： < 1E-12/1s
< 6E-13/10s
< 6E-13/100s
< 5E-13/ day (GNSS locked)

Phase noise： ≤ -100dBc/Hz @1Hz
≤ -130dBc/Hz @10Hz
≤ -145dBc/Hz @100Hz
≤ -160dBc/Hz @1kHz
≤ -170dBc/Hz @10kHz

Distortion:
Harmonic: ≤-50 dBc
Non-harmonic: ≤-90 dBc

Opt-100

Low-noise 100 MHz output

Phase noise： ≤ -95dBc/Hz @10Hz
≤ -125dBc/Hz @100Hz
≤ -155dBc/Hz @1kHz
≤ -170dBc/Hz @10kHz
≤ -170dBc/Hz @100kHz

Other indicators are the same as at 10 MHz.

Opt-BDC

IRIG-B DC code input decoding accuracy: 10 ns

Opt-B3

BDS/B3 Military Code Entry

Other Options:
Supports multi-channel 30.72 MHz, 90/80 MHz, RS485, RS422, 1PPS, 1PPM, 1PPH, and IRIG-B AC outputs. Complies with the electromagnetic compatibility requirements specified in Section 3.9.1 of GJB2242-94,