SpacePNT Demonstrates PNT Technology in LEO

SpacePNT, a Swiss positioning, navigation and timing (PNT) solution provider for the new space satellite market, has completed in-orbit validation tests of its NaviLEO spaceborne GNSS receiver platform. The platform is designed to deliver decimetre-level positioning and nanosecond-level timing accuracy in low-Earth orbit (LEO) and signal reception sensitivity for GTO/GEO/moon missions. Using its unique and proprietary hardware and software technology, it can operate in real time.

After its successful deployment in LEO onboard its hosting orbital transfer vehicle, the D-Orbit ION OTV SCV-011 satellite, on June 13, 2023, Space PNT conducted a series of experiments to validate the key functionalities of the radiation-tolerant technology. This is done by demonstrating multiple modes of operation, including dual-antenna and full-in-flight reprogramming using FPGA image and application software.

Flight models have already been delivered to commercial and institutional partners for these missions, said SpacePNT co-founder and CEO, Cyril Botteron.

Read more in *GPS World* article. https://www.gpsworld.com/spacepnt-completes-demonstration-of-pnt-technology-in-leo/?utm_source=Navigate%21+Weekly+News&utm_medium=Newsletter&utm_campaign=NCMCD240515002&oly_enc_id=1784A2382467C6V

2024-05-20

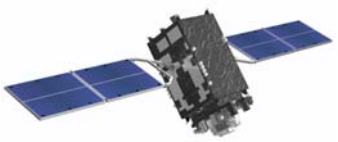
Research Report: Advancing Precision in Navigation

In early 2015, the Navigation Support Office of the European Space Agency (ESA) and the Japan Aerospace Exploration Agency (JAXA) began a collaboration. At its core, the ESA-JAXA collaboration is designed to cross-validate Japan's Quasi-Zenith Satellite System (QZSS) Precise Orbit Determination (POD) results and share expertise to improve the POD accuracy of QZSS.

The cross-validation of the QZSS POD performance was implemented by jointly analysing QZSS observations and validating the POD results of the QZSS satellites. As a result of this joint activity, ESA and JAXA have significantly improved the robustness and accuracy of their respective POD products. This collaborative approach not only ensures the continuous improvement of QZSS force modelling and precise orbit determination performance but also demonstrates the effectiveness of international cooperation in advancing the field of space navigation, especially as the benefits of GNSS interoperability become very evident.

An important milestone in this collaboration was ESA's role in supporting the In-Orbit Testing (IOT) activities for QZS-1R towards the end of 2021. The successful execution of these tests demonstrated the practical results of the ESA-JAXA partnership and further solidified the commitment of both agencies to enhance their capabilities for QZSS POD and associated products.

Read more in *GPS World* article. https://www.gpsworld.com/advancing-precision-in-navigation/?utm_source=Navigate%21+Weekly+News&utm_medium=Newsletter&utm_campaign=NCMCD240515002&oly_enc_id=1784A2382467C6V
2024-05-20



Defense Innovation Unit Launches Solicitation for Quantum Sensor Technologies

The U.S. Department of Defense's Defense Innovation Unit (DIU) has announced a solicitation under the Transition of Quantum Sensors (TQS) Program, aiming to enhance the capabilities of U.S. forces through advanced quantum technology.

This initiative seeks proposals for the development and demonstration of quantum sensors that will play a role in improving the Position, Navigation, and Timing (PNT) capabilities of military operations, amid increasing threats of GPS signal interference. Submissions are due by May 29 2024.

The vulnerability of traditional GPS and classical sensor technologies in critical military operations has prompted the DoD to seek more resilient and precise alternatives. Quantum sensors, leveraging atomic-level design, offer substantial improvements in accuracy and sensitivity. These sensors are envisioned to significantly reduce dependency on GPS by providing reliable navigation solutions even in GPS-denied environments.

The TQS Program is particularly focused on demonstrating the military utility of quantum sensors across various domains, including inertial measurement units (IMUs), magnetic navigation (MagNav), and anomaly detection. Key areas include:

- **Inertial Sensing:** Development of gyroscopes and accelerometer-based sensors with reduced drift and enhanced performance metrics.
- **Magnetic Sensing:** Advanced capabilities for magnetic field anomaly detection and MagNav systems that are immune to jamming and spoofing.
- **Technology Insertions:** Enhancements in integrated photonic systems and laser components aimed at improving sensor performance and efficiency.

Read more in *Inside GNSS* article. https://insidegnss.com/defense-innovation-unit-launches-solicitation-for-quantum-sensor-technologies/
2024-05-10

Unjammable Navigation Tech Gets First Airborne Test

A UK aircraft has tested ground-breaking quantum technology that could pave the way for an unjammable back-up for GPS navigation systems.
The government, which helped fund the research, said it was the first test of its kind to be publicly acknowledged.

While GPS is satellite-based, the new system is quantum-based - a term used to describe tech that is reliant on the properties of matter at very small scales.
Science minister Andrew Griffith said the test flights were "further proof of the UK as one of the world leaders on quantum".
GPS is a critically important system, used on planes ships and road vehicles and by the militarily, as well as helping your smartphone determine your location.
But signals from GPS satellites can be jammed, or "spoofed" to give misleading location data.
Read more in *article*…
https://www.bbc.com/news/articles/cz744gpl1dpo
2024-05-13

Galileo GNSS Satellites Successfully Launched Into Orbit by SpaceX

Galileo satellites GM25 and FM27 were successfully launched into orbit from Kennedy Space Center in Florida on April 27. Thierry Breton, Commissioner of the Internal Market of the European Union, confirmed via X, “2 new Galileo satellites successfully launched last night. Awaiting Ariane6, the 2024 launches are crucial for Galileo’s resilience, robustness and continuity of its civilian & military applications. Galileo deployment will continue in 2025.”

The satellites were launched by SpaceX Falcon 9, its 20th and final launch, owing to delays in the Ariane 6 launcher. “We know that we are now in a situation which is far more difficult than expected,” Stephane Israel, CEO of Arianespace, the company that builds the Ariane and Vega launchers, told *Inside GNSS* at the recent European Space Policy Conference. “What we call the transition [from Ariane 5 to Ariane 6 and Vega C] did not go as planned, for many reasons.”

Read more in *Inside GNSS* article. https://insidegnss.com/galileo-gnss-satellites-successfully-launched-into-orbit-by-spacex/

2024-04-29

GLONASS CDMA Signals Now On L1, L2

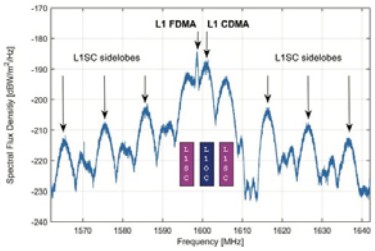
GLONASS satellites traditionally use L1 and L2 frequency division multiple access (FDMA) signals. FDMA is characterised by a different transmit frequency for each satellite. Newer satellite generations also transmit an L3 code division multiple access (CDMA) signal. CDMA uses the same frequency but different ranging codes for individual satellites. The first GLONASS K2 satellite, with the space vehicle number R803, was launched in August 2023. It extends the range of CDMA signals to the L1 and L2 bands.

Frequency spectra of R803, including these new signals. They were measured with the 30 m high-gain antenna of the German Space Operations Center (GSOC) in Weilheim, Germany, on Jan. 17, 2024. The largest and sharpest peak in the L1 band at 1,598.625 MHz originates from the 0.5 MHz binary phase-shift keying (BPSK) FDMA signal. The centre peak of the L1 CDMA signal is located at 1,600.995 MHz. It is related to the L1 open service signal consisting of a data component (L1OCd) and a pilot component (L1OCp). L1OCd and L1OCp are combined by time-division multiplexing. The peaks that are ±5 MHz away from the L1 CDMA centre frequency are introduced by the binary offset carrier (BOC) modulation of the secured L1SC signal. Prominent L1SC side lobes are visible ±15, ±25 and ±35 MHz offset from the centre frequency. A quadrature phase-shift keying (QPSK) modulation is used to combine the L1OC and L1SC signals. The local minimum between 1,610 MHz and 1,614 MHz is caused by a notch filter onboard the satellite to protect radio astronomical observations of the Hydroxyl spectral line at 1,612 MHz.

Read more in *GPS World* article. https://www.gpsworld.com/glonass-cdma-signals-now-on-l1-

l2/?utm_source=Navigate%21+Weekly+News&utm_medium=Newsletter&utm_campaign=NCMCD240424002&oly_enc_id=1784A2382467C6V

2024-04-29



Estonia Says Russia Violates International Rules With GPS Interference

Estonia accused Russia of violating international airspace regulations by interfering with GPS signals and the Baltic nation's foreign minister said it will take up the matter with its NATO and European Union partners.

Finnair on Monday announced a temporary suspension of its flights to Tartu in eastern Estonia for a month due to ongoing GPS disturbances that prevented two aircraft from landing.

The flights will be suspended to allow the airport to install an alternative approach method not relying on GPS, Finnair said. Most airports have such equipment installed.

The Finnish airline said it did not know where the interference originated but that there had been an increase in incidents since 2022.

The carrier has reported similar problems near Russia's Kaliningrad exclave and Finland's eastern border with Russia.

Read more in *article*…

https://www.usnews.com/news/world/articles/2024-04-30/estonia-says-russia-violates-international-rules-with-gps-interference

2024-04-30

Finnair Cancels Flights Amid Increased GNSS Jamming

Finnair, the sole international airline operating flights to Tartu, Estonia, has suspended its daily service to the city from April 29 to May 31, 2024. The decision comes in response to ongoing GNSS interferences and disruptions, including two instances where flights had to return to Helsinki, Finland, due to excessive jamming in the region.

The current approach methods at Tartu Airport rely heavily on GNSS signals, which have been disrupted frequently in the area. To address this, Finnair plans to use the one-month flight suspension period to develop and implement alternative navigation methods at Tartu Airport that can operate independently of GNSS. Finnair aims to enhance the safety and reliability of operations, preventing similar incidents in the future.

This suspension of flights highlights a broader issue of increasing GNSS jamming and spoofing, which has been a growing concern since the start of the Ukraine war in 2022 — specifically near Kaliningrad, the Black Sea, the Caspian Sea and the Eastern Mediterranean.

Read more in *GPS World* article. https://www.gpsworld.com/finnair-cancels-flights-amid-increased-gnss-jamming/?utm_source=Navigate%21+Weekly+News&utm_medium=Newsletter&utm_campaign=NCMCD240501002&oly_enc_id=1784A2382467C6V

2024-05-07

Space Tech Firm Xona Secures $19M for Enhanced Satellite Navigation Network

Xona, a developer of a new satellite network, has announced the successful closure of a $19 million Series A funding round, led by Future Ventures and Seraphim Space, with contributions from NGP Capital, Industrious Ventures, Murata Electronics, Space Capital, and Aloniq.

The capital raised will expedite the rollout of Xona's low Earth orbit (LEO) satellite network, marking the initiation of beta operations for their PULSAR satellite service. This service is designed to deliver high-accuracy navigation crucial for advancing intelligent and autonomous technologies.

"A century ago, people looked to the North Star for trusted guidance when other methods were unavailable," said Brian Manning, CEO and co-founder of Xona. "AI and automation are the future - our PULSAR service aims to be for these industries what the North Star was for humanity in previous centuries."

Rob Desborough, General Partner at Seraphim Space, commented: "After half a century of use, our dependence on GPS is absolute. Outages could cause incalculable damage to the global economy, while enhancement opens up whole new industries. Waiting for GPS to fail, or for hostile powers to spoof it, is not an option for our security or commercial industries. Xona and the pioneering team are executing on building the GPS the modern era needs and we're delighted to continue to support their transformative vision."

PULSAR promises significant enhancements over GPS in terms of accuracy, availability, and security, addressing the needs of industries like agriculture, automotive, and defense that are moving towards automation.

Read more in *Space Daily* article.
https://www.spacedaily.com/reports/Space_Tech_Firm_Xona_Secures_19M_for_Enhanced_Satellite_Navigation_Network_999.html

2024-05-09

Assessing Environmental Changes With GNSS Reflectometry

An innovative geodetic tool called GNSS-IR is a more effective technique than tide gauge for monitoring sea surface height as the basis for modelling sea level variations, according to the study outlined in this article.

The utilization of remote sensing observations to monitor essential climate variables (ECVs) has become increasingly important in studying their regional and global impacts, as defined by the Global Climate Observing System (GCOS). Understanding the Earth's surface conditions, including soil moisture runoff, snow, temperature, precipitation, water vapour, radiation, groundwater and sea surface height (SSH), can positively impact the environment and ecosystems. Here, the authors present an overview of how global navigation satellite systems (GNSS) can be employed for environmental monitoring, with a particular focus on sea surface height monitoring. This includes examination of the advantages and disadvantages of utilizing a network of permanent GNSS stations for monitoring sea level rise along shorelines.

Monitoring sea level rise is crucial to understanding and preparing for the potential impacts of climate change, such as flooding, erosion and saltwater intrusion in coastal areas. It can also affect global ocean circulation patterns and climate. Scientists can provide helpful information to policymakers and stakeholders by monitoring sea level change for informed decisions about land use, infrastructure development and emergency preparedness. Different techniques and sensors can be used individually or in combination to provide a complete picture of sea level changes, including tide gauge stations, satellite altimetry missions, satellite gravimetry techniques, GNSS stations, ocean buoys and acoustic sensors. One of the important applications of SSH monitoring is the study and analysis of tidal frequencies in the context of predicting tides, modelling sea currents, and harbour planning (e.g. breakwater design).

Read more in *GIM International* article. https://www.gim-international.com/content/article/assessing-environmental-changes-with-gnss-reflectometry?utm_source=newsletter&utm_medium=email&utm_campaign=Newsletter+%7C+GIM+%7C+09-05-2024++&sid=46052

2024-05-08