Japanese QZSS Authentication for Spoof-Proof Drone Delivery

Strengthening GNSS security in autonomous platforms, Japan's CORE Corporation, together with ACSL Ltd. and Rakuten Group, recently conducted a demonstration of anti-spoofing capabilities using Japan's Quasi-Zenith Satellite System (QZSS) Navigation Message Authentication (QZNMA) service.

The collaboration addressed the growing threat that is GNSS spoofing, where malicious signals fool receivers into reporting false positions, potentially leading to misrouted vehicles.

At the centre of the project was the newly developed ChronoSky PF2-AE, the world's first drone platform supporting QZSS authentication. The platform brought together CORE's new QZNMA-enabled Cohac∞ Ten++ GNSS receiver and ACSL's PF2-AE delivery drone. Project partners simulated disaster-relief supply missions in Chichibu City, Saitama Prefecture, demonstrating real-world resilience against spoofing attacks.

During the demonstration, two distinct operational scenarios under controlled spoofing conditions were evaluated. In the first scenario, where only a subset of satellite signals was spoofed, the drone quickly detected the anomaly, alerted its ground control station (GCS), and safely continued its autonomous flight. In the second, where all satellite signals were compromised, the drone again detected the spoofing, alerted the GCS, and transitioned to manual flight, allowing the operator to complete the delivery mission.

Read more in *Inside GNSS* article. https://insidegnss.com/japanese-qzss-authentication-for-spoof-proof-drone-delivery/

2025-04-17

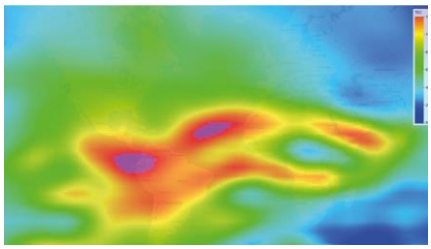
Signals, scintillation and the solar effect

With the current solar cycle expected to reach its peak this year, the associated solar storms and ionospheric disturbances will increase the likelihood of fluctuating GNSS signals. This article explores how geospatial professionals can proactively plan and prepare for these effects in order to maintain operational resilience and minimize productivity disruptions.

The current Solar Cycle 25 is now in the middle of its 11-year cycle. This means it is expected to reach its maximum this year, with a continued chance of high activity through 2026. The effects are real: in many cases visually stunning (e.g. auroras in lower latitudes), in others potentially troublesome – particularly to those who rely on GNSS for precise positioning and navigation. For geospatial professionals, the increased risk of solar storms and ionospheric disturbances or scintillation equates to a higher likelihood of rapid fluctuations in the strength and quality of GNSS signals. There is the potential for signal loss and complete outages, which needless to say directly affect positioning accuracy.

Read more in *GIM International* article. https://www.gim-international.com/content/article/signals-scintillation-and-the-solar-effect?utm_source=newsletter&utm_medium=email&utm_campaign=Newsletter+%7C+GIM+%7C+24-04-2025++&sid=46052

2025-04-23



Q-CTRL Overcomes GPS-Denial With Quantum Sensing

Q-CTRL, a developer of quantum infrastructure software, announced successful field trials of a new generation of quantum-assured navigation solutions validated to outperform comparable conventional alternatives in challenging real-world settings.

Q-CTRL has produced a new generation of quantum-assured navigation systems, Ironstone Opal, that delivers GPS-like positioning, is completely passive and undetectable, and cannot be jammed or spoofed. It aims to solve the most pressing

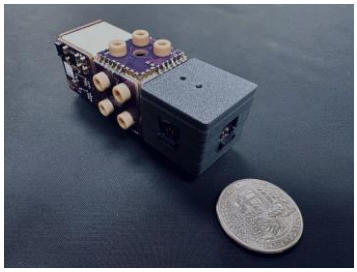
navigation challenges in the defence and civilian domains, enabling new missions, streamlining transport operations, and powering autonomous systems.

Q-CTRL conducted real-world ground and airborne trials showing its quantum-assured navigation solution enabled successful GPS-free navigation, outperforming a high-end conventional GPS alternative by up to 50x.

The Q-CTRL quantum-assured navigation system uses quantum sensors to detect tiny, otherwise imperceptible signals arising from Earth's structure that serve as magnetic "landmarks" for navigation — only quantum sensors provide the sensitivity and stability needed to continuously "see" these landmarks from a moving vehicle.

Read more in *Inside GNSS* article. https://insidegnss.com/q-ctrl-overcomes-gps-denial-with-quantum-sensing/

2025-04-14

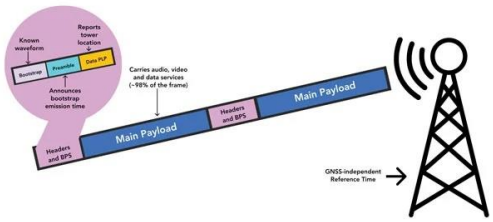


Television broadcasters propose new PNT service

More than 20 years ago, in these pages, we referred to television broadcast signals as "signals of opportunity" that might be used for positioning, navigation and timing (PNT). Since then, several other signals with a different primary purpose have also been considered as sources of PNT, and some have been used routinely for years now, such as WiFi routers for indoor navigation. On Feb. 26, 2025, the National Association of Broadcasters (NAB) filed a petition for rulemaking with the Federal Communications Commission (FCC) for television to transition to a new standard, ATSC 3.0, that enables what they call Broadcast Positioning System (BPS), as a way to enhance GPS resiliency.

Read more in *GPS World* article. https://www.gpsworld.com/television-broadcasters-propose-new-pnt-service/?utm_source=Omeda&utm_medium=Email&utm_campaign=NCMCD250409002&oly_enc_id=1784A2382467C6V

2025-04-11



GNSS on the moon: Lunar PNT era begins

The latest historic chapter in GNSS for space users was launched, as one would expect, at an Institute of Navigation (ION) GNSS+ conference — the one in Miami in 2019 — by a handful of technical and policy experts well positioned to “Go for the Gold” — GNSS on the moon! Thus, liquid refreshments in hand, the Lunar GNSS Receiver Experiment (LuGRE) concept was born, amongst excited discussion and scribbling on napkins by Oscar Pozzobon (Qascom), Joel Parker (NASA), Frank Bauer (NASA), Alberto Tuozzi (Agenzia Spaziale Italiana or ASI, Italian Space Agency), Lisa Valencia (NASA) and James “JJ” Miller (NASA).

Long before this productive, informal brainstorming session, global navigation satellite systems (GNSS), such as the U.S. GPS, were originally designed for use on or near Earth, providing positioning, navigation and timing (PNT) services up to an altitude of about 3,000 km (the GPS Terrestrial Service Volume). Over the decades, experimental missions pushed GNSS use higher, and by 2006, GPS specifications defined a Space Service Volume, extending GNSS services out to 36,000 km (geosynchronous orbit). NASA missions then deftly demonstrated GNSS utility well beyond Earth orbit — notably in 2019 with the Magnetospheric Multiscale Mission spacecraft formation, which successfully tracked GPS signals roughly 192,500 km from Earth, setting the world record for farthest and fastest reception of any GNSS signals in the space domain.

Building on this success, NASA proposed conducting the LuGRE in 2020 by using a combination of GPS and Europe’s Galileo signals at lunar distances.

Read more in *GPS World* article. https://www.gpsworld.com/gnss-on-the-moon-lunar-pnt-era-begins/?utm_source=Omeda&utm_medium=Email&utm_campaign=NCMCD250409002&oly_enc_id=1784A2382467C6V

2025-04-10

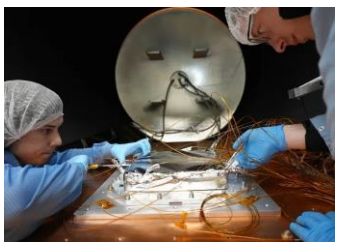
Space testing for Australian atomic clock tech

In concert with French space logistics company Exotrail, QuantX will launch a key component of its atomic clock technology, TEMPO, hosted on the ‘spacevan’ vehicle due for launch on a SpaceX mission in December 2025 at the earliest.
With the support of a $3.7 million grant from the Australian Space Agency’s Moon to Mars initiative, QuantX Labs will launch a key sub-system of its next-generation optical atomic clock.
This key subsystem, known as an optical frequency comb, is a cutting-edge tool that unlocks a myriad range of space applications beyond high-performance timing including deep-space communications, navigation, positioning and synchronised Earth observations.

Optical combs were first invented at the turn of the century and won the Nobel Prize in Physics in 2005 because of their potential broad-ranging impact.

QuantX’s demonstration will be the first time that an optical frequency comb has been launched into orbit.

Read more in *Spatial Source* article. https://www.spatialsource.com.au/space-testing-for-australian-atomic-clock-tech/?utm_campaign=SS%20-%20Overall%20Publication%20-%20Master&utm_medium=email&_hsenc=p2ANqtz-_PueWf0mXzp9DJ8BHUzNUQpO61hW28aztncU_JDOqA7D4s2wijw_BB4S-HGz4Qw_H8Oa4NwvWQji1WDJt_cKujWcwg-g&_hsmi=356913512&utm_content=356913512&utm_source=hs_email
2025-04-15



Space Force prepares for accelerated GPS III mission to enhance warfighter capabilities

The U.S. Space Force's Space Systems Command and Space Operations Command are preparing to launch the National Security Space Launch GPS III-7 mission, designated Space Vehicle 08, aboard a SpaceX Falcon 9 rocket. The launch is planned to take place from Space Launch Complex 40 at Cape Canaveral Space Force Station, Florida, no earlier than late May 2025.

This mission follows the successful Rapid Response Trailblazerlaunch in December 2024 and represents another accelerated effort. It involves a coordinated operation across multiple Space Force organizations to retrieve a GPS III satellite from storage, integrate it with the launch vehicle, and prepare it for launch on a compressed timeline.

The GPS III satellite is equipped with M-Code technology, which offers three times greater accuracy and eight times more resistance to jamming compared to earlier systems. This capability aims to enhance Precision, Navigation, and Timing services for the Joint Force, ensuring modernized support for military operations.

Read more in *GPS World* article. https://www.gpsworld.com/space-force-prepares-for-rapid-launch-of-gps-iii-7-satellite/?utm_source=Navigate%21+Weekly+News&utm_medium=Newsletter&utm_campaign=NCMCD250402003&oly_enc_id=1784A2382467C6V

2025-04-08

FCC seeks public input to strengthen alternative PNT

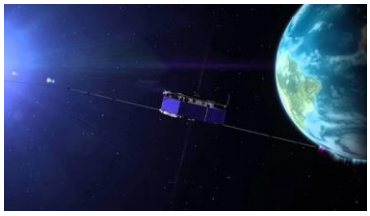
The Federal Communications Commission (FCC) has issued a Notice of Inquiry (NOI) seeking public input on positioning, navigation and timing (PNT) systems and policies. While GPS is crucial for the United States' economic and national security, its dependency as a single point of failure renders it vulnerable to disruption or manipulation by adversaries. Recognizing this vulnerability, leaders such as

President Trump, Chairman Cruz, and Senator Markey have advocated for developing alternative systems to ensure resilient PNT capabilities.

PNT data is integral to countless military, public safety, agricultural, and commercial activities. Given the dependence of the American economy and national security on GPS as the sole PNT source, the agency states that the U.S. government is prioritizing efforts to create robust backup systems that can safeguard essential functions in the event of GPS signal disruptions. The FCC's NOI examines how the agency can foster the development of alternative and complementary PNT.

Read more in *GPS World* article. https://www.gpsworld.com/fcc-seeks-public-input-to-strengthen-alternative-pnt/?utm_source=Navigate%21+Weekly+News&utm_medium=Newsletter&utm_campaign=NCMCD250326002&oly_enc_id=1784A2382467C6V

2025-03-31



PNT2026 conference coming to Sydney next year

The Positioning, Navigation and Timing 2026 (PNT2026) conference will be held at Sydney's Royal Randwick Racecourse from 4 to 6 February next year. Formerly known as the IGNSS Conference, PNT2026 will bring together local and global experts from industry, government, defence and academia to showcase and discuss the latest advancements in GNSS and alternative PNT technologies.
Key industry challenges will be on the agenda, as will applications across the aerospace, defence, smart city, autonomous systems and critical infrastructure sectors, and others.

This will be the first event of its kind since the International GNSS Association (IGNSS) merged with the Australian Institute of Navigation.
PNT2026 will be a forum for discussing key topics, such as:

- Core GNSS and PNT technologies: Satellite navigation, augmentation services and sensor integration;

- Resilient navigation and security: Interference mitigation, cyber threats and authentication;
- Emerging PNT solutions: Alternative navigation, quantum-enabled positioning and multi-sensor fusion; and
- Industry and policy insights: Future trends, regulatory challenges and national security applications.

Read more in *Spatial Source* article. https://www.spatialsource.com.au/pnt2026-conference-coming-to-sydney-next-year/?utm_campaign=SS%20-%20Overall%20Publication%20-%20Master&utm_medium=email&_hsenc=p2ANqtz-_MVw_0IKZoPY9vZF4OrTTZ7zVREHy9aBpssFtSxqsxoW9_bhVxjthXP3j84RvBVKZaK5oUNek7jjXnxrdfaF_1CLR3fg&_hsmi=354689023&utm_content=354689023&utm_source=hs_email

2025-03-31

How Can Measurements of Low-Cost Receivers be Used to Detect and Analyse RF Interference?

It is well-understood now that Global Navigation Satellite Systems (GNSS) are vulnerable to radio frequency interference (RFI) due to the very low power of their received signals. RFI can take the form of jamming, in which the GNSS frequencies are overwhelmed with unwanted power or spoofing, in which “fake” GNSS signals are transmitted.

In the case of jamming, the added signals/noise prevents receivers from locking the GNSS satellite signals, resulting in loss of position and timing information. In the case of spoofing, the fake GNSS signals provide false measurements to a receiver, leading to an incorrect “spoofed” position solution. It is common for jamming and spoofing to be used alongside each other, with jamming preventing real satellite signals from being tracked while fake “spoofed” signals are being transmitted.

Jamming and spoofing attacks have increased in conflict regions in Eastern Europe and the Middle East that also affect nearby civilians. Most RFI effects on civilian

users in these regions are “collateral,” meaning RFI was not targeting civilians, but civilians were affected because they were operating in the same region. These events highlight the need for detection and characterisation techniques that provide early RFI warnings to users, especially for safety-of-life critical applications such as aviation.

Read more in *Inside GNSS* article. https://insidegnss.com/how-can-measurements-of-low-cost-receivers-be-used-to-detect-and-analyze-rf-interference/

2025-03-31

Towards resilient navigation in the Baltics without satellites

Efficient shipping routes are vital for Germany's economy, especially in and around the Baltic Sea. However, maritime operations remain vulnerable to disruptions in satellite navigation systems such as GPS or Europe's Galileo. Such failures can cause vessel navigation displays to lose position data or worse, deliver false coordinates, increasing the likelihood of accidents.

To counter these risks, the German Aerospace Center (DLR), together with research bodies, government agencies, and private-sector partners, has created an alternative to satellite-based positioning. Known as Ranging Mode (R-Mode), this terrestrial radio navigation solution is now entering the standardisation phase. Plans are underway to expand the testing area in 2025 to include territories in Finland and Estonia.

Between 2017 and 2021, DLR led the development of the world's first large-scale testing ground for R-Mode, laying the groundwork for a backup system across the Baltic. "This first step towards establishing a maritime backup system in the Baltic Sea region has demonstrated that R-Mode technology works in practice as an alternative terrestrial navigation system, enabling ship positioning even without satellite-based systems," said Anke Kaysser-Pyzalla, Chair of the DLR Executive Board. "With this, DLR is not only making an important contribution to maritime safety, but ultimately also supporting economic performance."

Read more in *this* article…

https://www.spacedaily.com/reports/Towards_resilient_navigation_in_the_Baltic_without_satellites_999.html

2025-04-01