



TRACKING NEW DIRECTIONS

new boundaries for ground-based GPS anti-jam solutions

High-performance GPS anti-jam technology protects ground platforms in GPS-denied, degraded, intermittent or limited (DDIL) environments.

INTERFERENCE SUPPRESSION, OR GPS anti-jam technology, is critical terminology in modern warfare.

It's a force-protection measure that ensures assured positioning, navigation and timing (APNT) in GPS degraded and denied environments for its ground-based troops.

GPS Source, a subsidiary of General Dynamics Mission Systems, is a trusted provider of these vital capabilities, delivering APNT kits with anti-jam and anti-spoof capabilities that can be mounted on equipment by soldiers.

What makes these kits especially valuable to ground-based soldiers is the GPS Anti-Jam Technology (GAJT) from Hexagon | NovAtel which packs a very big punch.

Jammed up

As the potential for jamming signals has risen along with the number of at-risk systems, anti-jam technology has also begun to evolve, with an emphasis on protecting GPS

signals against peer and near-peer adversary Cyber Electromagnetic Activities (CEMA).

In search of advanced APNT solutions, including the DAGR Distributed Device (D3) PNT hub and the ECHO-II GPS indoor retransmission smart amplifier, and many other military grade components that receive, disseminate and rebroadcast GPS data.

David Jones, solutions architect, GPS/APNT Products with GPS Source, said: “During the development of the prototype, we were testing our assured PNT system with different antennas. We hadn’t worked much with NovAtel prior to this, but we really liked the look and feel of their antenna.”

The GAJT-710ML consists of an antenna array and null forming electronics inside a hardened enclosure for a wide range of land vehicles. This commercial off-the-shelf anti-jam antenna is designed for land, sea and fixed installations.

NovAtel’s GAJT-710ML detects unwanted interference and makes nulls in the antenna radiation pattern in the jammer’s direction, which prevents the jamming signal from overpowering the antenna and receiver electronics, ensuring a position can still be computed.

“The GAJT-710 has good performance and integrates very well with our system,” Jones added.

Figure 1: Two vehicles in range of a GNSS jammer. The vehicle on the right has a standard antenna and the GNSS signals are overpowered by the jammer. The vehicle on the left has an anti-jam antenna that blocks the jamming signal so GNSS signals can be received.

THE SYSTEM INCLUDES:

- **Enhanced D3 (ED3) Receiver**—Distributes centralized IS-GPS-153 and MSID messages to up to eight independent, unique interfaces. the newest D3 Devices can provide SAASM or M-code-protected GPS.
- **NovAtel’s GAJT-710ML Anti-Jam Technology**—Mitigates impact of enemy jammers and protects the ED3 Receiver (SAASM/M-Code) and can also protect Galileo E1 and QZSS. A second fixed reception pattern antenna (FRPA) feeds a receiver for other GNSS, and the signals are managed by the Anti-Jam Antenna Integration Module (AJAIM).
- **VICTORY CSAC Accessory Module (VCAM)**—Contains a Chip Scale Atomic Clock (CSAC) and software designed for electronic surveillance/electronic

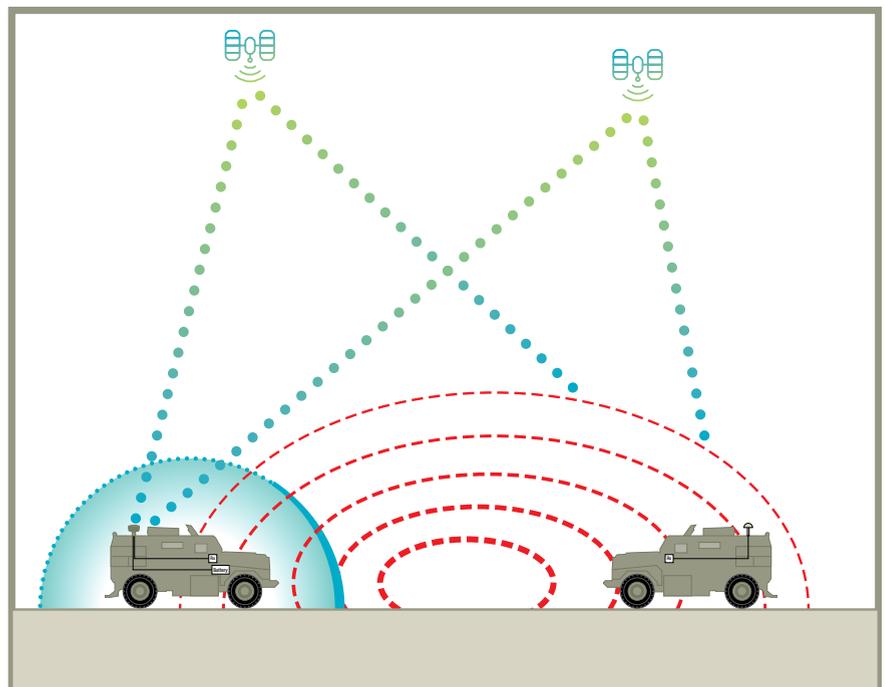
protection (ES/EP) and allows for integration of other solutions such as an inertial navigation system (INS) and anti-jam antennas.

Jones and his team modified the hardware to communicate with GAJT and collect the data. By the end of 2019, the prototype was ready for field testing.

Easy configuration

The APNT kits with GAJT-710ML’s are designed for military vehicles. Initial deliveries were in the fall of 2019 for testing, feedback and integration.

Jones explained: “It’s a plug-and-play design so it’s easy to install. Since each vehicle variant has a different configuration on the roof, a vehicle integrator worked with the to determine mounting locations and necessary hardware to support the kits to meet various requirements.”



Photos courtesy of NovAtel.

The mounts, called stovepipes, are elevated off the vehicle on a pylon to give the antenna an optimal view of the sky.

Thus far, the has been pleased with the performance of the APNT kits. The organization subsequently submitted orders for many additional systems that that have now been installed on ground vehicles.

Finding direction

Looking forward, Jones sees continued evolution of capabilities for the APNT kits including enhanced situational awareness. “This functionality would help the operators identify and locate jamming signal sources for greater response,” he said.

The newer generation of GAJT technology, which includes the GAJT-410ML and the next generation GAJT-710ML, will support additional functionality such as situational awareness to better characterize RF signals, Jones added, “The military is very excited to have situation awareness capability as it will open up a lot of opportunity.”

Success with the APNT kits has sparked interest in the versatile anti-jam solution across all branches of service. GPS Source expects to test the GAJT solution in other conditions for other applications in the future.

Jones concluded: “We have found the antenna to be [a] very competent solution. For heavy armor vehicles, the GAJT-710ML is the best choice.” ▲



The GAJT effect

NovAtel's GPS Anti-Jam Technology (GAJT family of commercial off-the-shelf COTS antennas) are suitable for land, sea and fixed installations. As a null-forming antenna system, GAJT ensures satellite signals necessary to compute position and time are always available. It is easily integrated into new platforms or can be retrofitted with the GPS receivers and navigation systems on existing and legacy civilian or military fleets.

The first in the GAJT family of antennas was the GAJT-710ML, which provides a high level of protection for land and marine platforms. GAJT-710ML has been deployed by the DoD since 2015. The new GAJT-710ML is a form and fit compatible unit with enhanced function replacement of the previous generation GAJT-710ML. It introduces several key improvements including Direction Finding (DF) to jamming sources, increased mechanical ruggedness and improved performance in both benign and contested environments.

The GAJT-410ML is an evolution of NovAtel's battle-proven anti-jam technology. Designed specifically for rapid integration into space-constrained military land applications, this easy-to-use system protects GPS-based navigation and precise timing receivers, including M-Code, from both intentional jamming and accidental interference. The Power Injector Data Converter (PIDC™) provides situational awareness by accessing the jammer status with all-important direction-finding (DF) capabilities across the single radio frequency (RF) cable. The antenna integrates easily into new or legacy fleets and uses the existing RF cable to supply data and power directly to the unit to reduce the need for costly platform modifications.

Photos courtesy of NovAtel.



Assured PNT in any environment

Assured Positioning, Navigation and Timing (APNT) are critical to the success of your mission. With cutting-edge Anti-Jam Antenna Systems (AJAS) like the GAJT-710 and the low SWaP variant GAJT-410, we deliver robust solutions to protect your PNT information from the threat of jamming and spoofing. With proven protection and situational awareness, your navigation superiority starts with Hexagon | NovAtel.

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