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» SYSTEM DESIGN / DEFENSE / MACHINE CONTROL

Locata ICD, Air Force CDR, Leica Product

In September, Locata Corporation of Canberra, Australia released its signal interface control document (ICD), announced successful completion of a critical design review (CDR) contract phase with the U.S. Air Force for a ground-based, centimeter-accurate truth-reference system for use in GPS-denied environments, participated in a new mining-directed product launch with partner Leica GeoSystems, and conducted extensive indoor demonstrations for attendees at ION GNSS.

ICD. This document is available for download as a 109-page PDF document at *www.locatacorp.com/icd/*. Sections include interface identification (ranging codes, timeslot structure and TDMA assignments, navigation data, S1/S6 signal structure), interface criteria (composite signal, PRN code characteristics, navigation data, Locata time and Locatalite Z-count), and more.

Accompanying text, excerpted here, on the web page explains:

"A LocataNet includes a number of LocataLite transceivers located within or around a defined service area. The user segment includes any number of fixed or moving Locata user receivers (rovers) operating within the service area and deriving locations and time within the area using signals emitted by the LocataLites. LocataNets can span areas as large as several tens of kilometers in extent, being for the most part limited by the availability of adequate line-of-sight geometries between the various elements of the LocataNet. With adequate signal power, working networks have demonstrated LocataLite-Rover operating ranges of up to 30 kilometers.

"Locata Rovers use the fine time definition supplied by the pseudorandom spreading codes impressed on LocataLite transmitted signals, along with data supplied by a data overlay on those signals, for calculating positions and time. The Locata network design also lends itself to integrated carrier phase position determination techniques for high location accuracy.

"LocataNets can operate their data overlay streams at either 100 bits per second or 50 bits per second.

"All valid emitters in a given LocataNet are synchronized to a master station in the network, either directly or indirectly, to within very tight tolerances, using a proprietary TimeLoc time synchronization process. TimeLoc maintains set phase differences among signals emitted by the various LocataLites in a LocataNet. Since all clocks track a master, the TimeLoc process compensates for differences in clock drift and aging among emitters, which therefore are not factors in position solutions. The LocataNet therefore does not need to transmit or use clock drift and aging coefficients.

"A LocataNet can operate completely autonomously, using its own relative and independent time reference generated by a designated Master LocataLite in the network. LocataNets can synchronize to any time source providing a 1 pulse-per-second (PPS) time reference, or operate independent of any such reference. Therefore, LocataNets can, for example, optionally synchronize themselves to GPS time, and transfer GPS time to any associated Locata user receiver, to within 100 nanoseconds of a one-1 PPS GPS time base supplied by an appropriate GPS time receiver at the Master LocataLite.

The air interface described by this specification introduces a time division multiple access scheme for LocataLite emissions to supplement the code division multiple access. The LocataNet pseudo-random spreading codes, derived from GPS C/A codes, run at ten times the rate of the C/A code in GPS, but with only a ten-percent transmit duty cycle within which an entire code epoch is transmitted. Each code therefore completes the entire code epoch in 100 microseconds, but sends its code sequence in only one time slot in each successive millisecond interval. The added signal orthogonality introduced by assigning different time slots to different emitters, assuming appropriate receiver design, supplies adequate signal discrimination to overcome the significant "near-far" problem local networks can otherwise introduce to their receivers.

"The LocataNet broadcasts signals on two frequencies within the 2.4 gigahertz license-free Industrial, Scientific, and Medical (ISM) band. Using this band avoids interference issues with GPS. The two S-band frequencies in use provide frequency diversity to aid in multipath mitigation, and a "wide lane" phase difference beat to aid in integrated carrier phase techniques."

Air Force CDR. The USAF 746th Test Squadron (746TS) awarded Locata a multi-year contract for a ground-based truth-reference system in July 2010, and the recent CDR was the last milestone to be met before the USAF committed to a technology demonstration in the United States. Locata's Non-GPS-Based Positioning System (NGBPS), sold commercially as a LocataNet, will provide accurate positioning when GPS is jammed over 2,500 square miles of the White Sands Missile Range (WSMR) in New Mexico, the company said.

Completion of the CDR moves contract work to an initial deployment over 600 square miles at WSMR for further testing in October. Over the last year, Locata has developed the hardware

and software required to track low and medium-dynamic flight profiles across the range of altitudes that WSMR tests the DoD's next-generation navigation systems.

Mining Jigsaw. Leica GeoSystems Mining announced a partnership with Locata to provide a high-precision radio-positioning system not reliant on GPS.

Known as the Leica Jigsaw Positioning System (Jps), it deploys ground-based LocataLite transmitters to augment conventional GPS systems. The LocataLites work without needing the additional corrections, communication, or other assistance normally used for GPS high-precision system, Leica said.

A high-precision positioning network using GPS alone requires a good view of the sky with sufficient geometry. In a mine, if a significant number of the satellites are blocked, the positioning fails, Leica explained. This is a common occurrence in deep pits and against high walls. With mine production efficiency being increasingly reliant on GPS positioning, this type of system failure is a major issue.

The issue has been overcome by Locata technology, Leica said. Leica Jps, powered by Locata, provides the LocataLites as "a new constellation of ground-based satellites" or alternative points of reference. These additional points of reference can be used in conjunction with, or completely independent of, the GPS satellite network.

Leica Jps can augment the Jps LocataLite signals with the GPS signals to give uninterrupted operation, solving the problem of blocked satellite signals and resultant downtime, Leica said. A Leica Jps network has been successfully deployed and used in Western Australia on a large open-cut gold mine in this manner, supporting the mine's high-precision guidance systems.

How Jigsaw Works. Transmitters are synchronized to each other. LocataLite transmitters generate an autonomous, nanosecond-accurate positioning network through a new synchronization process called TimeLoc.

LocataLites can be permanently positioned on site or moved at will, ensuring the mine's Leica Jps network is set up as needed. Leica said that the Locata network can be deployed independent of any GPS network, using only the LocataLites as points of reference, to provide a fully operational, stand-alone high-precision positioning network.

» SURVEY / GOVERNMENT

NovAtel Ionospheric Scintillation Receiver

NovAtel Inc. announced the GPStation-6 GNSS Ionospheric Scintillation and TEC Monitor (GISTM) receiver, designed for ionospheric monitoring and space weather applications. The GPStation-6 receiver integrates NovAtel's OEM628 measurement engine with a high-quality, low phase-noise oven-controlled crystal oscillator. It provides high-quality signal tracking, ionospheric scintillation, and total electron content (TEC) measurements for all current and upcoming GPS, GLONASS, Galileo, and Compass satellite signals.

Designed to replace the GSV4004B GISTM receiver, the GPStation-6 provides backwards compatibility for both hardware and software. Housed in NovAtel's EuroPak enclosure, the receiver provides a communications interface and log outputs compatible with the GSV4004B.

NovAtel is accepting GPStation-6 orders with product shipments planned for the fourth quarter of 2011.

» PROFESSIONAL OEM / SURVEY

JAVAD GNSS Announces Partnership with LightSquared

JAVAD GNSS announced a partnering with broadband company LightSquared. In promotional material distributed the ION-GNSS conference in Portland, Oregon, in September, JAVAD GNSS stated, "LightSquared not only can coexist with GPS, it complements it."

LightSquared's proposal to build a broadband network has come under fire from users of high-precision GNSS over possible interference issues.

JAVAD GNSS is promoting its latest receiver, the TRIUMPH-LS (LightSquared). "TRIUMPH-LS can benefit from LightSquared communication channels for receiving RTK corrections," JAVAD GNSS said. "LightSquared communication channels are much faster and less expensive than conventional channels for RTK correction transmissions."

LightSquared issued a press release stating the partnership will "develop a system that will eliminate related interference issues for high-precision GPS devices." JAVAD GNSS has completed the design, made prototypes, and tested those prototypes, LightSquared claimed. Preproduction units will be released for public tests in October, followed by mass production. High-precision receivers for positioning applications are expected to go to market by November 2011, and precision timing devices by March 2012.