GPS L5 Signal Tracking

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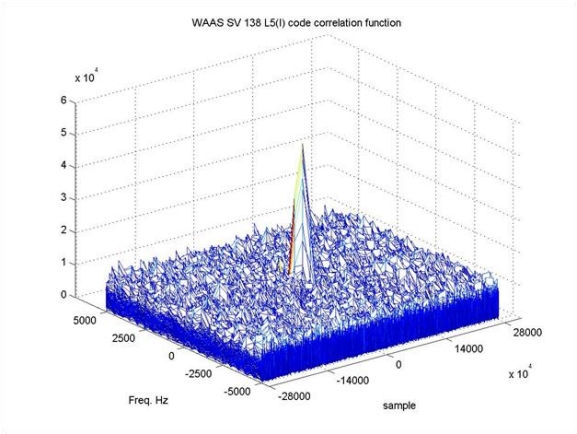

Wide Area Augmentation System L5 (1176.45 MHz) signal tracking. Left: Two-dimensional signal acquisition plot of WAAS SV 138. Top right: L1/L2/L5 front end. Bottom right: Host computer with Field-Programmable Gate Array and storage.

The motivation and applications of a global navigation satellite system (GNSS) instrumentation receiver are significantly different from those of high-end commercially available receivers. In particular, one application of an instrumentation receiver is to sample and store received in-band signals with as little front-end distortion and processing as possible, so as to maximize options for later processing using software radio concepts. For example, take interference research and characterization applications. The desire is to capture the GNSS-plus-interference signal with the highest possible fidelity, without automatic gain control (AGC) processing, while also avoiding front-end saturation within practical limits. Consequently, a high dynamic range, multi-bit-sampling radio frequency (RF) front-end is required for an instrumentation receiver.

Previously, we developed a dual frequency wideband RF front-end giving utmost priority to signal fidelity, and lower priority to size, weight, power, and cost constraints. The addition of the L5 frequency band enables the tracking of new GPS satellites to be launched in 2009. The performance of the front-end is evaluated through acquisition and tracking of the test L5 broadcasts from the Wide Area Augmentation System (WAAS) geosynchronous orbit (GEO) satellites: SV135 and SV138.

Further reading: Gunawardena, S., Zhu, Z., and Van Graas, F., "Triple Frequency RF Front-End for GNSS Instrumentation Receiver Applications, Proceedings of ION GNSS2008, Savannah, GA, September 2008.