Building national timing grids to mitigate GNSS vulnerabilities

Part 5: Development of a Time & Frequency Lab at the Bureau of Standards Jamaica

Obtaining a reliable, robust, and accurate timing source is increasingly important in today's connected world. Everything from controlling, coordinating and protecting power distribution across a national power grid to managing the high volumes of financial transactions executed on a stock exchange relies on highly accurate and synchronized clocks. As the transfer rates of digital communication networks increase, so does the need for nanosecond accurate timing sources.

Critical infrastructures and large-scale communication networks increasingly rely on global navigation satellite systems (GNSS), such as GPS, Galileo, and Beidou, to provide accurate, reliable, and secure timing services. GNSS offers a convenient and easy-to-implement timing source. Each satellite in a GNSS constellation features multiple atomic clocks, continuously providing accurate nanosecond level timing signals to connected receivers.

The ease of globally distributing accurate timing information using orbiting satellites, while one of the most successful aspects of any GNSS constellation, also highlights a dependency that increasingly involves a degree of risk.

Development of a Time & Frequency Lab at the Bureau of Standards Jamaica

The Bureau of Standards Jamaica (BSJ) has embarked on a journey to establish a time and frequency laboratory to provide time and frequency needs of the private and public sectors in Jamaica. This effort is aimed at obtaining international recognition through certification from the International Bureau of Weights and Measures (BIPM).

This will allow the BSJ to be equipped for the continuous realization of the UTC(BSJ) time scale and the continuous distribution of UTC(BSJ) time signals through various broadcast and calibration services. Establishing a time and frequency laboratory within the BSJ represents a proactive step to lay the foundation that will provide the government, business community and the public with time that can be trusted anywhere in the world. To ensure that Jamaica is fully prepared for international, hemispheric and regional trade under the World Trade Organization (WTO), Technical Barriers to Trade (TBT) and other free trade arrangements by having the traceable time and frequency measurement infrastructure in place. Furthermore, the successful development and operation of a logistics based economy will require that the financial sector, stock exchange, telecommunications, aviation, utilities, etc. have access to affordable time and frequency capabilities to support their safe and competitive operation.

The BSJ employs the use of Microchip's Precise Time-Scale System (PTSS), which is a turnkey timing system that is comparable to the international laboratories using commercial hardware and software. The system is capable of establishing a real time synchronization source for communications and navigation systems as well as establishing a national timing reference. The system in its full configuration is used by the BSJ and is equipped with every feature and capability used by similar international timing laboratories today such as NIST and CENAM as discussed above.

Development of a Time & Frequency Lab at the Bureau of Standards Jamaica. Paper on Establishing a Time and Frequency Lab at the BSJ.

More in Part 6: Timing Grid Distribution