Testing dual-band GPS receiver with Signal Studio N7609C

Today, as more and more commercial devices start to use dual-band GPS module (typically L1+L5) for improved location accuracy, the testing needs for dual-band GPS receiver have been increased significantly. To meet those requirements, N7609C Signal Studio added L1+L5 dual-band GPS signal generation capability in its 2019 Update1.0 release in August 2019. This document provides a demo guide for testing L1+L5 GPS receivers with N7609C.

Hardware Setup

Modern GPS stellates Block IIF transmit navigation signals on L1 band (1.57542GHz) as well as L5 band (1.17645 GHz). Having 2 bands signal received will facilitate the receiver to reduce the pseudorange error and therefore improve the location accuracy. To generate L1+L5 signals simultaneously, two N5172B/N5182B with option 503 or 506, 656 and 660 will be needed, as the frequency gap between L1 and L5 (400MHz) is larger than max 160MHz modulation BW of the signal generator. In addition, two signal generators must keep in synchronized playback, i.e. using master one to trigger the slave one, so that the signals from both instruments are in good synchronization.
Generate L1+L5 Dual-band GPS signals with N7609C

- Launch N7609C Signal Studio 2019 Update 1.0.
- Click System->Run System Configuration Wizard menu to bring up the hardware wizard and select **2. Dual Bands** function. Click Next to enter the IP address of two signal generators and make sure the connection is successfully established to them.
• Under GNSS node, change the Capability to newly added **Advanced Real-time Signal Generation Pro**, where user can configure the dual-band L1+L5 GPS signal generation. Basically, those settings are pretty similar to the GNSS single band ones but simplified, and user can create static scenario to simulate a stationary receiver with fixed longitude/latitude/altitude or dynamic scenario for a moving GPS receiver along a given trajectory. One enhancement is, user does not have to save the scenario to a file as in single band case, and they can simply click State On button to push those scenario settings to the instrument and start real-time scenario and signal generation on both bands immediately. During the signal is playing, user can also change the editable settings to get real-time update in the output signal.

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<th>Capability</th>
<th>Advanced Real-time Signal Generation Pro</th>
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<th>1. Capability</th>
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<td>2. Scenario Settings</td>
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<td>3. GPS Settings</td>
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• User does not have to specify the frequency for L1 or L5 manually, and N7609C software will take care of that automatically in dual-band capability.

• Under GPS Setting category, user can configure the state of signal component on each band independently. For example, control L5 band to transmit L5I only or L5Q only or both. Note that most receivers will require firstly acquiring GPS L1 as an anchor and may not be able to get location fix with L5-only signal.

• All the graphical views are the same as previous versions that display real-time satellite status and the trajectory during the signal playback.

• After a cold start on GPS receiver side, now user can perform various testing on the receiver, for example, TTFF, acquisition/tracking sensitivity, location accuracy, etc.

For more information about GNSS and Signal Studio, please visit:

- www.keysight.com/find/N7609C
- www.keysight.com/find/signalstudio

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