



GPS Spectrum Topics

*ICG-8, Dubai
November, 2013*



January 2012 Space-Based PNT Executive Committee



- January 13, 2012 National Space-Based Positioning, Navigation, and Timing (PNT) Executive Committee (EXCOM) co-chair letter to National Telecommunications and Information Administration (NTIA) proposed to draft new Global Positioning System (GPS) spectrum interference standards:
 - Inform future proposals for non-space, commercial uses in the bands adjacent to the GPS signals.
 - Ensure such proposals are implemented without affecting existing and evolving uses of space-based PNT that are vital to economic, public safety, scientific, and national security needs.



SPACE-BASED POSITIONING
NAVIGATION & TIMING
NATIONAL EXECUTIVE COMMITTEE

JAN 13 2012



The Honorable Lawrence E. Strickling
Assistant Secretary for Communications and Information
U.S. Department of Commerce
Washington, DC 20230

Dear Assistant Secretary Strickling:

At the request of the Federal Communications Commission (FCC) and the National Telecommunications and Information Administration (NTIA), the nine federal departments and agencies comprising the National Space-Based Positioning, Navigation and Timing (PNT) Executive Committee (EXCOM) have tested and analyzed LightSquared's proposals to repurpose the Mobile Satellite Services (MSS) frequency band adjacent to Global Positioning System (GPS) frequencies to permit another nationwide terrestrial broadband service. Over the past year we have closely worked with LightSquared to evaluate its original deployment plan, and subsequent modifications, to address interference concerns. This cooperative effort included extensive testing and analysis of GPS receivers. Substantial federal resources have been expended and diverted from other programs in testing and analyzing LightSquared's proposals.

It is the unanimous conclusion of the test findings by the National Space-Based PNT EXCOM Agencies that both LightSquared's original and modified plans for its proposed mobile network would cause harmful interference to many GPS receivers. Additionally, an analysis by the Federal Aviation Administration (FAA) has concluded that the LightSquared proposals are not compatible with several GPS-dependent aircraft safety-of-flight systems. Based upon this testing and analysis, there appear to be no practical solutions or mitigations that would permit the LightSquared broadband service, as proposed, to operate in the next few months or years without significantly interfering with GPS. As a result, no additional testing is warranted at this time.

The EXCOM Agencies continue to strongly support the President's June 28, 2010 Memorandum to make available a total of 500 MHz of spectrum over the next 10 years, suitable for broadband use. We propose to draft new GPS Spectrum interference standards that will help inform future proposals for non-space, commercial uses in the bands adjacent to the GPS signals and ensure that any such proposals are implemented without affecting existing and evolving uses of space-based PNT services vital to economic, public safety, scientific, and national security needs.

ASHTON B. CARTER
EXCOM Co-Chair
Deputy Secretary of Defense

JOHN D. PORCARI
EXCOM Co-Chair
Deputy Secretary of Transportation



GPS Adjacent Band Compatibility Assessment



- **DOT Deputy Secretary Tasking:**
 - Collaborate to develop a spectrum protection plan which provides a framework to define the processes and assumptions for development of GPS spectrum protection criteria on behalf of GPS civil users.

- **GPS Adjacent Band Compatibility Assessment will identify the processes for:**
 - Deriving adjacent-band power limits, as a function of offset frequency, necessary to ensure continued operation of all applications of GPS services.
 - Determining similar levels for future GPS receivers utilizing modernized GPS and interoperable Global Navigation Satellite System (GNSS) signals.



Methodology



- **Using FCC/NTIA-defined planned application in frequency bands adjacent to GPS**
 - Deployment scenario
 - Transmitter characteristics
 - Signal structure
- **Determine GPS receiver interference tolerances**
 - Set 1: Current receivers - Aviation standards (MOPS) or measured results for most GPS receivers which do not have defined standards
 - Set 2: Develop for next-generation multi-frequency/multi-constellation GNSS receivers
- **Define interaction scenarios**
 - GPS receiver use/location (airborne, urban, rural, etc.)
 - Terrestrial transmitter density
- ❖ **Specify adjacent band power limits for proposed new application as a function of frequency offset from GPS**



Near-Term Focus



- **Frequency Bands Adjacent to GPS L1**
 - Focus on an LTE concept

- **Leverage Receiver Categories used in 2011 Technical Working Group (TWG)**
 - Aviation*
 - Cellular
 - General Location/Navigation
 - High Precision
 - Timing
 - Networks
 - Space

* Certified avionics to be addressed by RTCA

- ❖ **Develop a Family of Curves on the Maximum Aggregate Power Level as a function of frequency offset from GPS**



Near-Term Focus (Continued)



- **Interaction Scenarios**
 - Need to consider separation distances and geometry from transmitter to GPS users for various applications
 - Location/Height of GPS receivers

- **Propagation Model**
 - Need to evaluate model(s) to apply

- **Develop Data Collection/Test Program**
 - Work with Government/Industry on a realistic timetable given resource constraints
 - Address how to handle proprietary information



Joint Task Group (JTG) 4-5-6-7



Background:

- Established by World Radio Conference 2012 (WRC-12) by the International Telecommunication Union (ITU) to consider additional spectrum allocations the mobile service on a primary basis and identification of additional frequency bands for International Mobile Telecommunications (IMT)
- GPS Directorate goal is to protect all GPS bands and adjacent bands from being proposed as candidate bands for reallocation or sharing with IMT; various US agencies and international GNSS providers share this interest in protecting GNSS bands

Current Status:

- Completed the 4th JTG Meeting in October 13, two meetings remain before the JTG finalizes its inputs to WRC-15
- Next meeting: 20-28 Feb 14; Geneva, Switzerland
- GPS Watch items: 1300-1400 MHz , 2025-2110 MHz and 2200-2290 MHz (USB), 1525-1559 MHz (Adjacent to L1), and any new submissions