Civil PNT Utilities

Civil GPS Service Interface Committee
U.S. States and Local Government Subcommittee
Seattle, WA
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Timothy A. Klein
Senior Policy Advisor / RITA NDGPS Coordinator
NDGPS@dot.gov

GPS.gov

- **Official U.S. Government information about GPS and related topics**
  - **Systems Modernization**
  - **Applications**
  - **Governance**
  - **Presentations**
  - **International Activities**
  - **Technical Documentation**
    - Federal Radionavigation Plan (FRP)
    - Interface Control Documents
    - Performance Standards and Specifications
    - GPS Satellite Simulator Working Group
    - Semi-Codeless/Codeless Civil Access Commitments

GPS is a Critical Component of the Global Information Infrastructure


Satellite Operations


Precision Agriculture


Surveying & Mapping

Aviation


Communications


Disease Control


Power Grids


Trucking & Shipping

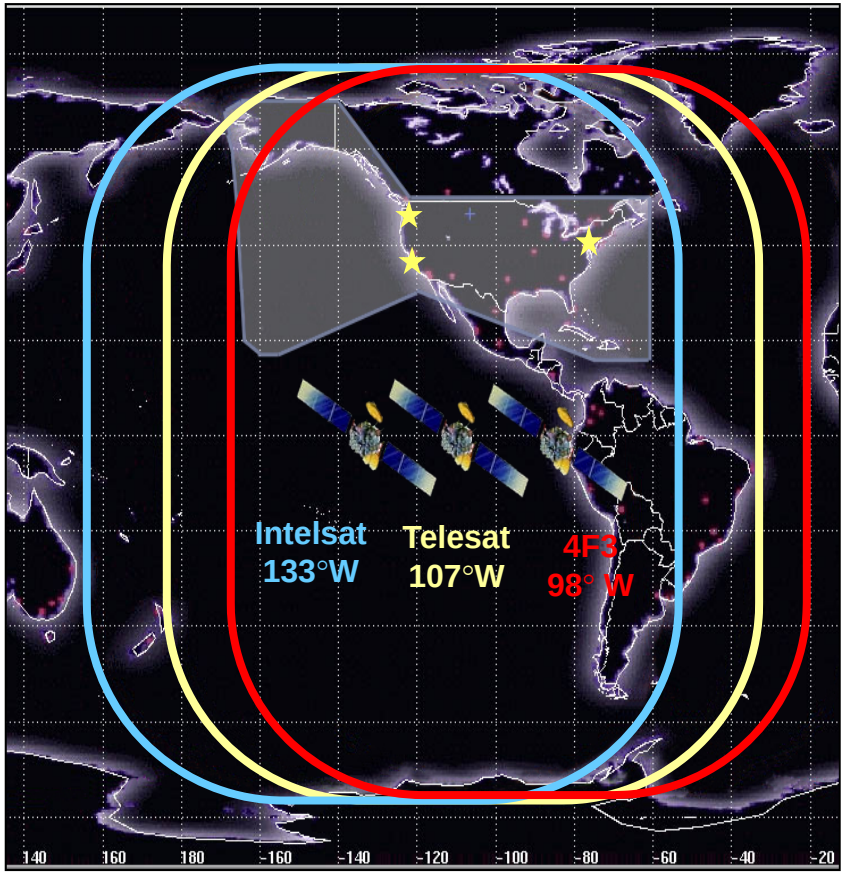

Oil Exploration


Fishing & Boating


Personal Navigation

FAA GPS Augmentation Programs

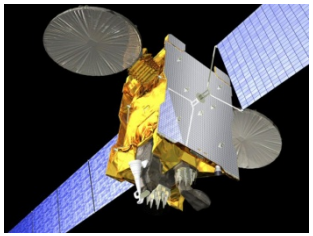
WAAS Architecture



38 Reference Stations

3 Master Stations

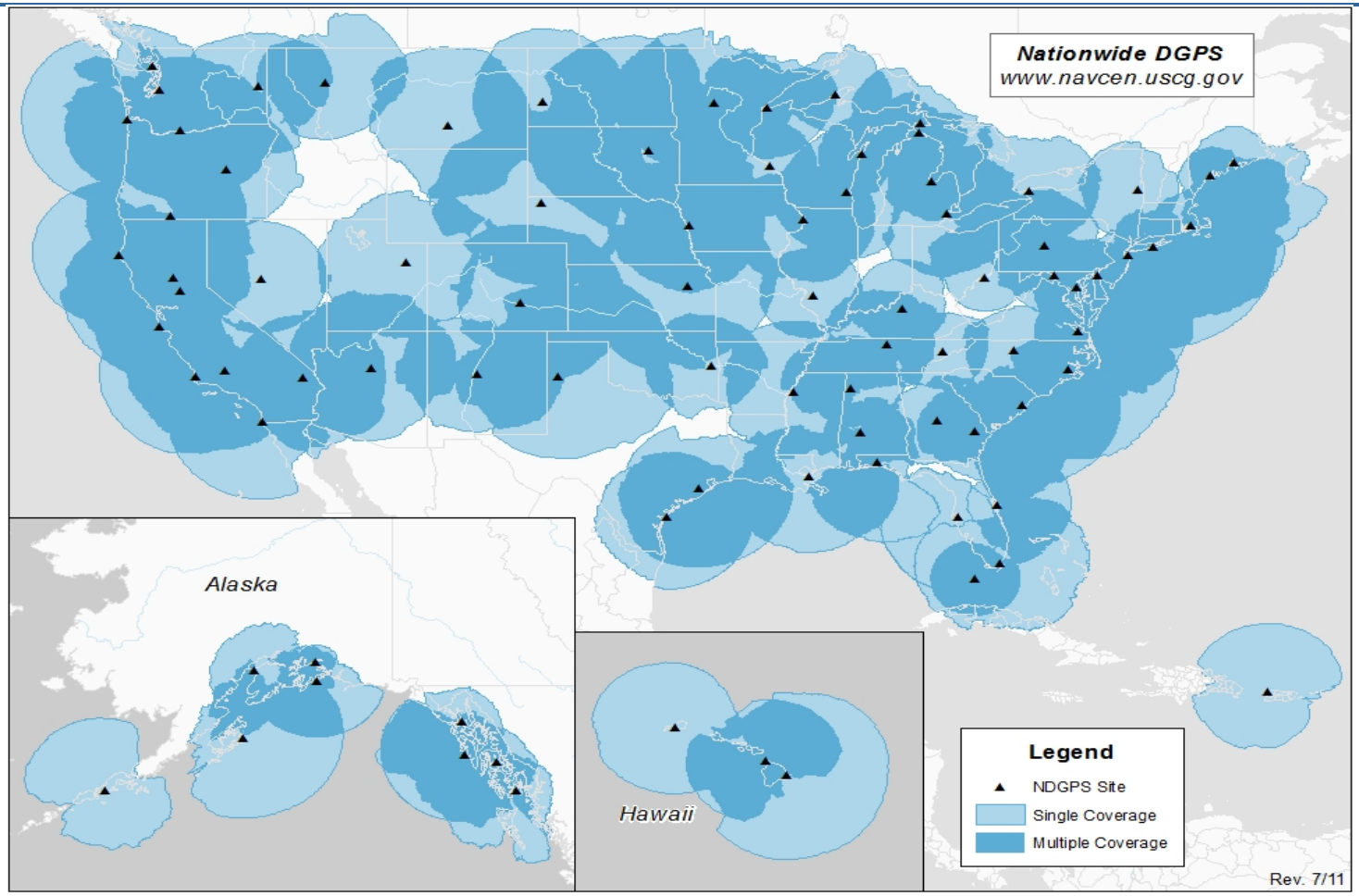
4 Ground Earth Stations



(2+1) Geostationary Satellite Links

2 Operational Control Centers

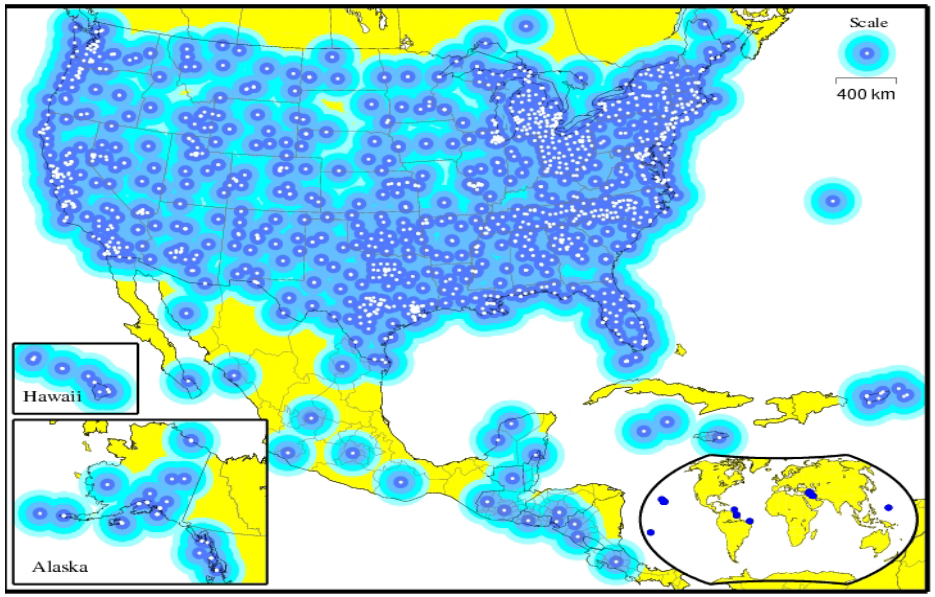
Nationwide Differential GPS



- Expansion of maritime differential GPS (DGPS) network to cover terrestrial United States
- Built to international standard adopted in 50+ countries

National Continuously Operating Reference Stations (CORS)

- Enables highly accurate, 3-D positioning
  - Centimeter-level precision
  - Tied to National Spatial Reference System
- **1,800+** sites operated by 200+ public, private, academic organizations



- NOAA/NGS's **Online Positioning User Service (OPUS)** automatically processes coordinates submitted via the web from around the world
- **NGS Real-Time GNSS Website** (beta version)
- **Leveling Online Computations User Service (LOCUS)** simplifies the office processing and adjustment of geodetic leveling

GPS-Based Applications are Critical to Major DOT Initiatives

Aviation – NextGen

Reliable and accurate positioning worldwide
Reduced delays
More fuel-efficient routes
Increased system capacity with enhanced safety

Rail – Positive Train Control

Reduced probability of collisions
Increased efficiency and capacity
Rapid rail structure and conditioning mapping

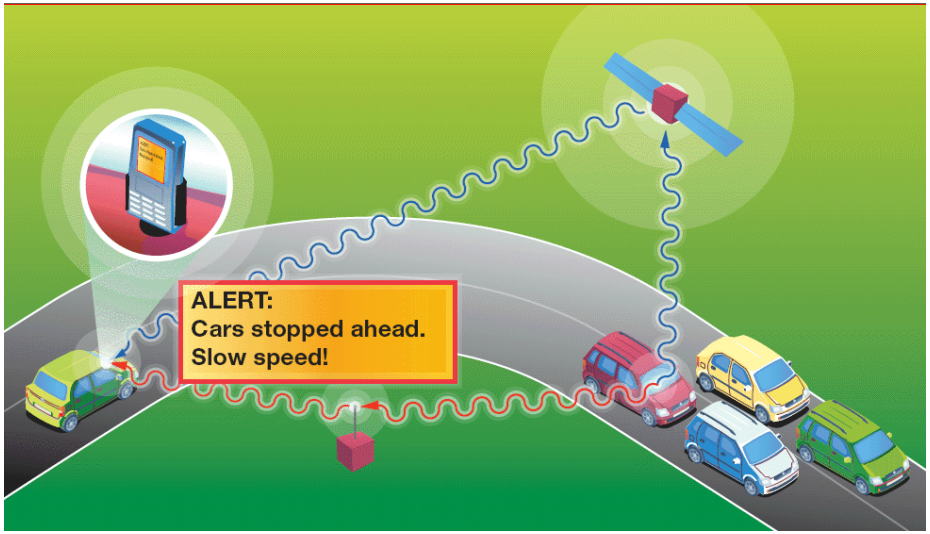
ITS/Connected Vehicle

Enable crash prevention among vehicles and between vehicles and infrastructure
Increased mobility and reduced environmental impact

What Are We Trying to Get to?

- Intelligent Transportation Systems (ITS) Safety Applications for all Surface Modes of Transportation
  - Leverage technology to make vehicles discoverable to other vehicles, infrastructure, and pedestrians
  - Enable 360° situational awareness to the vehicle and driver

- Intelligent Railroad Systems
  - Increase track and locomotive safety
    - Positive Train Control
    - Track Defect Location
    - Automated Asset Mapping/Surveying



Where are State DOTs Trying to Get to?

- GPS Enforcement of Designated Truck Routes
  - Illinois State Legislature required study
  - Illinois DOT study makes eight recommendations for truck GPS systems
    - Vertical clearance
    - Weight restrictions
    - Communications and enforcement of truck GPS systems

- Automated Vehicle Location (AVL) Systems for Data Collection
  - 2011 VDOT Survey
    - Road weather management systems
    - Near-real-time road conditions
    - Mapping noxious weed control
    - Tracking incarcerated workers

Recent State and Transit Initiatives

- Arkansas State Highway and Transportation Department
  - Installing GPS devices in each of the Department's 2,400 vehicles
  - First state agency to outfit all of its vehicles with GPS devices
    - Real-time vehicle diagnoses/immediate maintenance
    - Accountability for use, speed
    - Cost about $700,000; pay for itself in about eight months with fuel savings

- Washington State Ferries – largest ferry transit system in the U.S.
  - "Routine" maritime uses: vessel location, navigation, draft depth measurement
  - Recently added GPS customer services
    - Vessel Tracker ("Where's Your Ferry?")
    - Added GPS-derived estimated ferry arrival times, overlaid on tracking map
  - Researching Wireless-Over-Water (WOW) mobile safety and security application

- WashDOT Use of GPS Truck Data
  - Identifying and ranking traffic bottlenecks; performance measures
  - Real-time rerouting for freight movements around Port of Seattle

Easy to Purchase GPS Jamming Devices

- Growing market for low-cost GPS jammers
  - Concern over being tracked using GPS, particularly among those driving a company or fleet vehicle
- Many devices are battery-operated or can be plugged into a cigarette lighter
- Sold as “privacy protectors” or “personal protective devices”

$99

$99

$320

$129

$145

$30

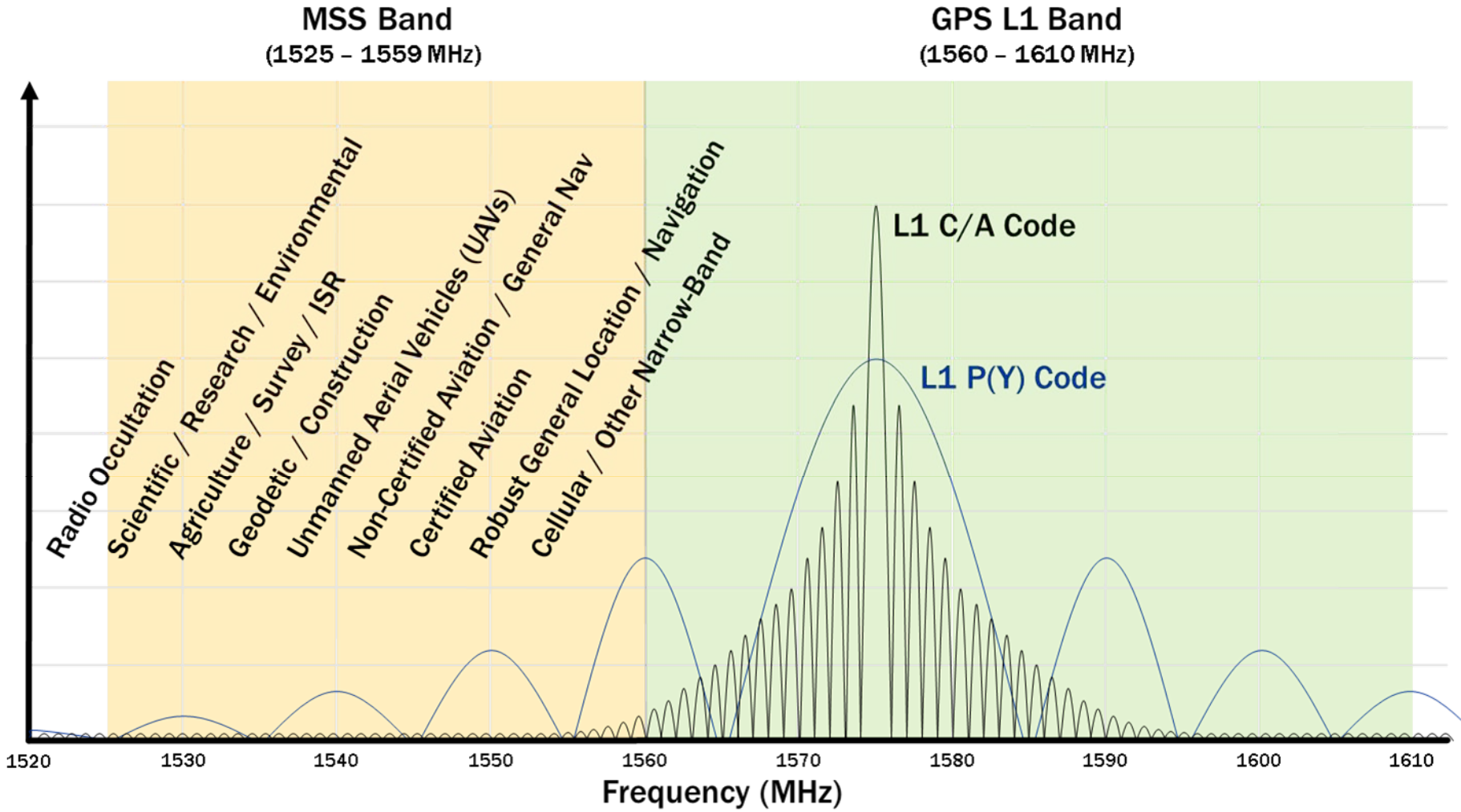
$430

$79

Response to LightSquared – DOT GPS Spectrum Protection Plan

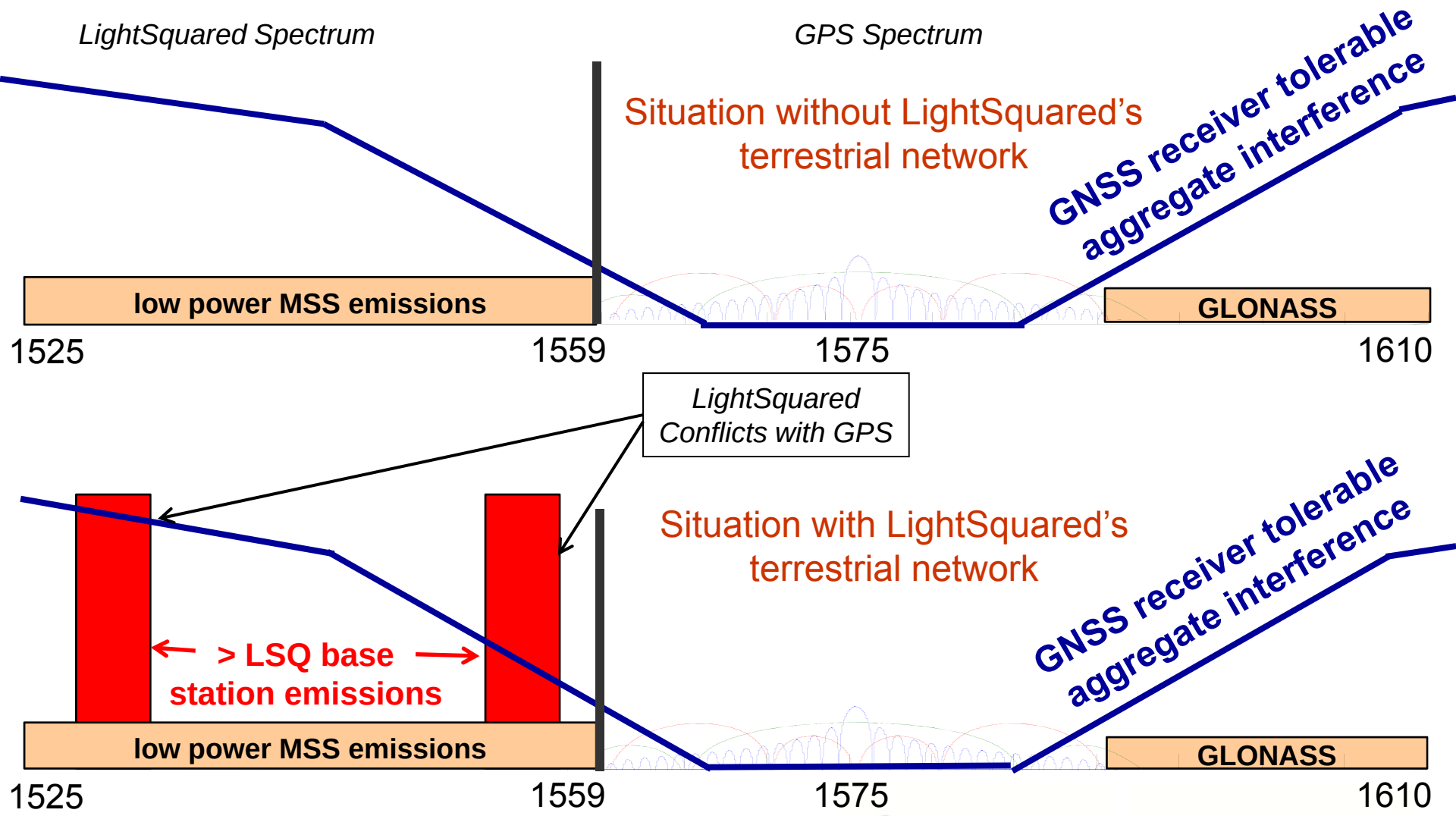
- January 13, 2012 National Space-Based Positioning, Navigation, and Timing (PNT) Executive Committee (EXCOM) co-chair letter to National Telecommunications and Information Administration (NTIA) proposed to draft new Global Positioning System (GPS) spectrum interference standards:
  - Inform future proposals 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.

GPS L1 Signal Spectrum Use



Notional – For Discussion Purposes Only (Not to Scale)

Illustration of Concerns with LightSquared



DOT GPS Spectrum Protection Plan - Status

- Deputy Secretary Tasking to FAA and RITA:
  - 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 Spectrum Protection Plan 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.
- GPS spectrum protection criteria will ensure continued use of existing space-based PNT services vital to economic, public safety, scientific, and national security needs, while also considering modernized GNSS signals.
  - Criteria will Inform future proposals for non-space, commercial uses in the bands adjacent to the GPS/GNSS signals.