GPS – Galileo Cooperation Agreement

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GPS-Galileo

- Each system managed, operated, and funded independently

- GPS and Galileo will be compatible and, for civil users, interoperable at the user level
  - Geodesy nearly identical ~ 2cm
  - Timing different but each system will transmit timing offsets
  - Radio frequency compatible

- Level playing field allows manufacturers to build “dual system” civil receiver
  - Civil users can choose to use GPS, Galileo, or combination based on their needs
National Security Compatibility

- EC agreed to use signal structures for Galileo PRS and Open Service signals that satisfy national security compatible criteria
  - Criteria, assumptions and methodology contained in reference documents signed by both sides
  - Consultations required if one Party changes signal structure and the Party believes it exceeds the criteria
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• Agreed to baseline signal structures for L1
  – Common BOC(1,1) signal – broadcasted by up to 60 satellites
  – GPS will continue to broadcast C/A code as well as BOC(1,1) for GPS III
  – Galileo PRS at BOC(15,2.5) cosine phase modulation

• Each system’s signals will be compatible with the other systems
  – They will “do no harm” to the other system’s

• Civil signals will be interoperable
  – A “dual system” receiver should be able to use any combination of GPS and Galileo signals to derive a solution
GPS and Galileo Signal Spectra

*BOC(15,10) modulation option shown for E5a/E5b.

Prepared by Chris Hegarty, MITRE
GPS and Galileo L1 Signal Spectra

- C/A-code
- Galileo OS and GPS III
- P(Y)-code
- M-code
- Galileo PRS

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Planned Baseline GPS and Galileo Signal Structures

• GPS Service
  – L5 – BPSK-10 centered at 1176.45 MHz [2006]
  – L2 – BPSK-1 centered at 1227.6 MHz [2005]
  – L1 – BPSK-1 centered at 1575.42 MHz [current]
     with an added BOC (1,1) [GPS III]

• Galileo*
  – E5A/E5B – 2 x BPSK-10 or BOC (15,10)
     between 1164-1214 MHz
  – E6 – BPSK-5 & BOC (10,5) centered at ~ 1279 MHz
  – E2/L1/E1 – BOC (1,1) OS
      BOC (15,2.5) cosine phased PRS centered
      at 1575.42 MHz

*(based on US/EC draft agreement & Galileo plans as currently understood by the U.S.)
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• Open service signals provided without direct user fees and signal specification information available on a non-discriminatory basis
  – Access to information for manufacturers may be subject to non-discriminatory commercial arrangement
  – GPS SPS civil service specifications will continue to be open and publicly available – no licensing fee

• Encrypted civil signals (i.e. Galileo Commercial and potentially Safety-of-Life) may be subject to a licensing fee
  – Parties shall endeavor to provide signals intended for safety of life services with the required level of safety as recognized by competent international bodies.
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• Any fees for Safety-of-life services for aviation and maritime will be consistent with ICAO and IMO rules
  – **GPS** civil services will continue to be **free** of direct user fees

• Sets up working groups
  – Trade and civil applications
  – Radio frequency compatibility and interoperability
  – Design and development of next generation
  – Security

• No transfer of technology to third parties without permission of originating party
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- Consult prior to establishing standards, certification or licensing requirements, or regulations
  - Unless mandating expressly authorized by ICAO or IMO
  - U.S. supports users’ ability to choose the service or services that best meets their requirements

- Non-discriminatory approach to trade in goods & services
  - Measures with respect to goods and services related to civil satellite-based navigation and timing signals or services, augmentations, and value-added services should not be used as a disguised restriction on or an unnecessary obstacle to international trade
Summary

• Cooperation agreement addresses national security, economic, and technical issues
• Protects compatibility
• Encourages civil interoperability