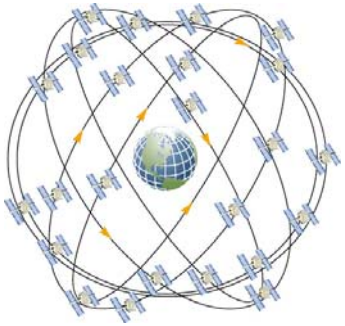
GPS Changes



Demetrios Matsakis

Note: All policy viewgraphs from http://www.pnt.gov

GPS Ground Segment

- MCS at Schriever AFB, CO & Alternate MCS at VAFB
- 16 Monitor Stations 6 OCS + 10 NGA
- 12 Ground Antennas 4 GPS + 8 AFSCN

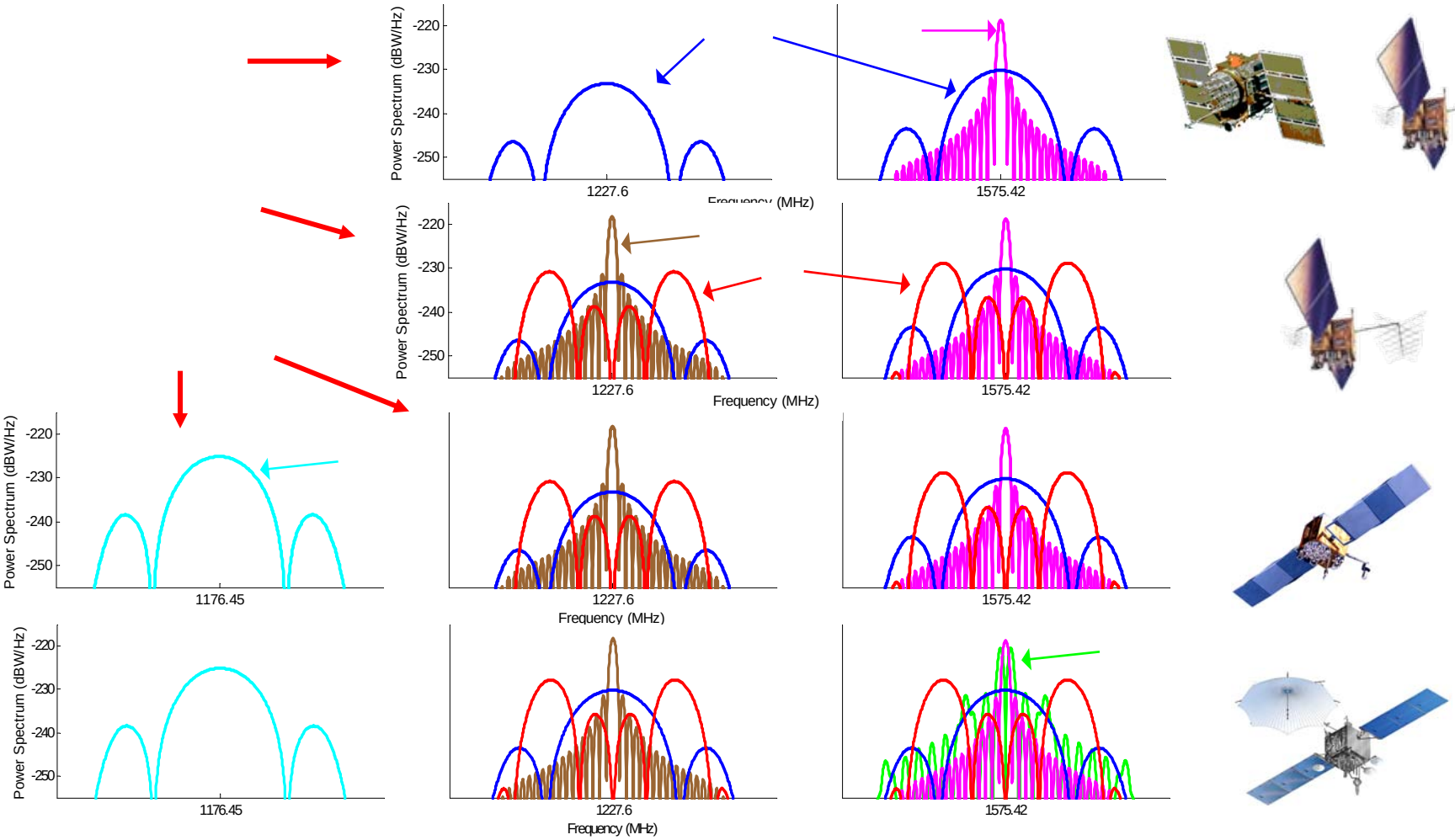
GPS – Serving the World

- Constellation – the largest ever - 30 Healthy Satellites
  - 12 Block IIA
  - 12 Block IIR
  - 6 Block IIR-M
- Residual Satellites
  - 3 Block IIA
- Most Recent Launch
  - IIR-20(M) – 7th modernized SV
    - Launched 24 Mar 09
    - SVN 49
    - First Transmission of L5, Apr 09
- Next Launches
  - IIR-21(M) – Aug 09
  - IIF-1 – Late CY09, Early CY10

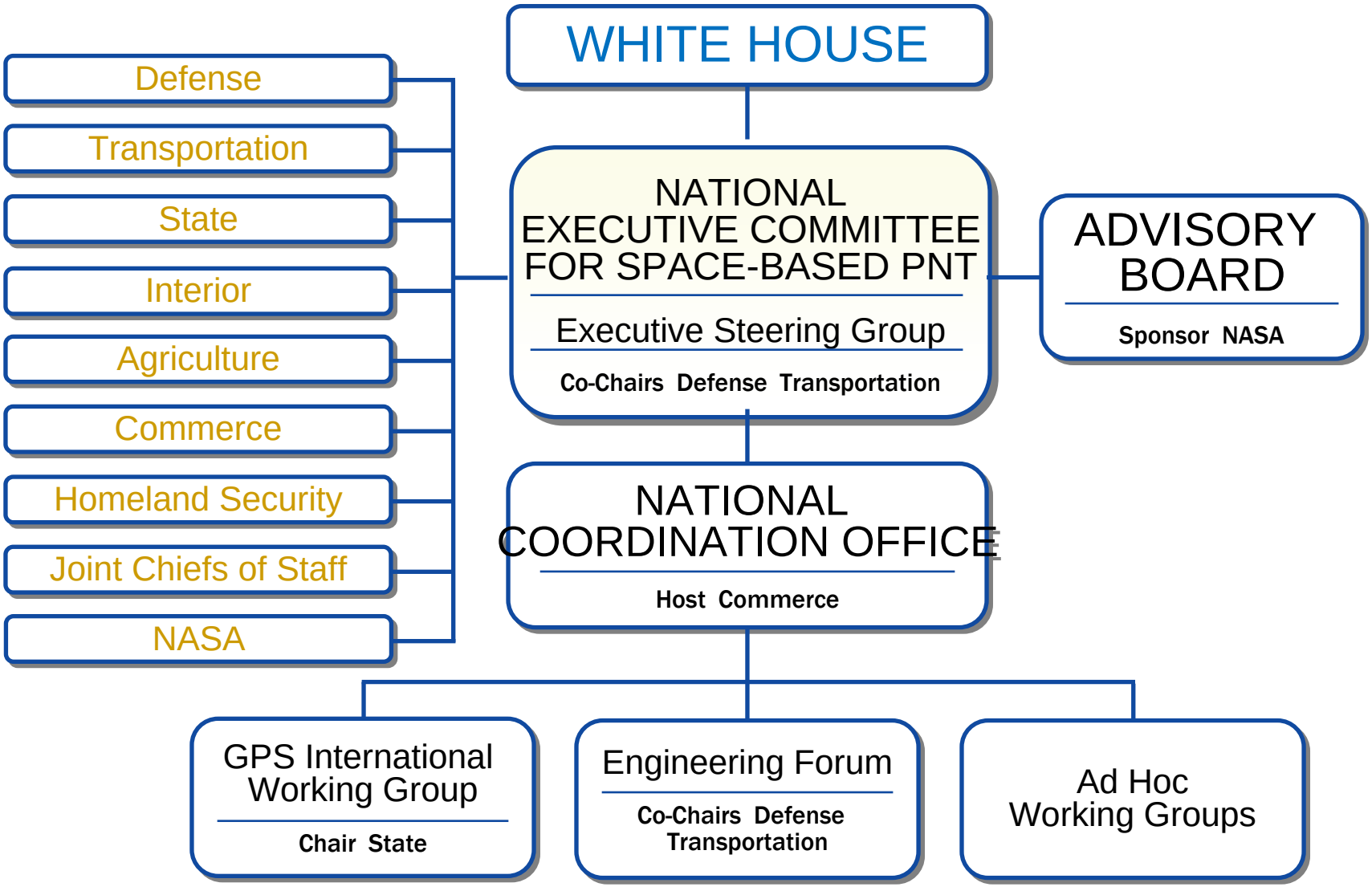
New Civil Signals

- Second civil signal “L2C”
  - Designed to meet commercial needs
  - Higher accuracy through ionospheric correction
  - 1st launch: Sep 2006 (GPS IIR-M); 24 satellites: ~2016
- Third civil signal “L5”
  - Designed to meet demanding requirements for transportation safety-of-life
  - 1st launch: 24 Mar 09 (IIR-20(M)); 24 satellites: ~2018
- Fourth civil signal “L1C”
  - Designed with international partners for GNSS interoperability
  - Begins with GPS Block III
  - 1st launch: ~2014; 24 satellites: ~2021

GPS – Spectrum



U.S. National Space-Based PNT Organization Structure



U.S. Space-Based PNT Policy

- Provide GPS and augmentations free of direct user fees on a continuous, worldwide basis
- Provide open, free access to information needed to develop equipment
- Continue to improve performance of GPS and augmentations
- Encourage international development of PNT systems based on GPS
- Seek to ensure international systems are interoperable with civil GPS and augmentations
- Address mutual security concerns with international providers to prevent hostile use

Reformatted from Ray Clore's presentation on www.pnt.gov

GPS III CDD Time Transfer Accuracy Requirement Rationale

- CDD Threshold for dynamic timing user case:
  - 15.1 ns (2 σ) = 15 ns GPS error combined with 2 ns UTC estimation error*, assuming global average with two satellites failed
- CDD Objective for dynamic timing user case:
  - 4.55 ns (2 σ) = 4.5 ns GPS error combined with 0.75 ns UTC estimation error, assuming global average with two satellites failed
- CDD Threshold for static timing user case:
  - 2.5/3.0 ns (2 σ) = 1.5 ns GPS error + 2 ns UTC estimation error (24 hour average)
- CDD Objective for static timing user case:
  - 1.0 ns (2 σ) = 0.5 ns GPS error + 0.75 UTC estimation error (24 hour average)

- UTC estimation error is defined as GPS Time – UTC(USNO)
- CDD = Capability Development Document
- All errors in this viewgraph are 2 σ

Merci beaucoup pour m'écouter

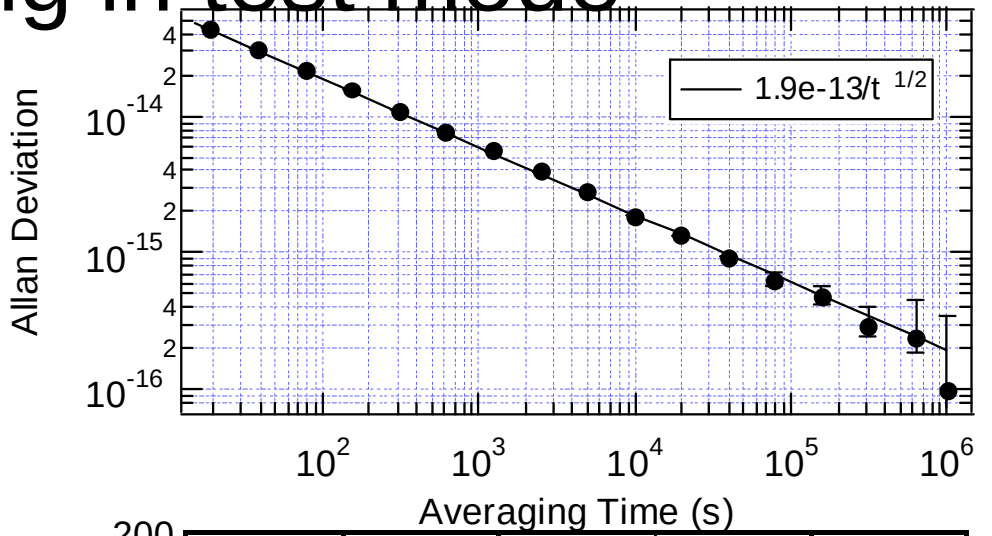
Thank you for listening

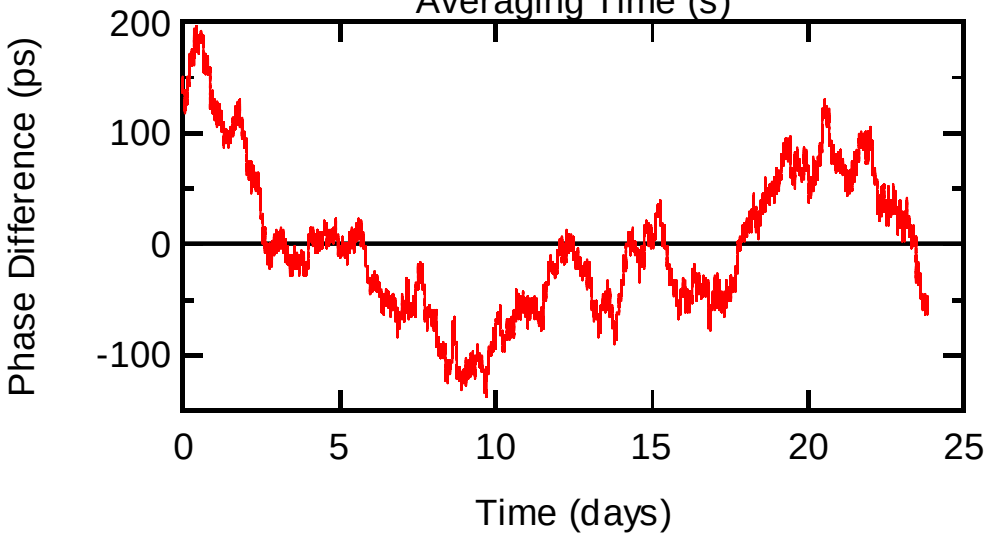
New Clock Building

Specifications: Temperature +/- 0.1 C Humidity +/- 3% RH *ALWAYS*

Clock Rooms in New Building

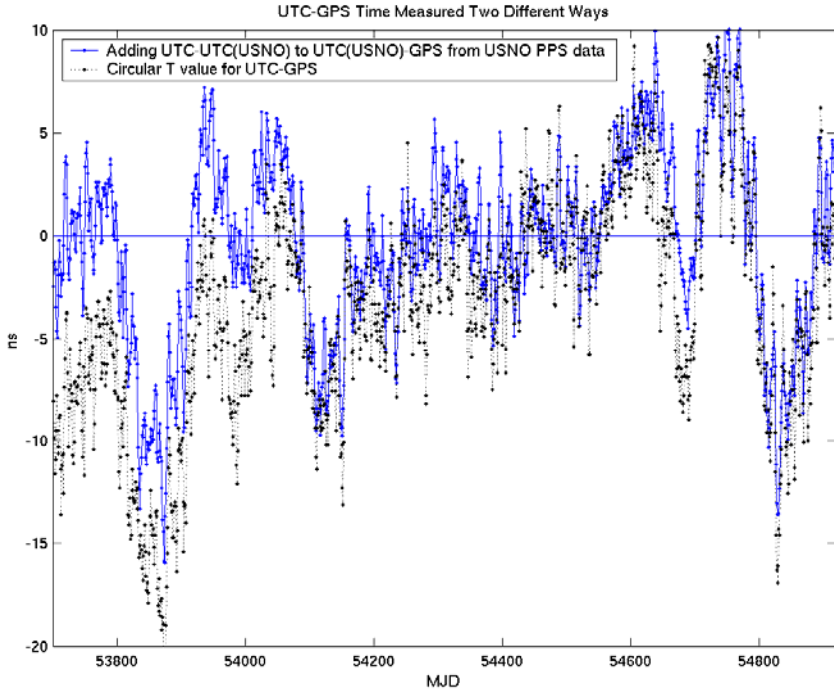
Two Rubidium Fountains operating in test mode

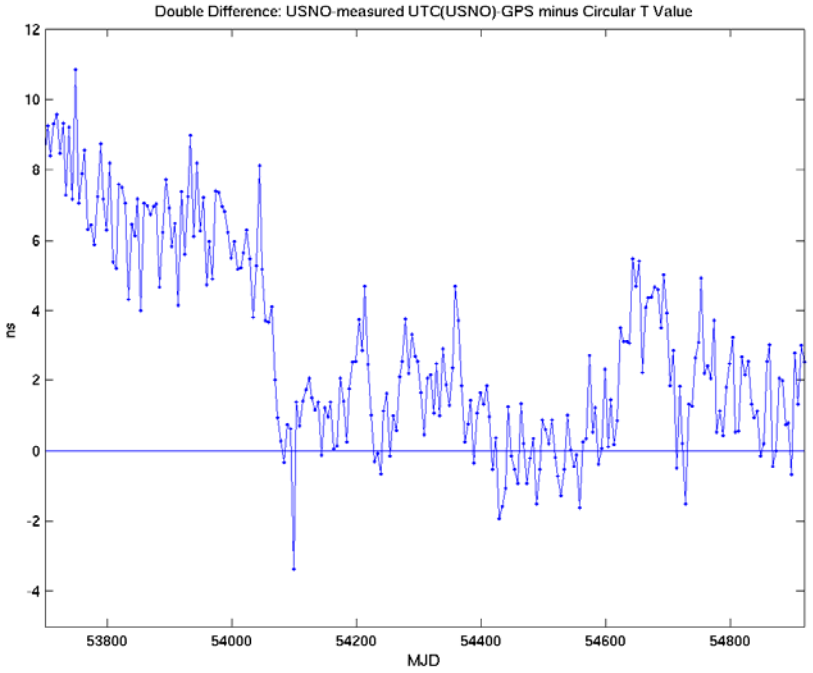




Galileo and GPS/NGA Monitors

Biases Reflected in Circular T





EAL and USNO cesiums