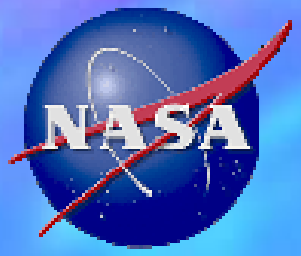

NASA Remote Sensing Issues: WRC-07 and Other Issues

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Introduction

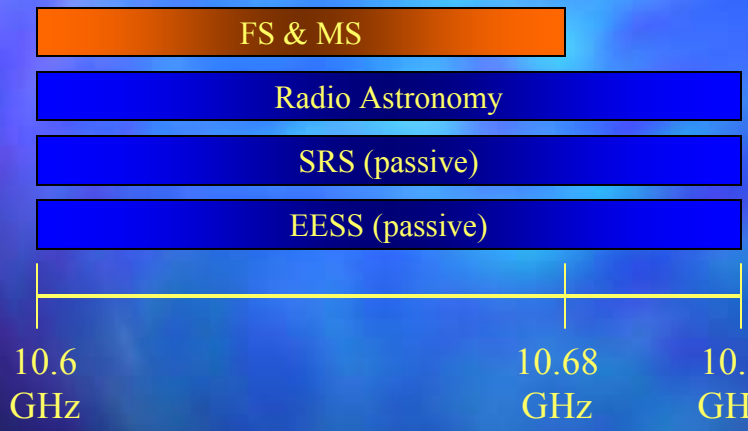
- 2007 World Radiocommunication Conference (WRC-07) will consider several issues related to remote sensing
- Pertinent WRC-07 Issues
  - Agenda Item 1.2: Passive sensing sharing conditions in 10.6-10.68 and 36-37 GHz
  - Agenda Item 1.3: Active sensing allocation extension of 200 MHz near 9.5 GHz

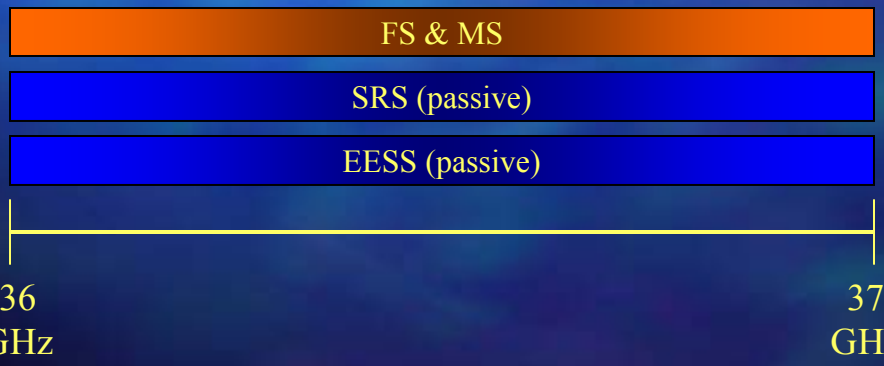
Pertinent WRC-07 Issues (continued)

- Agenda Item 1.17: MSS feederlinks near 1400-1427 MHz and protection of passive services in this band
- Agenda Item 1.20: Protection of passive sensors from unwanted emissions

Agenda Item 1.2

- Considers sharing conditions between FS/MS and passive sensors in the bands 10.6-10.68 GHz and 36-37 GHz





Agenda Item 1.2

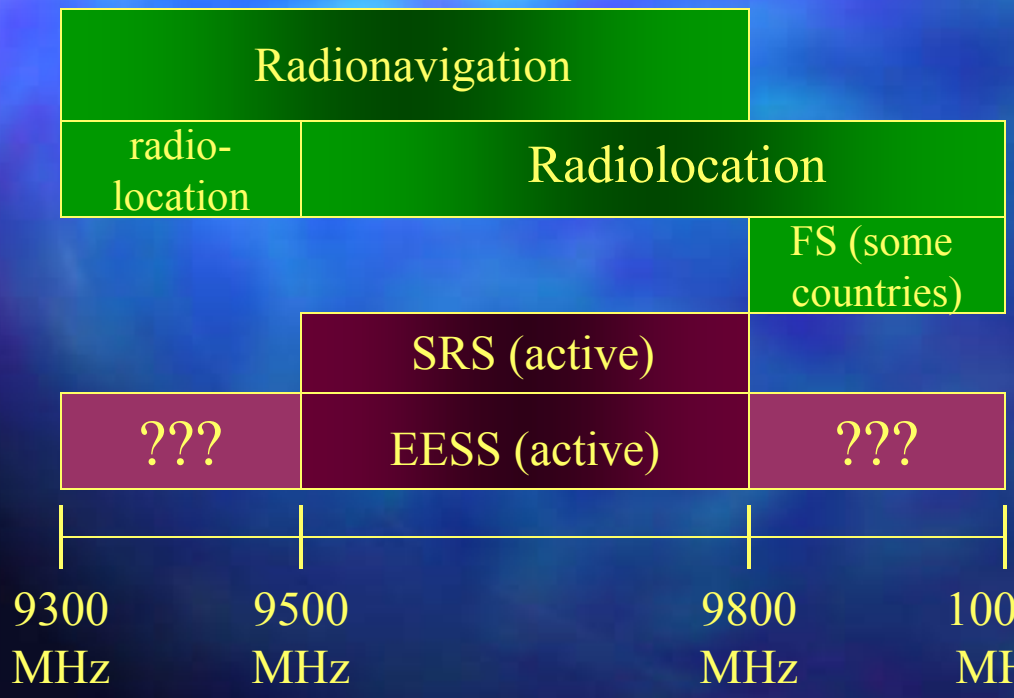
- Sharing in 10.6-10.68 GHz band problematic due to existing use of band by terrestrial FS transmitters
- International footnote 5.482 limits EIRP to 40 dBW and power to –3 dBW
- Similar domestic footnote US265
- Subsequently difficult to change sharing conditions in this band

Agenda Item 1.2

- Sharing in 36-37 GHz band has no existing sharing conditions due to lack of use by terrestrial FS transmitters
- Troublesome domestic footnote US263 makes passive sensors de facto secondary service to FS & MS
- Therefore, US proposal to protect passive sensors through some limitation on FS/MS transmitters unlikely, but international community may succeed anyway

Agenda Item 1.3

- Considers an extension of 200 MHz to existing active sensing allocation from 9500-9800 MHz

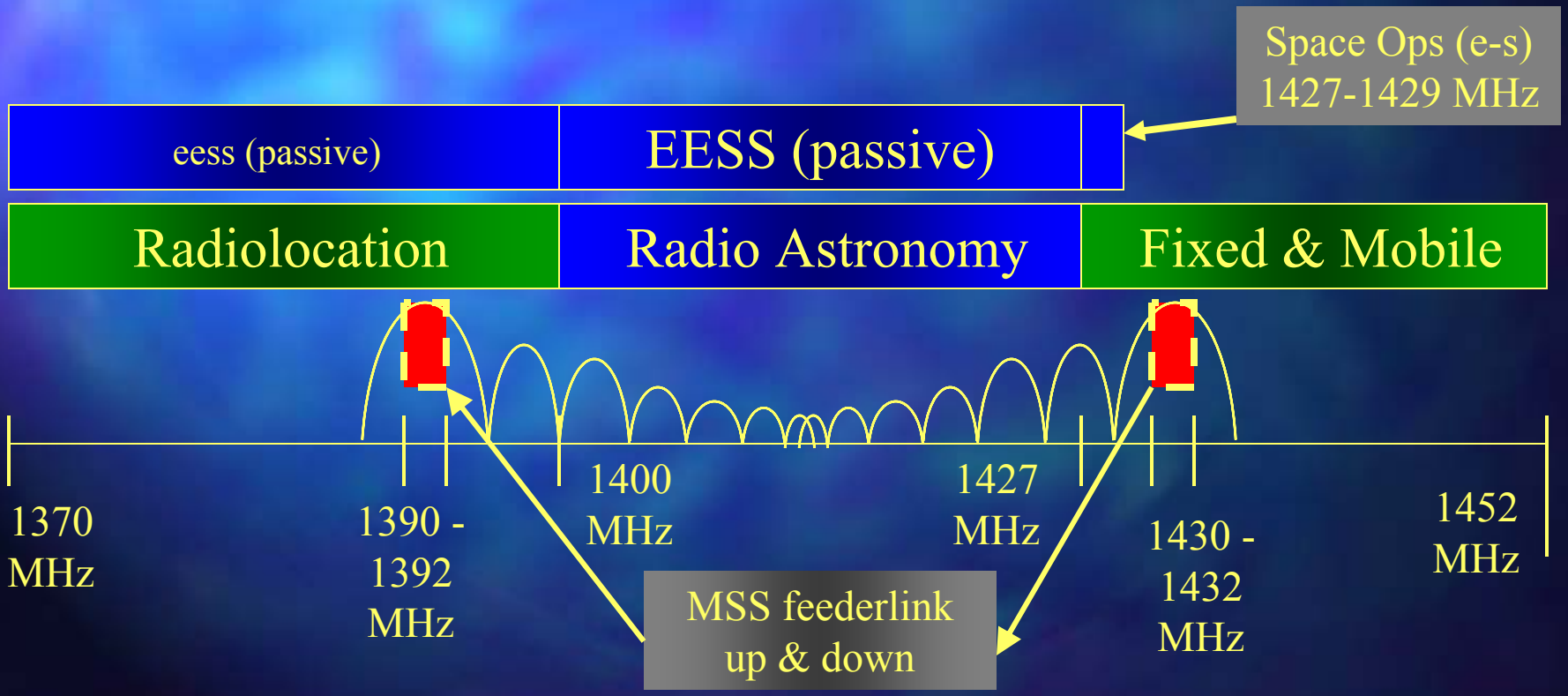


Agenda Item 1.3

- Sharing between spaceborne SAR and radar systems generally feasible since both are pulsed systems
- Radiolocation service also seeking upgrade to primary status in 9000-9200 MHz and 9300-9500 MHz
- US radar proponents will not accept statistical interference studies to prove compatibility
- But US generally supportive of both radiolocation upgrade and EESS (active) extension

Agenda Item 1.17

- Considers protection of existing services (including passive services in 1400-1427 MHz band) from MSS feederlink allocations in 1390-1392 MHz and 1430-1432 MHz bands

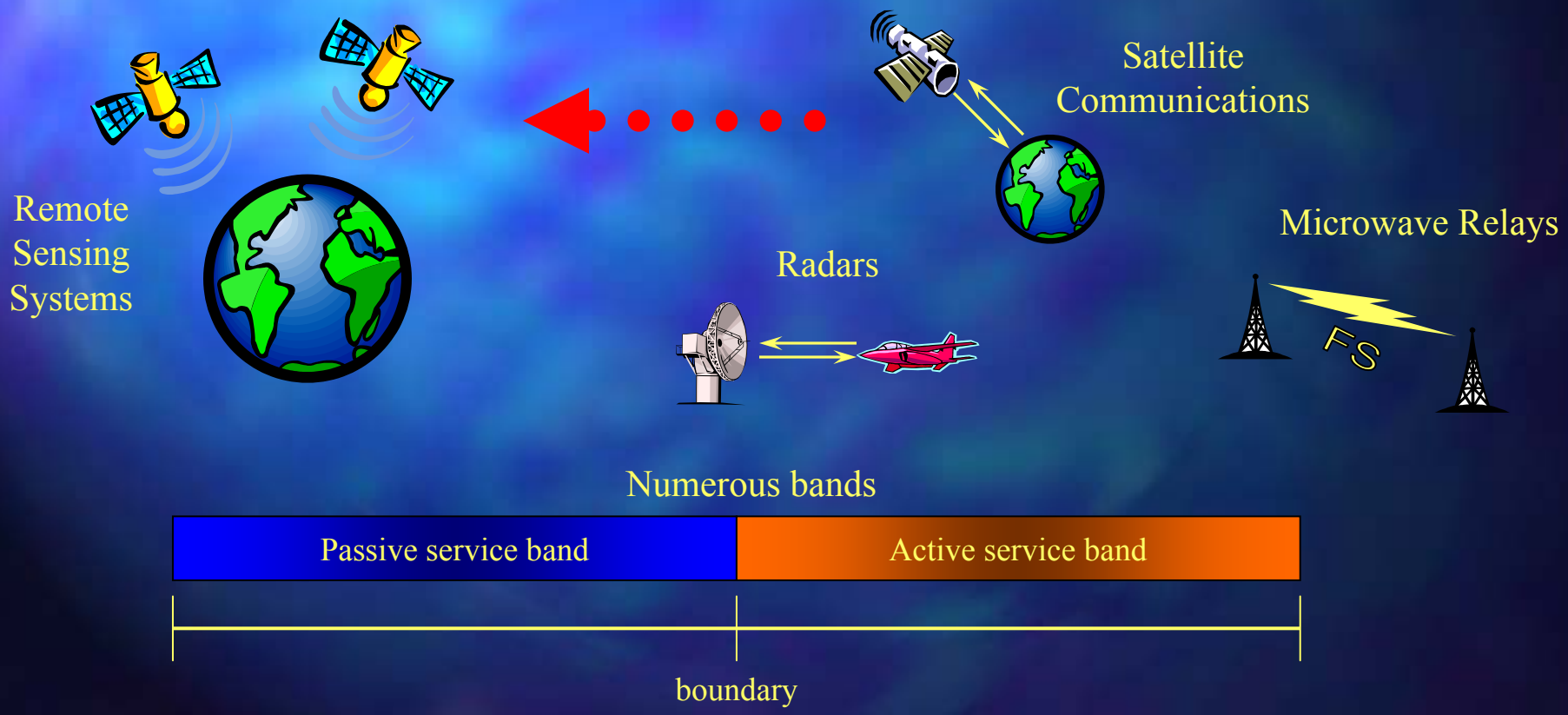


Agenda Item 1.17

- One US company is proponent of MSS system and allocation for feederlinks
- US Government Agencies' position is that existing services, including passive band from 1400-1427 MHz, MUST be protected
- Remote sensing allocation can be protected with appropriate out-of-band emission limit agreed to within international study community

Agenda Item 1.20

- Considers protection of passive sensors from unwanted/out-of-band emissions in specified bands (i.e., 1400-1427 MHz, 23.6-24 GHz, 31.3-31.5 GHz, 50.2-50.4 GHz and 52.6-54.25 GHz)



Agenda Item 1.20

- Controversial issue since active services do not want any "undue burden" on their operations to protect passive sensors
- FCC has blocked many technical studies from international submission, objecting to any possibility of regulatory limits to protect passive services from unwanted emissions in purely passive bands
- FCC is of the view that passive sensors do not need any additional protection because no incidents of interference have ever been reported to the Commission or NTIA

Other Agenda Items Indirectly Concerning Remote Sensing

- AI 1.7 deals with the space research service (passive) allocation in 1668-1668.4 MHz and sharing with MSS
  - No known present or future US use of this band for SRS (passive) and therefore no concern
- AI 1.8 deals with technical studies and regulatory provisions for high altitude platforms (HAPs) in 27.5-28.35 GHz and 31-31.3 GHz
  - Only concern is out-of-band emissions into 31.3-31.8 GHz passive remote sensing band
  - No change to international footnote 5.543A and agreed to out-of-band emission limit on HAPs systems

Other Agenda Items Indirectly Concerning Remote Sensing

- AI 1.18 deals with power flux density (pfd) limits in the band 17.7-19.7 GHz for satellite systems using highly inclined orbits
  - WRC-2000 made worldwide primary allocation to passive sensors (i.e., EESS (passive)) in the band 18.6-18.8 GHz
  - Only concern is that pfd limit enacted at WRC-2000 to protect worldwide use of 18.6-18.8 GHz passive band not be changed

Possible Future Conference Remote Sensing Issues

- Consider frequency allocations between 275 GHz and 3000 GHz taking into account the result of ITU-R studies (WRC-10)
  - Passive sensors noted in footnote 5.565, but there are currently no recognized allocations above 275 GHz in Table of Allocations
  - Significant information is available on the use of the 275-3000 GHz range by passive services, but little or no known use by active services

Current Remote Sensing Issues

- Domestic issue on FCC Rules for Ultra-Wide Band (UWB) devices, primarily vehicular radars from 22-29 GHz overlapping 23.6-24 GHz passive band
  - Interference into the important 23.6-24.0 GHz H_2O_v band from UWB vehicular radars could approach intolerable interference levels for high traffic densities, high market penetration, and particular look directions
  - Such interference would adversely impact measurement of water vapor for coastal zone climatalogy and land surface emissivity measurement

Current Remote Sensing Issues

- Use of the 6-7 GHz band for passive sensing
  - Measurement of sea surface temperature vital to early warning for tsunamis and other natural and weather-related phenomena
  - 6-7 GHz band not allocated nor protected in any way for passive sensing and is badly polluted by RFI from terrestrial and satellite communications systems
  - Look for possible alternative bands such as 4200-4400 MHz which is allocated on a secondary basis for passive sensing and is only shared with radio altimeters on-board aircraft

Current Remote Sensing Issues

- "Interference temperature" concept of controlling interference environment
  - While interesting conceptually, cannot be applied to any bands used in passive sensing since radiometers are measuring very small changes (i.e., $\Delta T \sim$ 0.1-0.5 K or smaller) in ambient noise floor
  - Allowing noise floor to be raised even slightly would be problematic to sensor data products

Current Remote Sensing Issues

- Software-defined and/or cognitive radios that adaptively look for unused or underutilized spectrum
  - Potentially useful concept AS LONG AS operation in passive sensing bands is PROHIBITED
  - Purely passive bands must be avoided or "notched out" of such radio devices
  - Shared passive sensing bands cannot afford any further increases in the noise floor