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# Current Spectrum Issues of Interest or Concern to NOAA/NESDIS

Beau Backus  
NOAA/NESDIS

20 July 2017

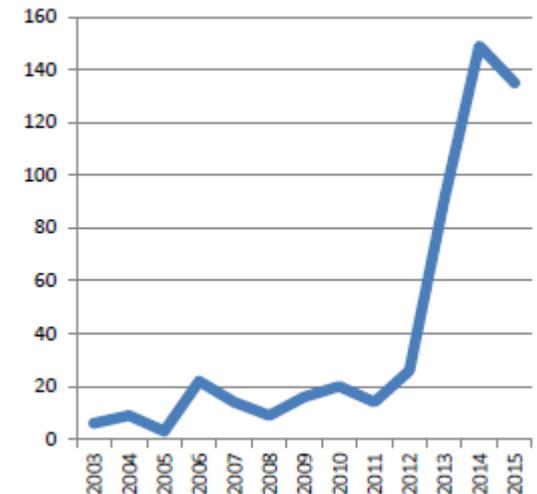


# Space Spectrum Issues



- **Small Sat:** Extremely large growth in small sat deployments are being projected and observed. Spectrum use is increasing and placing pressure on established systems for coordination in UHF, S, and X bands as well as other space allocated bands.
- **Passive Bands:** Various international mobile telecommunications (IMT) groups are examining spectrum above 6 GHz as part of 5G growth. Several bands in consideration are adjacent to critical passive bands used for remote sensing. Degradation in ability to use passive bands is a growing concern.
- **Space Weather:** In accordance with ITU Resolution 657 (WRC-15), review the results of studies, conducted for WRC-2019, relating to the technical and operational characteristics, spectrum requirements and appropriate radio service designations for space weather sensors, with a view to providing appropriate recognition and protection in the Radio Regulations without placing additional constraints on incumbent services.

Small satellite launches per year



M. Buscher & T. Funke, "TUB Small Satellite Database," SFCG-36 SF36-52/1, June 2016.

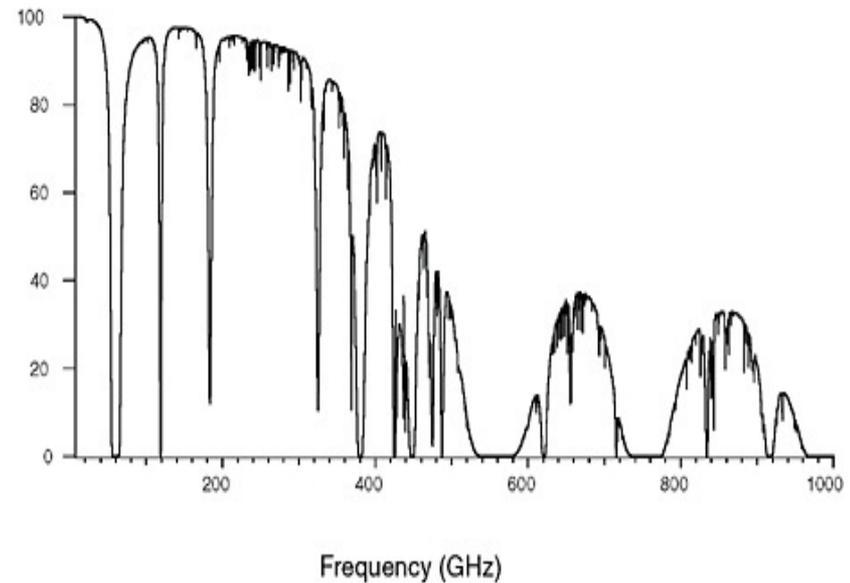
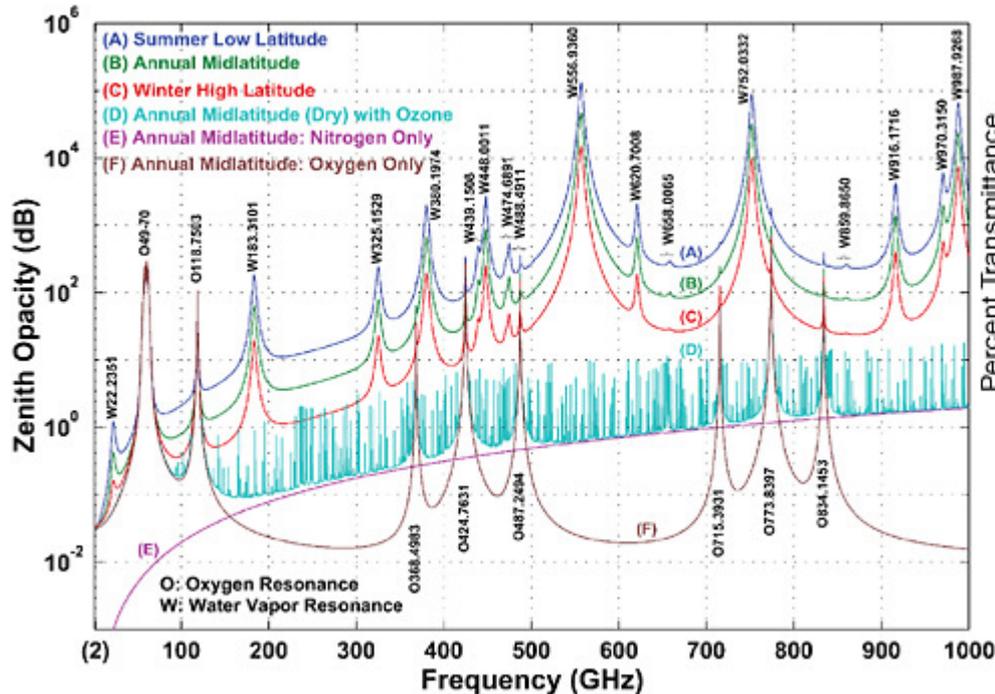


# Remote Sensing Spectrum



*There are no alternative frequencies for detecting natural properties*

- The transmission spectrum of the atmosphere and the opacity of the atmosphere to particular frequencies allow the detection of weak natural radio frequency emissions
- “Line radiation spectra can be used to obtain temperature and humidity profiles in the atmosphere from the surface up into the mesosphere” (Source: NAP, 2010)
- Potential interference to these measurements from proposed commercial broadband wireless should be investigated for developing mitigation methods and implementation



Source: <http://www.nap.edu/read/12800/chapter/1>



# NOAA Satellite Spectrum in Consideration for Repurposing

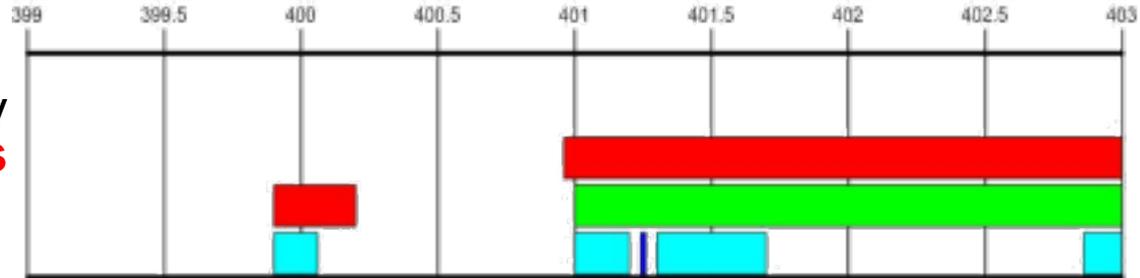
- **1695-1710 MHz:** Recently repurposed for sharing with AWS-3 (Advanced Wireless Services -3) licensees for use as LTE uplink band. Affects 27 critical federal sites and numerous other federal and nonfederal sites. Operations by AWS-3 has not begun so no validation of mitigation steps.
- **1675-1680 MHz:** In consideration for repurposing for use by commercial fix and mobile operations and continued shared use as a METSAT downlink band. Consideration primarily due to commercial party petition to US FCC in Proceeding RM-11681. Significant concern by NOAA on DCP downlink interference risk to GOES-R series.
- **400.15-420 and 150.05-174 MHz:** WRC-19 agenda item 1.7, resolution 659, assessment of the suitability of using existing SOS allocations below 1 GHz to accommodate the TT&C requirements for NGSO satellites with short duration missions.
- **5150-5925 MHz:** WRC-19 agenda item 1.16, to consider issues related to wireless access systems, including radio local area networks. May include additional spectrum allocations to the mobile service.
- **24.5-27.5 GHz:** WRC-19 agenda item 1.13, to consider identification of frequency bands for the future development of IMT, including possible additional allocations to the mobile service on a primary basis, in accordance with Resolution 238.
- **Above 24 GHz:** FCC Notice of Proposed Rulemaking, "Use of Spectrum Bands Above 24 GHz for Mobile Radio Services, GN Docket No. 14-177": Solicitation of comments on mobile use in the following bands – 27.5-28.35 GHz, 37-38.6 GHz, 38.6-40 GHz, 64-71 GHz



# Possible GOES DCS Spectrum Conflicts



Spectrum occupancy by **Smallsats**

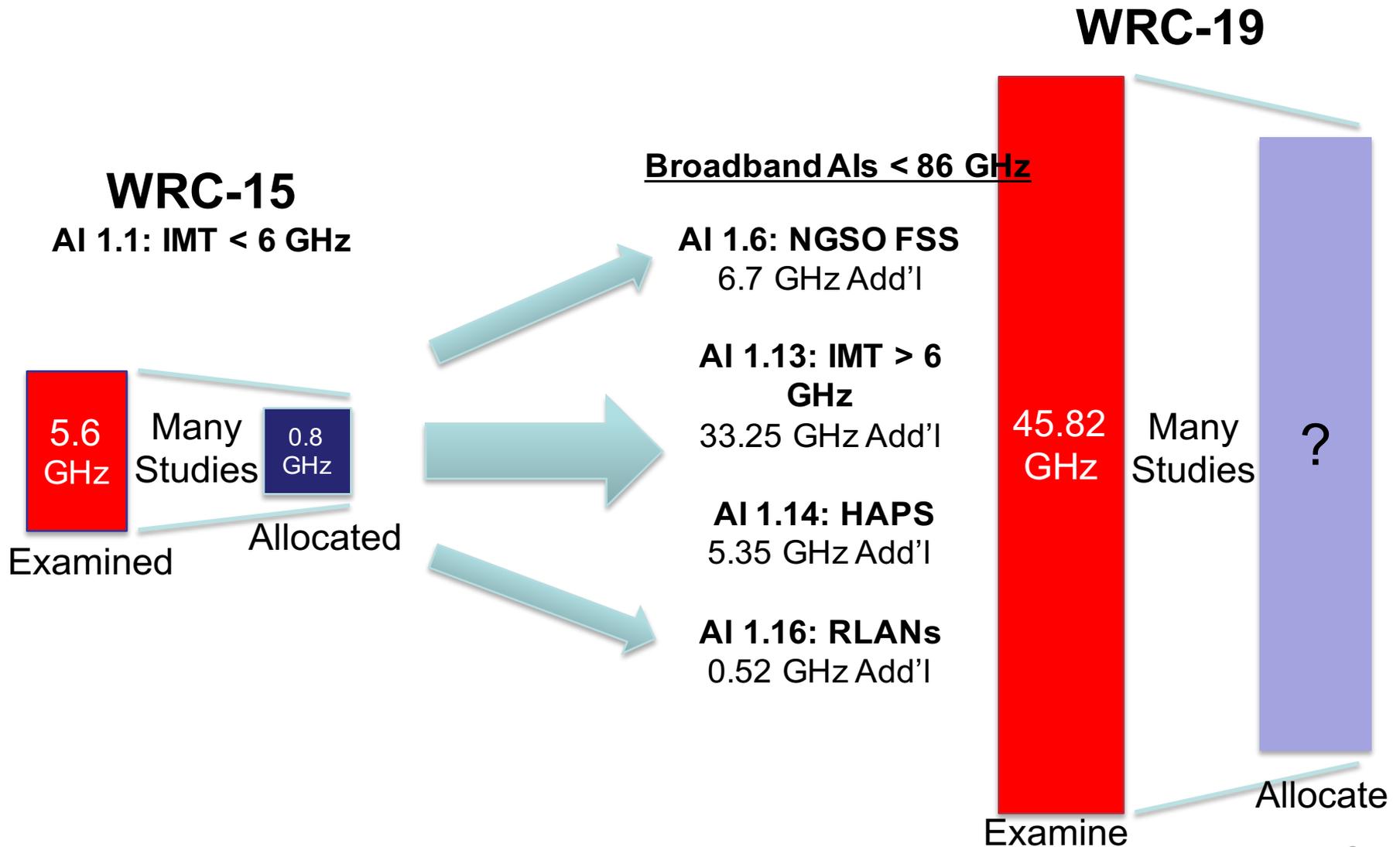


- ARGOS NGSO (Earth → space)
- JASON DORIS (Earth → space)
- DCS GSO International (Earth → space)
- Small satellites intend to operate in these bands

- The output power levels of these TT&C (**Earth-to-space**) can be much higher than the power levels used by the DCS platforms. Consequently, the **operation of these TT&C links to Smallsats would cause harmful interference to the DCS receivers onboard the EESS or MetSat satellites.**
- For the **space-to-Earth direction**, the space station **antennas used by Smallsats** are omnidirectional antennas, which **could result in significant levels of interference towards the DCS receivers on the satellite.** (The omnidirectional space station antennas transmit energy in all directions, including the space high above, even though it is meant to send signals to the ground stations.)



# Broadband a Growing Concern





# Summary

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- NOAA's National Weather Service relies on accurate, timely and reliable satellite observations to provide better information to save lives and property -- as it builds a Weather-Ready Nation
- Reliable access to spectrum is a critical component for achieving NOAA's missions in support of the public
- NOAA satellite operations have experienced interference in the 1670-1675 MHz for the past several years
- Federal and non-federal users of Data Collection Platform outside AWS-3 protection zones cannot be protected and will be subject to interference
  - Potential impacts to emergency management, weather warnings, aviation, and wildfire management capability
- These data are the basis for satellite products provided by NOAA to the public and other government agencies, and further used by the weather enterprise
- Additional studies required prior to any additional auction of NOAA authorized frequencies

Thank You!

