

## WIGOS Space 2040 workshop

# Radio-frequency spectrum management issues

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- ✓ **World Radio Conference (WRC) 2-27 November 2015**
- ✓ **3750 delegates**
- ✓ **Very intense meeting, more pressure on many agenda items than the previous WRC**
- ✓ **Preliminary results regarding WRC15**
  - ✓ **Current agenda as decided during WRC12**
  - ✓ **Future agenda for WRC19**
- ✓ **Future vision?**

## CURRENT AGENDA ITEM

- 1. IMT: protection of the 1400 1427 MHz frequency band, RLAN within the 5350-5470 MHz**
- 2. Ku Fixed Satellite Service (FSS)**
- 3. Protection of the 406-406.1 MHz frequency band**
- 4. Nano pico satellites**
- 5. Future allocation at 9 GHz for Synthetic aperture radars**

1. **Protection of the 1400 1427 MHz frequency band.**
  - 1300-1350 MHz band: no change
  - 1350-1400 MHz: no change
  - Above 1427 MHz: mandatory limits
2. **RLAN within the 5350-5470 MHz: no change.** This frequency band has a tremendous importance for the Exploration Satellite (active) for the synthetic aperture radars. **INCOMPATIBILITY BETWEEN Radio Local Area Network and satellites.** The first Sentinel 1A satellite program called European Copernicus, was launched into orbit last 3<sup>rd</sup> April 2014 for land monitoring of forests, water, soil and agriculture, emergency mapping support in the event of natural disasters, marine monitoring of the maritime environment, sea ice observations and iceberg monitoring, production of high resolution ice charts, forecasting ice conditions at sea, mapping oil spills, sea vessel detection, climate change monitoring.
3. **Telemetry/Telecommand at 2 GHz**
  - 2025 2110 MHz: no change
  - 2200 2290 MHz: no change

## Other agenda items, WRC15

1. Fixed Satellite Service (FSS) in Ku bands from 10 to 15 GHz  
Earth to Space: NO ALLOCATION within the 13.25-13.75 GHz.  
**INCOMPATIBILITY BETWEEN FSS uplinks and ALTIMETERS (JASON).**  
Discussion for uplink within the 14.5-14.8 GHz  
Downlink within the 13.4-13.65 GHz: **the satellite applications are fully protected using a power spectral density mask.**
2. 406-406.1 MHz: search and rescue applications. Nothing to do with meteorology, but the instruments are mounted on meteorological satellites for the LEO component. **Protection of the systems operating in the mobile-satellite service in the band 406-406.1 MHz.** Mainly an issue of unwanted emission: two guard bands of 100 kHz have been agreed below 406 MHz and above 406.1 MHz.
3. Nano/pico satellite: no change to the current way of filing very small satellites.
4. Synthetic aperture radar at 9 GHz: more precise images using a continuous spectrum of 1 GHz therefore an improved accuracy

1. **IMT: some bands to monitor**
  1. 10.6-10.7 GHz (Sweden)
  2. Proposals within the downlink satellite telemetry 25.5-27 GHz
  3. Around 23.6-24 GHz (unwanted emission)
  4. Around 31.3-31.8 GHz (unwanted emission)
  5. Around 50.2-4 GHz (unwanted emission)
  
2. **RLAN within the 5 GHz range including the 5350-5470 MHz: discussions still on going. Regarding the EESS band to **develop mitigation techniques** to make possible the deployment of indoor RLAN**
  
3. **FSS deployment (regulatory measures for non-GSO and GSO) and future allocation (Earth-to-Space) around 50.2-50.4 GHz and 52.6-54.25 GHz**
  
4. **Nano pico satellites: review the allocations for Space operation or possibility for future allocations (Earth-to-Space and Space-to-Earth) below 1 GHz. Moderate bandwidth requirements of less than 1 MHz.**
  
5. **HAPS: other identifications for high altitude platform station (station located on an object at an altitude of 20 to 50 km and at a specified, nominal, fixed point relative to the Earth)**

## Future agenda WRC2019 for Data Collection

**460-470 MHz : upgrading the current secondary allocation of the meteorological-satellite service (space-to-Earth) to a primary status and adding a primary allocation to the Earth exploration-satellite service (space-to-Earth) in the 460 – 470 MHz frequency band providing protection and not imposing any additional constraints on existing primary services in the band.**

**460-470 MHz: already used for data collection platforms. Need to secure the allocation in the future for space and meteorological agencies. A constraint on pfd (power flux density) on the ground shall be developed to protect the existing fixed/mobile services.**

**Mandatory limits at 400 MHz: protection of the EESS and METSAT(Earth-to-space) in the frequency band 401-403 MHz and the MSS(Earth-to-space) in the frequency band 399.9-400.05 MHz through the establishment of in band mandatory power limits.**

**Rationale:** satellite operators are planning to use these frequency bands mainly for telecommand (Earth-to-Space) purposes under the EESS, METSAT or MSS allocations and that the corresponding satellite networks are usually related to **small satellites (nano pico cubesat)**, and the output power levels of the satellite networks, can be much higher than the moderate/low power levels usually used for the operation of EESS, METSAT or MSS systems.

## Future vision for the space component (1/2)

Climate change, catastrophic events, monitoring of the planet : **importance of developing future instruments (13 and 35 GHz) measuring accurate levels of sea levels, lakes, sea shores and rivers.**

**Images using synthetic aperture radars at 5 and 9 GHz: monitoring of sea ice, of some areas after a catastrophic event**

### **NEED TO PROTECT THESE FREQUENCY BANDS**

**Data collection? Need to protect the frequency bands around 400 MHz because of cubesat or nanosat. To establish a primary downlink allocation at 460 470 MHz to secure the huge investments of the space component.**

**Future of data collection on the long term? probably Internet of things using satellite, but no corresponding allocation exists and there is not any agenda regarding IOT. Action to be conducted within regional groups (CEPT for example). IOT = not a WRC issue**

**Nano pico sat? Interesting! Useful for specific types of applications. The main issue is the lifetime of the satellite which is limited. Usually no propulsion capability on board the satellite.**



## Future vision for the space component (2/2)

**Space debris** : basically not an ITU issue. UNITED NATIONS OFFICE FOR OUTER SPACE AFFAIRS is in charge of this issue. Frequency regulators are not in charge of space debris. But, ITU-R can draft Recommendations using outputs from space agencies and UN Committee on the Peaceful Uses of Outer Space (UN COPUOS). UN and ITU developed a document called

Guidance on Space Object Registration and Frequency Management for Small and Very Small Satellites

ITU-R Resolution 68 (RA 15) makes explicit reference to this document. Many nations have developed a “Space Ia”.

**HAPS?** Interesting! There are many HAPS identifications in the RR, but almost no HAPS is currently operational. Many technical problems to maintain the HAPS platform in the air.

**IMT?** The BIG issue at the ITU. New IMT bands are foreseen in Ku, Ka and higher. Many METSAT/EESS frequency bands under pressure. Is it still IMT at these very high frequency bands?

**Any question?**

