Spectrum management for radio astronomy in Europe and beyond

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Frequency allocations

- **Primary allocation** (e.g. 322 – 328.6 MHz, 1400 – 1427 MHz)

  ➔ protection against all other services

- **Secondary allocation** (e.g. 4800 – 4990 MHz)

  ➔ protection against other secondary services

- **Notification of use** (e.g. 1330 – 1400 MHz)

  ➔ no protection (surviving on footnote 5.149)

- **ITU Radio Regulations** (international treaty)

  modifications at World Radio Conference (every 3-5 years)

  (**https://www.itu.int/pub/R-REG-RR/en)**

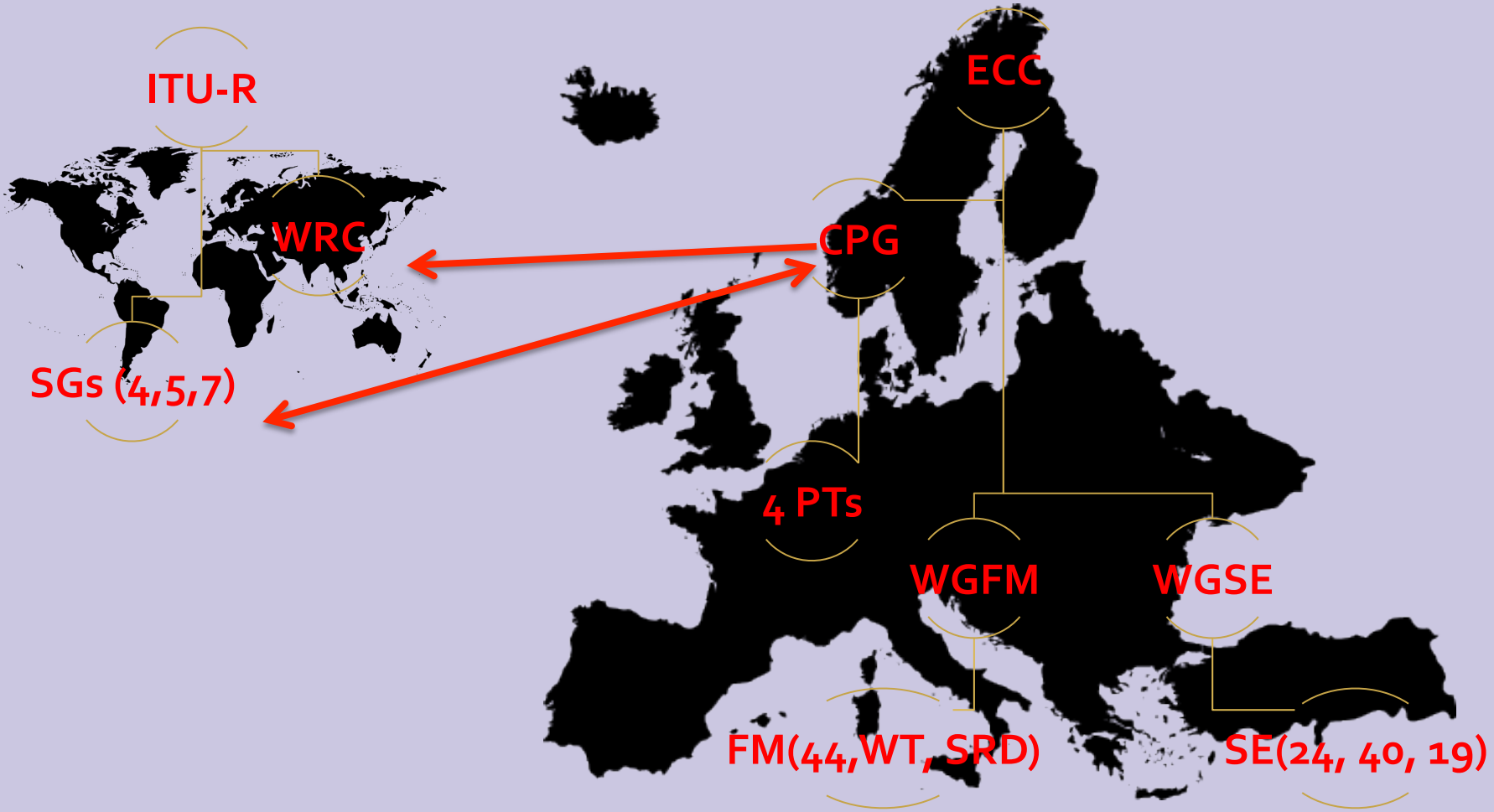
CRAF

- Committee on Radio Astronomy Frequencies
- Expert committee of European Science Foundation (ESF)
- Chairman: Wim van Driel (Paris Observatory)
- Frequency manager: Talayeh Hezareh
  (funded by contributions of member institutes)
- Members from 22 countries (radio observatories, national academies or funding agencies)
- one plenary face-to-face meeting per year, and one web-meeting

CRAF's activities

- CRAF (through its Frequency Manager) attends European and global frequency management meetings to identify possible threat to radio astronomy
- CRAF performs compatibility studies for new proposed spectrum allocations, and spells out the protection criteria for radio astronomy observations
- CRAF members are supposed to coordinate frequency issues at a national level

Framework of activities



CRAF is unique

- CRAF and its FM enjoy close collaboration with European and other administrations
- CRAF is the only RAS organization engaged in developing spectrum policy and producing technical studies with active services
- CRAF's achievements are adopted in other regions for protecting RAS from global spectrum issues

WRC-2019 agenda items

1.6 **to consider the development of a regulatory framework for non-geostationary orbital (NGSO) satellite systems that may operate in the frequency bands:**

37.5-42.5 GHz (space-to-Earth)
47.2-50.2 GHz (Earth-to-space) and
50.4-51.4 GHz (Earth-to-space)

CRAF should follow and contribute to the studies in 42 and 48 GHz bands

WRC-2019 agenda items

1.7 **to study the spectrum needs for telemetry, tracking and command in the space operation service for non-GSO satellites with short duration missions and, if necessary, to consider new allocations in the 150 – 450 MHz range**

CRAF should perform compatibility studies for the 150.05-153.0 MHz and 406.1-410.0 MHz bands

WRC-2019 agenda items

1.8 **to consider possible regulatory actions to support Global Maritime Distress Safety Systems (GMDSS) modernization and to support the introduction of additional satellite systems (Iridium) into the GMDSS**

Several regulatory problems (secondary downlink asking no upgrade for safety service) and interference with RAS in the 1610-1613 MHz band.

1.13 **to consider identification of frequency bands for the future development of International Mobile Telecommunications (IMT) in the following bands [IMT-2020 5G]**

CRAF is contributing to compatibility studies and following the AI alongside ESA

Frequency Band (GHz)	RAS Status	Note
23.6-24.0	PRIMARY	Passive band
31.3-31.5	PRIMARY	Passive band
42.5-43.5	PRIMARY	RAS band
48.54-49.44	--	Passive band
50.2-50.4	--	Passive band
76.0-77.0	PRIMARY	RAS band
81.0-86.0	PRIMARY	RAS band

WRC-2019 agenda items

1.14 **to consider appropriate regulatory actions for high-altitude platform stations (HAPS) [stationary drones providing internet]**

on a global level: 38-39.5 GHz,

on a regional level: in Americas 21.4-22 GHz and 24.25-27.5 GHz

CRAF supports RAS in R2, contributes to the ITU studies

WRC-2019 agenda items

1.15 **to consider identification of frequency bands for the land-mobile and fixed services applications operating in the frequency range 275-450 GHz**

CRAF contributes to the compatibility studies to ensure the protection of RAS

Further Issues for CRAF

- NGSO systems at 10.7-12.5 GHz (DL) and 14-14.5 GHz (UL)
  → OneWeb, SpaceX
- Iridium NEXT generation (never ending story)
- radars at different frequencies, e.g. 6 GHz, 79 GHz
- Mobile applications (LTE, PPDR,…) at 400 MHz
- wind turbines
- important but not allocated RAS bands and new technologies

  → wishes?

A normal working day

A very wrong Attitude

- "Astronomers use UWB observations in all bands so why bother protecting the few frequency allocations we have?"
- "It is a lost battle"
- "I would never want to have your job"
- "Spectrum management is a career killer"
- No input, no feedback on RFI, no involvement

To do list

- Submit RFI reports to your national administrations
  - Prepare a measurement report for a definite frequency band
  - Contact me to put you in touch with your relevant CRAF contact, or your administration directly
  - participate in national preparation meetings if need be

- Visit our website www.craf.eu to check information about your observatory

- Do not simply discard data, educate observers (esp students) not to take observing frequencies for granted, set up a forum for observers to record interference records

Thank you for your attention!