The Committee on Radio Astronomy Frequencies

Advocating for the protection of radio astronomy from harmful interference in Europe & South Africa

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Swiss SKA Days 2023, September 6-8

International spectrum management

- Allocation of frequency spectrum resources is the **sovereign right of national governments**.

- In Switzerland: Bundesamt für Kommunikation (BAKOM)/Federal Office of Communications (OFCOM) in Biel/Bienne

- Radiowaves do not respect national borders

→ international regulations required!

International spectrum management

International Telecommunication Union (ITU)

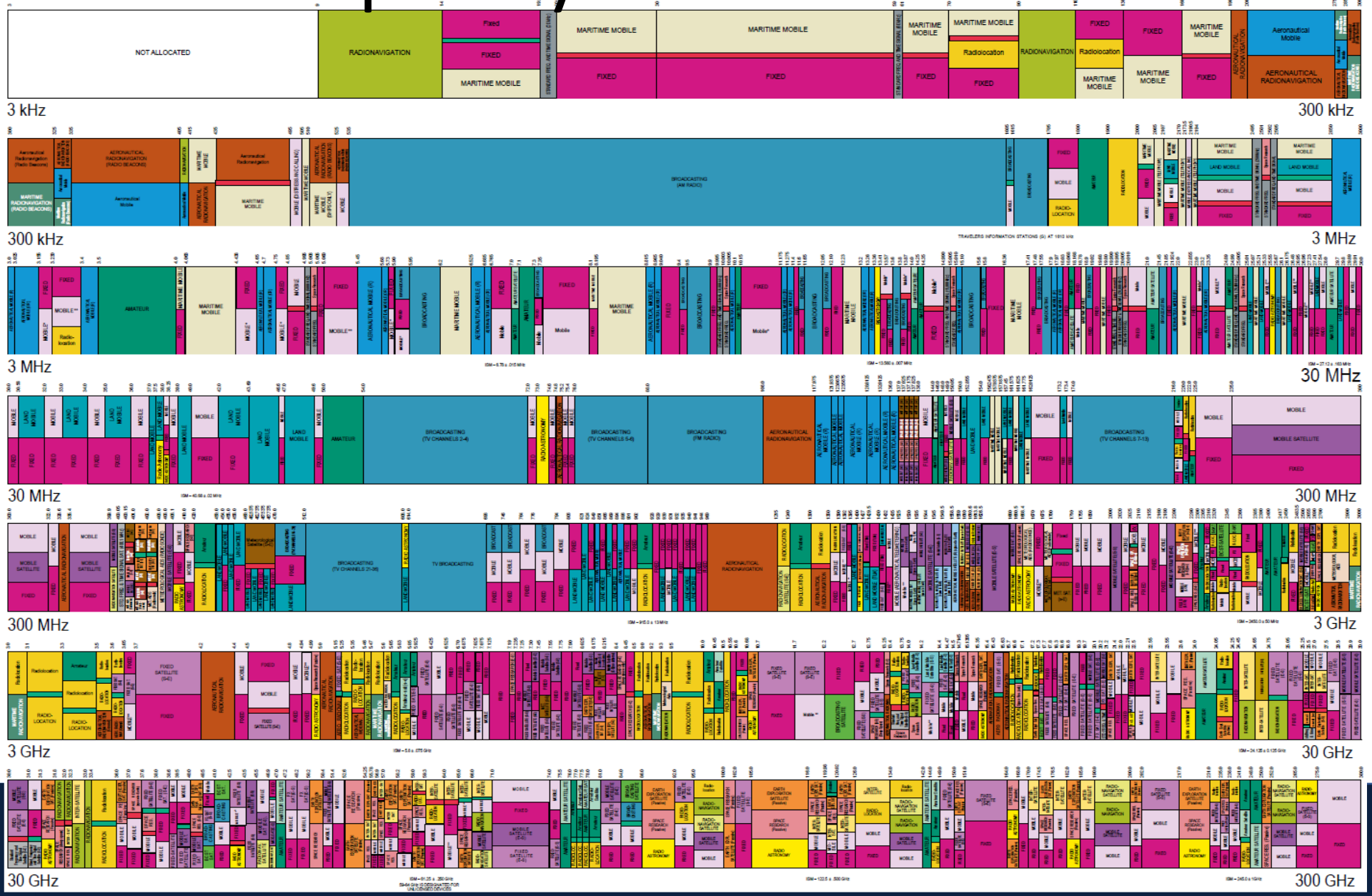
Agency of United Nations responsible for coordination of radiocommunication services and harmonization of radiofrequency spectrum at international level

Headquarters in Geneva

Assisted by regional telecom organizations (for Europe: European Conference of Postal and Telecommunications Administrations CEPT)

European Conference of Postal and Telecommunications Administrations (CEPT)

Frequency Allocation Chart



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Frequency Allocation Chart

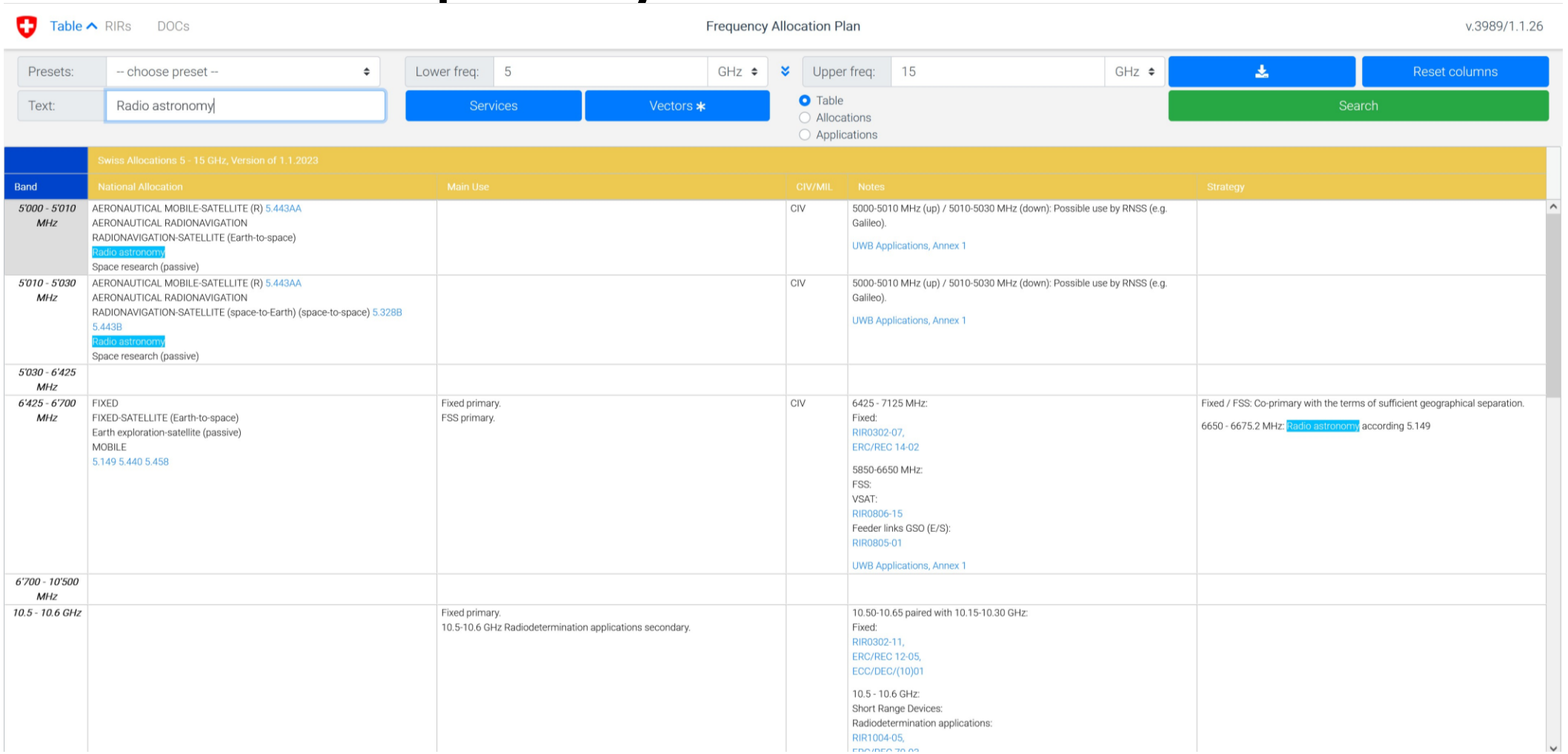

Table ^ RIRs DOCs

Frequency Allocation Plan

v.3989/1.1.26

Presets: -- choose preset --

Lower freq: 5 GHz

Upper freq: 15 GHz

Reset columns

Text: Radio astronomy

Services

Vectors *

Table

Allocations

Applications

Search

Swiss Allocations 5 - 15 GHz, Version of 1.1.2023

Band	National Allocation	Main Use	CIV/MIL	Notes	Strategy
5'000 - 5'010 MHz	AERONAUTICAL MOBILE-SATELLITE (R) 5.443AA AERONAUTICAL RADIONAVIGATION RADIONAVIGATION-SATELLITE (Earth-to-space) Radio astronomy Space research (passive)		CIV	5000-5010 MHz (up) / 5010-5030 MHz (down): Possible use by RNSS (e.g. Galileo). UWB Applications, Annex 1	
5'010 - 5'030 MHz	AERONAUTICAL MOBILE-SATELLITE (R) 5.443AA AERONAUTICAL RADIONAVIGATION RADIONAVIGATION-SATELLITE (space-to-Earth) (space-to-space) 5.328B 5.443B Radio astronomy Space research (passive)		CIV	5000-5010 MHz (up) / 5010-5030 MHz (down): Possible use by RNSS (e.g. Galileo). UWB Applications, Annex 1	
5'030 - 6'425 MHz					
6'425 - 6'700 MHz	FIXED FIXED-SATELLITE (Earth-to-space) Earth exploration-satellite (passive) MOBILE 5.149 5.440 5.458	Fixed primary. FSS primary.	CIV	6425 - 7125 MHz: Fixed: RIR0302-07, ERC/REC 14-02 5850-6650 MHz: FSS: VSAT: RIR0806-15 Feeder links GSO (E/S): RIR0805-01 UWB Applications, Annex 1	Fixed / FSS: Co-primary with the terms of sufficient geographical separation. 6650 - 6675.2 MHz: Radio astronomy according 5.149
6'700 - 10'500 MHz					
10.5 - 10.6 GHz		Fixed primary. 10.5-10.6 GHz Radiodetermination applications secondary.		10.50-10.65 paired with 10.15-10.30 GHz: Fixed: RIR0302-11, ERC/REC 12-05, ECC/DEC/(10)01 10.5 - 10.6 GHz: Short Range Devices: Radiodetermination applications: RIR1004-05,	

https://www.bakom.admin.ch/bakom/en/homepage/frequencies-and-antennas/national-frequency-allocation-plan.html

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Deciding body: ITU World Radiocommunication Conference

ITU World Radiocommunication Conference 2023 (WRC-23)
Dubai, United Arab Emirates, 20 November to 15 December 2023

World Radiocommunication Conferences (WRC) are held every three to four years to review, and, if necessary, revise the Radio Regulations, the international treaty governing the use of the radio-frequency spectrum and the geostationary-satellite and non-geostationary-satellite orbits. Revisions are made on the basis of an agenda determined by the ITU Council, which takes into account recommendations made by previous world radiocommunication conferences.

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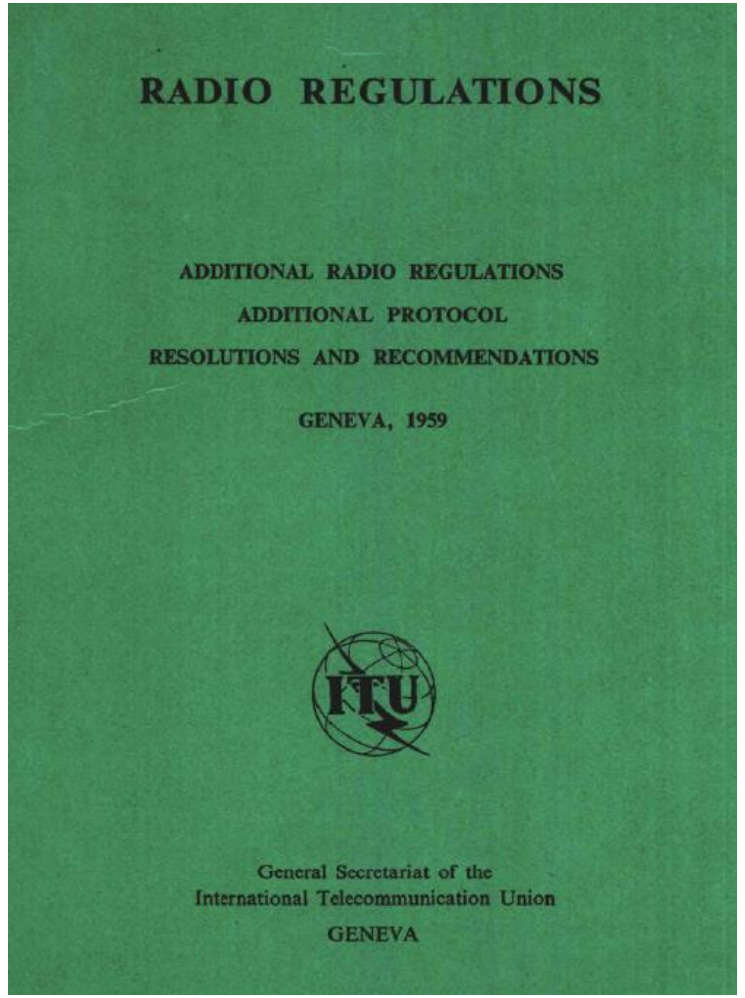
Radio Astronomy «Service» (RAS)

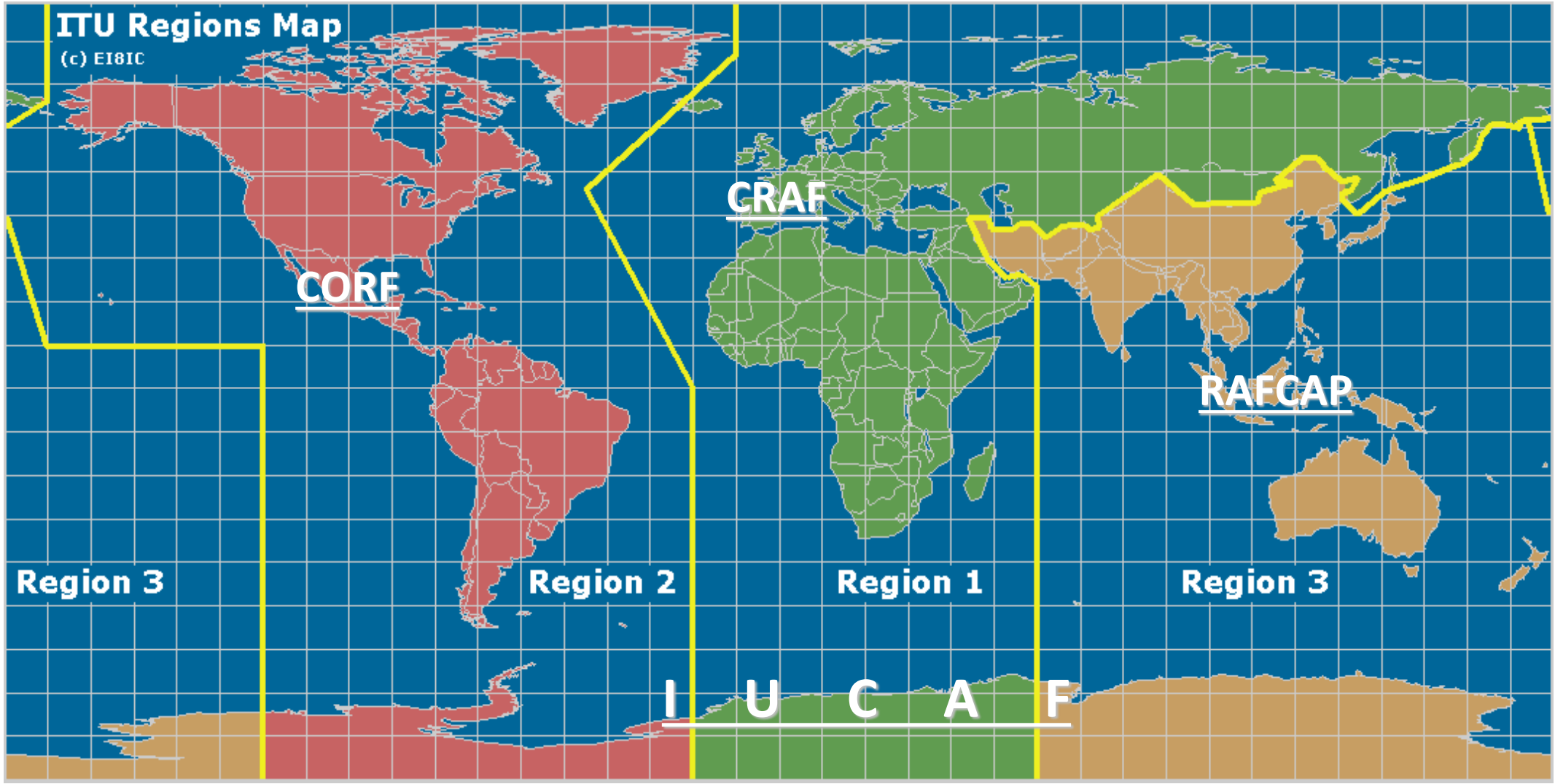
- Radio Astronomy recognized as (passive) *radiocommunication service* in 1959 creating legal basis to seek protection from interference

- Series of frequency bands allocated to RAS. Some bands provide exclusive allocation (“all emissions prohibited”), some do not.

- RAS interests have to be continuously protected as new or higher frequency applications become available



Radio Astronomy represented by regional committees



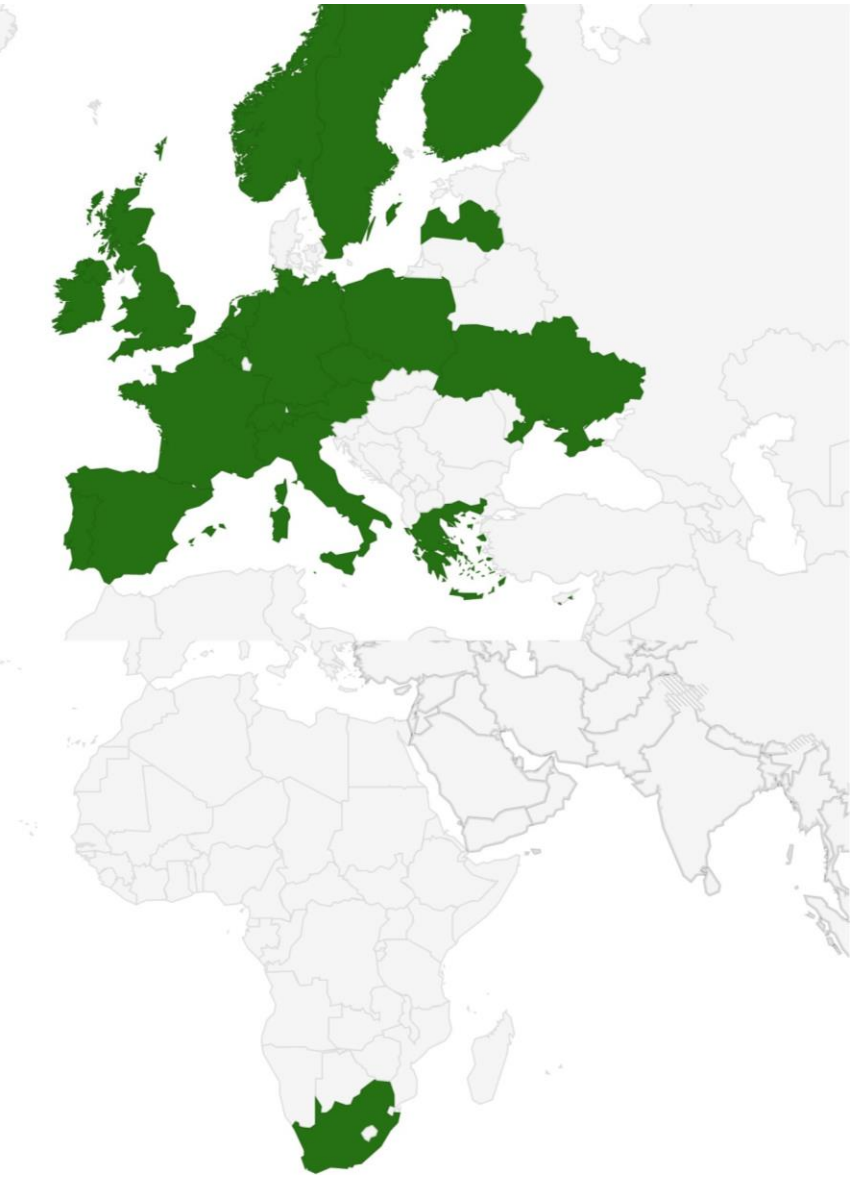
What is CRAF?

- Committee on radio astronomy frequencies is an expert committee of the European Science Foundation established in 1988

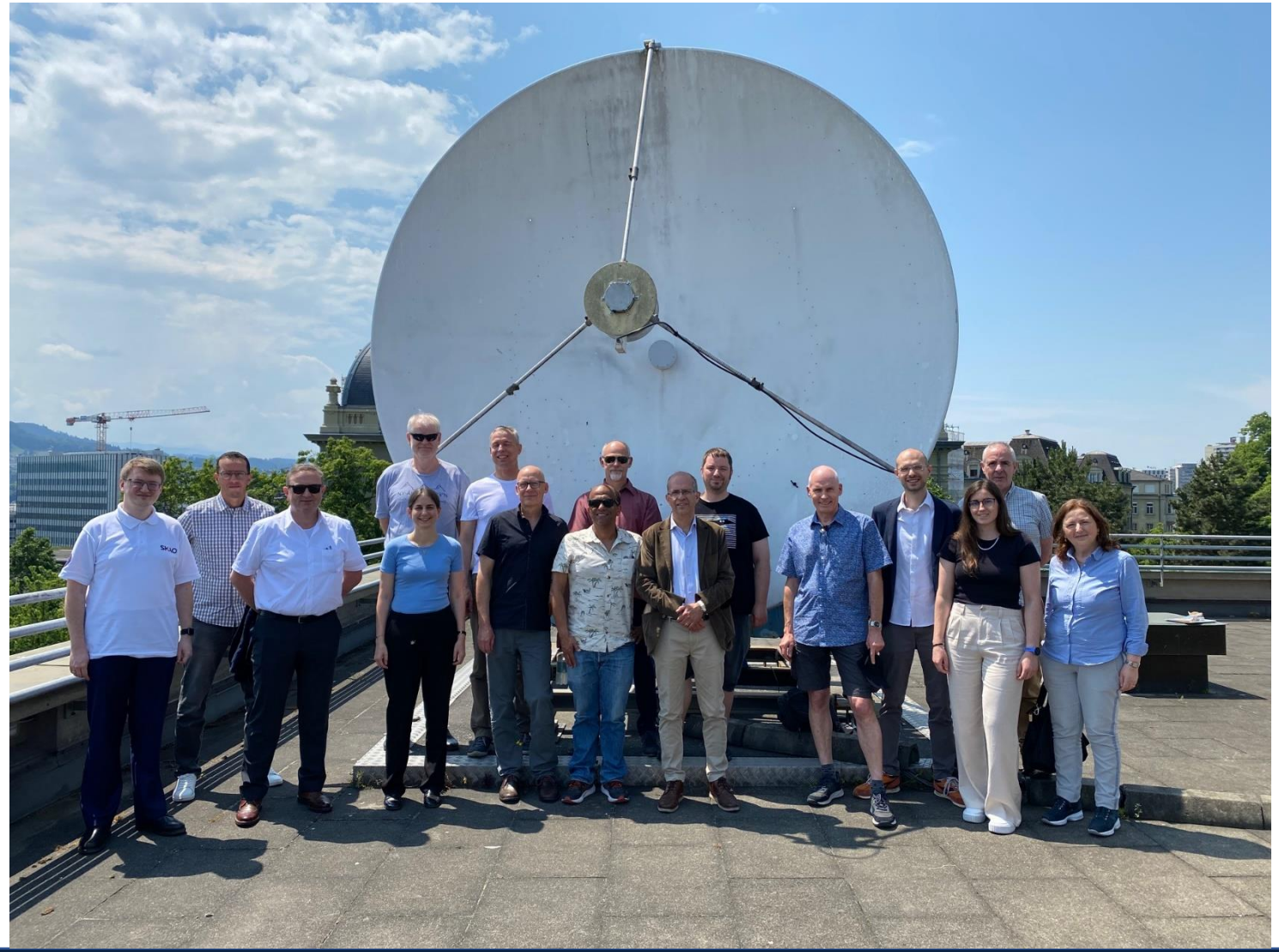
- 23 member countries and several international organizations with observer status - including SKAO!

- More information: www.craf.eu

CRAF – COMMITTEE ON RADIO ASTRONOMY FREQUENCIES



Who are we?



Swiss Representation

Swiss Commission for Astronomy (SCFA) of Swiss Academy of Sciences (SCNAT)

Axel Murk
Institute for Applied Physics
University of Bern

Susanne Wampfler
Center for Space and Habitability
University of Bern

Why should I care?

- Protecting existing or future **Swiss observatories** (Bleien, student telescopes)

- Relevance for the **facilities you are using even outside of Switzerland**:
  Need support of national administrations for radio astronomy concerns and requests – changes are typically consensus-based

- If you are a millimeter astronomer: **(sub-)millimeter regime is next!**
  (IEEE: “Frequencies from 100 GHz to 3 THz are promising bands for the next generation of wireless communication systems because of the wide swaths of unused and unexplored spectrum.“)

- Number of satellites rapidly increasing – **radio quiet zones no longer offer same level of protection**

What do we do?

- Monitor for topics with potential impact on radio astronomy (deadlines!)
- Carry out studies and prepare contributions in work item teams:
  - Spectrum Engineering
  - Geodetic VLBI (VGOS)
  - Space weather
  - RFI monitoring
  - IMT (Mobile)
  - Satellite topics
  - Public Outreach
- Exchange with national administrations, decision makers, partners (like SKAO), radio astronomy community

A few recent activities

- Satellite “megaconstellations” likely affect astronomy (optical and radio) in an unprecedented way
  → CRAF prepared and submitted request to BAKOM for measurements of satellite constellation emission jointly with SKAO & SKACH

- Study of how interference from car radars affects observatories like the IRAM 30m, Yebes 40m, NOEMA, and Onsala 20m

- Preparing positions for WRC-23 and explaining them to national administrations

Newsletter

Annual Newsletter

Subscribe or download on the website:

https://www.craf.eu/newsletter/

Handbook

We also offer a “Handbook for Radio Astronomy” (currently being updated, 2005 version on web)

Challenges

- Very limited resources – only one full time employee (frequency manager) versus companies with entire departments lobbying for their interests

- Awareness among astronomical community

- Astronomical antennae are not built for monitoring (e.g. tracking of satellites) and monitoring takes time away from science observations

Conclusions

- Spectrum use for radio astronomy is constantly being challenged and needs to be defended
- Partnering among entities working on protection of frequencies for radio astronomy (e.g. CPS, SKAO, CRAF) is key as we are all working with very limited resources compared to other radiocommunication services
- Satellite megaconstellations are changing the game – radio quiet zones are no longer sufficient for protecting an observatory