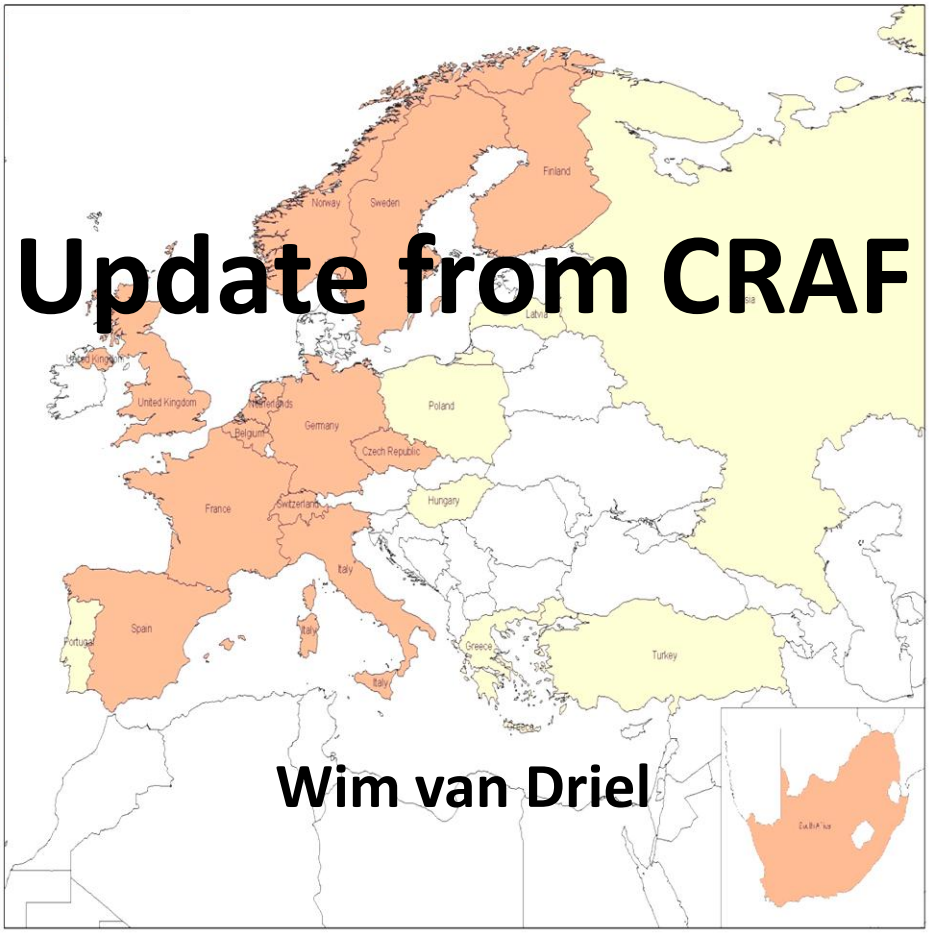
EUROPEAN SCIENCE FOUNDATION
SETTING SCIENCE AGENDAS FOR EUROPE

CRAF
Committee on Radio Astronomy Frequencies

RadioNet

SEVENTH FRAMEWORK PROGRAMME

Update from CRAF



Wim van Driel

CORF meeting, Amherst, 17 Oct. 2014

Introduction

- **C**ommittee on **R**adio **A**stronomy **F**requencies
- Expert committee of European Science Foundation (ESF) ⇒ change before end 2015
- Chairman: Hans van der Marel (ASTRON, NL)
- Frequency manager: Talayeh Hezareh

(funded by contributions of member institutes)

One of our founding fathers, Hans Kahlmann, passed away recently.

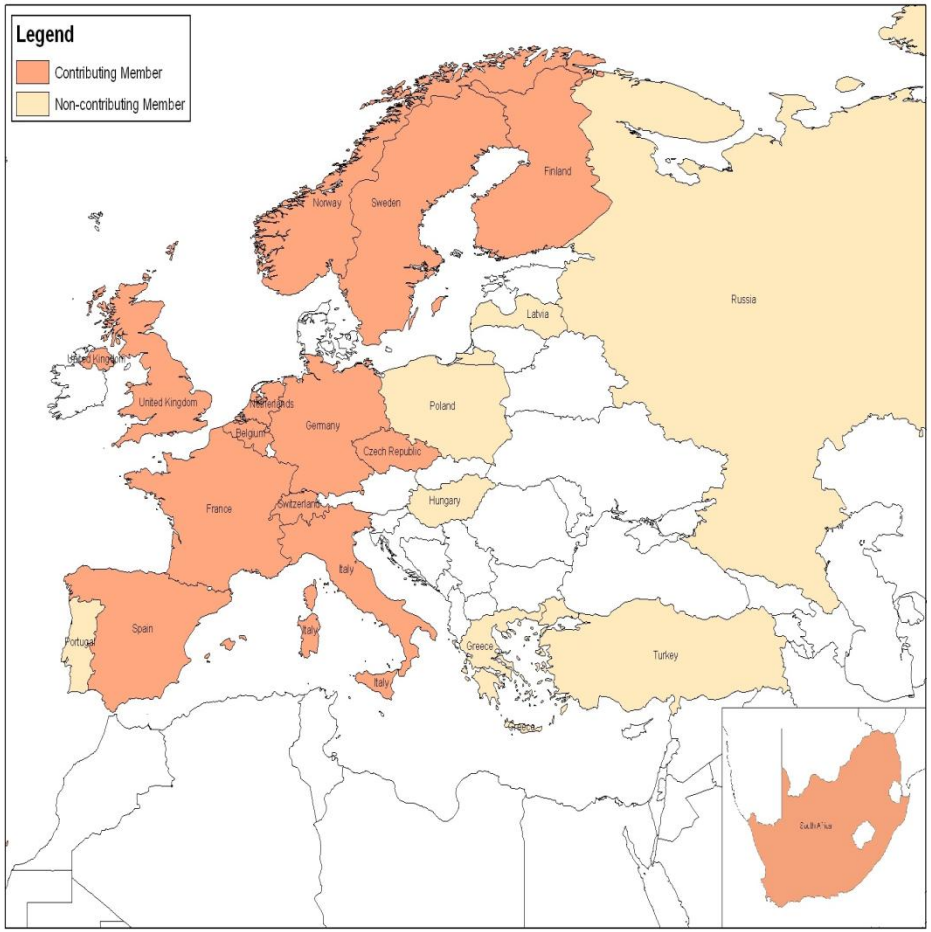
CRAF
Committee on Radio Astronomy Frequencies

CRAF Mission

1. to **keep** the frequency bands used for radio astronomical observations free from interference;
2. to **argue** the scientific needs of the European research community for continued access to and availability of the radio spectrum for radio astronomy; and
3. to **support** related science communities in their needs concerning interference-free radio frequency bands for passive use.

CRAF
Committee on Radio Astronomy Frequencies

CRAF member organisations



20 member countries (incl. Russia, Ukraine, Turkey and South Africa)

50 observatories and institutes, including

- European Space Agency (ESA)
- European Incoherent Scatter Scientific Association (EISCAT)
- Institut de Radio Astronomie Millimétrique (IRAM)
- International VLBI Service for Geodesy and Astrometry (IVS)

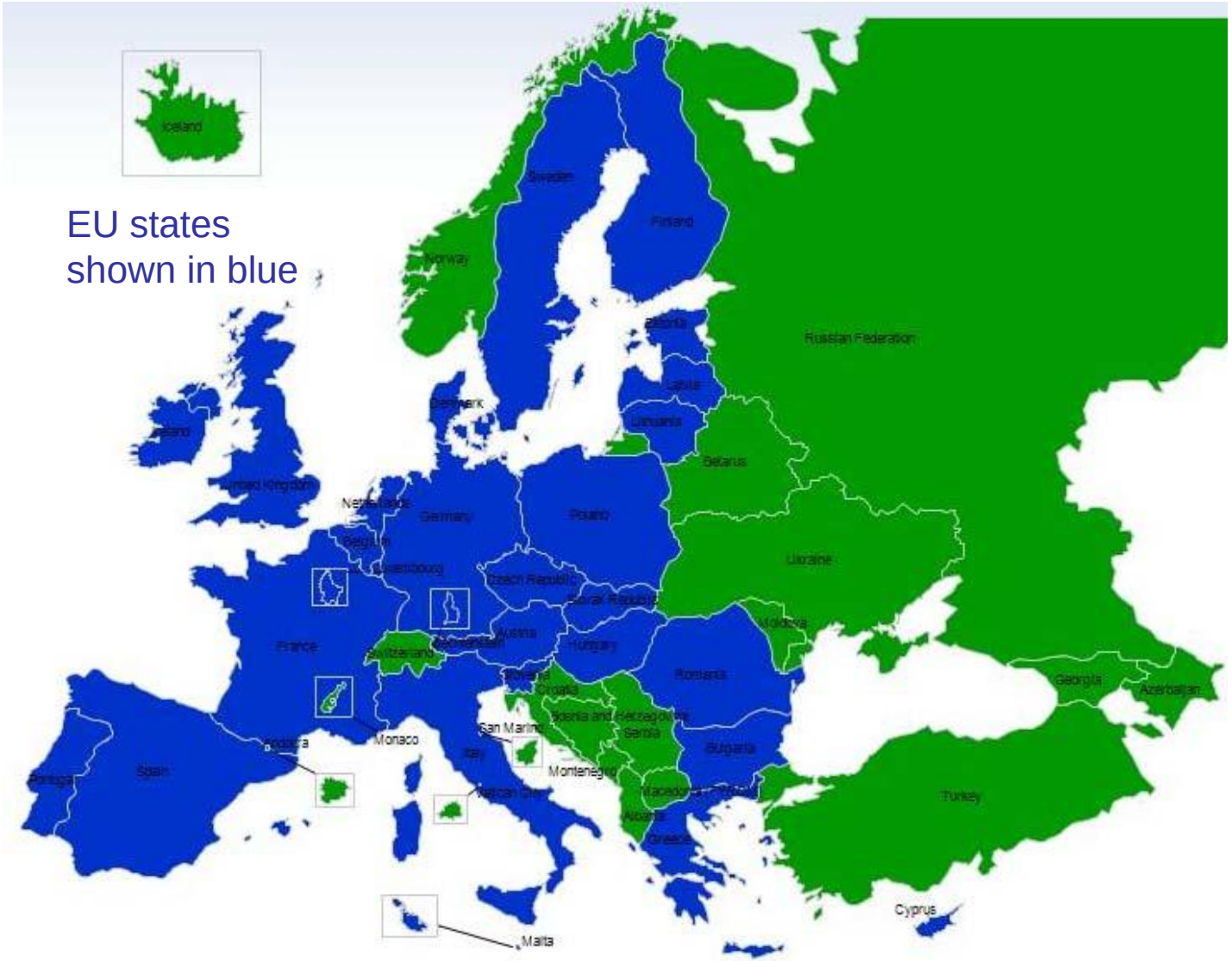
CRAF
Committee on Radio Astronomy Frequencies

Regulatory environment in Europe

- **CEPT/ECC:**
  - Frequency allocations/conditions of use
  - ECC Decisions (non mandatory, but binding for those members implementing the decision)
  - ECC Recommendations, ECC Reports, CEPT Reports
- **European Union (EU) / European Commission (EC):**
  - Regulations on market & competition
  - General radio spectrum policy (trading, etc.)
  - EC Decisions (mandatory)
- **ETSI:**
  - Harmonised standards (conformity, interoperability)

Committee on Radio Astronomy Frequencies

“You Europeans”



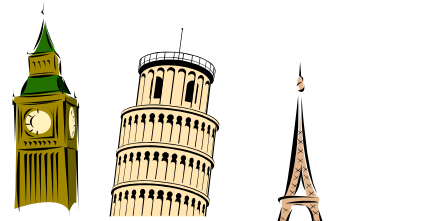
EU states shown in blue

48 CEPT countries

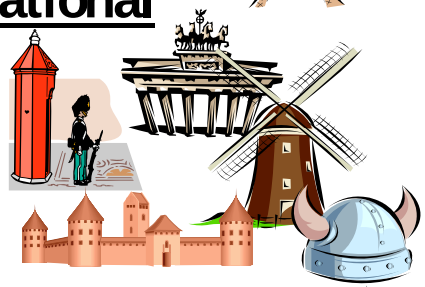
28 EU countries

CRAF
Committee on Radio Astronomy Frequencies

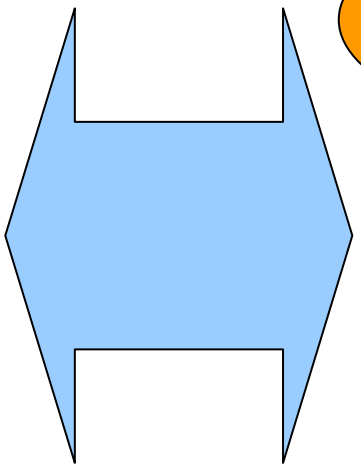
European Spectrum Management



National



Administrations



CEPT
Conference of European Post & Telecom Administrations

ECO

MoUs

EU EC
European Union
27 countries

ETSI
Governmental & industry members

Lobby

Studies, consultations

Direct input

Lobby, consultations

Manufacturers/ operators/ organisations

CRAF
Committee on Radio Astronomy Frequencies

CEPT: European Conference of Postal and Telecommunications Administrations

- **ECC** Electronic Communications Committee: telecommunications harmonisation, and European co-ordination and preparation for ITU-R meetings

  - WG Frequency Management (WG FM)
  - WG Spectrum Engineering (WG SE)
  - Conference Preparatory Group (CPG)

CEPT-ECC Project Teams

WG FM Project Teams:

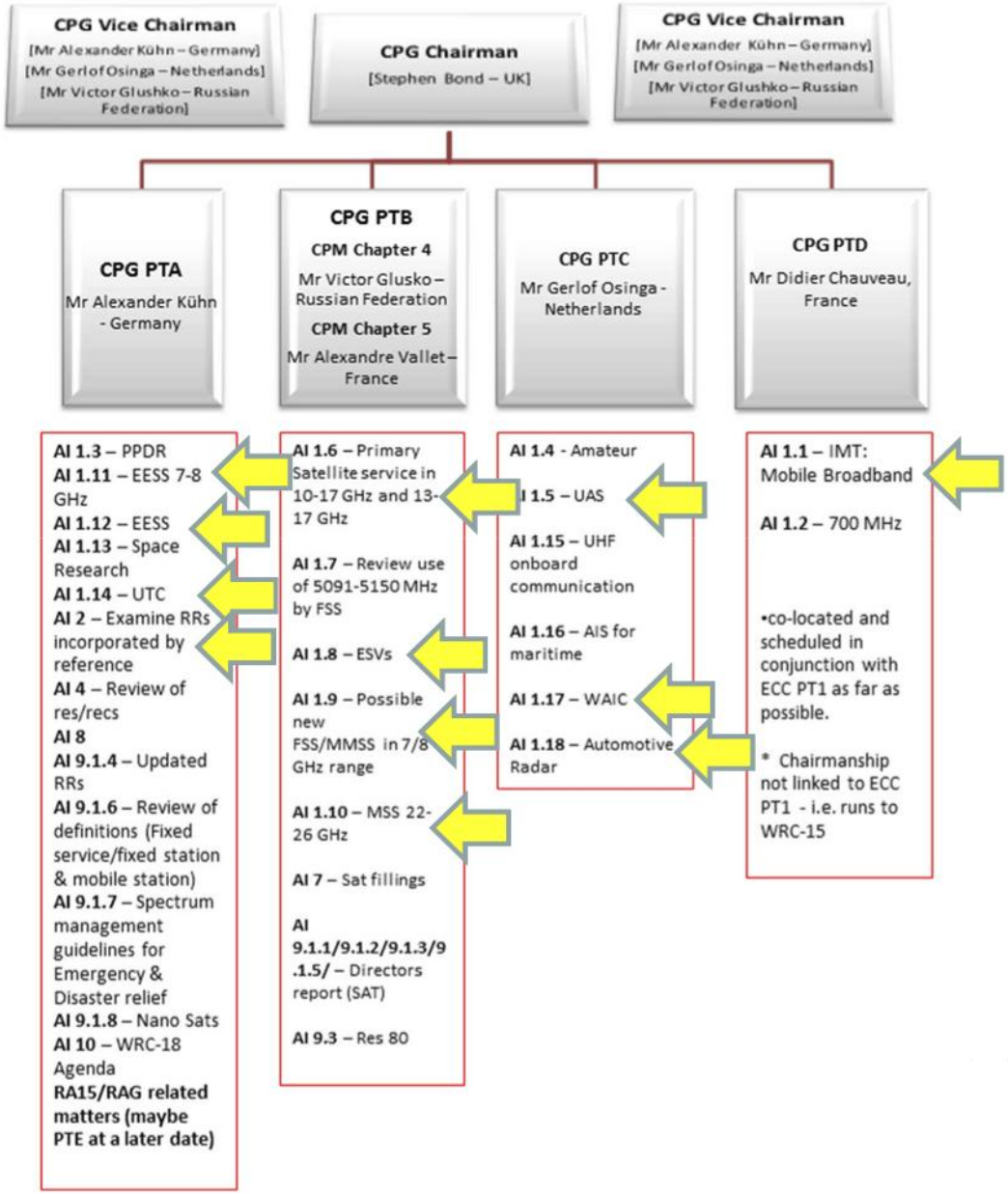
- FM44: Satellite Communications [IRIDIUM]

WG SE Project Teams:

- SE21: Unwanted Emissions
- SE24: Short Range Devices

CRAF
Committee on Radio Astronomy Frequencies

CEPT-ECC WRC-15 Conference Preparatory Group



European Union / European Commission

The Digital Agenda is the EU's strategy to help digital technologies, including the internet, to deliver sustainable economic growth.

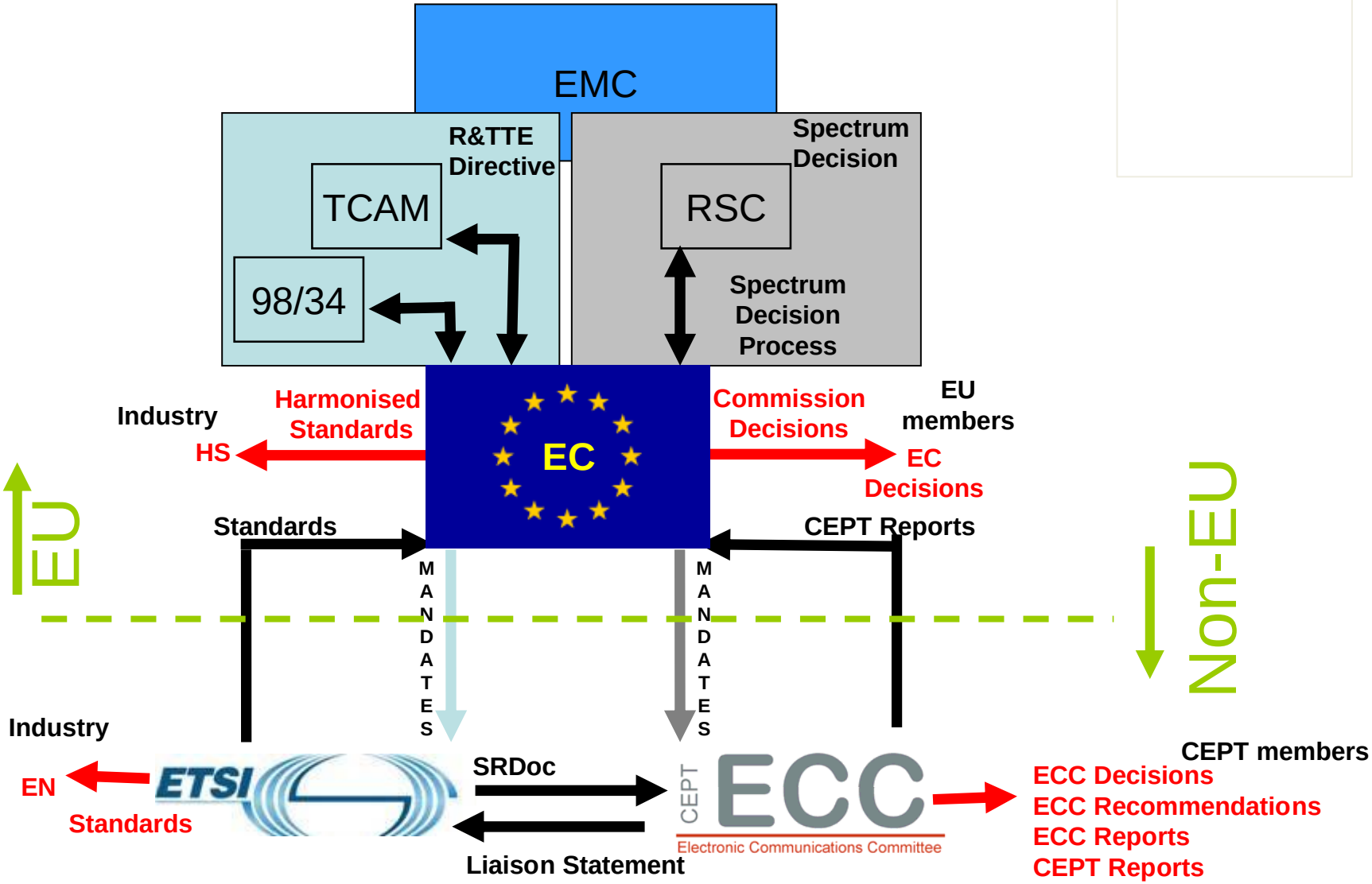
Managed by the European Commission Directorate General for Communications Networks, Content & Technology (DG-Connect).

➜ Radio Spectrum Policy Program **(pushing IMT)**

CRAF
Committee on Radio Astronomy Frequencies

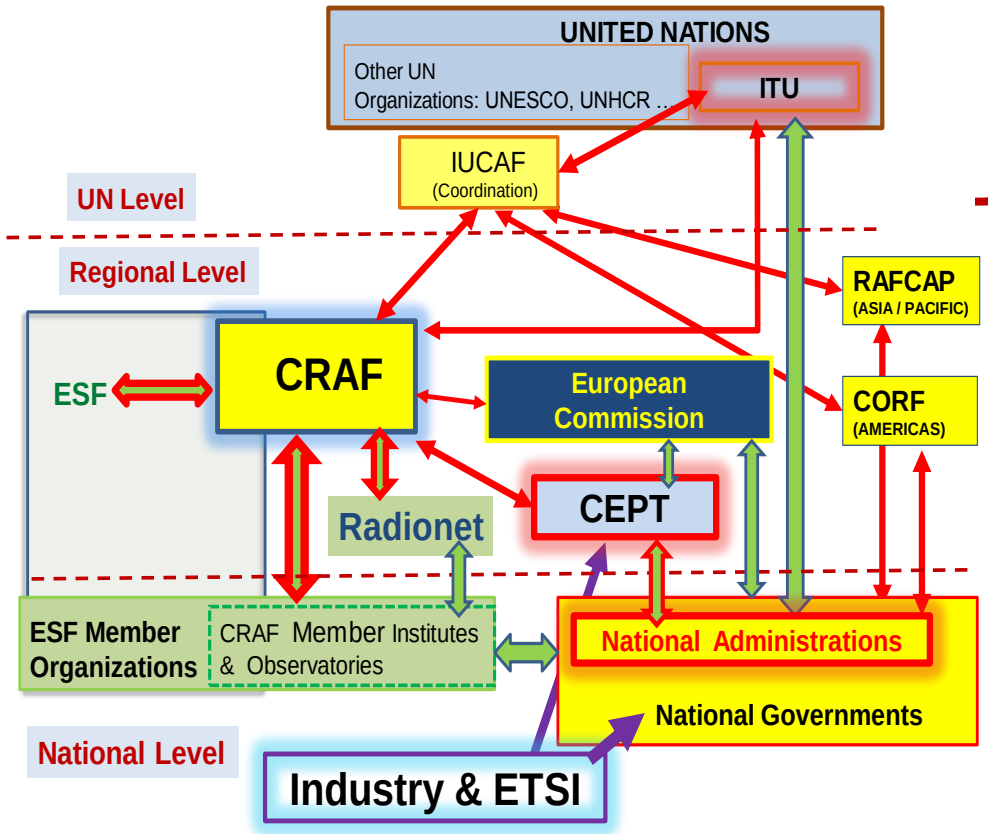
RSPG

- Radio Spectrum Policy Group (2002):
  - High-level advisory group that assists the EC in the development of radio spectrum policy
  - Can also be requested by European Parliament and/or Council for opinions or reports
  - Members: Senior representatives of Member states and the official representative of the EC



CRAF
Committee on Radio Astronomy Frequencies

CRAF's position in Spectrumland



Global: CRAF is a member of the Radiocommunication Sector of the **ITU**

Europe: CRAF has observer status in **CEPT** and participates in **ECC** meetings

National CRAF members are consulted by their **administrations**

CRAF
Committee on Radio Astronomy Frequencies

CRAF Publications

- CRAF newsletter (1-2 x year)
- Input documents to CEPT and ITU
  - Important to get support from administrations
- Views on EU public consultations
- Position document on WRC AIs
  - Input document to CPG
  - Members input it to national CPM process
- CRAF handbook for radio astronomy http://www.craf.eu/CRAFhandbook3.pdf
- CRAF website: http://www.craf.eu/

CRAF
Committee on Radio Astronomy Frequencies

WRC-15 Items of interest to CRAF (13!)

Approx. Frequency	Issue	Agenda Item
Various bands 470 – 6500 MHz	International Mobile Telecommunications	1.1 & 1.2
Various bands 2.7 – 15.7 GHz	WAIC	1.17
7-8 GHz	EESS uplinks	1.11
8.4 GHz	FSS and MMSS links	1.9
8.4 GHz & 10.6 GHz	High power EESS space-earth	1.12
10 -17 GHz	FSS	1.6
Bands around 14.5 GHz	ESV	1.8
Bands around 14.5 GHz **(?)**	UAS control links	1.5
22 – 26 GHz	MSS	1.10
77 GHz	Automotive SRR	1.18
	Modification of UTC	1.14
	ITU-R REC RA.769-2 included in referenced list of Recommendations	2

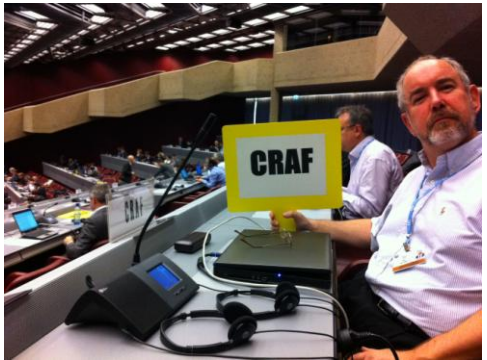
CRAF
Committee on Radio Astronomy Frequencies

WRC-15 AI 1.1

Identification of a total bandwidth of 800 MHz in the frequency range 410 MHz - 6 GHz for International Mobile Telecommunications (IMT), for the development of terrestrial mobile broadband applications

ITU-R JTG 4-5-6-7: CRAF played leading role for RAS

New Report ITU-R RA.[RAS-IMT]
on RAS-IMT compatibility in case of in-band sharing and adjacent band unwanted emissions



WRC-15 AI 1.1

New Report ITU-R RA.[RAS-IMT]:

In-band sharing not possible, separation distances for Base Stations around radio telescopes of 500+ km

Compatibility in adjacent bands looks feasible, *provided* sufficiently low limits are imposed on unwanted emissions (like those needed for the protection of the EESS(passive) at 1400-1427 MHz)

CRAF
Committee on Radio Astronomy Frequencies

WRC-15 AI 1.1

CRAF most strongly opposes allocations in (parts of) bands used by the RAS, i.e., 608-614 MHz, 1330-1400 MHz, 4800-4950 MHz and 4950-4990 MHz.

CRAF opposes allocations immediately adjacent to the passive bands at 1400-1427 MHz and 2690-2700 MHz.

CRAF also opposes proposed allocations adjacent to passive service bands (608-614 MHz and 4800-4990 MHz).

CRAF
Committee on Radio Astronomy Frequencies

WRC-15 AI 1.18

Allocation to the radiolocation service for car radars in the band 77.5-78.0 GHz

RAS has a secondary allocation in the band, covered by RR Footnote 5.149 (administrations are urged to take all practicable steps to protect the RAS from harmful interference)

Studies show need for 30 km radius exclusion zones
New danger: also consider low-altitude airborne radars – helicopters need 100 km exclusion zones; detailed new ECC report

CRAF
Committee on Radio Astronomy Frequencies

IRIDIUM

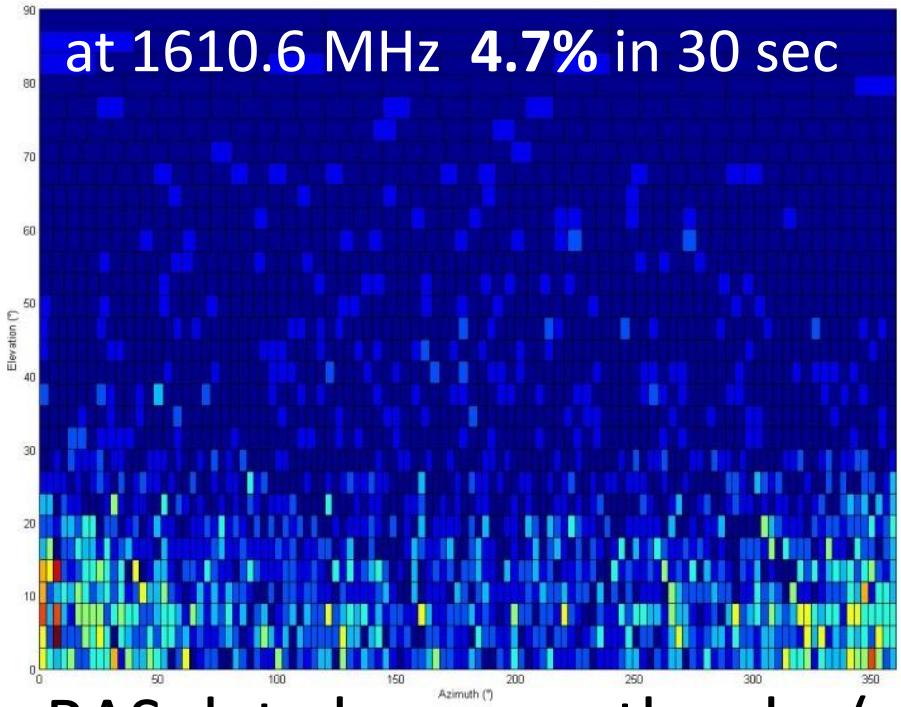
- "Big LEO" satellite system,
  66 satellites at ~780 km altitude
- Operated by Iridium LLC
- Licensed by FCC in 1995; in operation since 1998
- causing detrimental interference in primary RAS band 1610.6-1613.8 MHz, from a secondary allocation in adjacent band 1613.8-1626.5 MHz
- ESF-IRIDIUM Framework Agreement (1998): as of 2006, European RAS is to be protected at Rec RA.769 level
- Upgrade to Iridium NEXT from 2015

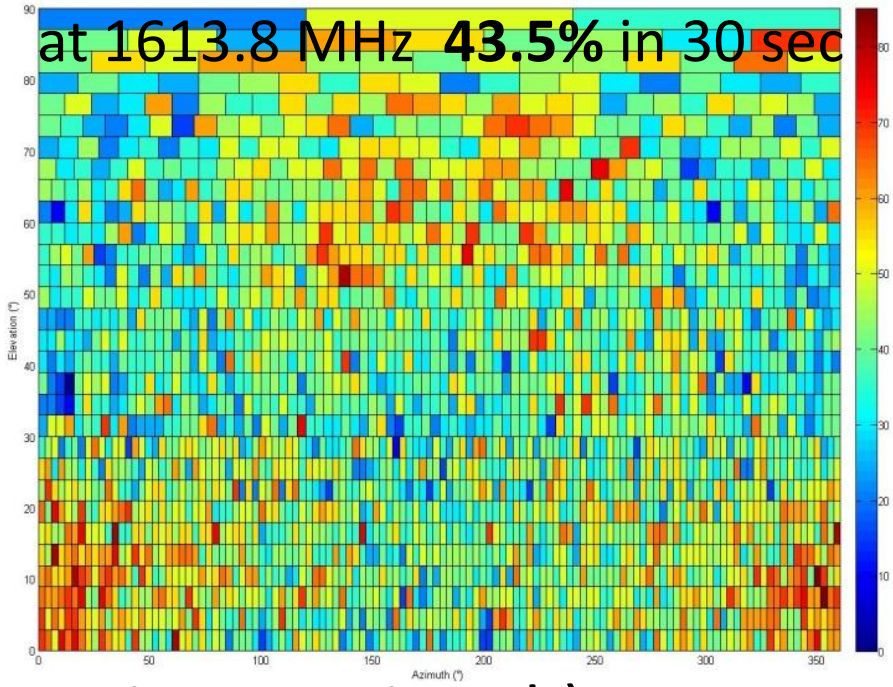
CRAF
Committee on Radio Astronomy Frequencies

Monitoring of IRIDIUM RFI

Leeheim satellite tracking station in Germany

12m dish with FFT spectrometer from MPIfR (Bonn)





RAS data loss over the sky (elevation vs azimuth)

CRAF
Committee on Radio Astronomy Frequencies

ECC Decision on IRIDIUM RFI

- Three ECC Reports, based on Leeheim monitoring, irrefutably show that:

  IRIDIUM RFI is well above ITU-R Rec RA.769 levels, causes data loss well above the 2% maximum level

- Updated ECC/DEC(09)02 adopted in November 2012 requires new generation of satellites to meet ITU-R Rec RA.769 interference limit by 1 January 2016

CRAF
Committee on Radio Astronomy Frequencies

IRIDIUM NEXT discussions in Europe

- IRIDIUM NEXT satellites can operate in an RAS Protection (RASP) mode, which would meet the Rec 769 criteria
- RASP mode has a reduced bandwidth, which is not sufficient for peak-hour traffic

- CRAF was offered part-time RASP operations, with lead times of 1-3 days

CRAF
Committee on Radio Astronomy Frequencies

IRIDIUM NEXT discussions in Europe

Discussion between CRAF and IRIDIUM on possible technical solutions for RFI-free RAS observations with NEXT operations

Reports to CEPT: first to PT FM 44, then WG FM

IRIDIUM has not yet offered a solution acceptable to CRAF…

CRAF
Committee on Radio Astronomy Frequencies

Thank you very much!

Baie dankie! Большое спасибо! Çok teşekkür ederim!
Dank u wel! Dziękuję bardzo! Grazie mille! Liels paldies!
Kiitos paljon! Köszönöm szépen! Merci beaucoup! Moc děkuji!
¡Muchas gracias! Muito obrigado! Σας ευχαριστώ πολύ!
Tack så mycket! Tusen takk! Велике спасибі! Vielen dank!

Questions?

CRAF
Committee on Radio Astronomy Frequencies