6G spectrum – The path to effective regulation in Europe

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The Great 6G Spectrum Debate
EUCNC & 6G Summit
Antwerp - Belgium, 3-6 June 2024

European Conference of Postal and Telecommunications Administrations
– 46 European countries cooperating to regulate posts, radio spectrum and communications networks

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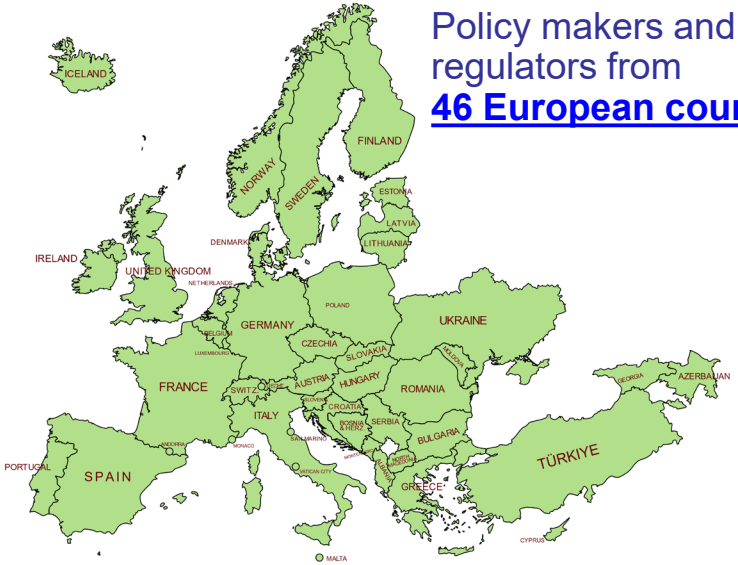
CEPT Introduction



Policy makers and regulators from **46 European countries**

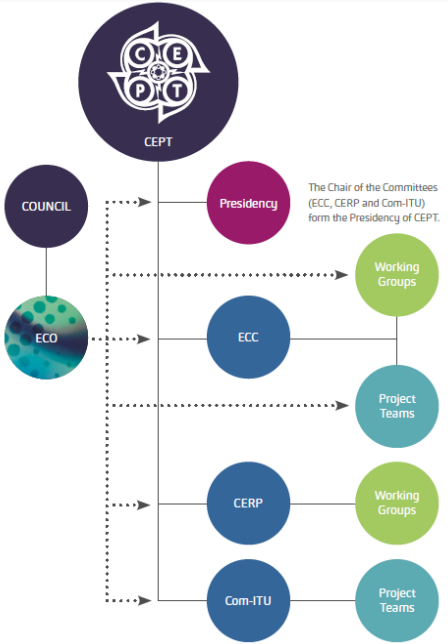
Promote harmonisation of telecommunication, radio spectrum and postal regulations

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

Com-ITU: Committee for ITU Policy – European co-ordination for ITU meetings

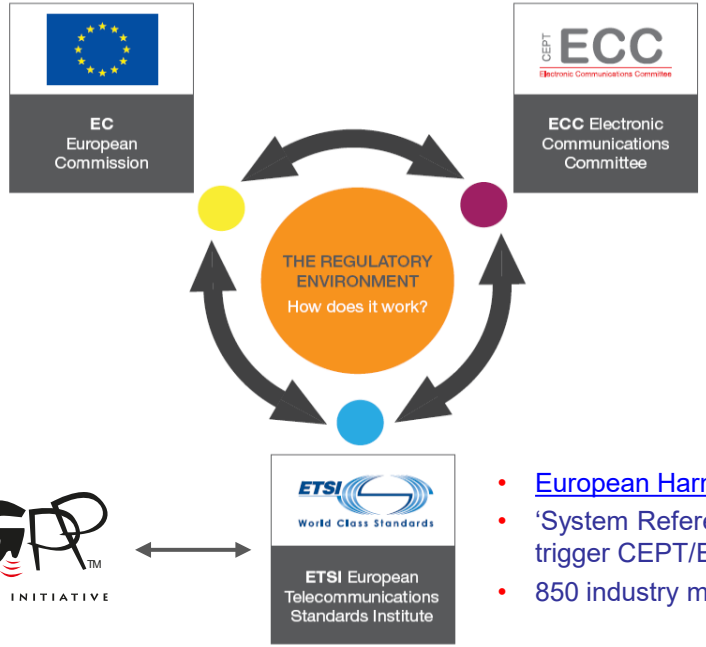
CERP: European Committee for Postal Regulation – postal regulation, as well as European co-ordination and preparation for meetings of the Universal Postal Union (UPU)

ECO: European Communications Office - Permanent office of the CEPT in Copenhagen



European regulatory framework for radio spectrum and equipment

- Single market issues (27 Member States)
- Binding regulations (EC Decisions) based on:
  - the technical expertise of CEPT/ECC (CEPT Reports)
  - ETSI harmonised standards



- Consensus based voluntary harmonisation (ECC Decisions) for 46 member countries
- Spectrum designation to systems/applications and technical conditions for its use

- European Harmonised standards (EN) for radio equipment
- 'System Reference Documents' (SRDoc) which inform and trigger CEPT/ECC work
- 850 industry members and European national regulators

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CEPT ECC
Electronic Communications Committee

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The CEPT preparation to WRC-27

CEPT
CONFERENCE PREPARATORY GROUP

1.9 Aero HF AM(OR)S Appendix 26

Project Team A
SCIENCE

- **1.8** Radiolocation 231.5-275/700 GHz
- **1.15** Lunar allocations
- **1.16** Radio quiet zones/RAS, from NGSO
- **1.17** Receiving space weather allocations
- **1.18** EESS (passive) & RAS above 76 GHz
- **1.19** EESS (passive) SST in 4 & 8 GHz

Project Team B
FIXED & BROADCASTING SATELLITE

- **1.1** ESIMS to GSO/NGSO in 47.2 to 51.4 'V' GHz
- **1.2** Smaller ES antennas in 13.75 – 14 GHz
- **1.3** NGSO gateways FSS E-s in 51.4- 52.4 GHz
- **1.4** FSS s-E in regions across 17.3-17.7/8 GHz
- **1.5** Unauthorised operation, service area
- **1.6** Equitable access in Q and V Bands
- **1.10** 71-76, 81-86 GHz eirp & pfd FSS/FS/MS
- **7** Satellite coordination procedures
- **9.2** Inconsistencies in the RRs via ITU BR Director Report
- **9.3** Check satellite processes are equitable

Project Team C
MOBILE SATELLITE & GENERAL ISSUES

- **1.11** L Band space-to-space links GSO/NGSO for MSS
- **1.12** Low data rate non-geo MSS in L/S Bands
- **1.13** MSS in IMT Bands to complement MS IMT
- **1.14** Additional MSS allocations
- **2** Review of incorporated Recs
- **4** Review of WRC Res/Recs
- **8** Footnotes
- **10** Future Agendas

Project Team 1
IMT MATTERS

- **1.7** IMT 4.4, 7, 8 & 15 GHz
- **1.13** MSS in IMT Bands to complement MS IMT *

*Studies for the protection of IMT terrestrial component from satellite component

Inaugural meeting CPG27-1 held in Copenhagen on 23-24 May 2024

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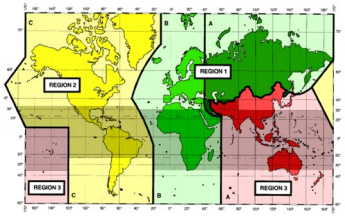
Mobile – Spectrum for 5G and 6G

WRC-23 → WRC-27

- **6425-7125** MHz identified for IMT to enable 5G and future 6G. The use of the band for Wi-Fi is recognised
- Mobile bands below 3 GHz for "high altitude platforms operating as IMT base stations" (**HIBS**)
- **470-960 MHz** (UHF band) reviewed, with a new secondary mobile allocation created in 470-694 MHz encompassing most CEPT countries. Possible further actions in the wider UHF at WRC-31
- Upgrade of allocation in **3.6-3.8 GHz**.
- Additional IMT identifications in some countries and regions outside Europe in 3.3-3.4 GHz, 3.6-3.8 GHz and 10-10.5 GHz

4 YEARS OF GLOBAL PREPARATION



Possible new IMT identifications for 5G and 6G in the bands (or parts thereof):

- **4400-4800 MHz** in Region 1 and 3
- **7125-7250 and 7750-8400 MHz** in Region 1;
- 7125-8400 MHz in Region 2 and 3;
- **14.8-15.35 GHz**

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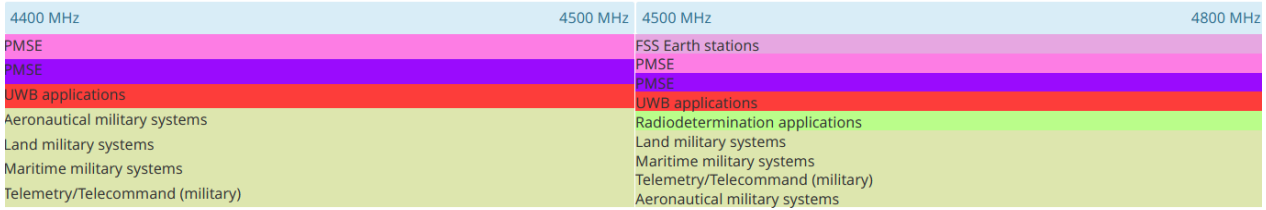
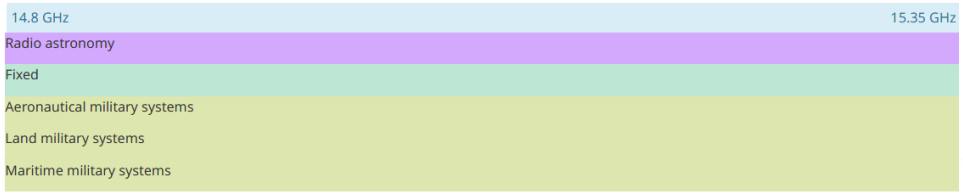
IMT 4.4, 7, 8 & 15 GHz - European Common Allocations (1/2)

4400 – 4800 MHz



14.8 – 15.35 GHz



The **European Table of Frequency Allocations and Applications (ECA Table)** provides the main usage of spectrum within CEPT countries for the frequency range from 8.3 kHz to 3000 GHz https://efis.cept.org/sitecontent.jsp?sitecontent=ecatable

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IMT 4.4, 7, 8 & 15 GHz - European Common Allocations (2/2)

7125-7250 MHz ….

7075 MHz – 7145 MHz	7145 MHz – 7190 MHz	7190 MHz – 7235 MHz	7235 MHz – 7250 MHz
Passive sensors (satellite)	Fixed	Fixed	Passive sensors (satellite)
Fixed	UWB applications	Passive sensors (satellite)	Fixed
Radiodetermination applications	Radiodetermination applications	UWB applications	UWB applications
UWB applications	PMSE	Radiodetermination applications	Radiodetermination applications
PMSE	PMSE	PMSE	PMSE
PMSE		PMSE	PMSE

…. and 7750-8400 MHz

7750 MHz – 7900 MHz	7900 MHz – 8025 MHz	8025 MHz – 8175 MHz	8175 MHz – 8215 MHz	8215 MHz – 8400 MHz
Fixed	Fixed	Earth exploration-satellite	Earth exploration-satellite	Earth exploration-satellite
Weather satellites	MSS Earth stations	Fixed	Fixed	Fixed
UWB applications	UWB applications	Land mobile	Land mobile	Radio astronomy
Radiodetermination applications	Radiodetermination applications	UWB applications	UWB applications	UWB applications
PMSE	Land military systems	Radiodetermination applications	Radiodetermination applications	Radiodetermination applications
PMSE	Satellite systems (military)	Satellite systems (military)	Land military systems	Land military systems
	PMSE	Land military systems	Satellite systems (military)	Satellite systems (military)
	PMSE	PMSE	PMSE	PMSE
		PMSE	PMSE	PMSE

Direct to Device/Cell

In bands allocated to the mobile-satellite service MSS

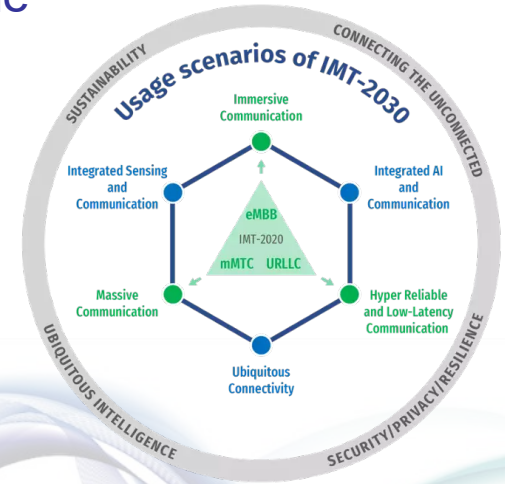
- Satellite connectivity ready to be provided in the bands already allocated to the Mobile-Satellite Service
- 3GPP has specified NTN bands in Release 17:
  - n255 (1626.5-1660.5 (Earth-to-space) / 1525-1559 MHz (space-to-Earth)
  - n256 (1980-2010 (Earth-to-space) / 2170-2200 MHz (space-to-Earth)
  - Others under study for Release 18 and beyond
- WRC-27 will discuss possible new allocations of additional to MSS in the frequency bands:
  - **2010-2025 MHz** (Earth-to-space) and **2160-2170** MHz (space-to-Earth) in Regions 1 and 3
  - **2120-2160 MHz** (space-to-Earth) in all Regions

In bands allocated to the mobile service MS

- Direct connectivity between space stations and IMT user equipment **is not currently internationally recognised/protected** in bands allocated to MS
- WRC-27 will discuss possible new allocations to MSS in 694/698 MHz and 2.7 GHz, taking into account Recommendation ITU-R M.1036
- Challenges:
  - **Interference issues**
  - **Cross-border issues**
  - **Specific Regional/National circumstances**

ECC activites – Development of CEPT 6G roadmap

- ECC is defining the **CEPT Roadmap for 6G**
- The CEPT Roadmap is expected to be approved in November
- Several main tasks are under discussion and the actions for those tasks are being defined:
  - Harmonisation
  - WRC-23
  - WRC-27
  - Other challenges



ECC – harmonization of the 6 GHz band

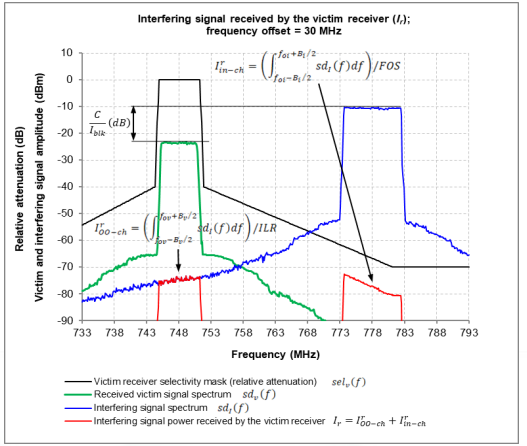
- Studies on possible technical conditions under which WAS/RLAN could operate and coexist with existing services in the 6425-7125 MHz band.
  - technical and operational characteristics WAS/RLAN in the band
  - sharing and compatibility issues with incumbent users
- Feasibility and sharing studies on the potential shared use of the 6425-7125 MHz frequency band between Mobile/Fixed Communication Networks and WAS/RLAN.
- No regulatory measure under consideration so far.
- A Mandate to CEPT from the European Commission is expected end of June.

ECC ongoing on Direct-to-Cell

- Exploring the regulatory and technical elements of satellite based Direct-to-Cell (D2C) communications via existing available smartphones
- Understanding of direct-to-cell satellite connectivity and explore relevant regulatory and national licencing issues.
  Cellular devices are unmodified smartphones
  (including 3GPP NTN in MSS bands and/or connectivity in MFCN bands).
- Focus on satellite-to-cellular device systems operating in frequency bands without satellite allocations (i.e. MFCN bands).
- Work expected to be concluded in February 2025.

ECC coexistence activities – improving receiver resilience

- ECC has been working on initiatives to characterise and improve receiver resilience, to 'future-proof' the coexistence environment and improve spectrum efficiency for **all users**
- ECC Report 310 in 2020 studied the issue:
  - measurements of common systems showing a wide range of receiver performance
  - identification of the key parameters affecting coexistence
- ECC Recommendation (24)01 and ECC Report 356, published in May, establish a new framework:
  - generic method for determining receiver resilience level
  - recommended levels for coexistence studies **and** incorporation in ETSI standards



The big picture

Key challenges for spectrum management

- Increasing shared and dynamic use of spectrum
- Sustainability of future telco
- Ensuring equal opportunities
- Cross domain technology trends
- Multi player cooperation

ECO's engagement with academia and research

- ECO is engaging in initiatives to improve links with the academic and research community
- Mutual benefit for all parties:
  - Promotion of the importance of regulation at all stages of the process - from inception of new technology to deployment
  - Input from research to inform direction of ECC's work
  - Promotion of SEAMCAT tool, and contributions from academia for future development
- Specific initiatives:
  - Collaboration with EC Joint Research Centre (JRC) to organise workshops at academic Conferences (EuCAP, EuCNC) – this session and others at EuCNC
  - Presentation of papers at Conferences
  - Presentation in EurAAP European School of Antennas (ESoA) courses
  - Keynotes at upcoming COST INTERACT meeting
  - Engagement with universities

EuCAP 2023

EUCNC | 6G Summit
Antwerp, Belgium ▪ 3-6 June 2024

cost
EUROPEAN COOPERATION
IN SCIENCE & TECHNOLOGY

Conclusions

- Effective spectrum regulation to enable new innovative applications is a collaborative, international effort, both at a European level and globally
- Technical coexistence studies are a crucial element in identifying new spectrum bands – these need to be based on sensible real-world parameters and modelling approaches
- ECC welcomes further engagement with the academia and research community