Future Network : Broadband-PPDR Spectrum needs and solutions

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Riding the (RADIO)waves of change

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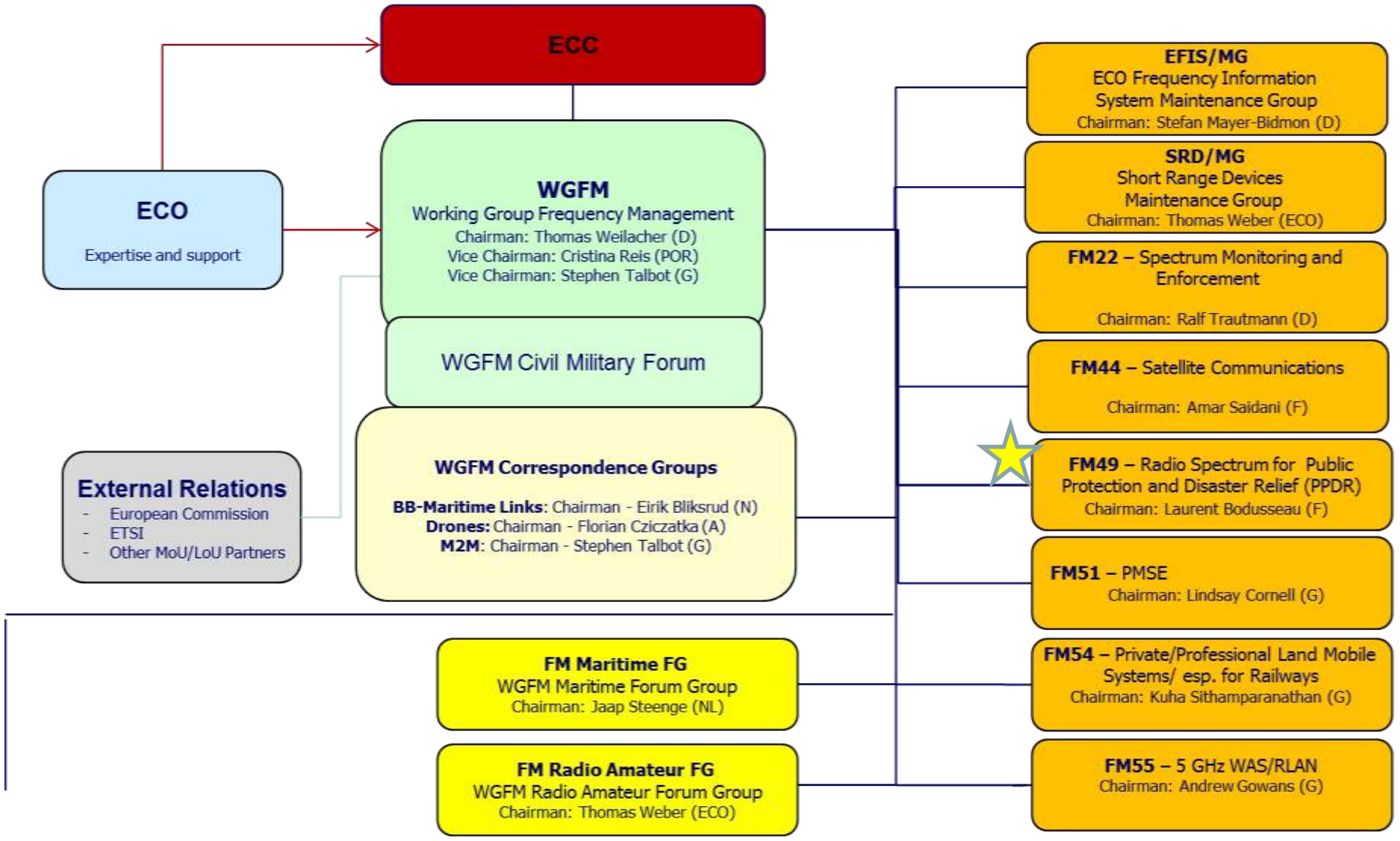
WGFM Organisation



Support from ECO, the permanent office established in Copenhagen

European Process of standardisation and regulation for radiocommunication devices and systems, inter-alia co-operation between CEPT and ETSI or work under mandates from the EC.

Updated: May 2015

FM49 was created in 2011

The approach

- Definition of use cases and deployment scenarios
- Identification of spectrum ranges to be studied (400 and 700MHz) and amount of frequencies necessary
- Identification of applications within and in adjacent bands (PMR, DTT, MFCN , radars …)
- Compatibility and feasibility studies
- Produce the regulatory framework including technical conditions to ensure a safe use of the band by BB-PPDR
- Inform ETSI and 3GPP about the regulation for the standardisation work

All documents are available : http://www.erodocdb.dk/default.aspx

Technical / Regulatory Documents

Needs (2013)

- User requirements and spectrum needs for future European broadband PPDR systems (Wide Area Networks) ECC Report 199

Technical studies (2015)

- Compatibility and sharing studies for BB PPDR systems operating in the 700 MHz range - ECC Report 239
- Compatibility studies regarding Broadband PPDR and other radio applications in 410-430 and 450-470 MHz and adjacent bands - ECC Report 240

Regulatory (2015-2016)

- Harmonised conditions and spectrum bands for the implementation of future European broadband PPDR systems - ECC Report 218
- **Harmonised technical conditions and frequency bands for the implementation of (BB-PPDR) systems** ECC/DEC/(16)02
- Cross-border coordination for Broadband Public Protection and Disaster Relief (BB-PPDR) systems in the frequency band 698 to 791 MHz ECC/REC/(16)03

ECC Report 199 - User requirements and spectrum needs for future European broadband PPDR systems

- Need for interoperability between European PPDR organisations
- Use of common technology improves international cooperation
- Use of LTE for economy of scale
- PPDR *application related requirements* presented in a form of a matrix developed by LEWP/RCEG.
  - location data, multimedia, office applications, download operational information, upload operational information, online data base enquiry…
  - vs throughput p/s per session, number of users, mobility (using while moving)…

ECC REP 199:Spectrum needs for three operational environments:

- day-to-day operations (category “PP1”)

Table 1: Total uplink bandwidth requirement for BB data communications

Frequency band	Traffic assumption	Low estimate	Medium estimate
420 MHz	1 incident “cell edge” 3 incidents near cell centre and background communications	8.0 MHz	12.5 MHz
750 MHz	1 incident “cell edge” 2 incidents near centre and background communications	7.1 MHz	10.7 MHz

Table 2: Total downlink bandwidth requirement for BB data communications

Frequency band	Traffic assumptions	Low estimate	Medium estimate
420 MHz	1 incident “cell edge” 3 incidents near centre with background communications	7.6 MHz	10.5 MHz
750 MHz	1 incident “cell edge” 2 incidents near centre with background communications	6.9 MHz	9.0 MHz

ECC REP 199: PP2 & DR

- **large emergency and/or public events (category “PP2”)**

disasters (category “DR”) –(the spectrum requirements for PP2 cover the early needs of a DR event (this is a simplifying assumption)).

Table 3: Total BB data communications results (royal wedding)

Frequency band	Traffic assumption	Less stringent case	Worst case
Independent of frequency band	PP2 traffic scenario with background communications	10.3 MHz	14.3 MHz

Total BB data communications results for London riots in August 2011 (an unplanned event).

Table 4: Total BB data communications results (London riots)

Frequency band	Traffic assumption	Less stringent case	Worst case
Independent of frequency band	PP2 traffic scenario with background communications	5.8 MHz	7.8 MHz

ECC Report 199: conclusions

- It is considered that **10 MHz of spectrum for the uplink and another 10 MHz for the downlink** provide enough capacity to meet the core requirements of the PP2 scenarios. This may vary on national basis.

- However there could be additional spectrum requirements on a national basis to cater for Direct Mode Operations (DMO), Air-Ground-Air (AGA), ad-hoc networks and critical voice communications over the WAN.

- The frequency ranges selected are 400 MHz and 700MHz

ECC REPORT 218 : TECHNOLOGY ASPECTS

- PPDR should be part of the global LTE ecosystem:
  - more choice of terminals,
  - lower prices,
  - roaming with commercial networks
  - and long term further developments.

- Noting that the work on developing the LTE technology to support the PPDR specific functionalities (Push To Talk, DMO …) has already started in 3GPP.

ECC REPORT 218 : IMPLEMENTATION OPTIONS

- **Dedicated network infrastructure for PPDR**

A specially designed mobile broadband network (either owned by the government or contracted operator) for BB-PPDR to meet the specified requirements (coverage, support of special broadband applications, resilience, security etc.).

- **Commercial network(s) infrastructure**

The governmental authority will buy mobile broadband services from one or several commercial mobile network operators, with or without special requirements.

Hybrid solutions

- Partly dedicated and partly commercial network infrastructure

ECC REPORT 218 : INTEROPERABILITY AND CROSS-BORDER COMMUNICATIONS

- Interoperability is to be realised on multiple layers through:
  - the availability of multi-band BB-PPDR UE
  - the adoption of common technical standards (i.e. LTE and its evolutions – base standards and specifications),
  - for solutions across the different BB-PDR networks solutions (dedicated, commercial or hybrid networks),
  - and also by standard conformance and interoperability specifications.

- It is not required to designate identical (harmonised) frequency bands for broadband PPDR in every country.

ECC REPORT 218 :CONCEPT OF “FLEXIBLE HARMONISATION”

ECC decided to use the concept of “*flexible harmonisation*” to enable an efficient implementation of BB PPDR within CEPT.

- common technical standard (i.e. LTE and its evolutions)
- national flexibility to decide on how much spectrum should be designated for PPDR within harmonised tuning range(s), according to national needs
- national choice of the most suitable implementation model (either dedicated, commercial or hybrid)

ECC DEC (16)02 - Harmonised technical conditions and frequency bands for the implementation of (BB-PPDR) systems

- Bands for which technical conditions have been defined are (with channelling arrangements 1.4 MHz, 3 MHz or 5 MHz) :

- 700MHz
  - 698-703 MHz (uplink) / 753-758 MHz (downlink)
  - Within 703-733 MHz (uplink) / 758-788 MHz (downlink) with conditions specified for MFCN
  - 733-736 MHz (uplink) / 788-791 MHz (downlink)

- 400MHz (frequency range)
  - 450.5-456.0 MHz (uplink) / 460.5-466.0 MHz (downlink)
  - 452.0-457.5 MHz (uplink) / 462.0-467.5 MHz (downlink)

CROSS BORDER FREQUENCY COORDINATION

- CEPT/ERC T/R 25-08 on the planning criteria and coordination of frequencies in the land mobile service in the range 29.7-470 MHz is under revision and will now address BB-PPDR.

- ECC/REC/(16)03 on cross-border coordination for Broadband Public Protection and Disaster Relief (BB-PPDR) systems in the frequency band 698 to 791 MHz (final approval in October 2016)

Commission Implementing Decision (EU) 2016/687

- Within the 703-733 MHz and 758-788 MHz frequency bands:

  "Without prejudice to the right of Member States to organise and use their spectrum for public safety and public security purposes and for defence, if PPDR radio communications are implemented, the technical conditions for wireless broadband electronic communications services in this annex should be used."

- "The frequency bands 703-733 MHz and 758-788 MHz, or a subset thereof, may also be used for PPDR radio communications. "

- Therefore when using BB-PPDR within the MFCN bands, MFCN least technical restrictions must be used.

- 2016/687/EU does not apply technical restriction in the 698-703 MHz, 733-736 MHz, 753-758 MHz and 788-791 MHz bands. This is covered by ECC Decision (16)02.

(http://eur-lex.europa.eu/legal-content/EN/TXT/?qid=1464706780910&uri=CELEX:32016D0687

OTHER USE CASES (CRITICAL VOICE, DIRECT MODE, AIR-GROUND-AIR AND AD-HOC NETWORKS)

- The same frequencies as for the WAN could be used for DMO and ad-hoc networks

- The report does not provide an indication on alternative options nor a solution for future PPDR AGA systems.

- The assumption is that mission critical voice will be carried in most countries by the existing dedicated mission critical voice (+ NB data) TETRA and TETRAPOL networks for many years (10-15 years). At the moment for mission critical voice there is a harmonised European NB PPDR allocation of 2x5 MHz in the 380-400 MHz band.

Next Steps…

- Ongoing work at CEPT level:
  - Further studies on the band 410-430MHz (no standardized for LTE yet)
  - Possible future revision of T/R 25-08 for the cross-border coordination in 400MHz based on further technical studies regarding LTE and CDMA
  - Publication of the Recommendation 16(03) on cross-border coordination for Broadband Public Protection and Disaster Relief (BB-PPDR) systems in the frequency band 698 to 791 MHz
- 3GPP work !!
  - The regulation is in place
  - 3GPP is starting to work on the standardization for 700MHz BB-PPDR equipment but needs to also trigger the 400MHz work.
  - Production of an HS via ETSI

National case : France

- France has already allocated 2*5MHz and 2*3MHz in the 700MHz band to Ministry of Interior for BB-PPDR.

- Protection of DTT below 694MHz via a power limit of 23dBm for the terminals and a restriction of out of band emission below 694MHz to -42dBm/8MHz under normal conditions and relaxed to -30dBm/8MHz under extreme environmental conditions.

- There are ongoing national work to identify a further block of 2*3MHz within the 451-456MHz paired with 461-466MHz for BB-PPDR.

THE END

THANK YOU