

Proposals ref. South Africa Draft Update of the National Radio Frequency Plan

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MOTOROLA SOLUTIONS

Introduction



Motorola thanks **ICASA** for maintaining most of the narrow band arrangements harmonized for PPDR/PMR use within 380-470MHz. Narrow band land mobile radio systems such as ETSI TETRA will continue to be the main platform for PPDR and mission critical PMR users for many years to come. Such systems require stability in availability of spectrum and harmonized arrangements. It is noted that ICASA have maintained a stable arrangements for PMR/PPDR within this range except for the 450-470MHz. It is our view that ICASA could relax their conditions in the future (currently defined in GOVERNMENT GAZETTE #38640, 30 MARCH 2015) in particular to allow narrow band digital PMR in guard bands.

Motorola notes that ICASA has not reflected yet the revised Resolution-646(WRC-2015) in its draft national frequency plan. Our view is that the opportunity for allocating spectrum for Broadband PPDR is now. There are more than 38 countries with a population of more than 2 Billion citizens that have allocated broadband PPDR spectrum within the global range 694-894MHz and that 4 regional Groups have agreed harmonized measures for implementation of Broadband PPDR within that range.

EVOLUTION OF MOBILE TECHNOLOGIES TOWARDS 2020



| | Consumer Cellular Mobile - IMT IMT spectrum WRC-1997, 2000, 2003, 2007, 2012 & 2015 --- 2019 | | | | |
|------------------|--|---|--|--|--|
| | 1G | 2G | 3G | 4G | 5G |
| RAN | AMPS,NMT,TACS | GSM/GPRS, DAMPS, cdmaOne | WCDMA/CDMA2000/ EVDO/HSPA+ | OFDMA,/MIMO | NR?, CloudRAN, Massive MIMO, mmWave |
| CORE | Circuit Swiched | Circuit Swiched | Circuit & Packet Swiched | Fully IP | Fully IP, Virtualised |
| User Svcs | Analogue Voice Phone calls | Digital Voice Phone calls, SMS, Packet Data | Digital Voice Phone calls, Mobile Internet | Mobile Broadband Services, Internet. Video , Video | Enhanced Mobile Broadband,, M2M, TV, Voice? ... |
| UE | Voice phones | Voice and SMS phones | Voice & Data phones Smartphones | Smartphones, Tablets Sensors, Wearables | Smartphones, Tablets Sensors, automonous vehicles, Wearbles,?? |

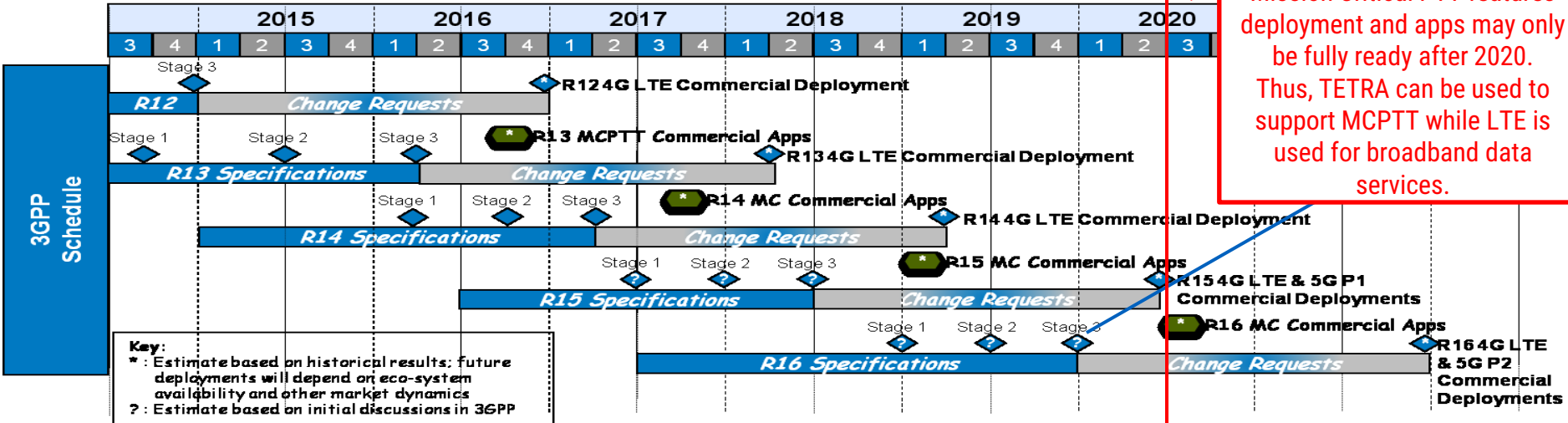


| | 1980's | 1990's | 2000's | 2010's | 2020's |
|---|--|--|--|--|--|
| Public Safety, Security & Mission Critical Land Mobile NB PPDR @ WRC-2003 BB PPDR @ WRC-2015 | | | | | |
| RAN | MPT1327, APC016, others | MPT1327, APOC16 | TETRA, APCO P25 | TETRA2, APCO2 P25 OFDMA/MIMO | TETRA2, APCO2 P25 OFDMA/MIMO, ?? CloudRAN, mWAVE..... |
| CORE | Circuit Swiched | Circuit Swiched | Fully IP | Fully IP, Virtualised | Fully IP, Virtualised |
| User Svcs | Analogue Voice Group , Emergency Calls, Scramblers | More Analogue Voice Group ,Priority Calls Voice Encryption | Digital Voice Group Priority Calls, Encryptions, SMS Packet Data | Digital Voice Group Emergency Calls, IP Security, SMS Packet Data, Video | Digital Voice Group Priority Calls, IP Security, SMSPacket Data, Video, M2M, ??? |
| UE | Voice only radios | Voice only radios | Digital Voice and Data radios, Data terminals | Digital Voice and Data radios, Smart PP, Devices,Wearables | Smart PP Devices, Wearables, Connected Officers & Vehicles |

3GPP RELEASES: MISSION CRITICAL FEATURES TOWARDS 5G



Mission Critical PTT features deployment and apps may only be fully ready after 2020. Thus, TETRA can be used to support MCPTT while LTE is used for broadband data services.



3GPP Release 12
(4G LTE standards)

- ProSe
- GCSE_LTE

3GPP Release 13
(4G LTE standards)

- MCPTT
- eProSe-Ext
- MCPTT codec
- 700MHz PPDR band - Middle East Region
- MBMS-enh
- IOPS
- SC_PTM

3GPP Release 14
(4G LTE standards)

- MCPTT Enhancements, MC Video, MC Data, MC common Arch
- MC Study Items*:
 - MCPTT to MCPTT Interconnect
 - MC Interworking between LTE & non-LTE (LMR),
 - MBMS for MC Services
- REAR** (Evolved ProSe Relay)
- 5G Study Items*:
 - SMARTER (Critical Comms), 5G Arch, 5G RAN

3GPP Releases 15-16
(4G LTE and 5G standards)

- Updates to previous Public Safety 4G LTE standards
- LTE to non-LTE Interworking
- Potential Public Safety 5G standards
- 5G standards
 - Phase 1 (P1) in Rel 15
 - Phase 2 (P2) in Rel 16
- others tbd

Mission Critical related features will take till R15 to complete

Key:
 * Study Items only produce proposals; then standards may be defined based upon the proposals
 ** Remote UE Access via Relay UE





**IMPLEMENTING WRC RES.646 (WRC-15) ON MOBILE BROADBAND PPDR NEEDS IN SOUTH AFRICA NATIONAL
FREQUENCY PLAN?**

PPDR IN ITU DEFINITION INCLUDES BOTH “PP” & “DR” COMPONENTS



**Public
Protection**

Maintenance of law and order, protection of life and property and emergency situations on a daily basis

Same meaning as

National Security & Public Safety

PPDR

Disaster Relief

Serious disruption of the functioning of society, posing a significant widespread threat to human life, health, property or the environment

ITU RELATED PPDR PUBLICATIONS



Resolution 646 (WRC15)

Adopted by WRC-03 and Revised by WRC-15 to include new bands for broadband

ITU-R Technical Studies

Report M.2377 PPDR Requirements

ITU WP5A: currently updating to reflect WRC15 and to develop further a separate Spectrum Requirements report

ITU Rec. M.2015 Freq. Arrangements

ITU Working Party 5A Currently revising to include regional and national allocations

Rec. M.2009 Radio Interfaces for PPDR

Revised in 2014 to include LTE-A as a radio interface for PPDR

Report ITU-R M.2291 Use of IMT for PPDR

SG5: Approved in Nov 2016 a revised M 2291 aligned with M.2377-1

Note: Next ITU Working Party 5a Meeting start on May-22 -2017 in Geneva

WRC RESOLUTION 646 SPECTRUM DECISIONS



[Resolution 646 \(WRC-2015\)](#) was revised to address needs for suitable spectrum for broadband PPDR in international Radio Regulations

WRC -2003

Resolution 646 established Regionally harmonized frequency bands for narrow-band PPDR (**380-470MHz** in Region 1)

WRC -2015

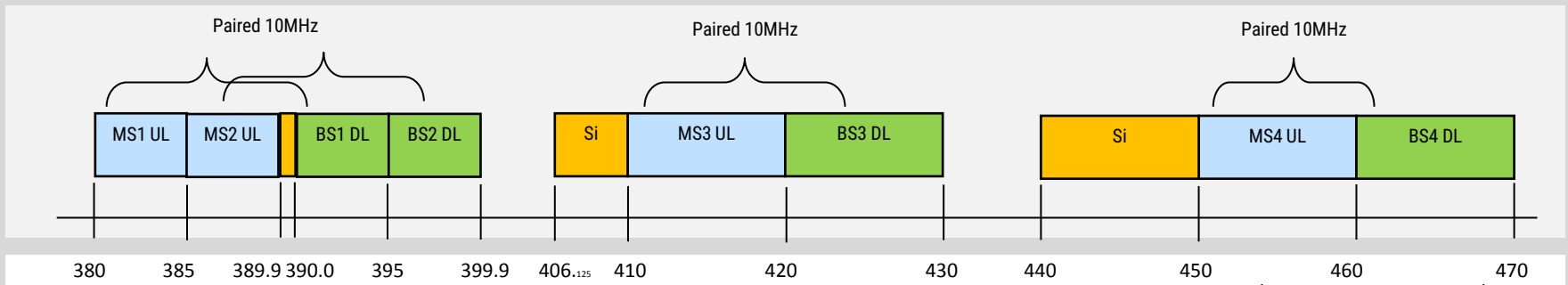
Revised Resolution 646 resolved to recognize **694-894 MHz** as the globally harmonized frequency range, in particular for Broadband PPDR

NARROWBAND SPECTRUM HARMONIZATION



Region 1 (Middle East Africa, Europe and RCC countries)

Maintained UHF range 380-470 MHz with 380-400 MHz band being core arrangement for Narrowband / wideband PPDR systems (ex. TETRA & P25 & DMR)



Si: Simplex or Direct Mode arrangement
MS: Mobile station transmit (Up Link)
BS: Base station transmit (Down Link)

WRC RESOLUTION 646 SPECTRUM DECISIONS



WRC -2015

Revised Resolution 646 to address Broadband and added **694-894 MHz** as the globally harmonized frequency range, in particular for Broadband PPDR

BROADBAND PPDR SPECTRUM OPTIONS



National Decisions typically follow WRC and regional agreements;
Three options are considered:

1. Core mobile IMT band within Global Range e.g. 700MHz Band 28
2. Multi-country or regional driven band e.g. 700MHz Band 68 in Region 1 or Band 14 in North America
3. Develop a new band for a particular country

CITEL, CEPT, ASMG & APT have already provided their harmonized arrangements and reflected them in the draft revision of ITU R M2015 post WRC-2015
By Nov 2016, **ATU** (& RCC) remain the only Regional Group(s) that have not provided their preferred arrangements for Broadband PPDR or decided on framework

BROADBAND PPDR SPECTRUM OPTIONS



| Options | Risk | Benefits |
|--|--|--|
| Core Mobile Band e.g. B28 | Typically longer time to decide Shortage due to competition with MNO | Time to deploy Scale Devices free circulation Roaming & cross border Proven easier when security is a priority |
| Non-Core/ Regional PPDR developed band e.g. B14 , B68 | Needs agreements Supply risk Delayed Ecosystem Economies of scale (Niche) /Choice longer time between decision and deployment(ex: France) | Long term spectrum plan Coordinated cross border DR missions Flexibility |
| Special | Cost Cross border issues Vendor lock-in support Ecosystem Innovation Supply risk | Faster Decision |

CEPT RELATED PPDR PUBLICATIONS



[ECC Decision \(08\)05](#) (amended in June 2016) on the harmonisation of frequency bands for the implementation of digital Public Protection and Disaster Relief (PPDR) radio applications in bands within the 380-470 MHz range

[ECC Decision \(16\)02](#) on harmonised technical conditions and frequency bands for the implementation of Broadband Public Protection and Disaster Relief (BB-PPDR) systems (2016)

[ERC Decision \(01\)19](#) on harmonised frequency bands to be designated for the Direct Mode Operation (DMO) of the Digital Land Mobile Systems for the Emergency Services

[ECC Decision \(06\)05](#) on the harmonised frequency bands to be designated for Air-Ground-Air operation (AGA) of the Digital Land Mobile Systems for the Emergency Services

[ECC Decision \(11\)04](#) on Exemption from individual licensing of digital terminals of narrowband and wideband PMR/PAMR/PPDR systems and free circulation and use of digital terminals of narrowband and wideband PPDR systems operating in the 80 MHz, 160 MHz, 380-470 MHz and 800/900 MHz bands

[ECC Recommendation \(08\)04](#) The identification of frequency bands for the implementation of Broad Band Disaster Relief (BBDR) radio applications in the 5 GHz frequency range

[Recommendation T/R 25-08](#) on planning criteria and coordination of frequencies in the land mobile service in the range 29.7-921 MHz

[ECC 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

[ECC Report 102](#) on public protection and disaster relief spectrum requirements

[ECC Report 110](#) on the compatibility studies between Broad

LAND MOBILE SPECTRUM ARRANGEMENT SCENARIOS WITHIN 694-894MHz

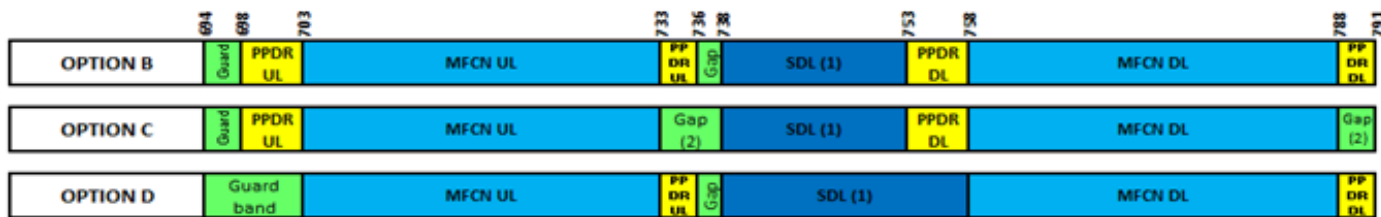


The ECC Decision (16)02 was approved in June 2016. It covers the flexible harmonisation for dedicated BB-PPDR spectrum in the 700 MHz. Making all below scenarios possible nationally.

PPDR in spectrum harmonised for MFCN (ECC/DEC(15)01)



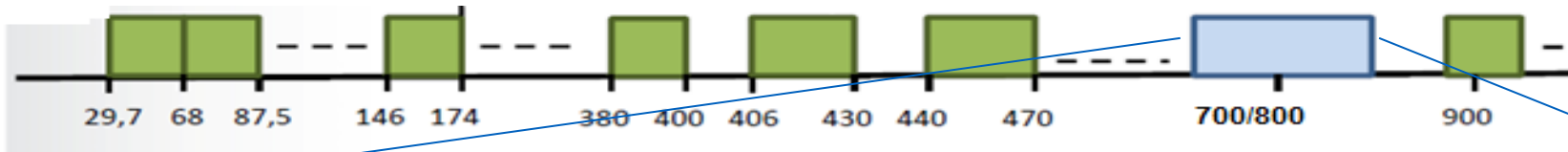
PPDR dedicated spectrum:



PPDR in a combination of MFCN and dedicated spectrum:

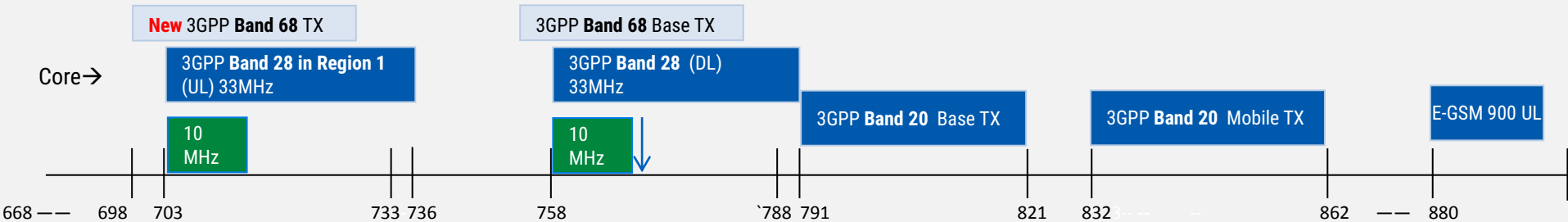


LAND MOBILE SPECTRUM ARRANGEMENT SCENARIOS WITHIN 694-894MHz



694 – 894 MHz GLOBAL RANGE FOR PPDR AS PER RESOLVES 2 OF RESOLUTION 646 (WRC-15)

Harmonized MOBILE LTE bands in Region 1

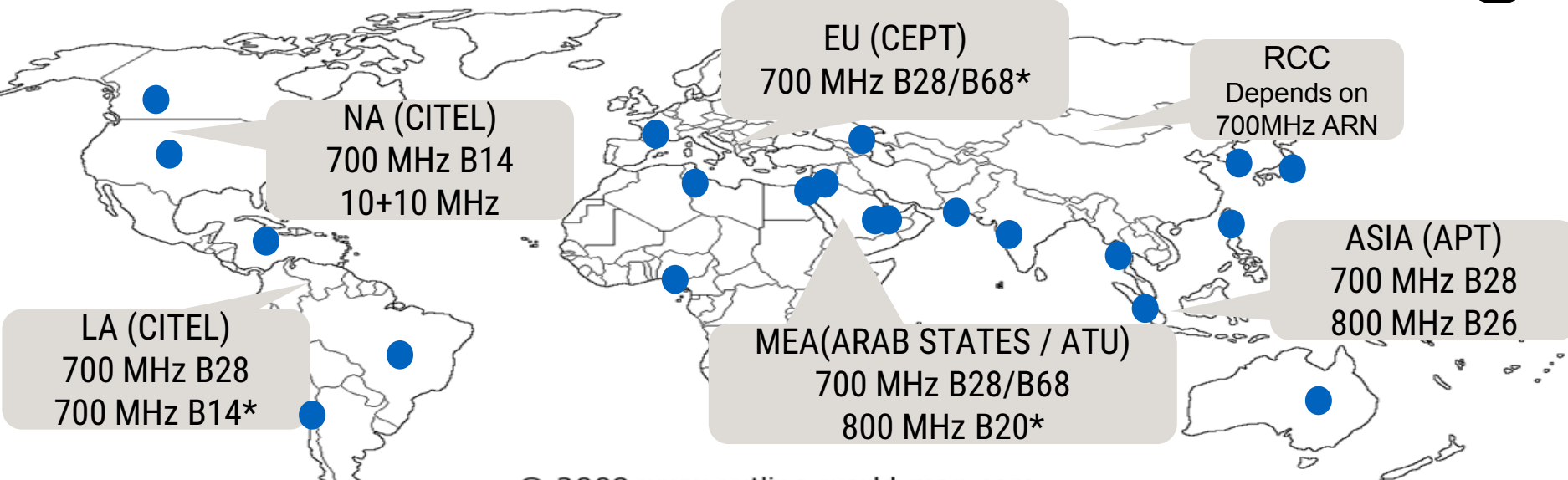


Adequate amount of spectrum to be nationally reserved for **Broadband PPDR** from within the bands identified for **Mobile IMT** (example of 2x10MHz) within the 694-894MHz range

BROADBAND SPECTRUM HARMONIZATION: WHAT WE KNOW TODAY



- More than 38 countries identified spectrum for B-PPDR to date within 694-894MHz



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| | | |
|--|---|---|
| US 700 Band Plan /Canada | 3GPP Band 14 (special band) | 788-798/758-768 MHz |
| APT 700 Band plan (LATM, ASIA, ME) | 3GPP Band 28 | 703-748/758-803 MHz |
| Arab/Europe. Africa R1* 700 Band plan (MEA) | 3GPP Band 68 (special band under develop'nt) Or within Band 28 2x(30+3)MHz | 698-728/753-788 MHz 703-736/758-791MHz |
| Asia 800 Band Plan (ASIA) | 3GPP Band 26 | 814-834/859-879 MHz |
| EU 800 Band Plan (R1*) | 3GPP Band 20 | 791-821/832-862 MHz |



HOW MUCH SPECTRUM FOR BROADBAND PPDR IS NEEDED?

BROADBAND PPDR SPECTRUM CALCULATION METHODS



Several methods for estimating spectrum requirements were developed (summary below).

Studies indicate a min. requirement of 10+10MHz Mobile LTE Spectrum. Good compromise between cost of deployment, needs and likely availability of mobile spectrum for PPDR in 694-894MHz.

ITU Developed a number of methods for spectrum needs under ANNEX 7 of ITU R M2377 Radiocommunication objectives and requirements for Public Protection and Disaster Relief (PPDR) Report (07/2015)

| Annex | Source | Bandwidth requirements (MHz) | | Comments |
|-------|--------------------|------------------------------|----------|---|
| | | Uplink | Downlink | |
| 7A | CEPT | 10 | 10 | Data only Public Protection level 2 event ECC Report 199 Conclusions (ETSI-LEWP model) |
| 7B | UAE | 16.9 | 12.5 | Two incidents data |
| 7C | Motorola Solutions | > 20 | 20 | Level 3 incident (FDD) |
| 7D | Israel | 20 | 20 | |
| 7E | China | 30-40 | | TD-LTE, depends on different scenarios |
| 7F | Korea | 10 | 10 | |

PROPOSAL FOR ICASA FOR PPDR PLANNING CONSIDERATION



| Narrowband / wideband PPDR | Narrow/Wideband PPDR | Broadband PPDR |
|--|---|--|
| 380-385 MHz paired with 390-395MHz(Primary) ✓ exists | 406.1-416 MHz paired with 416-426 MHz ✓ exists | 694-791 MHz (IMT based) (703-713 paired with 758-768MHz (primary)) + add |
| 385-389.9 MHz paired with 395-399.9 MHz (Secondary) ✓ exists | | (ex.698-708 paired with 753-763MHz (secondary), IMT based) |
| Resolution 646 (WRC 2003) on PPDR identified 380-470MHz range (narrow / wideband) | | Res. 646-WRC-15 Added 694-894MHz for Broadband PPDR |

✓ is already in current NFP draft

+ is proposed to be added

SUMMARY OF RECOMMENDATIONS REF 694-791MHz



The proposal is to reflect WRC Resolution 646 Broadband PPDR in its draft NFP plan by:

- Adding ref. to Res 646 (WRC-15) on Broadband PPDR in the 694-791MHz to the noting section & updating IMT Roadmap plan for 700MHz to reflect that part of the band would be reserved for emergency services and governmental agencies
- Update the CRASA PPDR Framework to reflect preferred options for Broadband PPDR in the 700MHz
- Update ITU R M 2015 as per resolves sections of Res. 646 once the process above is completed
- LTE Band 28 (Starts at 703MHz) equipment: ecosystem already available driven by commercialization
- LTE Band 68 (starts at 698MHz) is being finalized in 3GPP and yet to be commercialized

How much Spectrum is needed?

- A 10+10MHz block for BB PPDR in 700MHz.
- Ex: 2x20 MHz and 3+3Mhz for commercial use
 - 2x10 MHz for Broadband PPDR in 700MHz
 - Spectrum decision encourages investment in Public Safety Broadband

What deployment model?

- Dedicated spectrum is envisioned even when Hybrid model of deployment is considered
- Dedicated network for Mission Critical users/ Government Radio Network
- Different operational governance / partnership models available

THANK YOU

Any Questions?



MOTOROLA SOLUTIONS