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| **Radiocommunication Study Groups** |  |
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| Source: Document 5A/TEMP/154(Rev.1) | **Annex 22 to Document 5A/469-E** |
| **8 June 2017** |
| **English only** |
| Annex 22 to Working Party 5A Chairman’s Report | |
| preliminary draft revision of RECOMMENDATION ITU-R M.2015-1 | |
| Frequency arrangements for public protection and disaster relief radiocommunication systems in accordance  with Resolution 646 (Rev.WRC-15) | |

(2012-2014)

Summary of the revision

[TBD]

Scope

This Recommendation is intended to promote global and regional harmonization of frequency bands for public protection and disaster relief. It provides guidance on frequency arrangements for public protection and disaster relief radiocommunications, in particular within the frequency ranges specified in *resolves* 2 and 3 of the Resolution **646 (Rev.WRC-15)**, as well as countries’ frequency arrangements.

The combination of Resolution **646** **(Rev.WRC-15)** and other relevant ITU-R Recommendations and Reports are to be considered as a package in relation to the provision of PPDR services and applications, therefore the considering, noting and recognizing below will only mention information pertinent for this ITU-R Recommendation.

Keywords

PPDR, frequency arrangements, harmonized

The ITU Radiocommunication Assembly,

considering

*a)* that Resolution **646 (Rev.WRC-15)** encourages administrations to use harmonized frequency ranges for PPDR to the maximum extent possible when undertaking their national planning for their PPDR applications;

*b)* that Resolution **646 (Rev.WRC-15)** resolved to include harmonized PPDR frequency arrangements within the frequency ranges specified in *resolves* 2 and 3 of that Resolution*,* as well as countries’ frequency arrangements for PPDR, in this Recommendation;

*c)*that addressing the growing telecommunication and radiocommunication needs of PPDR agencies and organizations is vital to the maintenance of law and order, protection of life and property, disaster relief and emergency response;

*d)* that many administrations wish to facilitate interoperability and interworking between systems used for PPDR radiocommunication, both nationally and for cross-border operations in emergency situations and for disaster relief;

*e)* that, although narrowband and wideband systems will continue to be used to meet PPDR requirements, there is a growing need for broadband applications to support improved data and multimedia capabilities, which require higher data rates and higher capacity;

*f)* that, over time, narrowband public protection and disaster relief (PPDR) applications, for example mission critical voice and low-data rate applications, may be provided by broadband systems;

*g)* that administrations may have different operational needs and spectrum requirements for their PPDR agencies and organizations depending on their policy objectives and organizational structures;

*h)* that usage of the same frequency bands will enable administrations to achieve the benefits of harmonization, such as:

– increased potential for interoperability;

– clear guidance for standardization;

– increased volume of equipment resulting in economies of scale, more cost-efficient and affordable equipment and expanded equipment availability, which is of particular benefit to developing countries;

– improved spectrum management and planning;

– more effective international aid during disasters and major events; and

– enhanced cross-border coordination and circulation of equipment;

*i)* that some commercial terrestrial and satellite systems are complementing the dedicated systems in support of PPDR, and that the use of commercial solutions will be in response to technology development and market demands,

noting

*a)* that spectrum planning for PPDR radiocommunications is performed at the national level, taking into account the need for interoperability and benefits of neighbouring administrations using harmonized or common frequency bands;

*b)* that flexibility must be afforded to administrations:

– to determine, at the national level, how much spectrum to make available for PPDR from the ranges in the resolves part of Resolution **646 (Rev.WRC-15)** taking into account the existing applications and their evolution, in order to meet their particular national requirements;

– to determine the need and timing of availability, as well as the conditions of usage, of the bands for PPDR in order to meet specific regional or national situations,

recognizing

*a)* that Resolution **646 (Rev.WRC-15)** encourages administrations to consider the identified frequency bands/ranges or parts thereof in *resolves* *2 & 3* when undertaking their national planning for the purposes of achieving harmonized frequency bands/ranges for advanced PPDR systems and applications;

*b)* that administrations may be using other frequency arrangements for the provision of PPDR, as listed in Annex 2 and there is a need for administrations using these frequency arrangements to ensure compatibility between PPDR applications and stations of other services in neighbouring countries operating in accordance with the Radio Regulations;*c)* the continuing need for development of regionally harmonized frequency arrangements for the purposes of implementing advanced PPDR solutions;

*d)* that the frequency arrangements in the Annexes are provided for PPDR applications in the mobile service;

*e)* that compatibility of stations using these frequency arrangements with other services operating in other countries is studied in the ITU at the service level and not at the application level;

*f)* the relationship between Resolution **646 (Rev.WRC-15)** on public protection and disaster relief, which invites to review and revise of this Recommendation, and Resolution **647 (Rev.WRC-15)** on radiocommunication aspects, including spectrum management guidelines, for early warning, disaster prediction, detection, mitigation and relief operations relating to emergencies and disasters, which also addresses the need to coordinate activities under these Resolutions in order to minimize any possible overlap

*g)* that Recommendation ITU‑R M.2009 provides information on technologies that may be appropriate for use in these frequency arrangements;

*h)* that Report ITU-R M.2291 addresses the current and possible future use of international mobile telecommunications (IMT), including the use of long term evolution (LTE), in support of broadband PPDR communications;

*i)* that Report ITU-R M.2377 contains the radiocommunication objectives and requirements for PPDR;

*j)* that some of the bands addressed in this Recommendation have been identified by World Radiocommunication Conferences for use by administrations wishing to implement IMT,

recommends

1 that the harmonized frequency arrangements in Annex 1 should be used by administrations as guidance when making spectrum available for PPDR applications;

2 that administrations implementing the harmonized frequency arrangements in the Annex 1 should make all necessary efforts to ensure compatibility between PPDR applications and stations of other services in neighbouring countries operating in accordance with the Radio Regulations.

*[Editor’s note: Recommends may need to be revised based on new annexes.]*

*[Editor’s note: At the suggestion of the Secretariat to facilitate processing, the following Annexes are shown as deleted to be replaced by the revised Annexes]*



































Annex 1

Recommended arrangements for public protection and disaster relief operations in the bands listed in resolves 2 and 3 of Resolution 646 (Rev.WRC-15)

*[Editor’s note: Page numbers to be inserted at a later stage.]*

*[Editor’s note: The consistency of language (e.g., 700 MHz band) needs to be reviewed.]*

| Section 1: Arrangements in parts of the frequency range 694-894 MHz  (as per *resolves* 2 of Resolution **646 (Rev.WRC-15)**) | | |
| --- | --- | --- |
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| 1 | Harmonized frequency arrangements within the frequency range 698 to 791 MHz in accordance with the CEPT harmonization measure on broadband PPDR operations |  |
| 1 | Examples of frequency arrangements within the bands 694 to 791 MHz in Arab States for public protection and disaster relief operations |  |
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| 2 | Harmonized frequency arrangements within the frequency range 703 to 869 MHz in accordance with the CITEL harmonization measuresfor broadband PPDR |  |
| 2 | Harmonized frequency arrangements within the frequency range 764 to776 and 794-806 MHz in accordance with the CITEL harmonization measures for PPDR applications |  |
| 2 | Examples of frequency arrangements within the frequency range 806 to 869 MHz in some countries in Region 2 for narrowband PPDR |  |
| 3 | Harmonized frequency arrangements within the frequency range 694 to 894 MHz in accordance with the APT harmonization measures for broadband PPDR |  |
| 3 | Examples of frequency arrangements within the frequency range 694 to 894 MHz in some countries of Region 3 for narrowband and/or broadband PPDR |  |

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| --- | --- | --- |
| Section 2: Frequency Arrangements in parts of the frequency range 380-470 MHz (as per *resolves* 3 of Resolution **646 (Rev.WRC-15)**) | | |
| Region / Sub Section | Example Frequency Arrangement(s) | Page |
| 1 | Examples of frequency arrangements for the band 380-470 MHz in certain countries in Region 1 for narrowband and wideband public protection and disaster relief operations in accordance with CEPT harmonization measure ECC/DEC/(08)05 |  |
| 1 | Examples of frequency arrangements for the band 450-470 MHz in Region 1 (CEPT) for broadband public protection and disaster relief operations |  |
| 1 | Examples of frequency arrangements for the band 380-399.3 MHz in some countries in Region 1 for narrowband PPDR |  |
| 2 | There are no bands listed for Region 2 in *resolves* 3 of Resolution **646 (Rev.WRC-15)** |  |
| 3 | Examples of frequency arrangements within the frequency range 406.1-430 MHz in some countries of Region 3 for narrowband PPDR |  |
| 3 | Examples of frequency arrangements within the frequency range 440-470 MHz in some countries of Region 3 for narrowband PPDR |  |

|  |  |  |
| --- | --- | --- |
| Section 3: Frequency Arrangements in parts of the frequency range 4 940-4 990 MHz  (as per *resolves* 3 of Resolution **646 (Rev.WRC-15)**) | | |
| Region | Example Frequency Arrangement(s) | Page |
| 3 | Examples of frequency arrangements within the frequency band 4940-4990 MHz in some countries of Region 3 |  |

**Section 1 – Arrangements in parts of the frequency range 694 to 894 MHz**

Sub Section 1: Region 1

Harmonized frequency arrangements within the frequency range 698 to 791 MHz in accordance with the CEPT harmonization measure   
on broadband PPDR operations

CEPT countries wishing to introduce broadband PPDR (BB-PPDR) in parts of the 700 MHz range shall apply the least restrictive technical conditions (LRTC) to ensure coexistence with other services. The paired frequency arrangements according to ECC/DEC/(16)02 are:

TABLE X

Title

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Frequency arrangement | Paired arrangements | | | | Notes |
| Mobile station TX (MHz) | Centre gap (MHz) | Base station TX (MHz) | Duplex separation (MHz) |
| a) | 698-703 | 50 | 753-758 | 55 | LRTC specified in Annex 1 of ECC/DEC/(16)02 |
| b) | 703-733 | 25 | 758-788 | 55 | LRTC specified in ECC/DEC/(15)01 |
| c) | 733-736 | 52 | 788-791 | 55 | LRTC specified in Annex 1 of ECC/DEC/(16)02 |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 698-703 | 703-708 | 708-713 | 713-718 | 718-723 | 723-728 | 728-733 | 733-736 | 736-753 | 753-758 | 758-763 | 763-768 | 768-773 | 773-778 | 778-783 | 783-788 | 788-791 |
| PPDR  a)  up-link | PPDR  b)  uplink  (MFCN) | | | | | | PPDR  c)  up-link | … | PPDR  a)  down-link | PPDR  b)  downlink  (MFCN) | | | | | | PPDR  c)  down-link |
| 5 MHz | 30 MHz (6 blocks of 5 MHz) | | | | | | 3 MHz |  | 5 MHz | 30 MHz (6 blocks of 5 MHz) | | | | | | 3 MHz |

Administrations requiring 2x10 MHz for BB-PPDR, as calculated in Report ITU-R M.2377-0 and ECC Report 199, and authorizing the full 2x30 MHz in option b) for commercial MFCN can no longer identify 2x10 MHz for dedicated BB-PPDR networks within the 700 MHz band. These administrations may therefore need to use the remaining part as shown in option a) and c) and additionally use the 400 MHz range (see frequency arrangement R1-1-2).

For further information on BB-PPDR in CEPT please see ECC/DEC/(16)02 and the relevant reports mentioned therein.

Examples of frequency arrangements within the bands 694 to 791 MHz   
in Arab States for public protection and disaster relief operations

The following frequency arrangement is harmonized for implementation of Broadband PPDR based on IMT technology in Arab States with bandwidth of 2x5 MHz (UL: 698-703 MHz, DL: 753-758 MHz), which has the potential to be harmonized in Region 1.

This arrangement is in line with 3GPP Band 68 with OOBE of -25 dBm/8 MHz

3GPP **Band 28** LD Mobile TX

**New** 3GPP **Band 68** Mobile TX

New 3GPP **Band 68** Base TX

3GPP **Band 28 LD** Base TX

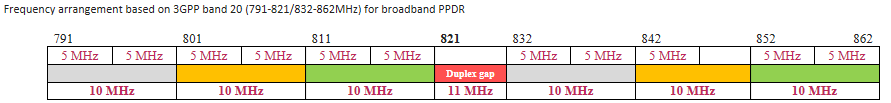
694. 698 703 728-733-736 753 758-------------------783-788 791

Harmonized arrangements for 700MHz Broadband PPDR in Arab states

Administrations wishing to implement wider channel bandwidth up to 2x20 MHz can combine multiple blocks of 5 MHz based on 3GPP Band 68 and/or Band 28 to meet their national Broadband PPDR requirements ( e.g. UL: 698–718, DL: 753–773 MHz).

Examples of frequency arrangements within the bands 791 to 862 MHz   
in some countries in Region 1 for broadband public protection and disaster relief operations

Some countries in Region 1 implemented Broadband PPDR based on the frequency arrangement (791-821 MHz UL and 832-862 MHz DL) (3GPP Band 20).



Sub Section 2: Region 2

Harmonized frequency arrangements within the frequency  
range 703 to 869 MHz in accordance with the CITEL  
harmonization measures[[1]](#footnote-10) for broadband PPDR

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Frequency arrangement** | **Mobile station transmitter (MHz)** | **Centre gap (MHz)** | **Base station transmitter (MHz)** | **Duplex separation(MHz)** | **Notes** |
| a)1 | 703-748 | 10 | 758-803 | 55 |  |
| b) | 788-798 | 20 | 758-768 | 30 | Reverse duplex |
| c) | 807-824 | 28 | 852-869 | 45 |  |
| d) | 807-814 | 45 | 859-869 | 52 |  |

Note 1: PCC.II/REC.49 (XXVII-16) recommends that administrations that wish to define a particular frequency range for PPDR within this frequency range preferably use the lower portion of this band.

*[Placeholder for figure to come from CITEL PCC.II]*

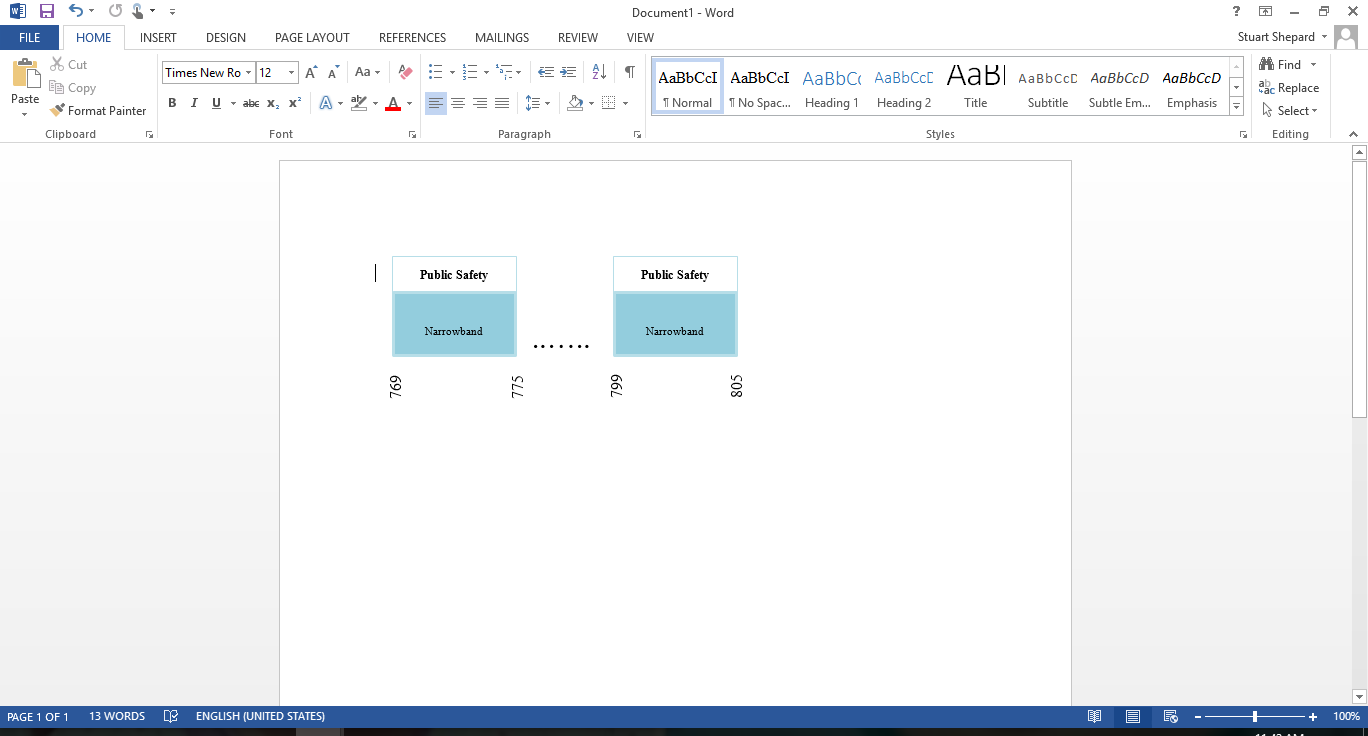
# Harmonized frequency arrangements within the frequency range 764 to 776 MHz and 794 to 806 in accordance with the CITEL harmonization measures[[2]](#footnote-11) for PPDR applications[[3]](#footnote-12)

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Frequency arrangement | Base station transmit (MHz) | Center gap | Mobile station transmit (MHz) | Duplex separation | Notes |
| a) **[[4]](#footnote-13)** | 764-768 | 26 | 794-798 | 30 |  |
| b) **[[5]](#footnote-14)** | 768-776 | 22 | 798-806 | 30 |  |
| c) **[[6]](#footnote-15)** | 769-775 | 24 | 799-805 | 30 | Note 1 |
| NOTE 1 – This frequency block is used for PPDR applications that provide narrowband voice and low-speed data services. In the context of PPDR, narrowband was defined in Resolution **646 (Rev.WRC‑12)** as “supporting voice and low data-rate applications, typically in channel bandwidths of 25 kHz or less”. Narrowband channels may also be consolidated into wideband channels (50 to 150 kHz) if approval by the licensing administration is obtained through a limited waiver process. | | | | | |

Frequency arrangements a) and b)



Frequency arrangements c)



# Examples of frequency arrangements within the frequency range 806 to 869 MHz in some countries in Region 2 for narrowband PPDR

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Frequency arrangement** | **Mobile station/ Control station transmit (MHz)** | **Center gap** | **Base station transmit  (MHz)** | **Duplex separation** | **Notes** |
| a) | 806-809 | 40 | 851-854 | 45 | PPDR1[[7]](#footnote-16) |
| b) | 821-824 | 42 | 866-869 | 45 | PPDR2[[8]](#footnote-17) |

Frequency arrangements a) and b)



The frequencies corresponding to the centre frequency of the channel number are defined by the following formulas, where *n* is the channel number:

| Channel number | Mobile station transmit Channel centre frequency (MHz) | Base station transmit Channel centre frequency (MHz) | Channel bandwidth (kHz) |
| --- | --- | --- | --- |
| *n* = 1 to 600 | *fn* = 806.0125 + (0.025) × (*n* − 1) | *fn* = 851.0125 + (0.025) × (*n* − 1) | 25 |
| *n* = 602 to 790 except 639, 677, 715, 753 | *fn* = 821.0375 + 0.0125 × (*n* − 602) + 0.025 × floor[(*n* − 601) / 38] | *fn* = 866.0375 + 0.0125 × (*n* − 602) + 0.025 × floor[(*n* − 601) / 38] | 12.5 |
| *n* = 601, 639, 677, 715, 753 | *fn* = 821.0125 + 0.5 × floor[(*n* − 601) / 38] | *fn* = 866.0125 + 0.5 × floor[(*n* − 601) / 38] | 25 |
| *n* = 791 to 830 | *fn* = 823.5 + (0.0125) × (*n* − 791) | *fn* = 868.5 + (0.0125) × (*n* − 791) | 25 |

PPDR channels may be assigned throughout this band and specific blocks may be designated exclusively for PPDR applications. Radio equipment is capable of tuning to all channels in the band ensuring interoperability. To simplify cross-border coordination and to ensure that public safety agencies have access to a stable and predictable pool of radio frequency channels, neighbouring administrations could implement complementary frequency arrangements, an example being shown in the figure above.

Sub Section 3: Region 3

Harmonized frequency arrangements within the frequency range 694 to 894 MHz in accordance with the APT harmonization measures[[9]](#footnote-18)   
for broadband PPDR

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Frequency arrangement | Paired arrangements | | | | Notes |
| Mobile station TX (MHz) | Centre gap (MHz) | Base station TX (MHz) | Duplex separation (MHz) |
| a) | 703-748 | 10 | 758-803 | 55 | 3GPP Band 28 |
| b) | 824-849 | 17 | 869-894 | 45 | 3GPP Band 5 |
| c) | 814-849 | 27 | 859-894 | 45 | 3GPP Band 26 |
| d) | 807-824 | 28 | 852-869 | 45 | 3GPP Band 27 |

Frequency arrangement a): 703-748/758-803 MHz

|  |  |  |
| --- | --- | --- |
| 703-748 | 748-758 | 758-803 |
| PPDR uplink |  | PPDR downlink |
| 45 MHz (9 blocks of 5 MHz) |  | 45 MHz (9 blocks of 5 MHz) |

The channelling plan for frequency arrangement a) is based on a channel bandwidth of 5 MHz or 10 MHz. The centre frequency (fN) of the Nth channel is given by:

|  |  |  |  |
| --- | --- | --- | --- |
| Channel number | Mobile station transmit Channel centre frequency (MHz) | Base station transmit Channel centre frequency (MHz) | Channel bandwidth (MHz) |
| *N* = 1 to 9 | *fN* = 705.5 + (5) × (*N* − 1) | *fN* = 760.5 + (5) × (*N-1*) | 5 |

Frequency arrangement b): 824-849/869-894 MHz

|  |  |  |
| --- | --- | --- |
| 824-849 | 849-869 | 869-894 |
| PPDR uplink |  | PPDR downlink |
| 45 MHz (9 blocks of 5 MHz) |  | 45 MHz (9 blocks of 5 MHz) |

The channelling plan for frequency arrangement b) is based on a channel bandwidth of 5 MHz or 10 MHz. The centre frequency (fN) of the Nth channel is given by:

|  |  |  |  |
| --- | --- | --- | --- |
| **Channel number** | **Mobile station transmit Channel centre frequency (MHz)** | **Base station transmit Channel centre frequency (MHz)** | **Channel bandwidth (MHz)** |
| *N* = 1 to 9 | *fN* = 826.5 + (5) × (*N* − 1) | *fN* = 871.5 + (5) × (*N-1*) | 5 |

Frequency arrangement c): 814-849/859-894 MHz

|  |  |  |
| --- | --- | --- |
| 814-849 | 849-859 | 859-894 |
| PPDR uplink |  | PPDR downlink |
| 35 MHz (7 blocks of 5 MHz) |  | 35 MHz (7 blocks of 5 MHz) |

The channelling plan for frequency arrangement c) is based on a channel bandwidth of 5 MHz or 10 MHz. The centre frequency (fN) of the Nth channel is given by:

|  |  |  |  |
| --- | --- | --- | --- |
| Channel number | Mobile station transmit Channel centre frequency (MHz) | Base station transmit Channel centre frequency (MHz) | Channel bandwidth (MHz) |
| *N* = 1 to 7 | *fN* = 816.5 + (5) × (*N* − 1) | *fN* = 861.5 + (5) × (*N-1*) | 5 |

Frequency arrangement d): 807-824/852-869 MHz

|  |  |  |
| --- | --- | --- |
| 807-824 | 824-852 | 852-869 |
| PPDR uplink |  | PPDR downlink |
| 15 MHz (3 blocks of 5 MHz) |  | 15 MHz (3 blocks of 5 MHz) |

The channelling plan for frequency arrangement d) is based on a channel bandwidth of 5 MHz or 10 MHz. The centre frequency (fN) of the Nth channel is given by:

|  |  |  |  |
| --- | --- | --- | --- |
| Channel number | Mobile station transmit Channel centre frequency (MHz) | Base station transmit Channel centre frequency (MHz) | Channel bandwidth (MHz) |
| *N* = 1 to 3 | *fN* = 811.5 + (5) × (*N* − 1) | *fN* = 856.5 + (5) × (*N-1*) | 5 |
| *N* = 1 to 3 | *fN* = 809.5 + (5) × (*N* − 1) | *fN* = 854.5 + (5) × (*N-1*) | 5 |

Examples of frequency arrangements within the frequency range 694 to 894 MHz in some countries of Region 3 for narrowband   
and/or broadband PPDR

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Frequency arrangement | Paired arrangements | | | | Notes |
| Mobile station TX (MHz) | Centre gap (MHz) | Base station TX (MHz) | Duplex separation (MHz) |
| e) | 718-728 | 10 | 773-7833 | 55 |  |
| f) | 806-824 | 27 | 851-869 | 45 |  |
| g) | 806-824 | 27 | 851-869 | 45 |  |
| h) | 806-834 | 17 | 851-879 | 45 |  |
| i) | 806-824 | 27 | 851-869 | 45 |  |
| j) | 806-824 | - | 851-869 | - |  |

Frequency arrangement e)

|  |  |  |
| --- | --- | --- |
| 718-728 | 728-773 | 773-783 |
| PPDR uplink |  | PPDR downlink |
| 10MHz (2 blocks of 5 MHz) |  | 10 MHz (2 blocks of 5 MHz) |

The channelling plan for frequency arrangement e) is based on a channel bandwidth of 5 MHz or 10 MHz. The centre frequency (fN) of the Nth channel is given by:

|  |  |  |  |
| --- | --- | --- | --- |
| Channel number | Mobile station transmit Channel centre frequency (MHz) | Base station transmit Channel centre frequency (MHz) | Channel bandwidth (MHz) |
| *N* = 1 to 2 | *fN* = 720.5 + (5) × (*N* − 1) | *fN* = 775.5 + (5) × (*N-1*) | 5 |
| *N=1* | *fN* = 723 | *fN* = 778 | 10 |

Frequency arrangement f)

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| 806-813 |  | 814-824 | 824-851 | 851-858 |  | 859-869 |
| Narrowband uplink |  | Broadband uplink |  | Narrowband uplink |  | Broadband uplink |
|  |  | 10 MHz (2 blocks of 5 MHz) |  |  |  | 10 MHz (2 blocks of 5 MHz) |

The channelling plan for frequency arrangement f) is based on a channel bandwidth of 25 kHz for the narrowband component and 5 MHz or 10 MHz for the broadband component. The centre frequency (fN) of the Nth channel is given by:

|  |  |  |  |
| --- | --- | --- | --- |
| Channel number | Mobile station transmit Channel centre frequency (MHz) | Base station transmit Channel centre frequency (MHz) | Channel bandwidth |
| *N* = 1 to 280 | *fN* = 806.0125 + (0.025) × (*N* − 1) | *fN* = 851.0125 + (0.025) × (*N-1*) | 25 kHz |
| *N* = 1 to 2 | *fN* = 816.5.5 + (5) × (*N* − 1) | *fN* = 861.5 + (5) × (*N-1*) | 5 MHz |
| *N =* 1 | *fN* = 819 | *fN* = 864 | 10 MHz |

Frequency arrangement g) has two options

*Option 1*

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| 806-809 | 809-824 | 824-851 | 851-854 | 854-869 |
| NB up | PPDR uplink |  | NB down | PPDR downlink |
|  | 15 MHz  (3 blocks of 5 MHz) |  |  | 15 MHz  (3 blocks of 5 MHz) |

*Option 2*

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| 807-822 | 822-824 | 824-852 | 852-867 | 867-869 |
| PPDR uplink | NB up |  | PPDR downlink | NB down |
| 15 MHz  (3 blocks of 5 MHz) |  |  | 15 MHz  (3 blocks of 5 MHz) |  |

Frequency arrangement h)

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| 806-823 |  | 824-834 | 834-851 | 851-868 |  | 869-879 |
| Narrowband uplink |  | PPDR uplink |  | Narrowband downlink |  | PPDR downlink |
|  |  | 10 MHz (2 blocks of 5 MHz) |  |  |  | 10 MHz (2 blocks of 5 MHz) |

The channelling plan for frequency arrangement d) is based on a channel bandwidth of 25 kHz for the narrowband component and 5 MHz or 10 MHz for the broadband component. The centre frequency (fN) of the Nth channel is given by:

|  |  |  |  |
| --- | --- | --- | --- |
| Channel number | Mobile station transmit Channel centre frequency (MHz) | Base station transmit Channel centre frequency (MHz) | Channel bandwidth |
| *N* = 1 to 680 | *fN* = 806.0125 + (0.025) × (*N* − 1) | *fN* = 851.0125 + (0.025) × (*N-1*) | 25 kHz |
| *N* = 1 to 2 | *fN* = 826.5.5 + (5) × (*N* − 1) | *fN* = 871.5 + (5) × (*N-1*) | 5 MHz |
| *N =* 1 | *fN* = 829 | *fN* = 874 | 10 MHz |

Frequency arrangement i)

|  |  |  |
| --- | --- | --- |
| 806-824 | 824-851 | 851-869 |
| Narrowband uplink |  | Narrowband downlink |
| 18 MHz in channels of 6.25/12.5/25 KHz |  | 18 MHz in channels of 6.25/12.5/25 KHz |

The channelling plan for frequency arrangement i) is for trunked mobile services in three sub-bands:

*Sub-band 806-811/851-856 MHz with channel bandwidth of 25 kHz*

|  |  |  |  |
| --- | --- | --- | --- |
| Channel number | Mobile station transmit Channel centre frequency (MHz) | Base station transmit Channel centre frequency (MHz) | Channel bandwidth |
| *N* = 1 to 200 | *fN* = 806.0125 + (0.025) × (*N* − 1) | *fN* = 851.0125 + (0.025) × (*N-1*) | 25 kHz |

*Sub-band 811-813.5/856-858.5 MHz with channel bandwidth of 12.5 kHz*

|  |  |  |  |
| --- | --- | --- | --- |
| Channel number | Mobile station transmit Channel centre frequency (MHz) | Base station transmit Channel centre frequency (MHz) | Channel bandwidth |
| *N* = 1 to 200 | *fN* = 811.00625 + (0.0125) × (*N* − 1) | *fN* = 856.00625 + (0.0125) × (*N-1*) | 12.5 kHz |

*Sub-band 813.5-816/858-861 MHz with channel bandwidth of 6.25 kHz*

|  |  |  |  |
| --- | --- | --- | --- |
| Channel number | Mobile station transmit Channel centre frequency (MHz) | Base station transmit Channel centre frequency (MHz) | Channel bandwidth |
| *N* = 1 to 400 | *fN* = 813.503125 + (0.00625) × (*N* − 1) | *fN* = 858.503125 + (0.00625) × (*N-1*) | 6.25 kHz |

*[Editor’s note: the following two examples were not in the previous meeting output of M.2015 (Annex 21 to 5A/298) or in APT/AWG/Report-73. Clarification is required at a future meeting, or propose to remove these two examples]*

*Sub-band 816-821/861-866 MHz with channel bandwidth of 25 kHz*

|  |  |  |  |
| --- | --- | --- | --- |
| Channel number | Mobile station transmit Channel centre frequency (MHz) | Base station transmit Channel centre frequency (MHz) | Channel bandwidth |
| *N* = 1 to 200 | *fN* = 816.0125 + (0.025) × (*N* − 1) | *fN* = 861.0125 + (0.025) × (*N-1*) | 25 kHz |

*Sub-band 821-824/866-869 MHz with channel bandwidth of 12.5 kHz*

|  |  |  |  |
| --- | --- | --- | --- |
| Channel number | Mobile station transmit Channel centre frequency (MHz) | Base station transmit Channel centre frequency (MHz) | Channel bandwidth |
| *N* = 1 to 240 | *fN* = 821.00625 + (0.0125) × (*N* − 1) | *fN* = 866.00625 + (0.0125) × (*N-1*) | 12.5 kHz |

Frequency arrangement j)

*[Editor’s note: Further contributions would be encouraged to the next meeting containing the frequency arrangements appropriate for frequency arrangement j) as the Editor is unable to reproduce the frequency arrangements contained in G3-1-2 in the agreed format.]*

\*\*\*\*\*\*\*\*\*\*\*\*\*\*

Section 2 – 380-470 MHz

Sub Section 1: Region 1 380-470 MHz

**Examples of frequency arrangements for the band 380-470 MHz   
in certain countries in Region 1 for narrowband and wideband   
public protection and disaster relief operations in accordance with CEPT harmonization measure ECC/DEC(08)05**

Examples of frequency arrangements for the band 380-470 MHz in certain countries in Region 1 for narrowband and wideband public protection and disaster relief operations.

The frequency range 380-470 MHz has been identified as a tuning range for PPDR in Region 1. The frequency band 380-385 MHz (uplink)/390-395 MHz (downlink) is the harmonized core band for permanent use for PPDR. For more information relating to countries within Europe, see ECC/DEC/(08)05 and ECC Report 102.

Wideband PPDR applications use channels within available parts of the frequency range 380‑470 MHz.

Additionally certain channels have been identified for DMO (Direct mode operation) and AGA (Air‑ground-air operation) purposes.

## 1.1 DMO (Direct mode operation)

Simplex channels within the frequency bands 380-380.150 MHz and 390-390.150 MHz should be used as harmonized channels for DMO. For more information relating to countries within Europe see ERC/DEC/(01)19.

## 1.2 AGA (Air-ground-air operation)

Duplex channels within the frequency bands 384.800 MHz-385 MHz/394.800-395 MHz should be used as the core band for harmonized channels for AGA. Duplex channels within the frequency bands 384.750 MHz-384.800 MHz/394.750-394.800 MHz may be used as the preferred extension band for AGA when additional channels are required. For more information relating to countries within Europe, see ECC/DEC/(06)05.

## 1.3 Centre frequencies

a) For systems with a channel bandwidth of up to 150 kHz

*FCH* = band edge – (channel bandwidth/2) + *n* \* channel bandwidth

where:

*FCH* = centre frequency;

*n* = channel number (1, 2, 3, ...);

band edge: is lower edge of frequency band.

b) For systems with a channel bandwidth of 200 kHz

The centre frequencies should be selected according to the formula under *a)* with an option to offset these centre frequencies by 100 kHz.

c) For systems with a channel bandwidth of 1.25 MHz

The centre frequencies should be selected according to the formula under *a)* with an option to offset these centre frequencies by multiples of 12.5 kHz, in order to provide flexibility to locate the centre frequencies in the optimum position within the band.

Examples of frequency arrangements within the frequency range 450-470 MHz in some countries of Region 1 (CEPT) for broadband public protection and disaster relief operations

Administrations in certain countries in Region 1 wishing to introduce additional spectrum for BB-PPDR in parts of the 400 MHz range shall apply least restrictive technical conditions (LRTC) to ensure coexistence with other services. The channelling arrangements 1.4 MHz, 3 MHz or 5 MHz within the following paired frequency ranges according to ECC/DEC/(16)02 are:

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Frequency arrangement** | **Mobile station transmitter (MHz)** | **Centre gap (MHz)** | **Base station transmitter (MHz)** | **Duplex separation(MHz)** | **Notes** |
| a) | 450.5-456.0 | Depending on center frequencies and bandwidth chosen based on national circumstances | 460.5-466.0 | Depending on center frequencies and bandwidth chosen based on national circumstances | LRTC specified in Annex 2 of ECC/DEC/(16)02 |
| b) | 452.0-457.5 | 462.0-467.5 |

450-470 MHz range examples



The centre frequencies of the above may be shifted within the band based on national circumstances. BB-PPDR within the 452.5-457.5/462.5-467.5 MHz can be used to benefit from existing conditions of 3GPP band 31 however it should be noted that this has not been studied and may cause interference for countries where channel 21 is used for DTT. For further information see ECC Report 218.

This 400 MHz range does not provide enough available spectrum to provide a stand-alone solution in certain countries in Region 1 requiring 2x10 MHz for BB-PPDR as calculated in ECC Report 199, however this 400 MHz range can offer national flexibility, e.g. in the context of additional spectrum beside the 700 MHz range.

Examples of frequency arrangements for the band 380-399.3 MHz   
in some countries in Region 1 for narrowband public protection   
and disaster relief operations



Sub Section 2: Region 2

There are no bands listed for Region 2 in *resolves* 3 of Resolution **646 (Rev.WRC-15)**.

Sub Section 3: Region 3

Examples of frequency arrangements within the frequency range 406.1-430 MHz in some countries of Region 3 for narrowband PPDR

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Frequency arrangement | Paired arrangements | | | | Notes |
| Mobile station TX (MHz) | Centre gap (MHz) | Base station TX (MHz) | Duplex separation (MHz) |
| a) | 410-420 | 0 | 420-430 | 10 |  |
| b) | 414.0125-414.1000 | N/A | 414.0125-414.1000 | N/A |  |
| c) | 406.1125-411.5875 | 2.525 | 414.1125-419.5875 | 8 |  |
| d) | 457.50625–459.9875 | 7.51875 | 467.50625–469.9875 | 10 |  |
| e) | 408.6375–410.5375 | 7.55 | 418.0875–420.0000 | 9.45 |  |
| f) | 420.0000–430.0000 | - | - | - |  |

The channelling plan for frequency arrangement a) is used in some countries for narrowband PPDR and digital trunked radio systems. The channelling plan is based on 12.5 kHz channel spacing, providing a total of 800 pairs of physical radio channels. Although the standard channel spacing is 12.5 kHz, there is flexibility to assign two or more contiguous channels (i.e. 25 KHz, 50 KHz or 100 KHz) as required.

The center frequency (fN) of the Nth channel is given by:

|  |  |  |  |
| --- | --- | --- | --- |
| Channel number | Mobile station transmit Channel center frequency (MHz) | Base station transmit Channel center frequency (MHz) | Channel bandwidth (kHz) |
| *N* = 1 to 800 | *fN* = 410.006125 +( N-1)\*0.0125 | *fN* = 420.00625 +( N-1)\*0.0125 | 12.5 |

The channel arrangements are divided into 4 pairs of frequency blocks (blocks A/A’, blocks B/B’, blocks C/C’, and blocks D/D’) with transmit/receive separation of 10 MHz. The channel allotment plan is designed to minimize inter-modulation and frequency interference problems by assigning co-sited channels that are 250 kHz apart. The frequency blocks A, B, C and D, which contain 200 channels each, are divided into ten (10) channel groups (i.e. A01-A10, B01-B10, C01-C10 and D01-D10) respectively.

The numbers of channels/channel groups assigned are based on the service requirement of the user agency based among others on the area covered, grade of service (GOS), capacity and services provided. The channel allotment plan is given by:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Block | A | B | C | D |
| Group Nos. 01 to 10 | X= 1 to 10  A = 1 to 10 | X= 1 to 10  B = 1 to 10 | X= 1 to 10  C = 1 to 10 | X= 1 to 10  D =1 to 10 |
| Channel Number N= | 2\*A-1+20\*(X-1) and  2\*A+20\*(X-1) | 2\*B+199+20\*(X-1) and  2\*B+200+20\*(X-1) | 2\*C+399+20\*(X-1) and  2\*C+400+20\*(X-1) | 2\*D+599+20\*(X-1) and  2\*D+600+20\*(X-1) |

Frequency arrangement b)

The channelling plan for frequency arrangement b) is based on channel arrangements currently used in New Zealand for simplex services. The center frequency (fN) of the Nth channel is given by:

|  |  |  |  |
| --- | --- | --- | --- |
| Channel number | Mobile station transmit Channel center frequency (MHz) | Base station transmit Channel center frequency (MHz) | Channel bandwidth (kHz) |
| *N* = 1 to 8 | *fN* = 414.01250 + ((N-1) \* 0.0125) | *fN* = 414.01250 + ((N-1) \* 0.0125) | 12.5 kHz |

Frequency arrangements c)

The channelling plan for frequency arrangement c) is based on channel arrangements currently used in New Zealand for duplex services. The center frequency (fN) of the Nth channel is given by:

|  |  |  |  |
| --- | --- | --- | --- |
| Channel number | Mobile station transmit Channel center frequency (MHz) | Base station transmit Channel center frequency (MHz) | Channel bandwidth (kHz) |
| *N* = 1 to 439 | *fN* = 406.11250 + ((N-1) \* 0.0125 | *fN* = 414.11250 + ((N-1) \* 0.0125) | 12.5 |

Frequency arrangement d)

*[Editor’s note: there is no detail in APT Report 73 to populate this frequency arrangement]*

Frequency arrangement e)

*[Editor’s note: there is no detail in APT Report 73 to populate this frequency arrangement]*

Frequency arrangement f)

*[Editor’s note: there is neither a diagram nor channeling plan available, only text description in the APT Report 73]*

The channelling plan for frequency arrangement f) is is used to accommodate bi-directional fixed point-to-point links and is not considered as a candidate band for land mobile applications.

Examples of frequency arrangements within the frequency range 440-470 MHz in some countries of Region 3 for narrowband PPDR

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Frequency arrangement | Paired arrangements | | | | Notes |
| Mobile station TX (MHz) | Centre gap (MHz) | Base station TX (MHz) | Duplex separation (MHz) |
| g) | 457.50625–459.9875 | 7.51875 | 467.50625–469.9875 | 10 |  |

Frequency arrangement a)

*[Editor’s note: there is no detail in APT Report 73 to populate this frequency arrangement]*

\*\*\*\*\*\*\*\*\*\*\*\*\*

Section 3 – Region 3

**Examples of frequency arrangements within the frequency band 4940-4990 MHz in some countries of Region 3**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Frequency arrangement | Paired arrangements | | | | Notes |
| Mobile station TX (MHz) | Centre gap (MHz) | Base station TX (MHz) | Duplex separation (MHz) |
| a) | 4940-4990 | N/A | 4940-4990 | N/A |  |

Frequency arrangement a)

The channelling plan for frequency arrangement a) supports channel widths from 5 MHz to 20 MHz, to provide the flexibility needed for Administrations to support a variety of PPDR operational requirements.

|  |  |  |  |
| --- | --- | --- | --- |
| Channel number (nch) | Channel centre 5 MHz | Channel centre 10 MHz | Channel centre 20 MHz |
| 1 | 4942.5 |  |  |
| 2 |  | 4945.0 |  |
| 3 | 4947.5 |  |  |
| 4 |  | 4950.0 | 4950.0 |
| 5 | 4952.5 |  |  |
| 6 |  | 4955.0 | 4955.0 |
| 7 | 4957.5 |  |  |
| 8 |  | 4960.0 | 4960.0 |
| 9 | 4962.5 |  |  |
| 10 |  | 4965.0 | 4965.0 |
| 11 | 4967.5 |  |  |
| 12 |  | 4970.0 | 4970.0 |
| 13 | 4972.5 |  |  |
| 14 |  | 4975.0 | 4975.0 |
| 15 | 4977.5 |  |  |
| 16 |  | 4980.0 | 4980.0 |
| 17 | 4972.5 |  |  |
| 18 |  | 4985.0 |  |
| 19 | 4977.5 |  |  |

Because these channels overlap one another, Administrations may take precautions in their assignment procedures to ensure that overlapping channels do not occur in close enough proximity to cause conflicts between multiple PPDR users. Note that not all of the channels are available in some countries.

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Annex 2

*[Editor’s note: Page numbers to be inserted at a later stage.]*

|  |  |  |
| --- | --- | --- |
| Annex 2  Country-Specific Frequency Arrangements (as per resolves 4 of Resolution 646 (Rev.WRC-15)) | | |
| Region of country(ies) / Section | Example Frequency Arrangement(s) | Page |
| 1 | There are no frequency arrangements provided by Region 1 administrations for inclusion here as per *resolves* 4 of Resolution **646 (Rev.WRC-15)** |  |
| 2 | Examples of frequency arrangements for the band 380-399.99 MHz in certain countries in Region 2 for narrowband public protection and disaster relief operations |  |
| 2 | Examples of frequency arrangements for the band 4 940–4 990 MHz in certain countries in Region 2 for public protection and disaster relief operations in accordance with CITEL harmonization measures |  |
| 3 | Examples of frequency arrangements within the frequency range 138-144 MHz in certain countries in Region 3 for narrowband PPDR |  |
| 3 | Examples of frequency arrangements within the frequency range 351 to 370 MHz in certain countries in Region 3 for narrowband public PPDR |  |
| 3 | Examples of frequency arrangements within the frequency range 170 to 205 MHz in certain countries in Region 3 for broadband PPDR |  |
| 3 | Examples of frequency arrangements within the frequency range 1 447 to 1 467 MHz in certain countries in Region 3 for broadband PPDR |  |
| 3 | Examples of frequency arrangements within the frequency range 403-413.4375 MHz in certain countries in Region 3 for narrowband PPDR |  |
| 3 | Examples of frequency arrangements within the frequency range 405.0125-415.4375 MHz in certain countries in Region 3 for broadband PPDR |  |

Country frequency arrangements for public protection and disaster relief   
as per *resolves* 4 of Resolution 646 (Rev.WRC-15)

Section 1 – Region 1 country-specific frequency arrangements

There are no frequency arrangements provided by Region 1 administrations for inclusion here as per *resolves* 4 of Resolution **646 (Rev.WRC-15)**.

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Section 2 – Region 2 country-specific frequency arrangements

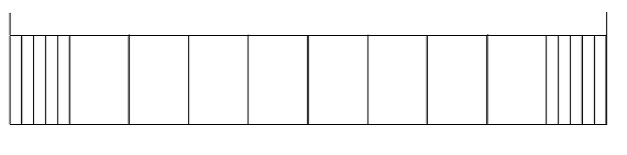
Examples of frequency arrangements for the band 380-399.99 MHz in certain countries in Region 2 for narrowband public protection and disaster relief operations

*[Editor’s note: Mexico to provide frequency arrangement for next meeting]*

Examples of frequency arrangements for the band 4 940–4 990 MHz in some countries in Region 2 in accordance with CITEL harmonization measures[[10]](#footnote-19) for PPDR

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Frequency arrangement | Mobile station/ Control station transmit (MHz) | Center gap | Base station transmit  (MHz) | Duplex separation | Notes |
| a) |  |  |  |  | 4940-4990  Pairing unspecified |

Frequency arrangement a):



4940

MHz

4990

MHz

5

x 1 MHz wide channels

8

x 5 MHz wide channels

5

x 1 MHz wide channels

Table

CITEL PCC.II channelling plan for the band 4 940-4 990 MHz for PPDR

|  |  |  |
| --- | --- | --- |
| Channel | Lower frequency (MHz) | Upper frequency (MHz) |
| 1 | 4 940 | 4 941 |
| 2 | 4 941 | 4 942 |
| 3 | 4 942 | 4 943 |
| 4 | 4 943 | 4 944 |
| 5 | 4 944 | 4 945 |
| 6 | 4 945 | 4 950 |
| 7 | 4 950 | 4 955 |
| 8 | 4 955 | 4 960 |
| 9 | 4 960 | 4 965 |
| 10 | 4 965 | 4 970 |
| 11 | 4 970 | 4 975 |
| 12 | 4 975 | 4 980 |
| 13 | 4 980 | 4 985 |
| 14 | 4 985 | 4 986 |
| 15 | 4 986 | 4 987 |
| 16 | 4 987 | 4 988 |
| 17 | 4 988 | 4 989 |
| 18 | 4 989 | 4 990 |

The CITEL PCC.II recommended frequency channelling plan for the 4 940-4 990 MHz band for public protection and disaster relief consists of ten 1 MHz channels and eight 5 MHz channels as per the figure and table above. Channels may be aggregated for higher capacity or higher bandwidth applications to allow maximum flexibility and implementation of future broadband technologies. Some countries may also choose to partition the 5 MHz channels.

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Section 3 – Region 3 country-specific frequency arrangements

Examples of frequency arrangements within the frequency range 138-144 MHz in certain countries in Region 3 for narrowband PPDR

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Frequency arrangement | Paired arrangements | | | | Notes |
| Mobile station TX (MHz) | Centre gap (MHz) | Base station TX (MHz) | Duplex separation (MHz) |
| a1) | 138.00625-140.50625 |  | 141.00625-143.50625 | 3 | Duplex |
| a2) | 140.50625-141.00625 | N/A | 140.50625-141.00625 | N/A | Simplex |
| a3) | 143.50625-143.99375 | N/A | 143.50625-143.99375 | N/A | Simplex |

Frequency arrangement a1), a2), a3)

|  |  |  |  |
| --- | --- | --- | --- |
| 138.00625-140.50625 | 140.50625-141.00625 | 141.00625-143.50625 | 143.50625-143.99375 |
| Narrowband uplink | Narrowband uplink | Narrowband downlink | Narrowband uplink |
| Duplex | Simplex | Duplex | Simplex |

The channelling plan for frequency arrangement a1) is a duplex arrangement. The center frequency (fN) of the Nth channel is given by:

|  |  |  |  |
| --- | --- | --- | --- |
| Channel number | Mobile station transmit Channel center frequency (MHz) | Base station transmit Channel center frequency (MHz) | Channel bandwidth (kHz) |
| N = 1 to 200 | fN = 138.0125 + (0.0125) × (N − 1) | fN = 141.0125 + (0.0125) × (N – 1) | 12.5 |

The channelling plan for frequency arrangement a2) is a simplex arrangement. The center frequency (fN) of the Nth channel is given by:

|  |  |  |
| --- | --- | --- |
| Channel number | Channel center frequency (MHz) | Channel bandwidth (kHz) |
| *N* = 1 to 40 | *fN* = 140.51250 + (0.0125) × (*N* − 1) | 12.5 |

The channelling plan for frequency arrangement a3) is a simplex arrangement. The center frequency (fN) of the Nth channel is given by:

|  |  |  |
| --- | --- | --- |
| Channel number | Channel center frequency (MHz) | Channel bandwidth (kHz) |
| *N* = 41 to 79 | *fN* = 143.51250 + (0.0125) × (*N* − 41) | 12.5 |

**Examples of frequency arrangements within the frequency range 351 to 370 MHz in certain countries in Region 3 for narrowband PPDR**

The frequency range 351-370 MHz has been identified by the Ministry of Industry and Information Technology of the People’s Republic of China for narrowband public protection and disaster relief operations. And a number of PPDR radio communication systems have been deployed on the frequency range 351-370 MHz in the People’s Republic of China.

**Examples of frequency arrangements within the frequency range 170-205 MHz in certain countries in Region 3 for broadband PPDR**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Frequency arrangement | Paired arrangements | | | | Notes |
| Mobile station TX (MHz) | Centre gap (MHz) | Base station TX (MHz) | Duplex separation (MHz) |
| b) | 172.5-202.5 | N/A | 172.5-202.5 | N/A | TDD |

Frequency arrangement b)

|  |  |  |
| --- | --- | --- |
| 170-172.5 | 172.5-202.5 | 202.5-205 |
| Guard band | Broadband PPDR | Guard band |
|  | 6 blocks of 5 MHz |  |

**Examples of frequency arrangements within the frequency range 1 447 to 1 467 MHz in certain countries in Region 3 for broadband PPDR**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Frequency arrangement | Paired arrangements | | | | Notes |
| Mobile station TX (MHz) | Centre gap (MHz) | Base station TX (MHz) | Duplex separation (MHz) |
| c) | 1447-1467 | N/A | 1447-1467 | N/A | TDD |

Frequency arrangement c)

|  |
| --- |
| 1447-1467 |
| Broadband PPDR |
| 4 blocks of 5 MHz,  2 blocks of 10 MHz  or 1 block of 20 MHz |

The channelling plan for frequency arrangement a) may be assigned throughout this band and specific blocks may be designated exclusively for government applications. The center frequency (fN) of the Nth channel is given by:

|  |  |  |
| --- | --- | --- |
| Channel number | Channel center frequency (MHz) | Channel bandwidth (MHz) |
| *N* = 1 to 4 | *fN* = 1449.5 + (5) × (*N* − 1) | 5 |
| *N* = 1 to 2 | *fN* = 1452.0 + (5) × (*N* − 1) | 10 |
| *N* = 1 | *fN* = 1457.0 | 20 |

The frequency range 1 447-1 467 MHz has been identified by the Ministry of Industry and Information Technology of the People’s Republic of China for PPDR. It is noticed that a number of broadband trunking system trial networks have been deployed on the 1 447-1 467 MHz band, for example in Beijing, Nanjing, and Tianjin.

**Examples of frequency arrangements within the frequency range 403‑413.4375 MHz in certain countries in Region 3 for narrowband PPDR**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Frequency arrangement | Paired arrangements | | | | Notes |
| Mobile station TX (MHz) | Centre gap (MHz) | Base station TX (MHz) | Duplex separation (MHz) |
| d) | 403.0000–403.9875 | - | 412.4625–413.4375 | 9.4625 | 12.5 kHz |

*[Editor’s note: This frequency arrangement from APT/AWG Report 73 is from Australia. Contributions are invited to improve this section of the document.]*

**Examples of frequency arrangements within the frequency range  
405.0125-415.4375 MHz in certain countries in Region 3 for broadband PPDR**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Frequency arrangement | Paired arrangements | | | | Notes |
| Mobile station TX (MHz) | Centre gap (MHz) | Base station TX (MHz) | Duplex separation (MHz) |
| e) | 405.0125–406.0000 | - | 414.4625–415.4375 | 9.45 | 12.5 kHz |

*[Editor’s note: This frequency arrangement from APT/AWG Report 73 is from Australia. Contributions are invited to improve this section of the document.]*

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1. PCC.II/REC. 18 (VII-06) and PCC.II/REC.49 (XXVII-16) [↑](#footnote-ref-10)
2. PCC.II/REC. 18 (VII-06). [↑](#footnote-ref-11)
3. PCC.II/REC.18 (VII-06) does not specify broadband, wideband, or narrowband. It refers only to PPDR applications. [↑](#footnote-ref-12)
4. This frequency arrangement is from the Canadian rules. For more details, see Industry Canada’s Gazette Notice No. DGTP-007-09 – Narrowband and Wideband Public Safety Radiocommunication Systems in the bands 768-776 MHz and 798-806 MHz (<http://www.ic.gc.ca/eic/site/smt-gst.nsf/eng/sf09553.html>). [↑](#footnote-ref-13)
5. This frequency arrangement is from the Canadian rules. For more details, see Industry Canada’s Gazette Notice No. DGTP-007-09 – Narrowband and Wideband Public Safety Radiocommunication Systems in the bands 768-776 MHz and 798-806 MHz (<http://www.ic.gc.ca/eic/site/smt-gst.nsf/eng/sf09553.html>). [↑](#footnote-ref-14)
6. This band plan is from the United States’ FCC Rules. For more details, see Part 90 of the FCC Rules at <https://www.fcc.gov/general/rules-regulations-title-47> [↑](#footnote-ref-15)
7. This frequency arrangement is from the United States’ FCC Rules. For more details, see Part 90 of the FCC Rules at <https://www.fcc.gov/general/rules-regulations-title-47>. [↑](#footnote-ref-16)
8. This frequency arrangement is from the Canadian rules. For more details, see Standard Radio System Plan 502 at <http://www.ic.gc.ca/eic/site/smt-gst.nsf/eng/sf00050.html>. [↑](#footnote-ref-17)
9. APT/AWG/REP-73 Edition: April 2017 – “*Harmonization of frequency ranges for use by wireless PPDR applications in Asia-Pacific region”* [↑](#footnote-ref-18)
10. PCC.II/REC. 16 (VII-06): Use of the 4940-4990 MHz band in the Americas for Public Protection and Disaster Relief. [↑](#footnote-ref-19)