



**Recommendation ITU-R M.2015-2**  
(01/2018)

**Frequency arrangements for public  
protection and disaster relief  
radiocommunication systems in accordance  
with Resolution 646 (Rev.WRC-15)**

**M Series**  
**Mobile, radiodetermination, amateur  
and related satellite services**

## Foreword

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<b>BT</b>	Broadcasting service (television)
<b>F</b>	Fixed service
<b>M</b>	<b>Mobile, radiodetermination, amateur and related satellite services</b>
<b>P</b>	Radiowave propagation
<b>RA</b>	Radio astronomy
<b>RS</b>	Remote sensing systems
<b>S</b>	Fixed-satellite service
<b>SA</b>	Space applications and meteorology
<b>SF</b>	Frequency sharing and coordination between fixed-satellite and fixed service systems
<b>SM</b>	Spectrum management
<b>SNG</b>	Satellite news gathering
<b>TF</b>	Time signals and frequency standards emissions
<b>V</b>	Vocabulary and related subjects

*Note: This ITU-R Recommendation was approved in English under the procedure detailed in Resolution ITU-R 1.*

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## RECOMMENDATION ITU-R M.2015-2

**Frequency arrangements for public protection and disaster relief  
radiocommunication systems in accordance  
with Resolution 646 (Rev.WRC-15)**

(2012-2015-2018)

**Scope**

This Recommendation is intended to promote global and regional harmonization of frequency bands for public protection and disaster relief (PPDR). It provides guidance on frequency arrangements for PPDR 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, harmonization

**Abbreviations/Glossary**

3GPP	Third Generation Partnership Project
APT	Asia-Pacific Telecommunity
ATU	African Telecommunications Union
CEPT	European Conference of Postal and Telecommunications Administrations
CITEL	Inter-American Telecommunication Commission
IMT	International Mobile Telecommunications
LRTC	Least restrictive technical conditions
PPDR	Public protection and disaster relief

**Related ITU Recommendations, Reports**

Recommendation ITU-R M.1826	Harmonized frequency channel plan for broadband public protection and disaster relief operations at 4 940-4 990 MHz in Regions 2 and 3
Recommendation ITU-R M.2009	Radio interface standards for use by public protection and disaster relief operations in some parts of the UHF band in accordance with Resolution <b>646 (Rev.WRC-12)</b>
Report ITU-R M.2291	The use of International Mobile Telecommunications (IMT) for broadband public protection and disaster relief (PPDR) applications
Report ITU-R M.2377	Radiocommunication objectives and requirements for Public Protection and Disaster Relief (PPDR)
Report ITU-R M.2415-0	Spectrum needs for Public Protection and Disaster Relief

The ITU Radiocommunication Assembly,

*considering*

- a) that Resolution **646 (Rev.WRC-15)** encourages administrations to use harmonized frequency ranges for public protection and disaster relief (PPDR) to the maximum extent possible when undertaking their national planning for their PPDR applications;
- b) that Resolution **646 (Rev.WRC-15)** resolves to include in this Recommendation harmonized PPDR frequency arrangements within the frequency ranges specified in *resolves* 2 and 3 of that Resolution, as well as, as specified in *resolves* 4, countries' frequency arrangements for PPDR;
- 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 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 common frequency bands will enable administrations to achieve the benefits of ,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 administrations have the flexibility:

- to determine, at the national level, how much spectrum to make available for PPDR 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 and 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) that Resolution **647 (Rev.WRC-15)** addresses radiocommunication aspects, including spectrum management guidelines, for early warning, disaster prediction, detection, mitigation and relief operations relating to emergencies and disasters, and also addresses the need to coordinate activities under Resolutions **646 (Rev.WRC-15)** and **647 (Rev.WRC-15)** in order to minimize any possible overlap;
- g) that Recommendation ITU-R M.2009 provides appropriate radio interface standards 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 Report ITU-R M.2415-0 addresses the estimation of spectrum needs for PPDR;
- k) 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 frequency arrangements in Annex 1, in the harmonized frequency ranges in *resolves* 2 and 3 of Resolution **646 (Rev.WRC-15)**, should be used by administrations as guidance when making spectrum available for PPDR applications;
- 2** that administrations implementing the frequency arrangements in the Annexes should make all necessary efforts to ensure compatibility between PPDR and stations of other services in neighbouring countries.

## Annex 1

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

<b>Section 1: Arrangements in parts of the frequency range 694-894 MHz (as per <i>resolves 2</i> of Resolution 646 (Rev.WRC-15))</b>		
<b>Region</b>	<b>Sub-Section</b>	<b>Frequency Arrangement(s)</b>
1	1-1.1	Harmonized frequency arrangements within the frequency range 698 to 791 MHz in accordance with the CEPT harmonization measure ECC/DEC/(16)02 for broadband PPDR
1	1-1.2	Harmonized frequency arrangements within the bands 694 to 791 MHz in accordance with the Arab States harmonized measures for broadband PPDR
1	1-1.3	Frequency arrangements within the bands 791 to 862 MHz in some countries of Region 1 for broadband PPDR
1	1-1.4	Harmonized frequency arrangements within the frequency range 694 to 894 MHz in accordance with ATU harmonization measures for broadband PPDR
1	1-1.5	Frequency arrangements within the frequency range 723 to 788 MHz in some countries of Region 1 for broadband PPDR
1	1-1.6	Frequency arrangements within the frequency range 703 to 768 MHz in some countries of Region 1 for broadband PPDR
2	1-2.1	Harmonized frequency arrangements within the frequency range 703 to 869 MHz in accordance with the CITELE harmonization measures for broadband PPDR
2	1-2.2	Harmonized frequency arrangements within the frequency range 764 to 806 MHz in accordance with the CITELE harmonization measures for PPDR applications
2	1-2.3	Frequency arrangements within the frequency range 806 to 869 MHz in some countries of Region 2 for narrowband PPDR
3	1-3.1	Harmonized frequency arrangements within the frequency range 694 to 894 MHz in accordance with the APT harmonization measures for broadband PPDR
3	1-3.2	Frequency arrangements within the frequency range 694 to 894 MHz in some countries of Region 3 for narrowband and/or broadband PPDR

<b>Section 2: Frequency Arrangements in parts of the frequency range 380-470 MHz (as per <i>resolves 3</i> of Resolution 646 (Rev.WRC-15))</b>		
<b>Region</b>	<b>Sub-Section</b>	<b>Frequency Arrangement(s)</b>
1	2-1.1	Frequency arrangements for the band 380 to 470 MHz in some countries of Region 1 for narrowband and wideband PPDR in accordance with CEPT harmonization measure ECC/DEC/(08)05
1	2-1.2	Harmonized frequency arrangements within the frequency range 450.5 to 467.5 MHz in accordance with CEPT harmonization measure ECC/DEC/(16)02 for broadband PPDR

<b>Section 2: Frequency Arrangements in parts of the frequency range 380-470 MHz (as per <i>resolves</i> 3 of Resolution 646 (Rev.WRC-15))</b>		
Region	Sub-Section	Frequency Arrangement(s)
1	2-1.3	Frequency arrangements within the frequency range 380 to 399.99 MHz in some countries of Region 1 for narrowband PPDR
1	2-1.4	Harmonized frequency arrangements within the frequency range 380 to 470 MHz in accordance with the ATU harmonization measures for narrowband and/or wideband PPDR
2	2-2	There are no bands listed for Region 2 in <i>resolves</i> 3 of Resolution <b>646 (Rev.WRC-15)</b>
3	2-3.1	Frequency arrangements within the frequency range 406.1 to 430 MHz in some countries of Region 3 for narrowband PPDR
3	2-3.2	Frequency arrangements within the frequency range 440 to 470 MHz in some countries of Region 3 for narrowband PPDR

<b>Section 3: Frequency Arrangements in parts of the frequency range 4 940-4 990 MHz (as per <i>resolves</i> 3 of Resolution 646 (Rev.WRC-15))</b>		
Region	Sub-Section	Frequency Arrangement(s)
3	3-1.1	Harmonized frequency arrangements within the frequency band 4 940 to 4 990 MHz in some countries of Region 3 for broadband PPDR

## SECTION 1

### Arrangements in parts of the frequency range 694 to 894 MHz

#### 1-1 Region 1

#### 1-1.1 Harmonized frequency arrangements within the frequency range 698 to 791 MHz in accordance with the CEPT harmonization measure ECC/DEC/(16)02 for broadband PPDR

#### Frequency arrangements for broadband PPDR in the 698-791 MHz frequency range

Frequency arrangement (options)	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

### Detailed description of the frequency arrangement

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

### Channelling arrangement for option b)

Channel number	Mobile station transmit Channel centre frequency (MHz)	Base station transmit Channel centre frequency (MHz)	Channel bandwidth (MHz)
$N = 1$ to 6	$f_N = 703 - 2.5 + N \times 5$	$f_N = 758 - 2.5 + N \times 5$	5

Administrations requiring  $2 \times 10$  MHz for broadband PPDR, as calculated in Report ITU-R M.2377-0 and ECC Report 199, and authorizing the full  $2 \times 30$  MHz in option b) for commercial mobile/fixed communications networks (MFCN) can no longer identify  $2 \times 10$  MHz for dedicated broadband 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.

For further information on broadband PPDR usage in CEPT please see ECC/DEC/(16)02 (“Harmonised technical conditions and frequency bands for the implementation of Broadband Public Protection and Disaster Relief (BB-PPDR) systems”) and the relevant ECC Reports mentioned therein. For international coordination Resolution **749 (Rev.WRC-15)** and Resolution **760 (WRC-15)** are applied as appropriate. For the frequency range 698-791 MHz ECC/REC/(16)03 (“Cross-border coordination for Broadband Public Protection and Disaster Relief (BB-PPDR) systems in the frequency band 698-791 MHz”) is relevant within CEPT.

#### 1-1.2 Harmonized frequency arrangements within the frequency range 694-791 MHz in accordance with the Arab States harmonized measures for broadband PPDR

The following frequency arrangements are possible options of harmonized bands for implementation of broadband PPDR based on IMT technology in Arab States with bandwidth of  $2 \times 5$  MHz starting at 698 MHz, which has the potential to be harmonized in Region 1.

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

#### Frequency arrangements for broadband PPDR in the 694-791 MHz frequency range

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	$2 \times 5$ MHz
b)	698-708	45	753-763	55	$2 \times 10$ MHz
c)	698-713	40	753-768	55	$2 \times 15$ MHz
d)	698-718	35	753-773	55	$2 \times 20$ MHz



**Detailed description of the frequency arrangement**

698-703	703-708	708-713	713-718	718-723	723-728	728-733	733-736	736-752	753-758	758-763	763-768	768-773	773-778	778-783	783-788	788-791
PPDR a) uplink									PPDR a) downlink							
PPDR b) uplink									PPDR b) downlink							
PPDR c) uplink									PPDR c) downlink							
PPDR d) uplink									PPDR d) downlink							
5 MHz	30 MHz (6 blocks of 5 MHz)						3 MHz		5 MHz	30 MHz (6 blocks of 5 MHz)						3 MHz

**Channelling arrangement**

Channel number	Mobile station transmit Channel centre frequency (MHz)	Base station transmit Channel centre frequency (MHz)	Channel bandwidth (MHz)
$N = 1$ to 4	$f_N = 698 - 2.5 + N \times 5$	$f_N = 753 - 2.5 + N \times 5$	5

Administrations wishing to implement wider channel bandwidth up to  $2 \times 20$  MHz starting from (UL: 698-703 MHz, DL: 753-758) MHz can combine multiple blocks of 5 MHz based on 3GPP Band 68 to meet their national broadband PPDR requirements (e.g. UL: 698-718, DL: 753-773 MHz).

**1-1.3 Frequency arrangements within frequency range 791 to 862 MHz in some countries of Region 1 for broadband PPDR**

**Frequency arrangements for broadband PPDR in the 791-862 MHz frequency range**

Frequency arrangement	Paired arrangements				Notes
	Mobile station TX (MHz)	Centre gap (MHz)	Base station TX (MHz)	Duplex separation (MHz)	
a)	832-862	11	791-821	41	3GPP band 20

**Detailed description of the frequency arrangement**

790-791	791-796	796-801	801-806	806-811	811-816	816-821	821-832	832-837	837-842	842-847	847-852	852-857	857-862
	PPDR downlink							PPDR uplink					
	30 MHz (6 blocks of 5 MHz)						11 MHz	30 MHz (6 blocks of 5 MHz)					

### Channelling arrangement

Channel number	Mobile station transmit Channel centre frequency (MHz)	Base station transmit Channel centre frequency (MHz)	Channel bandwidth (CBW) (MHz)
$N = 1$ to 6	$f_N = 832 - 2.5 + N \times 5$	$f_N = 791 - 2.5 + N \times 5$	5

The frequency range 791-821/832-862 MHz has been identified for broadband PPDR operations in Qatar. Part of this frequency range is used for PPDR operations in Qatar.

#### 1-1.4 Harmonized frequency arrangements within the frequency range 694-894 MHz in accordance with the ATU harmonization measures for broadband PPDR

##### Frequency arrangements for broadband PPDR in the 694-894 MHz frequency range

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	Core band broadband PPDR Based on 3GPP LTE Band 68 for broadband PPDR
b)	703-733	25	758-763	55	Broadband PPDR for CBW = 10, 15 MHz Assumes 3GPP LTE Band 68 or Band 28A specs for $F_c < 723$ MHz @ CBW 10 MHz Band 28 for $F_c > 723$ MHz @ CBW > 10 MHz
c)	733-736	52	788-791	55	Assumes 3GPP LTE Band 28B CBW: 1.5, 3 MHz

### Channelling arrangement

Channel number	Mobile station transmit Channel centre frequency (MHz)	Base station transmit Channel centre frequency (MHz)	Channel bandwidth (MHz)
$N = 0$ to 5	$f_N = 703 - 2.5 + N \times 5$	$f_N = 758 - 2.5 + N \times 5$	5
$N = 1$ to 3	$f_N = 703 - 5 + N \times 10$	$f_N = 758 - 5 + N \times 10$	10
$N = 1$	$f_N = 734.5$	$f_N = 789.5$	3
$N = 1$ to 2	$f_N = 733 - 0.75 + N \times 1.5$	$f_N = 788 - 0.75 + N \times 1.5$	1.5

Administrations requiring parts of the  $2 \times 30$  MHz for broadband PPDR, may, as a national matter, implement a combination of options b) and c) above.

#### 1-1.5 Frequency arrangements within the frequency range 723 to 788 MHz in some countries of Region 1 for broadband PPDR

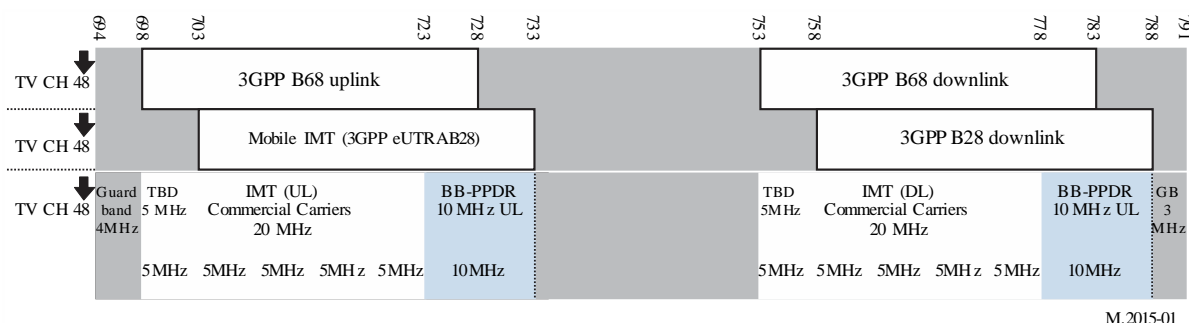
**Frequency arrangements for broadband PPDR in the 723-788 MHz frequency range**

Frequency arrangement	Paired arrangements				Notes
	Mobile station TX (MHz)	Centre gap (MHz)	Base station TX (MHz)	Duplex separation (MHz)	
a)	723-733	45	778-788	55	2 × 10 MHz Based on 3GPP LTE Band 28

**Channelling arrangement**

Channel number	Mobile station transmit Channel centre frequency (MHz)	Base station transmit Channel centre frequency (MHz)	Channel bandwidth (MHz)
$N = 1$ to 2	$f_N = 723 - 2.5 + N \times 5$	$f_N = 778 - 2.5 + N \times 5$	5
$N = 1$	$f_N = 723 - 5 + N \times 10$	$f_N = 778 - 5 + N \times 10$	10

**Detailed description of the frequency arrangement**



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**1-1.6 Frequency arrangements within the frequency range 703 to 768 MHz in some countries of Region 1 for broadband PPDR**

**Frequency arrangements for broadband PPDR in the 703 to 768 MHz frequency range**

Frequency arrangement	Paired arrangements				Notes
	Mobile station TX (MHz)	Centre gap (MHz)	Base station TX (MHz)	Duplex separation (MHz)	
a)	703-713	45	758-768	55	2 × 10 MHz FDD based on IMT specifications

**Channelling arrangement**

Channel number	Mobile station transmit Channel centre frequency (MHz)	Base station transmit Channel centre frequency (MHz)	Channel bandwidth (MHz)
$N = 1$	$f_N = 703 - 5 + N \times 10$	$f_N = 758 - 5 + N \times 10$	10

## Detailed description of the frequency arrangement

694	703	713	723	733	753	763	773	783	
↓ DTTV	9 MHz	BB-PPDR 10 MHz UL	Mobile operators 20 MHz			25 MHz	BB-PPDR 10 MHz DL	Mobile operators 20 MHz	
		10 MHz	10 MHz	10 MHz		10 MHz	10 MHz	10 MHz	

M.2015-02

## 1-2 Region 2

1-2.1 Harmonized frequency arrangements within the frequency range 703 to 869 MHz in accordance with the CITELE harmonization measures<sup>1</sup> for broadband PPDR

## Frequency arrangements for broadband PPDR in the 703-869 MHz frequency range

Frequency arrangement	Mobile station transmitter (MHz)	Centre gap (MHz)	Base station transmitter (MHz)	Duplex separation (MHz)	Notes
a) <sup>(1)</sup>	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	

<sup>(1)</sup> 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.

1-2.2 Harmonized frequency arrangements within the frequency range 764 to 806 MHz in accordance with the CITELE harmonization measures<sup>2</sup> for PPDR applications<sup>3</sup>

## Frequency arrangements for PPDR applications in the 764-806 MHz frequency range

Frequency arrangement	Base station transmit (MHz)	Centre gap (MHz)	Mobile station transmit (MHz)	Duplex separation	Notes
a) <sup>4</sup>	764-768	26	794-798	30	
b) <sup>4</sup>	768-776	22	798-806	30	
c) <sup>5</sup>	769-775	24	799-805	30	Note 1

<sup>1</sup> PCC.II/REC. 18 (VII-06) and PCC.II/REC.49 (XXVII-16).

<sup>2</sup> PCC.II/REC. 18 (VII-06).

<sup>3</sup> PCC.II/REC.18 (VII-06) does not specify broadband, wideband, or narrowband. It refers only to PPDR applications.

<sup>4</sup> 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>).

<sup>5</sup> 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>.

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.

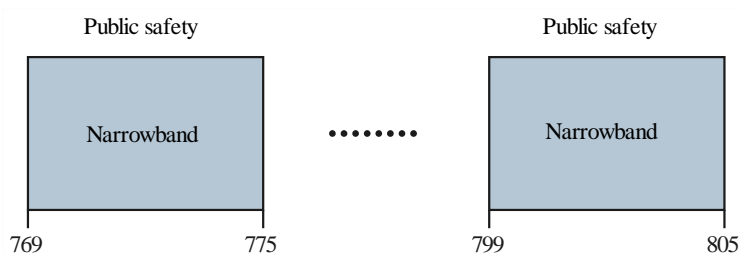
Detailed description of the frequency arrangement for a) and b)



\* Block A will be subject to a future consultation.  
 \*\* The amount of narrowband (NB) and wideband (WB) spectrum will be set out in the relevant standard

M.2015-03

Detailed description of frequency arrangement c)



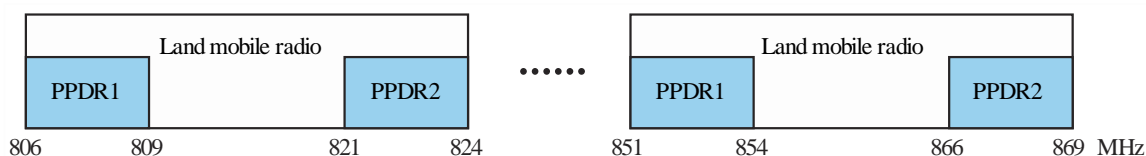
M.2015-04

### 1-2.3 Frequency arrangements within the frequency range 806 to 869 MHz in some countries of Region 2 for narrowband PPDR

#### Frequency arrangements for narrowband PPDR in the 806-869 MHz frequency range

Frequency arrangement	Mobile station/ Control station transmit (MHz)	Centre gap (MHz)	Base station transmit (MHz)	Duplex separation	Notes
a)	806-809	42	851-854	45	PPDR1 <sup>6</sup>
b)	821-824	42	866-869	45	PPDR2 <sup>7</sup>

Detailed description of the frequency arrangement for a) and b)



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<sup>6</sup> 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>.

<sup>7</sup> 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>.

### Channelling arrangement

Channel number	Mobile station transmit Channel centre frequency (MHz)	Base station transmit Channel centre frequency (MHz)	Channel bandwidth (kHz)
$n = 1$ to 600	$f_n = 806.0125 + (0.025) \times (n - 1)$	$f_n = 851.0125 + (0.025) \times (n - 1)$	25
$n = 602$ to 790 except 639, 677, 715, 753	$f_n = 821.0375 + 0.0125 \times (n - 602) + 0.025 \times \text{floor}((n - 601) / 38)$	$f_n = 866.0375 + 0.0125 \times (n - 602) + 0.025 \times \text{floor}((n - 601) / 38)$	12.5
$n = 601, 639, 677,$ 715, 753	$f_n = 821.0125 + 0.5 \times \text{floor}((n - 601) / 38)$	$f_n = 866.0125 + 0.5 \times \text{floor}((n - 601) / 38)$	25
$n = 791$ to 830	$f_n = 823.5 + (0.0125) \times (n - 791)$	$f_n = 868.5 + (0.0125) \times (n - 791)$	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.

### 1-3 Region 3

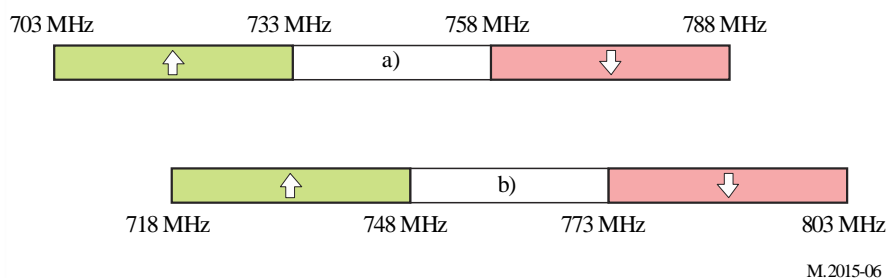
#### 1-3.1 Harmonized frequency arrangements within the frequency range 694 to 894 MHz in accordance with the APT harmonization measures<sup>8</sup> for broadband PPDR

##### Frequency arrangements for broadband PPDR in the 694-894 MHz frequency range

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 (Note 1)
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

NOTE 1 – 3GPP Band 28 consists of a dual-duplexing arrangement as shown in the Figure below.

<sup>8</sup> APT/AWG/REP-73 Edition: April 2017 – “Harmonization of frequency ranges for use by wireless PPDR applications in Asia-Pacific region”.



For frequency arrangements a) to d) in Region 3, any one or two 5+5 MHz or one 10+10 MHz channels can be used for broadband PPDR.

**Detailed description of the frequency arrangement for a)**

703-748 MHz	748-758	758-803 MHz
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.

**Channelling arrangement**

Channel number	Mobile station transmit Channel centre frequency (MHz)	Base station transmit Channel centre frequency (MHz)	Channel bandwidth (MHz)
$N = 1$ to 9	$f_N = 705.5 + (5) \times (N - 1)$	$f_N = 760.5 + (5) \times (N - 1)$	5

**Detailed description of the frequency arrangement for b)**

824-849 MHz	849-869	869-894 MHz
PPDR uplink		PPDR downlink
25 MHz (5 blocks of 5 MHz)		25 MHz (5 blocks of 5 MHz)

The channelling plan for frequency arrangement b) is based on a channel bandwidth of 5 MHz or 10 MHz.

**Channelling arrangement**

Channel number	Mobile station transmit Channel centre frequency (MHz)	Base station transmit Channel centre frequency (MHz)	Channel bandwidth (MHz)
$N = 1$ to 5	$f_N = 826.5 + (5) \times (N - 1)$	$f_N = 871.5 + (5) \times (N - 1)$	5

**Detailed description of the frequency arrangement for c)**

814-849 MHz	849-859	859-894 MHz
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.

**Channelling arrangement**

Channel number	Mobile station transmit Channel centre frequency (MHz)	Base station transmit Channel centre frequency (MHz)	Channel bandwidth (MHz)
$N = 1$ to 7	$f_N = 816.5 + (5) \times (N - 1)$	$f_N = 861.5 + (5) \times (N - 1)$	5

**Detailed description of the frequency arrangement for d)**

807-824 MHz	824-852	852-869 MHz
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.

**Channelling arrangement**

Channel number	Mobile station transmit Channel centre frequency (MHz)	Base station transmit Channel centre frequency (MHz)	Channel bandwidth (MHz)
$N = 1$ to 3	$f_N = 811.5 + (5) \times (N - 1)$	$f_N = 856.5 + (5) \times (N - 1)$	5
$N = 1$ to 3	$f_N = 809.5 + (5) \times (N - 1)$	$f_N = 854.5 + (5) \times (N - 1)$	5

**1-3.2 Frequency arrangements within the frequency range 694-894 MHz in some countries of Region 3 for narrowband and/or broadband PPDR****Frequency arrangements for narrowband and broadband PPDR in the 694-894 MHz frequency range**

Frequency arrangement	Paired arrangements				Notes
	Mobile station TX (MHz)	Centre gap (MHz)	Base station TX (MHz)	Duplex separation (MHz)	
e)	718-728	45	773-783	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	–	

**Detailed description of the frequency arrangement for e)**

718-728 MHz	728-773	773-783 MHz
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.



**Channelling arrangement**

Channel number	Mobile station transmit Channel centre frequency (MHz)	Base station transmit Channel centre frequency (MHz)	Channel bandwidth (MHz)
$N = 1$ to 2	$f_N = 720.5 + (5) \times (N - 1)$	$f_N = 775.5 + (5) \times (N - 1)$	5
$N=1$	$f_N = 723$	$f_N = 778$	10

**Detailed description of the frequency arrangement for f)**

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

**Channelling arrangement**

Channel number	Mobile station transmit Channel centre frequency (MHz)	Base station transmit Channel centre frequency (MHz)	Channel bandwidth
$N = 1$ to 280	$f_N = 806.0125 + (0.025) \times (N - 1)$	$f_N = 851.0125 + (0.025) \times (N - 1)$	25 kHz
$N = 1$ to 2	$f_N = 816.5.5 + (5) \times (N - 1)$	$f_N = 861.5 + (5) \times (N - 1)$	5 MHz
$N = 1$	$f_N = 819$	$f_N = 864$	10 MHz

**Detailed description of the frequency arrangement for g) – option 1**

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

**Detailed description of the frequency arrangement for g) – option 2**

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

**Detailed description of the frequency arrangement for h)**

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

The channelling plan for frequency arrangement h) is based on a channel bandwidth of 25 kHz for the narrowband component and 5 MHz or 10 MHz for the broadband component.

**Channelling arrangement**

Channel number	Mobile station transmit Channel centre frequency (MHz)	Base station transmit Channel centre frequency (MHz)	Channel bandwidth
$N = 1$ to 680	$f_N = 806.0125 + (0.025) \times (N - 1)$	$f_N = 851.0125 + (0.025) \times (N - 1)$	25 kHz
$N = 1$ to 2	$f_N = 826.5.5 + (5) \times (N - 1)$	$f_N = 871.5 + (5) \times (N - 1)$	5 MHz
$N = 1$	$f_N = 829$	$f_N = 874$	10 MHz

**Detailed description of the frequency arrangement for i)**

806-824 MHz	824-851 MHz	851-869 MHz
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.

**Channelling arrangements in the sub-band 806-811/851-856 MHz**

Channel number	Mobile station transmit Channel centre frequency (MHz)	Base station transmit Channel centre frequency (MHz)	Channel bandwidth
$N = 1$ to 200	$f_N = 806.0125 + (0.025) \times (N - 1)$	$f_N = 851.0125 + (0.025) \times (N - 1)$	25 kHz

**Channelling arrangements in the sub-band 811-813.5/856-858.5 MHz**

Channel number	Mobile station transmit Channel centre frequency (MHz)	Base station transmit Channel centre frequency (MHz)	Channel bandwidth
$N = 1$ to 200	$f_N = 811.00625 + (0.0125) \times (N - 1)$	$f_N = 856.00625 + (0.0125) \times (N - 1)$	12.5 kHz

**Channelling arrangements in the sub-band 813.5-816/858-861 MHz**

Channel number	Mobile station transmit Channel centre frequency (MHz)	Base station transmit Channel centre frequency (MHz)	Channel bandwidth
$N = 1$ to 400	$f_N = 813.503125 + (0.00625) \times (N - 1)$	$f_N = 858.503125 + (0.00625) \times (N - 1)$	6.25 kHz

**Detailed description of the frequency arrangement for j)**

806-812 MHz	812-813	813-819 MHz	819-857 MHz	857-858	858-864 MHz	864-868.100	868.100-869.025
N/A	NB up	Narrowband uplink	N/A	NB down	Narrowband downlink	N/A	Simplex

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

**Channelling arrangements in the sub-band 868.100-869.025 MHz**

Channel number	Simplex channel centre frequency (MHz)	Channel bandwidth
$N = 1$ to 37	$f_N = 868.1125 + (0.025) \times (N - 1)$	25 kHz

**Channelling arrangements in the sub-band 813-819/858-864 MHz**

Channel number	Mobile station transmit Channel centre frequency (MHz)	Base station transmit Channel centre frequency (MHz)	Channel bandwidth
$N = 1$ to 240	$f_N = 813.0125 + (0.025) \times (N - 1)$	$f_N = 858.0125 + (0.025) \times (N - 1)$	25 kHz

**Channelling arrangements in the sub-band 812-813/857-858 MHz**

Channel number	Mobile station transmit Channel centre frequency (MHz)	Base station transmit Channel centre frequency (MHz)	Channel bandwidth
$N = 1$ to 79	$f_N = 812.00625 + (0.0125) \times (N - 1)$	$f_N = 857.00625 + (0.0125) \times (N - 1)$	12.5 kHz
$N = 1$ to 39	$f_N = 812.0125 + (0.025) \times (N - 1)$	$f_N = 857.0125 + (0.025) \times (N - 1)$	25 kHz

## SECTION 2

**Frequency Arrangements in parts of the frequency range 380-470 MHz  
(as per *resolves* 3 of Resolution 646 (Rev.WRC-15))**

**2-1 Region 1**

**2-1.1 Frequency arrangements within the frequency range 380 to 470 MHz in some countries of Region 1 for narrowband and wideband PPDR in accordance with CEPT harmonization measure ECC/DEC/(08)05**

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, preferably in 380-430 MHz.

Additionally, certain channels have been identified for DMO (direct mode operation) and AGA (air-ground-air operation) purposes.

**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.

**AGA (air-ground-air operation)**

Duplex channels within the frequency bands 384.800-385 MHz/394.800-395 MHz should be used as the core band for harmonized channels for AGA. Duplex channels within the frequency bands 384.750-384.800 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.

**Centre frequencies**

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

$$F_{CH} = \text{band edge} - (\text{channel bandwidth}/2) + n \times \text{channel bandwidth}$$

where:

$F_{CH}$  = 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.

**2-1.2 Harmonized frequency arrangements within the frequency range 450.5 to 467.5 MHz in accordance with the CEPT harmonization measure ECC/DEC/(16)02 for broadband PPDR**

**Frequency arrangements for broadband PPDR in the 450-467.5 MHz frequency range**

Alternative frequency arrangements	Mobile station TX (MHz)	Centre gap (MHz)	Base station TX (MHz)	Duplex separation (MHz)	Notes
a)	450.5-456	4.5	460.5-466	10	LRTC specified in Annex 2 of ECC/DEC/(16)02
b)	452-457.5	4.5	462-467.5	10	LRTC specified in Annex 2 of ECC/DEC/(16)02

**Detailed description of the frequency arrangement option a)**

Alternative frequency arrangements (MHz)	450.5-456	456-460.5	460.5-466	466-467.5
Option a)	PPDR uplink		PPDR downlink	
	5.5 MHz	4.5 MHz	5.5 MHz	1.5 MHz

**Detailed description of the frequency arrangement option b)**

Alternative frequency arrangements (MHz)	450.5-452	452-457.5	457.5-462	462-467.5
Option b)		PPDR uplink		PPDR downlink
	1.5 MHz	5.5 MHz	4.5 MHz	5.5 MHz

The exact channelling arrangements for broadband PPDR in the 450.5-467.5 MHz frequency range are left to the individual decision of each CEPT administration. These can use channels of 1.4 MHz, 3 MHz or 5 MHz.

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

### 2-1.3 Frequency arrangements within the frequency range 380-399.99 MHz in some countries of Region 1 for narrowband PPDR

#### Frequency arrangements for narrowband PPDR in the 380-399.99 MHz frequency range

Frequency arrangement	Paired arrangements				Notes
	Mobile station TX (MHz)	Centre gap (MHz)	Base station TX (MHz)	Duplex separation (MHz)	
a)	380.0125-389.9875	0	390.0125-399.9875	10	Duplex

#### Detailed description of the frequency arrangement

	380.0125-389.9875 MHz		390.0125-399.9875 MHz	
	Narrowband uplink		Narrowband downlink	
	399 channels of 25 kHz		399 channels of 25 kHz	

#### Channelling arrangement

Channel number	Mobile station transmit Channel centre frequency (MHz)	Base station transmit Channel centre frequency (MHz)	Channel bandwidth (kHz)
$N = 1$ to 399	$f_N = 380.025 + (N - 1) \times 0.025$	$f_N = 390.025 + (N - 1) \times 0.025$	25

The frequency range 380-399.9 MHz has been identified for narrowband PPDR operations in Qatar. Part of this frequency range is used for PPDR operations in Qatar.

### 2-1.4 Harmonized frequency arrangements within the frequency range 380-470 MHz in accordance with the ATU harmonization measures for narrowband and/or wideband PPDR

#### Frequency arrangements for narrowband and wideband PPDR in the 380-470 MHz frequency range

Frequency arrangement	Paired arrangements				Notes
	Mobile station TX (MHz)	Centre gap (MHz)	Base station TX (MHz)	Duplex separation (MHz)	
a)	380-385	5	390-395	10	Core PPDR band for NB 25 kHz CBW
b)	385-389.99	5	395-399.99	10	Expansion band for PPDR 25 kHz CBW
c)	410-420	5	420-430	10	Expansion Band for PPDR 12.5/25 kHz CBW

## Channelling arrangement

Channel number	Mobile station transmit Channel centre frequency (MHz)	Base station transmit Channel centre frequency (MHz)	Channel bandwidth (MHz)
N = 1 to 396 380-400MHz	$FCH_n = \text{Band Edge} - (\text{Channel Spacing} / 2) + n \times \text{Channel Spacing}$	$FCH_n = \text{Band Edge} + \text{Duplex Separation} - (\text{Channel Spacing} / 2) + n \times \text{Channel Spacing}$	25 kHz
N = 0 to n 410-430MHz n= 1 to 400 @25kHz n= 1 to 800@12.5kHz	$FCH_n = \text{Band Edge} - (\text{Channel Spacing} / 2) + n \times \text{Channel Spacing}$	$FCH_n = \text{Band Edge} + \text{Duplex Separation} - (\text{Channel Spacing} / 2) + n \times \text{Channel Spacing}$	12.5/25 kHz

## 2-2 Region 2

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

## 2-3 Region 3

## 2-3.1 Frequency arrangements within the frequency range 406.1 to 430 MHz in some countries of Region 3 for narrowband PPDR

## Frequency arrangements for narrowband PPDR in the 406.1-430 MHz frequency range

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	Narrowband
b)	414.0125-414.1000	N/A	414.0125-414.1000	N/A	Narrowband
c)	406.1125-411.5875	2.525	414.1125-419.5875	8	Narrowband
d)	457.50625-459.9875	7.51875	467.50625-469.9875	10	Narrowband 12.5 kHz
e)	408.6375-410.5375	7.55	418.0875-420.0000	9.45	Narrowband 12.5 kHz
f)	420.0000-430.0000	–	–	–	

## Detailed description of the frequency arrangement for a)

410-420 MHz	420-430 MHz
Narrowband PPDR uplink	Narrowband PPDR downlink
800 channels of 12.5 kHz	800 channels of 12.5 kHz

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.

### Channelling arrangements

Channel number	Mobile station transmit Channel centre frequency (MHz)	Base station transmit Channel centre frequency (MHz)	Channel bandwidth (kHz)
$N = 1$ to 800	$f_N = 410.006125 + (N - 1) \times 0.0125$	$f_N = 420.00625 + (N - 1) \times 0.0125$	12.5

The channel arrangements are divided into four 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.

### Channelling arrangement

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=	$2 \times A - 1 + 20 \times (X - 1)$ and $2 \times A + 20 \times (X - 1)$	$2 \times B + 199 + 20 \times (X - 1)$ and $2 \times B + 200 + 20 \times (X - 1)$	$2 \times C + 399 + 20 \times (X - 1)$ and $2 \times C + 400 + 20 \times (X - 1)$	$2 \times D + 599 + 20 \times (X - 1)$ and $2 \times D + 600 + 20 \times (X - 1)$

### Detailed description of the frequency arrangement for b)

414.0125-414.1000 MHz
Simplex
8 channels of 12.5 kHz

The channelling plan for frequency arrangement b) is based on channel arrangements currently used in New Zealand for simplex services.

### Channelling arrangement

Channel number	Mobile station transmit Channel centre frequency (MHz)	Base station transmit Channel centre frequency (MHz)	Channel bandwidth (kHz)
$N = 1$ to 8	$f_N = 414.01250 + ((N - 1) \times 0.0125)$	$f_N = 414.01250 + ((N - 1) \times 0.0125)$	12.5 kHz



**Detailed description of the frequency arrangement for c)**

406.1125-411.5875 MHz	411.5875-414.1125 MHz	414.1125-419.5875
Narrowband PPDR uplink		Narrowband PPDR downlink
439 channels of 12.5 kHz		439 channels of 12.5 kHz

The channelling plan for frequency arrangement c) is based on channel arrangements currently used in New Zealand for duplex services.

**Channelling arrangement**

Channel number	Mobile station transmit Channel centre frequency (MHz)	Base station transmit Channel centre frequency (MHz)	Channel bandwidth (kHz)
$N = 1$ to 439	$f_N = 406.11250 + ((N - 1) \times 0.0125)$	$f_N = 414.11250 + ((N - 1) \times 0.0125)$	12.5

**2-3.2 Frequency arrangements within the frequency range 440 to 470 MHz in some countries of Region 3 for narrowband PPDR****Frequency arrangements for narrowband PPDR in the 440-470 MHz frequency range**

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	

**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))****3-1 Region 3****3-1.1 Harmonized frequency arrangements within the frequency band 4 940-4 990 MHz in some countries of Region 3 for broadband PPDR****Frequency arrangements for broadband PPDR in the 4940-4990 MHz frequency range**

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	

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.

#### Channelling arrangement

Channel number ( $n_{ch}$ )	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	4982.5		
18		4985.0	
19	4987.5		

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.

## Annex 2

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

<p align="center"><b>Section 1: Country-Specific Frequency Arrangements (as per <i>resolves 4</i> of Resolution 646 (Rev.WRC-15))</b></p>		
<b>Region</b>	<b>Sub-Section</b>	<b>Frequency Arrangement(s)</b>
1	1.1	Frequency arrangements within the frequency range 4940 to 5250 MHz in some countries of Region 1 for Broadband Disaster Relief radio applications in accordance with CEPT harmonization measure ECC/REC/(08)04
<p align="center"><b>Section 2: Country-Specific Frequency Arrangements (as per <i>resolves 4</i> of Resolution 646 (Rev.WRC-15))</b></p>		
<b>Region</b>	<b>Sub-Section</b>	<b>Frequency Arrangement(s)</b>
2	2.1	Harmonized frequency arrangements within the frequency range 4 940 to 4 990 MHz in some countries of Region 2 in accordance with CITEL harmonization measures for PPDR
<p align="center"><b>Section 3 Country-Specific Frequency Arrangements (as per <i>resolves 4</i> of Resolution 646 (Rev.WRC-15))</b></p>		
<b>Region</b>	<b>Sub-Section</b>	<b>Frequency Arrangement(s)</b>
3	3.1	Frequency arrangements within the frequency range 138 to 144 MHz in some countries of Region 3 for narrowband PPDR
3	3.2	Frequency arrangements within the frequency range 351 to 370 MHz in some countries of Region 3 for narrowband PPDR
3	3.3	Frequency arrangements within the frequency range 170 to 205 MHz in some countries of Region 3 for broadband PPDR
3	3.4	Frequency arrangements within the frequency range 1 447 to 1 467 MHz in some countries of Region 3 for broadband PPDR
3	3.5	Frequency arrangements within the frequency range 403 to 413.4375 MHz in some countries of Region 3 for narrowband PPDR

<b>Section 3</b> <b>Country-Specific Frequency Arrangements</b> <b>(as per <i>resolves 4</i> of Resolution 646 (Rev.WRC-15))</b>		
<b>Region</b>	<b>Sub-Section</b>	<b>Frequency Arrangement(s)</b>
3	3.6	Example of frequency arrangements within the frequency range 405.0125 to 415.4375 MHz in some countries of Region 3 for narrowband PPDR
3	3.7	Frequency arrangements within the frequency range 380 to 399.9 MHz in some countries of Region 3 for narrowband PPDR

## SECTION 1

### Region 1 country-specific frequency arrangements

#### 1 Region 1

##### 1.1 Frequency arrangements within the frequency range 4 940 to 5 250 MHz in some countries of Region 1 for Broadband Disaster Relief radio applications in accordance with CEPT harmonization measure ECC/REC/(08)04

Spectrum within the frequency band 5 150-5 250 MHz should be the preferred option for the deployment of Broadband Disaster Relief (BBDR) radio applications within CEPT. Spectrum within the frequency band 4 940-4 990 MHz should be the optional band in CEPT countries, which do not foresee incompatibilities with active radio astronomy sites, fixed service or mobile service usage in this band. At least 50 MHz of spectrum should be made available for digital BBDR radio applications by administrations.

Spectral power density should not exceed the values of 26 dBm/MHz e.i.r.p. for a BBDR Base Station (BS) and 13 dBm/MHz e.i.r.p. for BBDR User Equipment (UE).

SECTION 2

Region 2 country-specific frequency arrangements

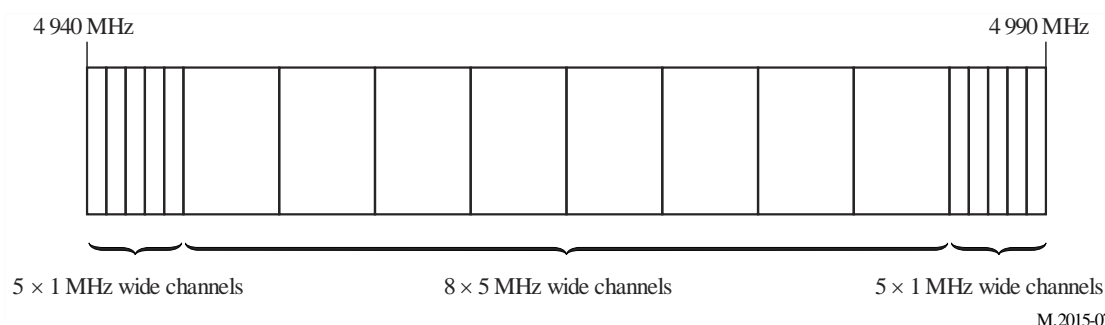
2 Region 2

2.1 Harmonized frequency arrangements within the frequency range 4 940 to 4 990 MHz in some countries of Region 2 in accordance with CITELE harmonization measures<sup>9</sup> for PPDR

Frequency arrangements for broadband PPDR in the 4 940-4 990 MHz frequency range

Frequency arrangement	Notes
a)	4 940-4 990 Pairing unspecified

Detailed description of the frequency arrangement for a)



Channelling arrangements

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

<sup>9</sup> PCC.II/REC. 16 (VII-06): Use of the 4 940-4 990 MHz band in the Americas for Public Protection and Disaster Relief.

Channelling arrangements (*end*)

Channel	Lower frequency (MHz)	Upper frequency (MHz)
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 CITEI PCC.II recommended frequency channelling plan for the 4 940-4 990 MHz band for PPDR consists of ten 1 MHz channels and eight 5 MHz channels as 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.

## SECTION 3

## Region 3 country-specific frequency arrangements

## 3 Region 3

## 3.1 Frequency arrangements within the frequency range 138 to 144 MHz in some countries of Region 3 for narrowband PPDR

## Frequency arrangements for narrowband PPDR in the 138-144 MHz frequency range

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

**Detailed description of the frequency arrangement for a1), a2) and a3)**

138.00625-140.50625	140.50625-141.00625	141.00625-143.50625	143.50625-143.99375
Narrowband duplex uplink	Narrowband simplex	Narrowband duplex downlink	Narrowband simplex

The channelling plan for frequency arrangement a1) is a duplex arrangement.

**Channelling arrangement**

Channel number	Mobile station transmit Channel centre frequency (MHz)	Base station transmit Channel centre frequency (MHz)	Channel bandwidth (kHz)
$N = 1$ to 200	$f_N = 138.0125 + (0.0125) \times (N - 1)$	$f_N = 141.0125 + (0.0125) \times (N - 1)$	12.5

The channelling plan for frequency arrangement a2) is a simplex arrangement.

**Channelling arrangement**

Channel number	Channel centre frequency (MHz)	Channel bandwidth (kHz)
$N = 1$ to 40	$f_N = 140.51250 + (0.0125) \times (N - 1)$	12.5

The channelling plan for frequency arrangement a3) is a simplex arrangement.

**Channelling arrangement**

Channel number	Channel centre frequency (MHz)	Channel bandwidth (kHz)
$N = 41$ to 79	$f_N = 143.51250 + (0.0125) \times (N - 41)$	12.5

### 3.2 Frequency arrangements within the frequency range 351-370 MHz in some countries of 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 PPDR operations. A number of PPDR radio communication systems have been deployed on the frequency range 351-370 MHz in the People's Republic of China.

### 3.3 Frequency arrangements within the frequency range 170 to 205 MHz in some countries of Region 3 for broadband PPDR

#### Frequency arrangements for broadband PPDR in the 170-205 MHz frequency range

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

#### Detailed description of the frequency arrangement for b)

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

### 3.4 Frequency arrangements within the frequency range 1 447 to 1 467 MHz in some countries of Region 3 for broadband PPDR

#### Frequency arrangements for broadband PPDR in the 1 447-1 467 MHz frequency range

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

#### Detailed description of the frequency arrangement for 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 c) may be assigned throughout this band and specific blocks may be designated exclusively for government applications.



## Channelling arrangement

Channel number	Channel centre frequency (MHz)	Channel bandwidth (MHz)
$N = 1$ to 4	$f_N = 1449.5 + (5) \times (N - 1)$	5
$N = 1$ to 2	$f_N = 1452.0 + (5) \times (N - 1)$	10
$N = 1$	$f_N = 1457.0$	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 networks have been deployed on the 1 447-1 467 MHz band, for example in Beijing, Nanjing and Tianjin.

### 3.5 Frequency arrangements within the frequency range 403 to 413.4375 MHz in some countries of Region 3 for narrowband PPDR

#### Frequency arrangements for narrowband PPDR in the 403-413.4375 MHz frequency range

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

### 3.6 Example of frequency arrangements within the frequency range 405.0125 to 415.4375 MHz in some countries of Region 3 for narrowband PPDR

#### Frequency arrangements for narrowband PPDR in the 405.0125-415.4375 MHz frequency range

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

### 3.7 Frequency arrangements within the frequency range 380 to 399.9 MHz in some countries of Region 3 for narrowband PPDR

#### Frequency arrangements for narrowband PPDR in the 380-399.9 MHz frequency range

Frequency arrangement	Paired arrangements				Notes
	Mobile station TX (MHz)	Centre gap (MHz)	Base station TX (MHz)	Duplex separation (MHz)	
f)	380.0125-389.8875	-	390.0125-399.8875	10	Duplex

#### Channelling arrangement

Channel number	Mobile station transmit Channel centre frequency (MHz)	Base station transmit Channel centre frequency (MHz)	Channel bandwidth (kHz)
$N = 1$ to 395	$f_N = 380.025 + (N - 1) \times 0.025$	$f_N = 390.025 + (N - 1) \times 0.025$	25

The frequency range 380-399.9 MHz has been identified for narrowband PPDR operations in Malaysia. Part of this frequency range is used for PPDR operations in Malaysia.

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