



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**



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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 646 (Rev.WRC-12)
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 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)**

Section 1: Arrangements in parts of the frequency range 694-894 MHz (as per <i>resolves</i> 2 of Resolution 646 (Rev.WRC-15))		
Region	Sub-Section	Frequency Arrangement(s)
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

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))		
Region	Sub-Section	Frequency Arrangement(s)
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

Section 2: Frequency Arrangements in parts of the frequency range 380-470 MHz (as per <i>resolves 3 of Resolution 646 (Rev.WRC-15)</i>)		
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 3 of Resolution 646 (Rev.WRC-15)</i>
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

Section 3: Frequency Arrangements in parts of the frequency range 4 940-4 990 MHz (as per <i>resolves 3 of Resolution 646 (Rev.WRC-15)</i>)		
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 2×10 MHz for broadband PPDR, as calculated in Report ITU-R M.2377-0 and ECC Report 199, and authorizing the full 2×30 MHz in option b) for commercial mobile/fixed communications networks (MFCN) can no longer identify 2×10 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 2×5 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	2×5 MHz
b)	698-708	45	753-763	55	2×10 MHz
c)	698-713	40	753-768	55	2×15 MHz
d)	698-718	35	753-773	55	2×20 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 2x20 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 2×30 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

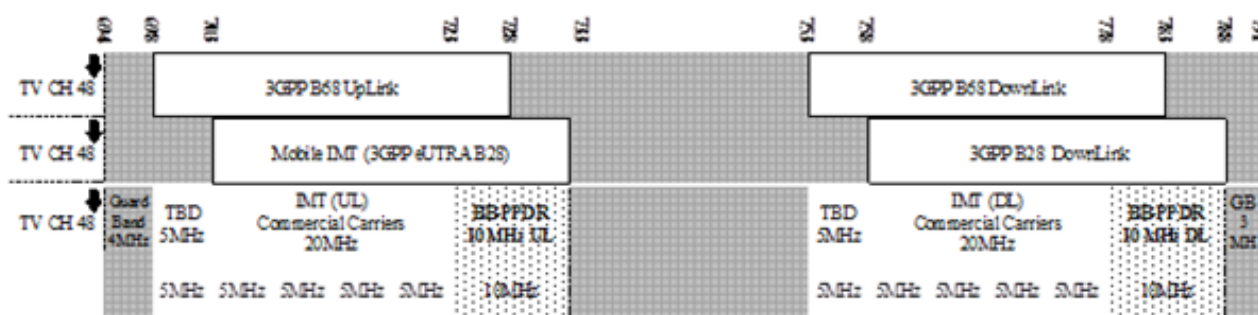
Frequency arrangements for broadband PPDR in the 723-788 MHz frequency range

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)
$N = 1 \text{ to } 2$	$f_N = 723 - 2.5 + N \times 5$	$f_N = 778 - 2.5 + N \times 5$	5
$N = 1$	$f_N = 723 - 5 + N \times 10$	$f_N = 778 - 5 + N \times 10$	10

Detailed description of the frequency arrangement



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