



Recommendation ITU-R M.2015-1
(02/2015)

**Frequency arrangements for public
protection and disaster relief
radiocommunication systems
in UHF bands in accordance
with Resolution 646
(Rev.WRC-12)**

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

Foreword

The role of the Radiocommunication Sector is to ensure the rational, equitable, efficient and economical use of the radio-frequency spectrum by all radiocommunication services, including satellite services, and carry out studies without limit of frequency range on the basis of which Recommendations are adopted.

The regulatory and policy functions of the Radiocommunication Sector are performed by World and Regional Radiocommunication Conferences and Radiocommunication Assemblies supported by Study Groups.

Policy on Intellectual Property Right (IPR)

ITU-R policy on IPR is described in the Common Patent Policy for ITU-T/ITU-R/ISO/IEC referenced in Annex 1 of Resolution ITU-R 1. Forms to be used for the submission of patent statements and licensing declarations by patent holders are available from <http://www.itu.int/ITU-R/go/patents/en> where the Guidelines for Implementation of the Common Patent Policy for ITU-T/ITU-R/ISO/IEC and the ITU-R patent information database can also be found.

Series of ITU-R Recommendations

(Also available online at <http://www.itu.int/publ/R-REC/en>)

Series	Title
BO	Satellite delivery
BR	Recording for production, archival and play-out; film for television
BS	Broadcasting service (sound)
BT	Broadcasting service (television)
F	Fixed service
M	Mobile, radiodetermination, amateur and related satellite services
P	Radiowave propagation
RA	Radio astronomy
RS	Remote sensing systems
S	Fixed-satellite service
SA	Space applications and meteorology
SF	Frequency sharing and coordination between fixed-satellite and fixed service systems
SM	Spectrum management
SNG	Satellite news gathering
TF	Time signals and frequency standards emissions
V	Vocabulary and related subjects

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

Electronic Publication
Geneva, 2015

© ITU 2015

All rights reserved. No part of this publication may be reproduced, by any means whatsoever, without written permission of ITU.

RECOMMENDATION ITU-R M.2015-1

**Frequency arrangements for public protection and disaster relief
radiocommunication systems in UHF bands in accordance
with Resolution 646 (Rev.WRC-12)**

(2012-2015)

Scope

This Recommendation provides guidance on frequency arrangements for public protection and disaster relief radiocommunications in certain regions in some of the bands below 1 GHz identified in Resolution **646 (Rev.WRC-12)**. Currently, the Recommendation addresses arrangements in the ranges 380-470 MHz in certain countries in Region 1, 746-806 MHz and 806-869 MHz in Region 2, 406.1-410 MHz, 410-430 MHz, and 806-824/851-869 MHz in some countries in Region 3 in accordance with Resolutions ITU-R 53, ITU-R 55 and WRC Resolutions **644 (Rev.WRC-12)**, **646 (Rev.WRC-12)**, and **647 (Rev.WRC-12)**.

Keywords

PPDR, frequency arrangements, UHF band

The ITU Radiocommunication Assembly,

considering

- a)* that growing telecommunication and radiocommunication needs of public protection and disaster relief (PPDR) agencies and organizations are vital to the maintenance of law and order, protection of life and property, disaster relief and emergency response;
- b)* 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;
- c)* that a continuing requirement is envisaged for narrowband applications (such as voice and various types of messaging), along with wideband and broadband applications in the future;
- d)* that continuing development of new technologies such as International Mobile Telecommunications (IMT) and Intelligent Transport Systems (ITS) may be able to serve, support or supplement advanced public protection and disaster relief applications (PPDR);
- e)* that, over time, traditional narrowband public protection and disaster relief (PPDR) applications, such as mission critical voice and low-data rate applications, may be provided by advanced broadband systems;
- f)* that administrations may have different requirements for their public protection and disaster relief (PPDR) agencies and organizations depending on their operational needs, spectrum requirements, policy objectives and organizational structures;
- g)* that national spectrum planning for public protection and disaster relief (PPDR) radiocommunication systems needs to have regard for cooperation and bilateral consultation with other concerned administrations, in order to facilitate greater levels of spectrum harmonization;
- h)* that usage of the same frequencies of the same allocation will enable administrations to benefit from harmonization while continuing to meet national planning requirements,

noting

- a) that the benefits of spectrum harmonization are:
- increased potential for interoperability between public protection and disaster relief (PPDR) agencies and organizations within a particular administration, or between PPDR agencies and organizations in different administrations;
 - a broader manufacturing base and increased volume of equipment resulting in economies of scale and expanded equipment availability;
 - improved spectrum management and planning;
 - enhanced cross-border coordination and circulation of equipment.
- b) 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;
- c) the benefits of cooperation between countries for the provision of effective and appropriate humanitarian assistance during disasters;
- d) the needs of countries, particularly the developing countries, for low-cost communication equipment;
- e) that not all frequencies within an identified common frequency range will be available within each country of the relevant ITU Region;
- f) that flexibility must be afforded to administrations:
- to determine, at the national level, how much spectrum to make available for PPDR from the band identified in Resolution **646 (Rev.WRC-12)** in order to meet their particular national requirements;
 - to have the ability for the bands identified in Resolution **646 (Rev.WRC-12)** to be used by all services having allocations according to the provisions of the Radio Regulations, taking into account the existing applications and their evolution; and
 - to determine the need and timing of availability, as well as the conditions of usage of the bands identified in Resolution **646 (Rev.WRC-12)** for PPDR in order to meet specific national policy objectives, operational priorities, organizational structures and operating environments;
- g) that information on technologies that may be appropriate for use in these frequency arrangements is provided in 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)**;
- h) that Report ITU-R M.2291 – The use of International Mobile Telecommunications for broadband public protection and disaster relief applications, describes the features and benefits that make long term evolution (LTE) particularly suitable for PPDR applications;
- i) the relationship between Resolution **646 (Rev.WRC-12)** on public protection and disaster relief, which invites the development of this Recommendation, and Resolution **647 (Rev.WRC-12)** on spectrum management guidelines for emergency and disaster relief radiocommunication and Resolution **644 (Rev.WRC-12)** on radiocommunication resources for early warning, disaster mitigation and relief operations, which also address the need to coordinate activities under these Resolutions in order to prevent any possible overlap,

recognizing

- a) that Resolution **646 (Rev.WRC-12)** encourages administrations to consider the following identified frequency bands/ranges or parts thereof when undertaking their national planning for the purposes of achieving regionally harmonized frequency bands/ranges for advanced public protection and disaster relief solutions:
- in Region 1: 380-470 MHz as the frequency range within which the band 380-385/390-395 MHz is a preferred core harmonized band for permanent public protection activities within certain countries of Region 1 which have given their agreement;
 - in Region 2¹: 746-806 MHz, 806-869 MHz, 4 940-4 990 MHz;
 - in Region 3²: 406.1-430 MHz, 440-470 MHz, 806-824/851-869 MHz, 4 940-4 990 MHz and 5 850-5 925 MHz;
- b) the continuing need for development of regionally harmonized frequency arrangements for the purposes of implementing advanced PPDR solutions;
- c) that, in the context of Resolution **646 (Rev.WRC-12)**, the term “frequency range” means a range of frequencies over which relevant radio equipment is envisaged to be capable of operating, but limited to specific frequency band(s) according to national conditions and requirements;
- d) that currently some bands or parts thereof have been designated for existing public protection and disaster relief operations by some administrations, as is recognized in *recognizing g)* of Resolution **646 (Rev.WRC-12)**³;
- e) that the identification of these frequency bands/ranges or parts thereof for PPDR radiocommunications does not preclude the use of, nor establish priority over, any other frequencies for PPDR⁴ in accordance with the Radio Regulations including the provisions of Resolution **646 (Rev.WRC-12)**, and does not preclude the use of these bands/frequencies by any application within the services to which these bands/frequencies are allocated;
- f) that the frequency bands identified in Resolution **646 (Rev.WRC-12)** and covered by this Recommendation are allocated to a variety of services in accordance with the relevant provisions of the Radio Regulations;
- g) that the frequency arrangements in the Annexes are provided for PPDR applications in the mobile service at the national level;
- h) 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;

¹ Venezuela has identified the band 380-400 MHz for public protection and disaster relief applications.

² Some countries in Region 3 have also identified the bands 380-400 MHz and 746-806 MHz for public protection and disaster relief applications.

³ 3-30, 68-88, 138-144, 148-174, 380-400 MHz (including CEPT designation of 380-385/ 390-395 MHz), 400-430, 440-470, 764-776, 794-806 and 806-869 MHz (including CITELE designation of 821-824/866-869 MHz).

⁴ These additional frequency bands are used by some administrations for PPDR: 350-370 MHz (China), 791-801/832-842 MHz (Qatar) and 806-824/851-869 MHz (Israel). These additional frequency bands are considered for use by the administration of United Arab Emirates and Jordan for PPDR: 703-713/758-768 MHz.

- i) that Resolution ITU-R 53 instructs the Director of the Radiocommunication Bureau to assist Member States with their emergency radiocommunication preparedness activities, such as listing of currently available frequencies for use in emergency situations for inclusion in a database maintained by the Bureau;
- j) that World Radiocommunication Conferences have identified bands, including 450-470 MHz, and part or all of the bands 698-960 MHz in certain Regions and countries, for use by administrations wishing to implement IMT, as detailed in Nos. **5.286AA**, **5.317A**, **5.313A**, **5.316**, **5.316A** and **5.316B**, Resolution **224 (Rev.WRC-12)** and Resolution **749 (Rev.WRC-12)**;
- k) that the Regional Radiocommunication Conference (Geneva, 2006) established Regional Agreement relating to the planning of the digital terrestrial broadcasting service in Region 1 (parts of Region 1 *situated to the west of meridian 170° E and to the north of parallel 40° S*, except the territory of Mongolia) and in the Islamic Republic of Iran, in the frequency bands 174-230 MHz and 470-862 MHz (GE-06);
- l) that commercial terrestrial wireless systems may effectively complement dedicated systems in support of PPDR, particularly where advantage can be taken of the availability, high-bit rate, and reliability features of these commercial systems. There may be a need for suitable upgrading of such commercial systems to meet the specific needs of PPDR agencies,

recommends

- 1 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;
- 2 that the frequency arrangements in the Annexes should be used by administrations as guidance when making spectrum available for PPDR applications.

Annex 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

1 Region 1

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*

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

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.

Annex 2

Examples of frequency arrangements within the bands 763 to 776 MHz and 793 to 806 MHz in certain countries in Region 2 for narrowband, wideband and broadband public protection and disaster relief operations

1 Region 2

The frequency range 764-776 MHz and 794-806 MHz has been identified for PPDR in the CITELE PCC.II/REC. 18 (VII-06). Within this frequency range, administrations could consider a number of possible frequency arrangements examples as indicated below.

1.1 Example frequency arrangement “A”⁵

Base station transmit (MHz)	Mobile station transmit (MHz)	Frequency block
764-768	794-798	PPDR 1
768-776	798-806	PPDR 2



* 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-A1-01

1.2 Example frequency arrangement “B”⁶

Base station transmit (MHz)	Mobile station transmit (MHz)	Frequency block
758-768	788-798	PPDR 1 ¹
769-775	799-805	PPDR 2 ²
768-769	798-799	PPDR internal guardband

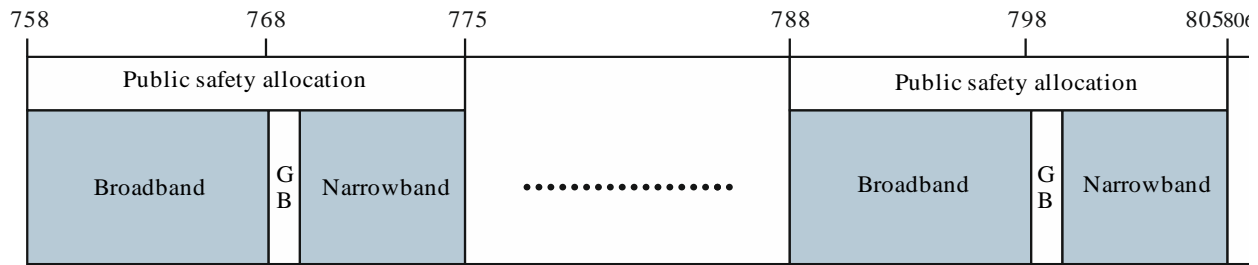
NOTE 1 – This frequency block is used for broadband PPDR applications⁷. Broadband PPDR applications include web browsing, tactical video, surveillance video, high resolution imaging, database access, and virtual private networks.

NOTE 2 – This frequency block is used for PPDR applications that provide narrowband voice and low-speed data services. In the context of PPDR, narrowband is 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.

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>).

⁶ This band plan is from the United States’ FCC Rules. For more details, see Part 90 of the FCC Rules at http://wireless.fcc.gov/index.htm?job=rules_and_regulations.

⁷ The use of the term “broadband” in this Annex means indicative data rates in the order of 1-100 Mbit/s with channel bandwidths dependent on the use of spectrally efficient technologies (from Resolution 646 (Rev.WRC-12) and Report ITU-R M.2033). It is recognized that other definitions of these terms exist in other ITU texts (such as Recommendation ITU-R F.1399) or in the rules of various individual administrations.



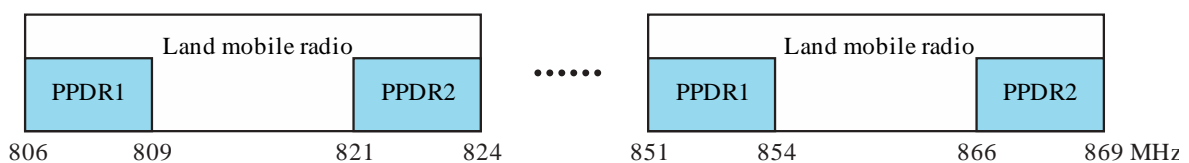
M.2015-A1-0

Annex 3

Examples of frequency arrangements for the band 806 to 869 MHz in certain countries in Region 2 for narrowband public protection and disaster relief operations

1 Region 2

In a number of countries in the Region 2, the band 806-824/851-869 MHz is allocated to the mobile service, and designated for Land Mobile Radio (LMR) applications. The duplex spacing is 45 MHz, with the base stations transmitting in the 851-869 MHz, and the mobile stations in the 806-824 MHz range. PPDR channels may be assigned throughout this band and specific blocks may be designated exclusively for PPDR applications. (See § 1.1) 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 below.



M.2015-A3-0

1.1 Example frequency arrangement

1.1.1 Designation of frequency blocks

Mobile station/ Control station transmit (MHz)	Base station transmit (MHz)	Frequency block
806-809	851-854	PPDR1 ⁸
821-824	866-869	PPDR2 ⁹

1.1.2 Channelization

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	$f_n = 806.0125 + (0.025) \times (n - 1)$	$f_n = 851.0125 + (0.025) \times (n - 1)$	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

⁸ This frequency arrangement is from the United States' FCC Rules. For more details, see Part 90 of the FCC Rules at http://wireless.fcc.gov/index.htm?job=rules_and_regulations.

⁹ 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>.

Annex 4

Examples of frequency arrangements for the range 406.1-430 MHz in certain countries in Region 3 for narrowband public protection and disaster relief operations

1 Region 3

1.1 Example frequency arrangement – 406.1-410 MHz

Parts of the band 406.1-410 MHz are used in certain Region 3 countries to accommodate trunked land mobile systems. Frequency arrangements for this spectrum are shown below.

Simplex services are accommodated within a 12.5 kHz channel raster on the following centre frequencies (MHz):

$$F_n = 406.01250 + ((N - 1) * 0.0125) \quad N = 1, 2, 3, \dots$$

1.2 Example frequency arrangement for digital PPDR within 410-430 MHz

The band 410-430 MHz is used in certain Region 3 countries to accommodate digital trunked land mobile systems.

The frequency band 410 to 430 MHz provides a total bandwidth of 20 MHz for Digital Trunked Radio Systems. The 12.5/25 kHz channelling plan is the standard channelling plan for this band giving a total of 800 physical radio channels (or equivalent trucked radio system analogue traffic channel of 1 600 noting possibility of two time slots per physical channel). Although the standard channel spacing is 12.5/25 kHz, it provides flexibility to operate two or more contiguous channels (i.e. 50 kHz or 100 kHz) if needed. Administrations normally assign one or more channel based on channel spacing 12.5 kHz or 25 kHz.

The channelling plan based on a raster of 12.5 kHz and 25 kHz is shown below:

1.2.1 Frequency arrangements for 25 kHz channel spacing

Centre frequencies of the base station transmitting channel are (MHz):

$$F_n = 420.0125 + (N - 1) * 0.025 \quad N = 1, 2, 3, \dots 400$$

The centre frequencies of the base station receiving channel is (MHz):

$$F_n = 410.0125 + (N - 1) * 0.025 \quad N = 1, 2, 3, \dots 400$$

1.2.2 Frequency arrangements for 12.5 kHz channel spacing

Centre frequencies of the base station transmitting channel are (MHz):

$$F_n = 420.00625 + (N - 1) * 0.0125 \quad N = 1, 2, 3, \dots 800$$

The centre frequencies of the base station receiving channel is (MHz):

$$F_n = 410.00625 + (N - 1) * 0.0125 \quad N = 1, 2, 3, \dots 800$$

1.2.3 Channel allotment plan

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.

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 $2*D+600+20*(X-1)$

Annex 5

Examples of frequency arrangements for the bands 806 to 824 MHz and 851 to 869 MHz in certain countries in Region 3 for narrowband and broadband public protection and disaster relief operations

1 Region 3

1.1 Example narrowband plan – 806-824/851-869 MHz

The entire band could be used for channel bandwidths of 25 kHz for digital trunked radio systems. However some administrations may want to use different channel bandwidths according to their policy. This sub-section provides examples of three channelling schemes. In the sub-band of 806-811/851-856 MHz the channel bandwidth is 25 kHz, in the sub-band of 811-813.5/856-858.5 MHz the channel bandwidth is 12.5 kHz and in sub-band 813.5-816/858-861 MHz the channel bandwidth is 6.25 kHz. The lower block 806-824 MHz is used for mobile station transmitters (uplink) and the upper block is used for base station transmitters (downlink).



M.2015-A5-01

Formulas to calculate the centre frequency of each channel are as follows:

- In sub-band of 806-811/851-856 MHz:

The band is divided into 25 kHz channels.

Centre frequency of N -th base station transmitting channel (MHz):

$$F_N = 851.0125 + (N - 1) \times 0.025 \quad N = 1, 2, 3, \dots, 200$$

Centre frequency of N -th base station receiving channel (MHz):

$$F'_N = 806.0125 + (N - 1) \times 0.025 \quad N = 1, 2, 3, \dots, 200$$

- In sub-band of 811-813.5/856-858.5 MHz:

This sub-band is divided into 12.5 kHz channels.

Centre frequency of N -th base station transmitting channel (MHz):

$$F_N = 856.00625 + (N - 1) \times 0.0125 \quad N = 1, 2, 3, \dots, 200$$

Centre frequency of N -th base station receiving channel (MHz):

$$F'_N = 811.00625 + (N - 1) \times 0.0125 \quad N = 1, 2, 3, \dots, 200$$

- In sub-band of 813.5-816/858.5-861 MHz:

This sub-band is divided into 6.25 kHz channels.

Centre frequency of N -th base station transmitting channel (MHz):

$$F_N = 858.503125 + (N - 1) \times 0.00625 \quad N = 1, 2, 3, \dots, 400$$

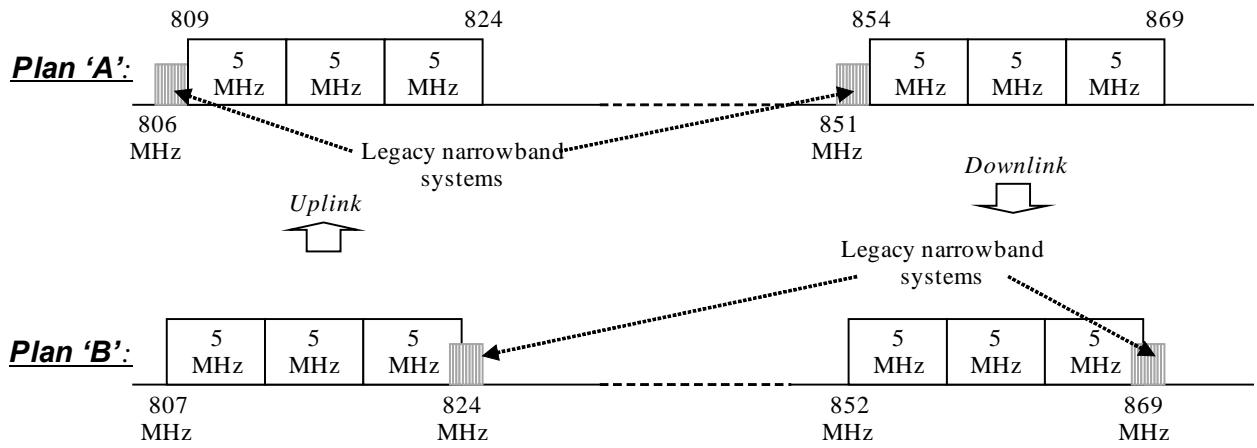
Centre frequency of N -th base station receiving channel (MHz):

$$F'_N = 813.503125 + (N - 1) \times 0.00625 \quad N = 1, 2, 3, \dots, 400.$$

1.2 Example broadband plan – 806-824/851-869 MHz

The broadband channel plan is based on paired frequencies with mobile station transmitters used in the frequency band 806-824 MHz (uplink) and base station transmitters used in the frequency band 851-869 MHz (downlink).

To allow for possible co-existence with legacy narrowband systems and adjacent broadband channel arrangements, administrations could consider the examples below:



M.2015-A5-0

The raster for the wideband channels is 100 kHz, which means that the channel center frequencies are an integer multiple of 100 kHz. The broadband channel bandwidth is an integer multiple of 5 MHz. This provides flexibility for administrations to implement appropriate channel arrangements in accordance with the above Plans 'A' or 'B', or some subset thereof, to suit specific national circumstances. Some administrations may want to use different amounts of broadband and narrowband spectrum than the examples in Plan 'A' or 'B' to allow for transition.

1.3 Example narrowband and broadband in 806-824/851-869 MHz

In Region 3 some countries, in accordance with Resolution **646 (Rev.WRC-12)**, have identified the band 806-824/ 851-869 MHz for PPDR in their national plans. With the regional adoption of the APT 700 MHz band plan, these countries wish to deploy broadband PPDR within the band 806-824/ 851-869 MHz and at same time a) provide the necessary spectrum for narrow band PPDR and b) ensure that the downlink of the APT 700 MHz band is protected from adjacent band interference from the uplink transmission of broadband systems operating in the band 806-824/851-869 MHz, particularly in cases where channel sizes of 10+10 or higher bandwidth are used in the APT 700 MHz band.

This example shows how narrowband and broadband systems can be deployed in the band 806-824/851-869 MHz while ensuring the necessary protection of the APT 700 MHz band from adjacent band interference. The sub-band 806-813/851-858 MHz is used for narrowband systems with a channel bandwidth of 25 kHz; the sub-band 814-824/859-869 MHz is used for broadband (LTE) systems using carrier bandwidths of 5 to 10 MHz. The sub-band 813-814/ 858-859 MHz acts as guard band between narrowband and broadband systems.

1.3.1 Example of frequency arrangement for narrowband and broadband systems



M.2015-A5-0

Mobile station/ Control station transmit (MHz)	Base station transmit (MHz)	Frequency block
806-813	851-858	Narrowband PPDR
813-814	858-859	Guard band
814-824	859-869	Broadband PPDR

1.3.2 Example channelization for narrowband

The channelling plan for the sub-band 806-813/851-858 MHz is based on the channel spacing of 25 kHz.

The centre frequency (f_N) of the N th channel is given by:

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

1.3.3 Example channelization for broadband

The channelling plan for broadband is based on a channel bandwidth of 5 MHz or 10 MHz as shown below:

The centre frequency (f_N) of the N -th channel for two 5 MHz channels is given by:

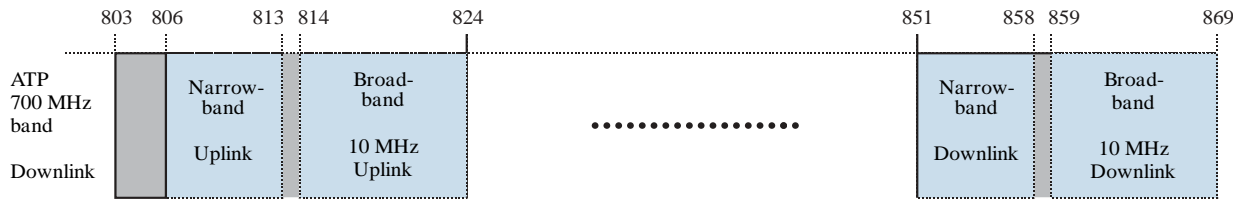
Channel number	Mobile station transmit Channel centre frequency (MHz)	Base station transmit Channel centre frequency (MHz)	Channel bandwidth (MHz)
$N = 1$ to 2	$f_N = 816.5 + (5) \times (N - 1)$	$f_N = 861.5 + (5) \times (N - 1)$	5



M.2015-A5-04

The centre frequency (f_N) of the N -th channel for one 10 MHz channels is given by:

Channel number	Mobile station transmit Channel centre frequency (MHz)	Base station transmit Channel centre frequency (MHz)	Channel bandwidth (MHz)
$N = 1$	$f_1 = 819$	$f_1 = 864$	10



M.2015-A5-0