APT RECOMMENDATION

on

USE OF THE BAND 4940-4990 MHZ FOR PUBLIC PROTECTION AND DISASTER RELIEF (PPDR) APPLICATIONS

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Introduction

The ITU WRC 2003 Resolution 646 identifies a number of frequency bands/ranges to achieve regionally harmonized spectrum for advanced PPDR solutions. Benefits of spectrum harmonization include: increased potential for interoperability, a broader manufacturing base and increased volume of equipment resulting in economies of scale and expanded equipment availability, improved spectrum management and planning and enhanced cross-border coordination and circulation of equipment.

Implementation of this Resolution will pave the way for the deployment of new technologies for broadband PPDR applications. At present, PPDR applications are mostly narrow-band supporting voice and low data-rate applications, typically in channel bandwidths of 25 kHz or less. It is anticipated that many future applications will be wideband-based (with data rates in the range of 384-1000 kbit/s) and/or broadband-based (with data rates in the range of 1-100 Mbit/s). (For details see Report ITU-R M.2033).

By WRC 2003 resolution 646, Administrations are encouraged to consider the following identified frequency bands/ranges or parts thereof when undertaking their national planning:

- 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 agreed countries of Region 1.
- Region 2: 746-806 MHz, 806-869 MHz, 4 940-4 990 MHz
- Region 3: 406.1-430 MHz, 440-470 MHz, 806-824/851-869 MHz, 4 940-4 990 MHz and 5 850-5 925 MHz (some countries in Region 3 have also identified the bands 380-400 MHz and 746-806 MHz for PPDR applications).

Administrations are urged, through this ITU Resolution, to use regionally harmonized bands for PPDR to the maximum extent possible, taking into account the national and regional requirements and also having regard to any needed consultation and cooperation with other concerned countries. They are further called upon to encourage PPDR agencies and organizations to utilize relevant ITU-R Recommendations in planning spectrum use and implementing technology and systems supporting public protection and disaster relief.

Scope

The scope of this Recommendation is to provide guidance on the frequency arrangements and other technical parameters for the PPDR applications in the band 4940-4990, with a view to assisting APT members on spectrum-related technical issues relevant to the implementation and use of the PPDR application in the bands identified in ITU-R WRC-2003 Resolution 646. The frequency arrangements are recommended from the point of view of enabling the most effective and efficient use of the spectrum to deliver PPDR applications using this frequency band – while minimizing the impact on other systems or services in this band.

ANNEX

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Asia Pacific Telecommunity (APT):

Considering:

a) that the term "public protection radiocommunication" refers to radiocommunications used by responsible agencies and organizations dealing with maintenance of law and order, protection of life and property and emergency situations;

b) that the term "disaster relief radiocommunication" refers to radiocommunications used by agencies and organizations dealing with a serious disruption of the functioning of society, posing a significant widespread threat to human life, health, property or the environment, whether caused by accident, natural phenomena or human activity, and whether developing suddenly or as a result of complex, long-term processes;

c) the growing telecommunication and radiocommunication needs of public protection agencies and organizations, including those dealing with emergency situations and disaster relief, that are vital to the maintenance of law and order, protection of life and property, disaster relief and emergency response;

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

e) that current PPDR applications are mostly narrow-band supporting voice and low data-rate applications, typically in channel bandwidths of 25 kHz or less;

f) that, although there will continue to be narrow-band requirements, many future applications will be wideband (indicative data rates in the order of 384-1000 kbit/s) and/or broadband (indicative data rates in the order of 1-100 Mbit/s) with channel bandwidths dependent on the use of spectrally efficient technologies;

g) that new technologies for wideband and broadband PPDR applications are being developed in various standards organizations[1];

h) that continuing development of new technologies such as IMT-2000 and systems beyond IMT-2000 and Intelligent Transportation Systems (ITS) may be able to support or supplement advanced PPDR applications;

i) that some commercial terrestrial and satellite systems are complementing the dedicated systems in support of PPDR, that the use of commercial solutions will be in response to technology development and market demands and that this may affect the spectrum required for those applications and for commercial networks;

j) that Resolution 36 (Rev. Marrakesh, 2002) of the Plenipotentiary Conference urges Member States to facilitate use of telecommunications for the safety and security of the personnel of humanitarian organizations;

k) that Recommendation ITU-R M.1637 offers guidance to facilitate the global circulation of radiocommunication equipment in emergency and disaster relief situations;

l) that some administrations may have different operational needs and spectrum requirements for PPDR applications depending on the circumstances;

m) that the Tampere Convention on the Provision of Telecommunications Resources for Disaster Mitigation and Relief Operations (Tampere, 1998), an international treaty deposited with the United Nations Secretary-General and related United Nations General Assembly resolutions and reports are also relevant in this regard,

n) that a minimized number of harmonized frequency arrangements in the bands identified for PPDR applications will:

– facilitate worldwide compatibility;

– facilitate international movement of PPDR equipment and systems;

– reduce the overall cost of PPDR equipment by providing economies of scale;

o) that when developing frequency arrangements possible technological constraints (e.g. cost efficiency, size and complexity of terminals, high speed/low power digital signal processing and the need for compact batteries) should be taken into account;

p) that guard bands for should be minimized to avoid wasting spectrum;

q) that when developing frequency arrangements, availability of low cost technologies such as wireless LAN should be taken into account;

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[1] For example, a joint standardization programme between the European Telecommunications Standards Institute (ETSI) and the Telecommunications Industry Association (TIA), known as Project MESA (Mobility for Emergency and Safety Applications) has commenced for broadband public protection and disaster relief. Also, the Working Group on Emergency Telecommunications (WGET), convened by the United Nations Office for Humanitarian Affairs (OCHA), is an open forum to facilitate the use of telecommunications in the service of humanitarian assistance comprising United Nations entities, major non-governmental organizations, the International Committee of the Red Cross (ICRC), ITU and experts from the private sector and academia. Another platform for coordination and to foster harmonized global Telecommunication for Disaster Relief (TDR) standards is the TDR Partnership Coordination Panel, which has just been established under the coordination of ITU with participation of international telecommunication service providers, related government departments, standards development organizations, and disaster relief organizations.

r) The channel plan adopted for use by the PPDR agencies should provide the greatest potential to support the variety of needs across multiple PPDR agencies. The width of the channels needed and the total amount of spectrum assigned for a given PPDR agency will depend on that agency's operational requirements.

recognizing

a) the benefits of spectrum harmonization such as:

– increased potential for interoperability;

– a broader manufacturing base and increased volume of equipment resulting in economies of scale and expanded equipment availability;

– improved spectrum management and planning; and

– enhanced cross-border coordination and circulation of equipment;

b) that the organizational distinction between public protection activities and disaster relief activities are matters for administrations to determine at the national level;

c) that national spectrum planning for PPDR needs to have regard to cooperation and bilateral consultation with other concerned administrations, which should be facilitated by greater levels of spectrum harmonization;

d) the benefits of cooperation between countries for the provision of effective and appropriate humanitarian assistance in case of disasters, particularly in view of the special operational requirements of such activities involving multinational response;

e) the needs of countries, particularly the developing countries [2], for low-cost communication equipment;

f) that the trend is to increase the use of technologies based on Internet Protocols;

g) that currently some bands or parts thereof have been designated for existing PPDR operations, as documented in Report ITU-R M.2033[3];

h) that for solving future bandwidth requirements, there are several emerging technology developments such as software-defined radio, advanced compression and networking techniques that may reduce the amount of new spectrum required to support some PPDR applications;

i) that in times of disasters, if most terrestrial-based networks are destroyed or impaired, amateur, satellite and other non-ground-based networks may be available to provide communication services to assist in PPDR efforts;

j) that the amount of spectrum needed for public protection on a daily basis can differ significantly between countries, that certain amounts of spectrum are already in use in various countries for narrow-band applications, and that in response to a disaster, access to additional spectrum on a temporary basis may be required;

k) that in order to achieve spectrum harmonization, a solution based on regional frequency ranges[4] may enable administrations to benefit from harmonization while continuing to meet national planning requirements;

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[2] Taking into account, for example, the ITU-D Handbook on disaster relief.

[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 CITEL designation of 821-824/866-869 MHz).

l) that not all frequencies within an identified common frequency range will be available within each country;

m) that the identification of a common frequency range within which equipment could operate may ease the interoperability and/or inter-working, with mutual cooperation and consultation, especially in national, regional and cross-border emergency situations and disaster relief activities;

n) that when a disaster occurs, the PPDR agencies are usually the first on the scene using their day-to-day communication systems, but that in most cases other agencies and organizations may also be involved in disaster relief operations,

recommends, for guidance of APT member administrations

The frequency band 4940-4990 MHz or parts thereof may be used to support broadband networks designed for PPDR high rate data and video information transfer. Such networks will need to be highly reliable, secure, and designed with coverage capabilities based on PPDR agency requirements. These networks are expected to include both pre-deployed hotspots throughout a PPDR agency's operational area and temporary ad hoc systems deployed at an incident scene as needed for incident scene management. Example detailed channeling plans, emission masks and power limits for use of this band for PPDR applications are contained in Annex-1

[4] In the context of this Resolution, the term "frequency range" means a range of frequencies over which radio equipment is envisaged to be capable of operating but limited to specific frequency band(s) according to national conditions and requirements.

Annex 1

a) Channel Plan: The following channeling plan (see Table 1) , which supports channel widths from 5 MHz to 20 MHz, to provide the flexibility needed for Administrations to support a variety of PPDR operational requirements. 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.

b) Emission Masks: The recommended emission masks for 4.9 GHz for low power devices is similar to the mask defined in the IEEE 802.11a standard and a tighter mask for higher power transmitters which provides better adjacent channel protection. The low-to-high power breakpoint, that is, the point at which the high power mask is required, varies by channel bandwidth: 20 dBm (100 milliwatts) for 20 MHz channels, 17 dBm for 10 MHz channels, and 14 dBm for 5 MHz channels. The less stringent mask for transmitting devices at lower power levels below these points allows existing 5 GHz commercial-off-the-shelf (COTS) wireless LAN equipment to be easily modified to operate in the 4.9 GHz band, thereby reducing costs for PPDR users. At the same time, the tighter mask used for powers above these levels provides additional adjacent channel protection needed to help reduce interference and increase the reliability for PPDR users. Manufacturers should also have the option to use the tighter mask for lower power transmitters as well, but would not be required to do so.

c) Power Limits: Power limits should be stipulated as a function of channel bandwidth. "High power" transmitters would require the use of a tighter mask to help prevent adjacent channel interference. "Low power" transmitters would have the option to operate with a less stringent mask. Example power limits are given in Table 2. Transmitters under the "High power" category which meet the tighter emission mask should be allowed to use transmit antennas with a directional gain up to 26 dBi at maximum transmit power output. Directional antenna gain could exceed 26 dBi, if both power transmit power and power spectral density are reduced dB-per-dB by the amount that directional antenna gain exceeds 26 dBi.

In some cases, Administrations may wish to impose lower power limits due to tighter frequency-sharing environment. An example set of such power limits is given in Table 3. The parameters are taken from a Broadband Wireless Access (BWA) system that has capability to accommodate broadband PPDR applications.

Table 1

Example channeling plan for 4940-4990 MHz

Channel Numbers * (n_{ch})	**Channel Center 5MHz**	**Channel Center 10MHz**	**Channel Center 20MHz**
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		

Table 2

Example power limits for transmitters in 4940-4990 MHz by PPDR applications

Channel Bandwidth (MHz)	Low power peak transmitter power (dBm)	High power peak transmitter power (dBm)
5	14	27
10	17	30
15	18.8	31.8
20	20	33

Table 3

Example parameters of BWA system to support PPDR applications

Channel Spacing	Occupied bandwidth	Peak transmitter power	Peak equivalent isotropic radiated power
5 MHz	4.5 MHz	24 dBm and 17 dBm/MHz	37 dBm
10 MHz	9.0 MHz		
20 MHz	19.7 MHz		

* Listen-before-transmit protocol is used to avoid interference.