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**APT REPORT ON**

**806 – 960 MHZ FREQUENCY ARRANGEMENTS, NATIONAL ALLOCATIONS AND ASSIGNMENTS FOR IMT**

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| **APT Wireless Group (AWG)** |  |
|  |  |

SOURCE: AWG-14/OUT-17

**APT REPORT ON 806 - 960 MHZ FREQUENCY ARRANGEMENTS,  
NATIONAL ALLOCATIONS AND ASSIGNMENTS FOR IMT**

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# Introduction

In recent years mobile broadband system has experienced extraordinary improvement which results in increasingly high requirement for radio frequency spectrum. The 800 MHz frequency is well recognized as one of the essential spectrum resource with perfect radio transmission characteristics. The 806-960 MHz band was allocated to the mobile service on a primary basis[[1]](#footnote-1).

In Region 3 there is a great interest in the usage of the 806-960 MHz band. As current usages and the frequency arrangements of the band are quite different among APT countries, a survey on APT Frequency Usage in the 806-960MHz band was developed in order to collect information on current and future usage of this band from APT administrations. And further considerations could be taken based on the information acquired from this survey.

# Scope

This report covers information of current spectrum usage and re-farming progress in the 806-960 MHz band in Asia Pacific Region. The objective is to identify current usage and future plan of 806-960 MHz in Asia Pacific countries with associated consideration on technical parameters of frequency allocation and assignments to trigger the further study related to 806-960MHz band issues.

# Vocabulary of terms

APT Asia Pacific Telecommunity

IMT International Mobile Telecommunications

# References

[Recommendation ITU-R M.1036](http://www.itu.int/rec/R-REC-M.1036/en)-4 - “Frequency arrangements for implementation of the terrestrial component of International Mobile Telecommunications (IMT) in the bands identified for IMT in the Radio Regulations (RR)”;

Resolution 224 (REV.WRC-12) - “Frequency bands for the terrestrial component of International Mobile Telecommunications below 1 GHz”

# ITU-R Recommendations

ITU-R has arranged the 698-960MHz frequency arrangement in ITU-R Recommendation 1036-4. The frequency arrangements related to 806-960 MHz band is shown as below:

TABLE 1

*Paired frequency arrangements related to 806-960 MHz band*

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Frequency arrangements | Paired arrangements | | | | Un-paired arrangements (e.g. for TDD) (MHz) |
| Mobile station transmitter (MHz) | Centre gap (MHz) | Base station transmitter (MHz) | Duplex separation(MHz) |
| A1 | 824-849 | 20 | 869-894 | 45 | None |
| A2 | 880-915 | 10 | 925-960 | 45 | None |

*Notes to Table 3:*

NOTE 1 – Due to the different usage in the bands 698-960 MHz between Regions, there is no common solution possible at this time.

NOTE 2 – The frequency arrangements for the band 698-960 MHz have been developed taking into consideration the following *recognizing*.

a) that Resolution 646 (WRC-03) encourages administrations to consider the following identified frequency bands, amongst others, for public protection and disaster relief when undertaking their national planning:

– in Region 2: 746-806 MHz, 806-869 MHz;

– in Region 3[[2]](#footnote-2): 806-824/851-869 MHz;

b) that the identification of the above frequency bands/ranges for public protection and disaster relief does not preclude the use of these bands/frequencies by any application within the services to which these bands/frequencies are allocated and does not preclude the use of nor establish priority over any other frequencies for public protection and disaster relief in accordance with the Radio Regulations.

The frequency arrangements for PPDR systems using IMT technologies in the bands identified in [Resolution 646 (WRC-03)](http://www.itu.int/oth/R0A0600001A/en), according to *considering* h) and *resolves* 6 of that Resolution, are outside the scope of this Recommendation. There are inherent benefits of deploying IMT technologies for PPDR applications in this band, including advantages of large coverage area and possible interoperability across the 700 and 800 MHz bands, noting the differences in operational requirements and implementations.

FIGURES A1 and A2   
(See notes to Table 1)



# APT members current usage and future plan of the band

In order to collect information on current usage and future plan, a Survey Questionnaire on APT Frequency Arrangement on 800 MHz band was used which includes the following questions:

**Question 1:** What is/are the current allocations (e.g. Mobile service, Fixed service, Broadcasting service, etc.) in the band806-960 MHz in your country?

**Question 2**: What application(s) (e.g. PMR, IMT, PPDR, etc.) and associated technologies are currently assigned/licensed in the band? Which frequency sub-band is used for each application? In addition, please describe system characteristics of applications currently used including details such as spectrum emission mask, in-band transmission power, bandwidth, receiver performance, etc.[[3]](#footnote-3).

**Question 3**: What is/are your planned future application(s) and corresponding frequency arrangement(s) for mobile broadband systems in the band 806-960MHz? Please provide detailed information, such as channel bandwidth/block size, guardbands if used, duplex method, TDD or FDD etc.

**Question 4:** What are detailed characteristics of applications planned? Please describe system characteristics of the applications planned including details such as spectrum emission mask, in-band transmission power, bandwidth, receiver performance etc.

**Question 5:** If detailed system characteristics are not available please provide a narrative description of planned or potential future uses.

**Question 6**: What is your transfer timetable for existing applications that will be re-farmed?

**Question 7:**Is there any other information and/or comments related to this band usage which is not included in the above questions?

The following summarize the responses of Survey Questionnaire by APT members on the current usage and future plan of the band 806 -960MHz:



## Australia

## China(Mainland)

|  |  |
| --- | --- |
| **Band(MHz)** | **Current Frequency Allocations** |
| 806-960 | FIXED  MOBILE 5.317A  Radiolocation  Note1 |

Note1: The 905-925 MHz band can be allocated to the aeronautical radionavigation service on a secondary basis. The 925-930 MHz can be allocated to the aeronautical radionavigationservice on a primary basis which shall be afforded protection from harmful interference by other service. (2001)

In China,the applications and associated technologies are currently assigned/licensed in the band is as following:

|  |  |  |  |
| --- | --- | --- | --- |
|  | **Frequency Sub-band(MHz)** | **Applications** | **Associated Technologies** |
| 1 | 806-821/851-866 | PLMR | TETRA |
| Gota |
| GT800 |
| 2 | 825-835/870-880 | IMT | CDMA |
| 3 | 821-825/866-870 | data communication |  |
| 4 | 885-915/930-960 | PLMN | GSM |
| 5 | 915-930 | PLMR |  |
| ARNS |  |

## Indonesia

|  |  |
| --- | --- |
| **Band(MHz)** | **Current Frequency Allocations** |
| 806 – 845 | MOBILE |
| 845 - 851 | MOBILE  FIXED |
| 851 – 915 | MOBILE |
| 915 – 935 | MOBILE  FIXED |
| 935 – 960 | MOBILE |

In Indonesia, the applications and associated technologies are currently assigned/licensed in the band is as following:

|  |  |  |  |
| --- | --- | --- | --- |
|  | **Frequency Sub-band(MHz)** | **Applications** | **Associated Technologies** |
| 1 | 806 – 824 (UL)/851 – 869 (DL) | PMR | Trunking, Conventional |
| 2 | 824 – 845 (UL)/869 – 890 (DL) | IMT | CDMA2000 |
| 3 | 890 – 915 (UL)/935 – 960 (DL) | IMT | GSM900/UMTS900 |
| 4 | 915 – 935 | PMR | Trunking, Conventional |
| Telemetry | SCADA |

## Japan

|  |  |
| --- | --- |
| **Band(MHz)** | **Current Frequency Allocations** |
| 806-958 | MOBILE |
| 958-960 | MOBILE  FIXED |

In Japan, the applications and associated technologies are currently assigned/licensed in the band is as following:

|  |  |  |  |
| --- | --- | --- | --- |
|  | **Frequency Sub-band(MHz)** | **Applications** | **Associated Technologies** |
| 1 | 806-810 | Radio microphone |  |
| 2 | 815-845, 860-890 | IMT | LTE(FDD) |
| WCDMA |
| CDMA2000 |
| 3 | 850-860, 905-915 | MCA  (Multi Channel Access) |  |
| 4 | 900-905, 945-950 | IMT | WCDMA |
| 5 | 950-958 | RFID |  |
| 6 | 958-960 | ENG |  |

## Malaysia

|  |  |
| --- | --- |
| **Band(MHz)** | **Current Frequency Allocations** |
| 806-890 | FIXED  MOBILE  BROADCASTING |
| 890 - 942 | FIXED  MOBILE  BROADCASTING  Radiolocation |
| 942 - 960 | FIXED  MOBILE  BROADCASTING |

In Malaysia, the applications and associated technologies are currently assigned/licensed in the band is as following:

|  |  |  |  |
| --- | --- | --- | --- |
|  | **Frequency Sub-band(MHz)** | **Applications** | **Associated Technologies** |
| 1 | 806-821/851-866 | Trunked radio System | - TETRA  - iDEN  - APCO25  - GoTa CDMA |
| Sub Band Plan for 816-821/861-866 (PPDR) |
| 2 | 821-824/866-869 | Broadband Wireless Access | - |
| 3 | 831-835/ 876-880 | CDMA | - |
| 4 | 880-915/925-960 | EGSM 900 and PGSM 900 | - |
| 5 | 919-923 | RFID | - |

## Republic of Korea

Band 806-960MHz is mostly used as mobile service in Korea. This includes commercial mobile services such as iDEN, CDMA and LTE as well as PS/PPDR service using TETRA.

|  |  |  |  |
| --- | --- | --- | --- |
|  | **Frequency Sub-band(MHz)** | **Applications** | **Associated Technologies** |
| 1 | 806-812(UL)/ 851-857(DL) | PPDR | TETRA |
| 2 | 812-817(UL)/ 857-862(DL) | Mobile | iDEN |
| 3 | 819-824(UL)/864-869(DL) | Mobile | LTE |
| 4 | 824-829(UL)/869-874(DL) | Mobile | CDMA |
| 5 | 829-849(UL)/874-894(DL) | Mobile | LTE |
| 6 | 905-915(UL)/ 950-960(DL) | Mobile | LTE |

## Singapore

|  |  |
| --- | --- |
| **Band(MHz)** | **Current Frequency Allocations** |
| 806-890 | FIXED  MOBILE  BROADCASTING |
| 890 - 960 | FIXED  MOBILE  BROADCASTING  Radiolocation |

In Singapore, the applications and associated technologies are currently assigned/licensed in the band is as following:

|  |  |  |
| --- | --- | --- |
|  | **Frequency Sub-band(MHz)** | **Applications/**  **Associated Technologies** |
| **1** | 806-823 / 851-868 | Trunk Radio Services |
| **2** | 824-835 / 869-880 | - |
| **3** | 880-890 / 925-935 | EGSM |
| **4** | 890-915 / 935-960 | GSM900 |
| UMTS900 |

## Thailand

|  |  |  |
| --- | --- | --- |
|  | **Band(MHz)** | **Current Frequency Allocations** |
| 1 | 806-890 | FIXED  MOBILE |
| 2 | 890-942 | FIXED  MOBILE  Radiolocation |
| 3 | 942-960 | FIXED  MOBILE |

In Thailand, the applications and associated technologies are currently assigned/licensed in the band is as following:

|  |  |  |  |
| --- | --- | --- | --- |
|  | **Frequency Sub-band(MHz)** | **Applications** | **Associated Technologies** |
| 1 | 806 - 824 | Analog Trunk Radio |  |
| 2 | 824 - 849 | Mobile | CDMA2000 1X |
| HSPA |
| AMPS-800 |
| 3 | 851 - 869 | Analog Trunk Radio |  |
| 4 | 869 - 894 | Mobile | CDMA2000 1X |
| HSPA |
| AMPS-800 |
| 5 | 897.5 - 915 | Mobile | GSM900/HSPA |
| 6 | 920 - 925 | RFID |  |
| 7 | 942.5 - 960 | Mobile | GSM900/HSPA |

## Viet Nam

In Viet Nam, the band allocation is as following:

|  |  |
| --- | --- |
| **Band(MHz)** | **Current Frequency Allocations** |
| 610-890 | 806-824  FIXED  MOBILE 5.317A  Broadcasting  5.149 5.306 5.311A 5.320 |
| 824-890  FIXED  MOBILE 5.317A  VTN8 5.149 5.306 5.311A 5.320 |
| 890-942 | 890-915  MOBILE 5.317A  Fixed  RadioLocation  VTN8 |
| 915-935  MOBILE 5.317A  Fixed  RadioLocation |
| 935-942  MOBILE 5.317A  Fixed  RadioLocation  VTN8 |
| 942-960 | MOBILE 5.317A  Fixed  VTN8 5.320 |

In Viet Nam, the applications and associated technologies are currently assigned/licensed in the band is as following:

|  |  |  |  |
| --- | --- | --- | --- |
|  | **Frequency Sub-band(MHz)** | **Applications** | **Associated Technologies** |
| 1 | 806 – 821 / 851 – 866 | PMR | Trunk Radio |
| 2 | 824 – 835 / 869 – 880 | PLMN | CDMA2000 |
| 3 | 880 – 890 / 925 – 935 | PLMN | eGSM |
| 4 | 890 – 915 / 935 – 960 | PLMN | GSM |
| 5 | 866 – 868 | SRD | RFID |

# Associated consideration of technical parameters with frequency allocation and assignments



## Frequency arrangement

Frequency arrangements for current and future usage of the band 806 -960 MHz for IMT/PLMN/PLMR in some APT countries are summarized in table below:

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Country** | Frequency Portion[[4]](#footnote-4) (MHz) | Applications[[5]](#footnote-5) | Duplex method | Duplex separation (MHz) if FDD | Channel Bandwidth (MHz) | Block Size (MHz) | Guardband between adjacent blocks (MHz) | Guardband[[6]](#footnote-6) at band edge (MHz) | Guardband[[7]](#footnote-7) at band edge (MHz) |
| **Australia** |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |
| **China** | 806-821 | PLMR(TETRA/Gota/GT800) | FDD | 45 | - | - | - | - | - |
| 851-866 | PLMR(TETRA/Gota/GT800) | FDD | 45 | - | - | - | - | - |
| 825-835 | IMT(CDMA) | FDD | 45 | - | - | - | - | - |
| 870-880 | IMT(CDMA) | FDD | 45 | - | - | - | - | - |
| 885-915 | PLMN(GSM) | FDD | 45 | - | - | - | - | - |
| 930-960 | PLMN(GSM) | FDD | 45 | - | - | - | - | - |
| **Indonesia** | 890 – 915 | IMT (WCDMA900) | FDD | 45 | 3.84, 4.2 | 7.5, 10 | -- | 3 | -- |
| 935 – 960 | IMT (WCDMA900) | FDD | 45 | 3.84, 4.2 | 7.5, 10 | -- | 3 | -- |
| **Japan** | 815-845 | IMT (LTE, WCDMA, CDMA2000) | FDD | 45 | 10 |  |  |  |  |
| 860-890 | IMT (LTE, WCDMA, CDMA2000) | FDD | 45 | 10 |  |  |  |  |
| 850-860 | MCA  (Multi Channel Access) | FDD | 55 |  |  |  |  |  |
| 905-915 | MCA  (Multi Channel Access) | FDD | 55 |  |  |  |  |  |
| 900-905 | IMT(WCDMA) | FDD | 45 | 10 |  |  |  |  |
| 945-950 | IMT(WCDMA) | FDD | 45 | 10 |  |  |  |  |
| **Korea** | 806-812 | PPDR(TETRA) | FDD | 45 |  |  |  |  |  |
| 851-857 | PPDR(TETRA) | FDD | 45 |  |  |  |  |  |
| 812-817 | Mobile(iDEN) | FDD | 45 |  |  |  |  |  |
| 857-862 | Mobile(iDEN) | FDD | 45 |  |  |  |  |  |
| 819-824 | LTE | FDD | 45 |  |  |  |  |  |
| 864-869 | LTE | FDD | 45 |  |  |  |  |  |
| 824-829 | CDMA | FDD | 45 |  |  |  |  |  |
| 869-874 | CDMA | FDD | 45 |  |  |  |  |  |
| 829-849 | LTE | FDD | 45 |  |  |  |  |  |
| 874-894 | LTE | FDD | 45 |  |  |  |  |  |
| 905-915 | LTE | FDD | 45 |  |  |  |  |  |
| 950-960 | LTE | FDD | 45 |  |  |  |  |  |
| **Viet Nam** | 880 – 915 | Mobile Broadband | FDD | 45 | 5, 10, 20 | Understudy | | | |
| 925 – 960 | LTE | FDD | 45 | 5, 10, 20 | Understudy | | | |
| **Malaysia** | 806-821 | PLMR(TETRA, iDEN, APCO25, GoTa CDMA) | FDD | 45 |  |  |  |  |  |
| 851-866 | PLMR(TETRA, iDEN, APCO25, GoTa CDMA) | FDD | 45 |  |  |  |  |  |
| 816-821 | PPDR | FDD | 45 |  |  |  |  |  |
| 861-866 | PPDR | FDD | 45 |  |  |  |  |  |
| 821-824 | Broadband Wireless Access | FDD | 45 |  |  |  |  |  |
| 866-869 | Broadband Wireless Access | FDD | 45 |  |  |  |  |  |
| 831-835 | CDMA | FDD | 45 |  |  |  |  |  |
| 876-880 | CDMA | FDD | 45 |  |  |  |  |  |
| 880-915 | EGSM 900 & PGSM 900 | FDD | 45 |  |  |  |  |  |
| 925-960 | EGSM 900 & PGSM 900 | FDD | 45 |  |  |  |  |  |
| **Singapore** | 806-823 | PLMR(Trunk Radio Services) | FDD | 45 |  |  |  |  |  |
| 851-868 | PLMR(Trunk Radio SErvices) | FDD | 45 |  |  |  |  |  |
| 880-890 | EGSM | FDD | 45 |  |  |  |  |  |
| 925-935 | EGSM | FDD | 45 |  |  |  |  |  |
| 890-915 | GSM900 & UMTS 900 | FDD | 45 |  |  |  |  |  |
| 935-960 | GSM900 & UMTS 900 | FDD | 45 |  |  |  |  |  |
| **Thailand** | 806 - 824 | Trunk Radio Services | FDD | 45 |  |  |  |  |  |
| 851 – 869 | Trunk Radio Services | FDD | 45 |  |  |  |  |  |
| 824 - 849 | Mobile | FDD | 45 |  |  |  |  |  |
| 869 - 894 | Mobile | FDD | 45 |  |  |  |  |  |
| 897.5 - 915 | Mobile | FDD | 45 |  |  |  |  |  |
| 942.5 - 960 | Mobile | FDD | 45 |  |  |  |  |  |

## Transfer table



### Indonesia

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Country** | **Frequency Sub-band** | **Existing Applications** | **New Applications** | **Transfer Timetable (year)** | | |
| **1-2** | **3-5** | **Long Term** |
| **Indonesia** | 890 – 915 MHz /  935 – 960 MHz | GSM900 | IMT (WCDMA900) | X |  |  |

### Japan

Japan istransferring the following systems until 31st March, 2018.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Country** | **Frequency Sub-band** | **Existing Applications** | **New Applications** | **Transfer Timetable (year)** | | |
| **1-2** | **3-5** | **Long Term** |
| **Japan** | 905-915 | MCA | IMT |  |  | X |
| 950-958 | RFID | IMT |  |  | X |
| 958-960 | ENG | IMT |  |  | X |
| 915-928 | - | RFID |  |  | X |
| 930-940 | - | MCA |  |  | X |

### Singapore

In Singapore, the transfer timetable is as below,

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Country** | **Frequency Sub-band** | **Existing Applications** | **New Applications** | **Transfer Timetable (year)** | | |
| **1-2** | **3-5** | **Long Term** |
| 806-823 MHz / 851-868 MHz | Trunk Radio Services | TBD |  |  |  |
| 824-835 MHz / 869-880 MHz | - | TBD |  |  |  |
| 890-915 MHz / 935-960 MHz | 2G/3G Mobile Cellular | Wireless Broadband Services / Mobile Services (IMT) |  |  | X |

### Viet Nam

In Viet Nam, band 806 – 960MHzwill be licensed via auction after 2020.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Country** | **Frequency Sub-band** | **Existing Applications** | **New Applications** | **Transfer Timetable (year)** | | |
| **1-2** | **3-5** | **Long Term** |
| **Viet Nam** | 880 – 915 MHz | GSM | LTE |  |  | X |
| 925 – 960 MHz | GSM | LTE |  |  | X |

## Technologies and System Characteristics for Application



### China Mainland

**GoTa**

GoTa is one of the associated technologies of PMR application. GoTa is a professional trunking system based on cdma2000 air interface technology. The following table presents the core parameters for GoTasystem.

|  |  |  |
| --- | --- | --- |
| **Parameter** | **GoTa** | **Note** |
| Channeling | Multiple channel |  |
| Modulation/Occupied BW | 1.23MHz |  |
| Channel Access or Occupation Rule | CW |  |
| License Regime | license required |  |
| Frequency bands (MHz) | 806-821/851-866 |  |
| Duplex method | Full Duplex FDD |  |
| Duplex separation | 45 MHz |  |
| Channel Bandwidth (MHz) | 1.25 |  |
| RF carrier spacing (kHz) | 1 250 |  |
| Area coverage technique | Cellular channel reuse of 1and sectorization Diversity receivers |  |
| Access method | CDMA |  |
| Modulation | BPSK  QPSK  8-PSK  16-QAM |  |
| Channelization code | Walsh codes and PN spreading codes (UL)  Walsh codes, PN spreading codes, or quasi-orthogonal codes (DL) |  |
| Scrambling (spreading) code | Long code, short PN code, and other pseudo-random codes |  |
| Channel coding | Convolution codes and Turbo codes with interleaving |  |
| Traffic channel structure:   * Basic rate speech codec:   + Bit rate (kbit/s)   + Error protection   + Coding algorithm * Alternative ratespeechcodec:   + Bit rate (kbit/s)   + Error protection   + Codingalgorithm | Traffic channel structure:  9.6, 4.8, 2.4, 1.2  CRC  EVRC  14.4,7.2,3.6,1.8  CRC  QCELP13K | QCELP:Qualcomm Code Excited Linear Predictive Coding |
| Control channel structure (number of channel types):   * Common control channel * Associated control channel * Broadcast control channel | See specifications  3 (for Common control channels)  1-7 (for Associated control channels)  1-7 (for Broadcast control channels) |  |
| Transmission rate (kbit/s) | 9.6~153.6 |  |
| Handover | Yes |  |
| Intersystem roaming capability | Yes |  |
| Design capability for multiple operators (systems) in same area | Yes |  |

**GT800**

GT800 is based on the GSM technologies. Detailed specification of the radio interface is follow 3GPP GSM specification.

|  |  |
| --- | --- |
| **Technique** | **GT800(based on GSM)** |
| Frequency band | 806-821MHz(DL) 851-866MHz(UL)  200kHz frequency space |
| Transmission power | BS:1\*60W/2\*40W/3\*27W/4\*20W  MS: 5W(37dBm)/ 2W(33dBm) / 0.8W(29dBm) |
| Receiver sensitivity | -113dBm(2%BER) |

BS blocking level:

|  |  |
| --- | --- |
| In band(786～831 MHz) |  |
| f0[[8]](#footnote-8) +/-600 KHz | -26 dBm |
| 800 KHz ≤∣f-f0∣<3 MHz | -16 dBm |
| 3 MHz ≤∣f-f0∣ | -13 dBm |
| Out of band | 8 dBm |

MS spherical radiator value should less than the value defined at the table:

|  |  |  |
| --- | --- | --- |
|  | 9KHz－1GHz | 1GHz－12.75GHz |
| Busy status | －36dBm（250nW） | －30dBm（1μW） |
| Idle status | －57dBm（2nW） | －47dBm（20nW） |

### Japan

**Radio microphone**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Frequency band (MHz)** | **Occupied bandwidth  (kHz)** | **Power level or spectral density (e.i.r.p.)** | **Transmission power and Antenna gain** | **Carrier sense** |
| 806.125-809.75 (125 kHz spacing) | Frequency modulation (except for Frequency shift keying) ≤ 110  Frequency modulation (limited to Frequency shift keying), Phase modulation or Quadrature amplitude modulation ≤ 192 | ≤ 16 mW (12.14 dBm) | ≤ 10 mW ≤2.14 dBi | Not required |

**IMT**

|  |  |  |  |
| --- | --- | --- | --- |
| **Technology** | **Occupied bandwidth** | **Transmission power** | **Antenna gain** |
| LTE(FDD) | 5MHz, 10MHz, 15MHz, 20MHz | (MS)≤dBm | (BS)Not stipulated  (MS)≤3dBi |
| WCDMA | 5MHz | (MS)≤dBm | (BS)Not stipulated  (MS) ≤3dBi |
| CDMA2000 | z | (MS) ≤dBm | Not stipulated |

**MCA**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Frequency band(MHz)** | **Usage** | **Occupied bandwidth (kHz)** | **Transmission power** | **Antenna gain** |
| 850.025-859.975 (25 kHz spacing) | RS to BS/MS |  | ≤W | 10.5dBi,  17dBi (Large cities) |
| 905.025 –914.975 (25 kHz spacing) | BS/MS to RS |  | W | (BS) 10dBi,  (MS) 4dBi |

**RFID**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Frequency band (MHz)** | **Occupied bandwidth (kHz)** | **Power level or spectral density (e.i.r.p.)** | **Transmission power and Antenna gain** | **Carrier sense** |
| 952-956.4 | ≤\*n kHz (n = 1-9) | ≤4W (36 dBm) | ≤ 1 W ≤ 6 dBi | –74 dBm |
| ≤\*n kHz (n = 1-21) | ≤500 mW (27dBm) | ≤250m W ≤ 3 dBi | –74 dBm |
| 952-957.6 | ≤\*n kHz (n = 1-5) | ≤mW (13 dBm) | ≤ 10 mW ≤ 3 dBi | –64 dBm |
| 950.8-957.6 | ≤\*n kHz (n = 1-5) | ≤mW (3 dBm) | ≤ 1 mW ≤ 3 dBi | –75dBm |
| 954-957.6 | ≤\*n kHz (n = 1-5) | ≤mW (13dBm) | ≤ 10mW ≤ 3 dBi | –75dBm |

**ENG**

|  |  |  |  |
| --- | --- | --- | --- |
| **Frequency band(MHz)** | **Occupied bandwidth (kHz)** | **Transmission power** | **Modulation Method** |
| 958-960 |  | ≤20W | FM |

### Malaysia

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **System Characteristics** | **Application of**  **Trunking Radio System** | **Application of**  **Broadband Wireless Access** | **Application of**  **CDMA** | **Application of**  **GSM 900** | **Application of**  **RFID** |
| **Bandwidth** | 2 x 15 MHz | 2 x 3 MHz | 4MHz x 2 | EGSM band - 2 x 10 MHz  PGSM band -  2 x 25 MHz | 4 MHz |
| **Channeling** | FDD | FDD | FDD | FDD |  |
| **Channel Width** | 25kHz or multiple of 25kHz | 1.23 MHz | 1.23MHz | 200kHz- | 200 kHz or  500 kHz |
| **Modulation/Occupied Bandwidth** | FDMA/TDMA/CDMA  25kHz or 1.25 MHz | 1.23 MHz | CDMA  1.23 MHz | TDMA/FDMA | - |
| **Direction/ Separation** | 806-821 MHz (UL)  851-866 MHz (DL)  45 MHz duplex spacing | 821-824 MHZ (UL)  866-869 MHz (DL)  45 MHz duplex spacing | 831-835MHz (UL)  876-880 MHz (DL)  45 MHz duplex spacing | 880-915 MHz (UL)  925-960 MHz (DL)  45 MHz duplex spacing |  |
| **License Regime** | The base station apparatus is  by way of Apparatus Assignment (AA) and the radio trunk access device is by way  of Class Assignment (CA) | Apparatus Assignment (AA) for base station and Class Assignment for access device. | Apparatus Assignment (AA) for base station and Class Assignment for access device | Apparatus Assignment (AA) for base station and Class Assignment for access device. | RFID interrogator with ERP below 2W is by way of Class Assignment (CA) and up to 4W ERP is by way of an Apparatus Assignment (AA) |

### Republic of Korea

**TETRA**

TETRA is used for PPDR/PS narrowband system is using TETRA.

**LTE**

For commercial mobile services, most of 806-960MHz spectrum has been utilized to use LTE. Three operators are using 2x10MHz channel bandwidth for LTE in 800/900MHz spectrum. One operator is using additional 2x5MHz channel bandwidth for LTE in E850 spectrum.

**CDMA**

CDMA is also used in 800MHz spectrum. Some part of spectrum is also utilized for narrowband commercial usage. iDEN is being used as the technology for narrowband commercial mobile service.

### Singapore

**Trunk Radio Services**

* Channel Spacing: 25 KHz
* Maximum RF Power Output

Base/Mobile: 25 W ERP

Portable: 5 W

* Spurious Emissions: 43 + 10log(P) where P = Rated carrier power in Watts

**EGSM**

The EGSM band adds 50 frequency channels to GSM

### Thailand

**RFID**

For unlicensed condition, the maximum transmit power shall not exceed 0.5 W (e.i.r.p)

For licensed condition, the maximum transmit power shall not exceed 4 W (e.i.r.p)

### VietNam

**Trunk Radio**

TETRA

Channel BW: 25 kHz

Duplex: 45 MHz

UL / DL: 806 – 821 MHz / 851 – 866 MHz

Apparatus License via First come First served regime

**CDMA2000**

CDMA2000 1X / EVDO

Channel BW: 1.25 MHz

Duplex: 45 MHz

UL/DL: 824 – 835 MHz / 869 – 880 MHz

Spectrum License via First come First served regime

**eGSM**

GSM / GPRS / EDGE

Channel BW: 200 kHz

Duplex: 45 MHz

UL/DL: 880 – 890 MHz / 925 – 935 MHz

Spectrum License via First come First served regime

**GSM**

GSM / GPRS / EDGE

Channel BW: 200 kHz

Duplex: 45 MHz

UL/DL: 890 – 915 MHz / 935 – 960 MHz

Spectrum License via First come First served regime

1. Subjected to *Footnote 5.317A, Radio Regulations*  [↑](#footnote-ref-1)
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. [↑](#footnote-ref-2)
3. If it is available, please provide the information of the additional following parameters for a particular application in the specified band for purpose of AFIS data collection: 1. Channeling: Single/Multiple channel, 2.Channel Width,3.Modulation/Occupied BW,4.Direction/Separation: UL/DL,5.Transmit Power (Max),6.Channel Access or Occupation Rule: % of time,7.License Regime: free access/exempted/license required [↑](#footnote-ref-3)
4. Please provide the start point and the end point in MHz of the frequency band for the application(s) [↑](#footnote-ref-4)
5. If the case is technology neutral, please indicate. [↑](#footnote-ref-5)
6. Guardband between the new application with services in adjacent band below 806 MHz [↑](#footnote-ref-6)
7. Guardband between the new application with services in adjacent band above 960 MHz [↑](#footnote-ref-7)
8. f0 is frequency of signal [↑](#footnote-ref-8)