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**APT REPORT ON**

**FREQUENCY USAGE OF THE BAND 3400-3600 MHZ**

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**APT Report on**

**Frequency Usage of the Band 3400-3600 MHz**

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# Introduction

The band 3 400-3 500 MHz is allocated in Region 3 on a primary basis to the FIXED, FIXED-SATELLITE (space-to-Earth) and on a secondary basis to Amateur, Mobile and Radiolocation services and the 3 500-3 600 MHz band is allocated in Region 3 on a primary basis to the FIXED, FIXED-SATELLITE (space-to-Earth) and MOBILE except aeronautical mobile, and on a secondary basis to Amateur, Mobile and Radiolocation services.

At WRC-07, the band 3400-3600MHz were extensively discussed in the Agenda Item 1.4 of WRC-07 and as a result, the WRC decided to keep allocation of mobile service in the band 3400-3500MHz on a secondary basis in three Regions but some footnotes identify this band for IMT.The band 3400-3500MHz is identified for IMT by ten countries of Asia-Pacific Region as per By footnotes 5.432A and 5.432B, the band 3500-3600MHz is identified for IMT by nine countries of Asia-Pacific Region as per footnote 5.433A. In Region 1, the band 3400-3600MHz is identified for IMT by eighty one countries as per footnote 5.430A. This identification does not preclude the use of this band by any application of the services to which it is allocated and does not establish priority in the Radio Regulations.

The current status of frequency usage of the band 3 400-3 600 MHz is identified for a variety of applications and services in Asia-Pacific region. Due to the characteristics of wide geographic coverage and resistance to rain-fade, there are many countries in Asia-Pacific region and around the world have deployed FSS in this band. In addition, the band or parts of it is already be used by Radar or FWA systems in some countries beyond the above applications.

The current usage and future plan of the band 3400 – 3600 MHz, as provided in the responses to the Questionnaire at the 13th APT Wireless Group Meeting, are in the Attachment of this document.

# Scope

This Report covers aspects related to the use of the 3400-3600MHz band. The objective is to identify current usage and future plan of 3400-3600MHz in Asia Pacific countries including technical conditions and license conditions and based on such identification to develop possible studies on 3400-3600MHz within AWG.

# Vocabulary of terms

FSS Fixed Satellite Service

IMT International Mobile Telecommunications

WRC World Radiocommunication Conference

BWA Broadband Wireless Access

CEPT European Conference of Postal and Telecommunications Administrations

ECC Electronic Communications Committee

3GPP Third Generation Partnership Project

# References

Report ITU-R M.2109, “ Sharing studies between IMT Advanced systems and geostationary satellite networks in the fixed-satellite service in the 3 400-4 200 and 4 500-4 800 MHz frequency bands”.

# Information from ITU-R and CEPT ECC

# ITU-R allocations

In the Radio Regulations, edition 2012, the frequency band 3400 – 3600 MHz is allocated in three Regions as follows:

Table: ITU-R allocations in 3400 – 3600 MHz

|  |
| --- |
| **Allocation to services** |
| **Region 1** | **Region 2** | **Region 3** |
| **3 400 – 3 600**FIXEDFIXED-SATELLITE(space-to-Earth)Mobile 5.430ARadiolocation | **3 400-3 500**FIXEDFIXED-SATELLITE (space-to-Earth)AmateurMobile 5.431ARadiolocation 5.4335.282 | **3 400-3 500**FIXEDFIXED-SATELLITE (space-to-Earth)AmateurMobile 5.432BRadiolocation 5.4335.282 5.432 5.432A |
| **3 500-3 700**FIXEDFIXED-SATELLITE (space-to-Earth)MOBILE except aeronautical mobileRadiolocation 5.433 | **3 500-3 600**FIXEDFIXED-SATELLITE (space-to-Earth)MOBILE except aeronautical mobile 5.433ARadiolocation 5.433 |

According to the RR 5.432A, RR 5.432B and RR 5.433A， the 3400-3600 MHz band has been allocated on a primary basis to the mobile, except aeronautical mobile in some APT counties, and is identified for International Mobile Telecommunications (IMT) with limitation that power flux density produced at 3m above ground does not exceed -154.5dBW/m2 per 4kHz for more than 20% of time at the border of territory of any other administrations.

# CEPT ECC status for the band 3400 – 3600 MHz

1. Annual leave shall accrue during the period of maternity leave, provided that the staff member returns to service for at least six months after the completion of maternity leave. If leave without pay has been granted following maternity leave, the annual leave accrued during the maternity leave shall be credited only six months after return to duty.

# CEPT ECC status for the band 3400 – 3600 MHz

CEPT ECC in December 2011 adopted Decision ECC(11)06 that designates 3400 – 3600 MHz to MFCN with the harmonized frequency arrangements. There are two frequency arrangements (TDD and FDD) for the band 3 400 – 3600 MHz in ECC Decision (11)06, both being placed at the same level of regulatory status. The Decision indicates that the frequency arrangement in the 3400 –3600MHz should be subject to review no later than end 2013 with the aim to identify a preferred frequency arrangement subject to market developments.

After the ECC Decision, the European Commission has mandated in March 2012 CEPT to undertake further studies on amending the technical conditions regarding spectrum harmonization in the band 3400 – 3600 MHz. CEPT is developing a report for common minimum restrictive conditions and harmonised frequency and channelling arrangements. As a result, CEPT Report 49 taking into account the results of the public consultation was published in November 2013.

The technical requirements defined in CEPT report 49 are applicable to base stations with different power levels, enabling network deployment with both macro cells and small cells. In the figures below it is assumed for simplicity that all blocks have been licensed to MFCN (individual license granted to mobile operators with rights of use of one or more 5 MHz blocks).

For the spectrum 3400 – 3600 MHz, the Block Edge Mask(BEM) has not been developed to protect other services or applications, and only applies in blocks that have been licensed to MFCN according to the new harmonized frequency arrangement. However, the BEM incorporates protection of military radiolocation below 3400 MHz for country specific cases.

The BEM consists of several elements. In-block power limit is applied to a block owned by an operator. The out-of-block elements consist of a baseline level, designed to protect the spectrum of other MFCN operators, and transitional levels enabling filter roll-off from in-block to baseline levels. Additionally, levels are provided for guard bands and for protection of radar operation below 3400 MHz.

In this report, CEPT has assessed and justified the need to introduce channelling arrangements in the 3400-3800 MHz band to develop a harmonised solution that is sufficiently precise for the development of EU-wide equipment.

For the 3400-3600 MHz band two channelling arrangements have been introduced: one comprising of a 200 MHz TDD plan, the other one comprising of the 2x80 MHz FDD plan as follows

The possibility of a preferred channelling arrangement for the 3.4-3.6 GHz band has been studied by ECC, as well as the possibility to have FDD and TDD on the same footing.

After the public consultation on this CEPT Report 49, the ECC decided in favour of having TDD as the preferred frequency arrangement with FDD frequency arrangement as an alternative. This decision and the new BEM and technical conditions have been reflected in an amendment to ECC Decision(11)06 to be published in March 2014.

Preferred Frequency arrangement for the 3400-3600 MHz band based on TDD

The frequency arrangement is a TDD arrangement, based on a block size of 5 MHz starting at the lower edge of 3400 MHz.

If blocks need to be offset to accommodate other users, the raster should be 100 kHz. Narrower blocks can be defined adjacent to other users, to allow full use of spectrum. It has to be noted that TDD in one extreme case also covers downlink only operation.

Alternative Frequency arrangement for the 3400-3600 MHz band based on FDD

The frequency arrangement is an FDD arrangement, based on a block size of 5 MHz starting at the lower edge of 3410 MHz. The sub-band 3410-3490 MHz is used for the uplink, the sub-band 3510-3590 MHz is used for the downlink. The resulting duplex gap is 20 MHz (3490-3510 MHz).

If blocks need to be offset to accommodate other uses, the raster should be 100 kHz. Narrower blocks can be defined adjacent to other users, to allow full use of spectrum.



# Consideration on the frequency arrangement in APT

The band 3 400-3 600 MHz is mainly used for FSS and is continually be used for FSS in some Asia-Pacific countries. In addition, the satellite networks play an important role in cases of disaster relief efforts in some countries. Where disaster occurs, terrestrial telecommunication systems are often unavailable and satellite equipment can quickly be dispatched for the establishment of telecommunication links. Therefore, other services shall not cause harmful interference to FSS operating in this band.

On the other hand, the band is identified for IMT by some countries of Asia-Pacific Region at WRC-07 as per footnotes 5.432A, 5.432B and 5.433A. Some of those Asia Pacific countries would find appropriate solutions on the global harmonized mobile usage of which system characteristics are consistent with international standards, such as 3GPP specifications for IMT.

This report should be referred for future compatibility studies between IMT systems in the frequency range 3400-3600 MHz and other existing systems/services in APT.

# Attachment

**Current usage and future plan of the band 3400 – 3600 MHz**

In order to collect information on current usage and future plan, a Survey Questionnaire FOR APT FREQUENCY USAGE IN THE 3 400-3 600 MHz BAND was used which includes the following questions:

**Question 1:** What is/are current allocation(s) (e.g., mobile service, fixed service, fixed-satellite service, broadcasting-satellite service, mobile-satellite service and so on) in the 3 400-3 600 MHz band in your country?

**Question 2:** What application(s) (e.g., PPDR, IMT, Broadband Wireless Access, VSAT etc) and associated technologies, (e.g., Wi-Fi, WiMAX, CDMA, W-CDMA etc) is/are currently licensed/used in the 3 400-3 600 MHz band? Which frequency sub-band is used for each application?

**Question 3:** Please describe system characteristics of applications currently used including details such as spectrum emission mask, in-band transmission power, bandwidth, receiver performance etc. You can provide detail characteristics of applications or the reference ITU-R Report/Recommendation.

**Question 4:** When there are multiple applications licensed in the 3 400-3 600 MHz band, how do you achieve sharing/compatibility between these applications?

**Question 5:** Do you have planned or potential future use on this band? (Yes / No)

**Question 6:** What is/are planned or potential future application/use in this band?

**Question 7:** Please describe systems characteristics of applications planned including details such as spectrum emission mask, in-band transmission power, bandwidth, receiver performance etc. You can provide detail characteristics of applications or the reference ITU-R Report/Recommendation.

**Question 8:** Do you have any expectations or suggestions for the AWG study on this band?

The following summarize information on the current usage and future plan of the band:

# Australia

**(1) CURRENT USAGE:**

**Question 1:** What is/are current allocation(s) (e.g., mobile service, fixed service, fixed-satellite service, broadcasting-satellite service, mobile-satellite service and so on) in the 3 400-3 600 MHz band in your country?

**Answer:**

|  |  |  |
| --- | --- | --- |
|  | Frequency sub-band (MHz) | Services / Allocation |
| 1 | 3 400-3 600 | FIXEDRADIOLOCATION 5.433 AUS11Amateur Fixed‑satellite (space‑to‑Earth)Mobile5.282 |

Note: Primary services are expressed in upper case letters and secondary services are expressed in lower case letters.

Australian footnote:

AUS11This service is intended to be used principally for the purposes of defence. The Department of Defence is normally consulted in considering non‑defence use of this service.

International footnotes:

**5.282** In the bands 435‑438 MHz, 1 260‑1 270 MHz, 2 400‑2 450 MHz, 3 400‑3 410 MHz (in Regions 2 and 3 only) and 5 650‑5 670 MHz, the amateur‑satellite service may operate subject to not causing harmful interference to other services operating in accordance with the Table (see No. **43**). Administrations authorising such use shall ensure that any harmful interference caused by emissions from a station in the amateur‑satellite service is immediately eliminated in accordance with the provisions of No. **25.11**. The use of the bands 1 260‑1 270 MHz and 5 650‑5 670 MHz by the amateur‑satellite service is limited to the Earth‑to‑space direction.

**5.433** In Regions 2 and 3, in the band 3 400‑3 600 MHz the radiolocation service is allocated on a primary basis. However, all administrations operating radiolocation systems in this band are urged to cease operations by 1985. Thereafter, administrations shall take all practicable steps to protect the fixed‑satellite service and coordination requirements shall not be imposed on the fixed‑satellite service.

Currently in Australia there are 1 430 devices licensed for operation in the 3 400-3 600 MHz band[[1]](#footnote-1). Most of these are located in or close to populated areas. Locations of devices can be seen in Figure 1. Purple dots indicate device location, grey areas represent remote density areas (generally low population) and blue areas represent high, medium and low density areas.

Figure 1

Locations of licensed devices operating in the 3 400-3 600 MHz band in Australia

(as at 1 June 2012)



**Question 2:** What application(s) (e.g., PPDR, IMT, Broadband Wireless Access, VSAT etc) and associated technologies, (e.g., Wi-Fi, WiMAX, CDMA, W-CDMA etc) is/are currently licensed/used in the 3 400-3 600 MHz band? Which frequency sub-band is used for each application?

**Answer:**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| No. | Frequency sub-band[[2]](#footnote-2) [MHz] | Applications/Services  | Associated technologies | Remarks (such as main purpose, etc.)[[3]](#footnote-3) |
| 1 | 3 400-3 457 | Amateur beacon | - | - |
| 2 | 3 400-3 594 | Amateur repeater | - | - |
| 3 | 3 400-3 600 | Earth receive | - | Gateway earth stations |
| 4 | 3 400-3 500 | Radiodetermination | Ship-borne radars | Government use |
| 5 | 3 425-3 492.5 and3 542.5-3 575 | Fixed wireless access (point-to-multipoint)  | 802.16d or 802.16e WiMAX, NaviniNetworks (CDMA), Nortel Proximity-I | Spectrum licensed in cities and major population centres. Technology flexible licensing. |
| 6 | 3 575-3 600 | Point-to-multipoint | 802.16d or 802.16e WiMAX, Nortel Proximity-I | Main use is for BWA.  |
| 7 | 3 590-3 600 | Point-to-point | - | FDD high capacity long distance backhaul. The band used for point to point extends from 3 590-4 190 MHz. |

Other applications/services/technologies may include closed-circuit Television, Global Positioning System Real Time Kinematic, Programmable Logic Controller data communications and proprietary WiMAX like services.

**Question 3:** Please describe system characteristics of applications currently used including details such as spectrum emission mask, in-band transmission power, bandwidth, receiver performance etc. You can provide detail characteristics of applications or the reference ITU-R Report/Recommendation.

**Answer:**

|  |  |  |
| --- | --- | --- |
| **Application**[[4]](#footnote-4) | **System characteristics** | **Reference** |
| **Spectrum emission mask** | **In-band transmission power** | **Bandwidth** | **Receiver performance** |
| 1 | - | 2-120 W | 0.01-1 kHz | - | Licence Data |
| 2 | - | 1-120 W | 0.85 kHz- 18 MHz | - | Licence Data |
| 3 | - | N/A | 1-30 MHz |  | Licence Data |
| 4 | - | 1000 W | 100 MHz | - | Licence Data |
| 5 | See Figures 4, 5, 6 | 16-50 dBm/MHz | 3.5-16.7 MHz |  | Licence Data3.4 GHz Marketing Plan[[5]](#footnote-5) |
| 6 | ETSI EN 302 326-2See also Figures 2, 3 at band edges | 5-20 W | 7-10 MHz WiMAX | - | Licence DataRALI FX14[[6]](#footnote-6)RALI FX19[[7]](#footnote-7) |
| 7 | - | 0.8-5 W | 30-40 MHz | - | Licence Data |

Figure 2

3 575 MHz boundary emission mask for broadband wireless access

using the 3 575-3 700 MHz band – Application 6



Figure 3

3 700 MHz boundary emission mask for broadband wireless access

using the 3 575-3 700 MHz band – Application 6



Figure 4

Emission limits for point-to-multipoint systems

3 425-3 442.5 MHz and 3 475-3 492.5 MHz – Application 5



Figure 5

In band and out-of-band emission mask for

widebeamwidth transmitters operating under a spectrum licence – Application 5

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Figure 6

In band and out-of-band emission mask for

narrowbeamwidth transmitters operating under a spectrum licence – Application 5

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**Question 4:** When there are multiple applications licensed in the 3 400-3 600 MHz band, how do you achieve sharing/compatibility between these applications?

**Answer:**

Sharing studies are conducted, taking into account relevant *Radiocommunications Assignment and Licensing Instructions* (RALIs – such as RALIs FX 14 and FX 19) and typical parameters of the applications involved. Outcomes of such studies inter alia include proposed required separation distances and/or frequency separations, and recommendations for modifications/improvements to be made to the receivers.

Typically only a single application/service type is licensed in cities and major population centres in the 3 400-3 600 MHz band. However, the large land mass and small population of Australia allows different applications to share the band in regional and remote areas through geographical separation distances and/or frequency separations as well as appropriate protection criteria.

**(2) FUTURE PLAN:**

**Question 5:** Do you have planned or potential future use on this band? (Yes / No)

**Answer:**

Yes. Some of the planned or future uses are commercial in confidence, information of which cannot be provided.

If you answered “Yes” to Question 4 above, please answer the following questions.

**Question 6:** What is/are planned or potential future application/use in this band?

**Answer:**

|  |  |  |  |
| --- | --- | --- | --- |
|  | Frequency sub-band (MHz) | Future application/use | Timeline |
| 1 | 3 425-3 492.5 and3 542.5-3 575 | Service and technology flexible | Post December 2015 (exact date yet to be decided) |
| 2 | 3 492.5-3 542.5 | Service and technology flexible | Post December 2015 (exact date yet to be decided) |
| 3 | 3 400-3 600 | Wireless broadband services / TD-LTE / FDD-LTE | Yet to be decided |

Other future applications/uses may include: high density indoor IMT systems (e.g. femtocells), outdoor heterogeneous networks, smart grid, distribution automation, load control, distributed generation and mobile access for field workers.

**Question 7:** Please describe systems characteristics of applications planned including details such as spectrum emission mask, in-band transmission power, bandwidth, receiver performance etc. You can provide detail characteristics of applications or the reference ITU-R Report/Recommendation.

**Answer:**

System characteristics for some systems include those specify in 3GPP 36 series and 3GPP TR 37.801 V10.0.0 (2011-10). Additional requirements may be required to facilitate sharing with other services and adjacent channel TDD operations. The exact nature of any such characteristics is yet to be decided.

**(3) OTHERS**

**Question 8:** Do you have any expectations or suggestions for the AWG study on this band?

**Answer:**

It is suggested that system characteristics should be consistent with international standards with a particular focus on 3GPP specifications for IMT services.

# China

**(1) CURRENT USAGE:**

**Question 1:** What is/are current allocation(s) (e.g., mobile service, fixed service, fixed-satellite service, broadcasting-satellite service, mobile-satellite service and so on) in the 3 400-3 600 MHz band in your country?

|  |  |  |
| --- | --- | --- |
|  | Frequency sub-band(MHz) | Services |
| 1 | 3400-3500 | FIXEDFIXED-SATELLITE(space-to Earth)AmateurMobile 5.432B5.282 5.432 Note1 Note2 |
| 2 | 3500-3600 | FIXEDFIXED-SATELLITE(space-to Earth)MOBILE(except aeronautical mobile) 5.433A5.433 Note1 Note2 |
|  |  |  |

Note1: The existing radiolocation service in the 3 400-3 600 MHz is encouraged to move out of these bands within an earliest timeframe. From the end of 2005, the use of new radio stations are not permitted, but the existing stations may continue to operate till the end of lifespan. (2001)

Note2: In this band, the quoted international footnotes on IMT application do not change the primary or secondary basis of existing services in the allocation table for mobile service. The study should be carried out on applying mode for the planned services, frequency use plan, compatible condition between services and coordination procedure in this band as soon as possible. Erenow, IMT applications are not put into practical operation. (2010)

**Question 2:** What application(s) (e.g., PPDR, IMT, Broadband Wireless Access, VSAT etc) and associated technologies, (e.g., Wi-Fi, WiMAX, CDMA, W-CDMA etc) is/are currently licensed/used in the 3 400-3 600 MHz band? Which frequency sub-band is used for each application?

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | Frequency sub-band(MHz) | Applications  | Associated technologies(\*) | Remarks (such as main purpose, etc.) |
| 1 | 3400-3430/3500-3530 | BWA(P-MP) |  |  |
| 2 | 3400-3600MHz | VAST | FDMA、 | Solve the communication of remote areas |
| 3 | 3582-3600MHz | MCPC | FDMA | Transmit TV |
| 4 | 3548-3558MHz | VAST | TDMA | Solve the communication of remote areas |

(\*) Please provide if available.

**Question 3:** Please describe system characteristics of applications currently used including details such as spectrum emission mask, in-band transmission power, bandwidth, receiver performance etc. You can provide detail characteristics of applications or the reference ITU-R Report/Recommendation.

**System Characteristics for Application 1**

1. System components

The reference model of the 3.5GHz fixed wireless access systems can refer to the following figure 1. It is composed by the network management subsystem, center station subsystems(CS) and terminal station subsystems(TS).



2． Frequency band and channel spacing

The BWA system uses the FDD Duplex mode, the transmitting frequency of the terminal station is 3400-3430MHz and the center station is 3500-3530MHz.

There are four channel allocation schemes, they are the channel spacing 1.75MHz, 3.5MHz, 7MHz and 14MHz. The center frequency can be calculated by the follow formulas, for

1. Channel spacing 1.75MHz,

 3398.625+1.75n（n=1,2,…18）MHz

 3498.625+1.75n（n=1,2,…18）MHz

1. Channel spacing 3.5MHz,

 3397.75+3.5n（n=1,2,…9）MHz

 3497.75+3.5n（n=1,2,…9）MHz

1. Channel spacing 7MHz,

 3396+7n（n=1,2,…4）MHz

 3496+7n（n=1,2,…4）MHz

1. Channel spacing 14MHz,

 3392.5+14n（n=1,2）MHz

 3492.5+14n（n=1,2）MHz

3 Transmit power and power margin

The maximum output power of the transmitter and power tolerance can be reference to the following table1.

Table 1, Transmit power and power margin for 3.5GHz BWA systems

|  |  |  |
| --- | --- | --- |
|  | Transmit power | power margin |
| TDMA system | 35dBm | ±1dB |
| DS-CDMA | 35dBm | ±2dB |
| FH-CDMA | +35dBm | ±2dB |

 4 Spectrum emission mask(TBD)

4.1 TDMA system

4.2 CDMA system

**System Characteristics for Application 3**

Broadcasting-satellite service:

MCPC

Modulation mode:QPSK 3/4TPC

Symbol Rate:27500Kb/s

Occupied Bandwidth:36MHz

**Question 4:** When there are multiple applications licensed in the 3 400-3 600 MHz band, how do you achieve sharing/compatibility between these applications?

A: Shared by different frequencies

Further sharing studies are still in the process.

**(2) FUTURE PLAN:**

**Question 5:** Do you have planned or potential future use on this band? (Yes / No)

A: Yes.

If you answered “Yes” to Question 4 above, please answer the following questions.

**Question 6:** What is/are planned or potential future application/use in this band?

|  |  |  |  |
| --- | --- | --- | --- |
|  | Frequency sub-band(MHz) | Future application/use | Timeline |
| 1 | 3400-3600 | IMT | No detailed timeline |
| 2 |  |  |  |

**Question 7:** Please describe systems characteristics of applications planned including details such as spectrum emission mask, in-band transmission power, bandwidth, receiver performance etc. You can provide detail characteristics of applications or the reference ITU-R Report/Recommendation.

System Characteristics for Application 1

System Characteristics for Application 2

**(3) OTHERS**

**Question 8:** Do you have any expectations or suggestions for the AWG study on this band?

# Indonesia

**(1) CURRENT USAGE:**

**Question 1:** What is/are current allocation(s) (e.g., mobile service, fixed service, fixed-satellite service, broadcasting-satellite service, mobile-satellite service and so on) in the 3 400-3 600 MHz band in your country?

|  |  |  |  |
| --- | --- | --- | --- |
|  | Frequency sub-band | Indonesia Usage | Indonesia Allocation |
| 1 | 3400 – 3500 MHz | Fixed satellite service | **3 400-3 500**FIXEDFIXED-SATELLITE (space-to-Earth)AmateurMobile 5.432BRadiolocation 5.4335.282 5.432 5.432A |
| 2 | 3500 – 3600 MHz | Fixed satellite service | **3 500-3 600**FIXEDFIXED-SATELLITE (space-to-Earth)MOBILE except aeronauticalmobile 5.433ARadiolocation 5.433 |

**Question 2:** What application(s) (e.g., PPDR, IMT, Broadband Wireless Access, VSAT etc) and associated technologies, (e.g., Wi-Fi, WiMAX, CDMA, W-CDMA etc) is/are currently licensed/used in the 3 400-3 600 MHz band? Which frequency sub-band is used for each application?

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | Frequency sub-band | Applications  | Associated technologies(\*) | Remarks (such as main purpose, etc.) |
| 1 | 3400 – 3600 MHz | VSATCellular BackhaulingTT&CFeeder link |  | Main purposeMain purposeMain purposeMain purpose |

(\*) Please provide if available.

**Question 3:** Please describe system characteristics of applications currently used including details such as spectrum emission mask, in-band transmission power, bandwidth, receiver performance etc. You can provide detail characteristics of applications or the reference ITU-R Report/Recommendation.

System Characteristics for Application 1

**Antenna diameter for VSAT minimum 1.8 m**

**Various bandwidths depend on application and modulation technology.**

**ITU Recommendation SF 1486**

**Appendix 2 ITU Radio Regulation - 2008(Rev. WRC-03)**

System Characteristics for Application 2

**-**

**Question 4:** When there are multiple applications licensed in the 3 400-3 600 MHz band, how do you achieve sharing/compatibility between these applications?

The only service in this frequency band 3400 – 3600 MHz is Fixed Satellite Service.

There are multiple applications in this Fixed Satellite Service and the compatibility between applications are easy to achieve (different orbital slot, different coverage, etc)

**(2) FUTURE PLAN:**

**Question 5:** Do you have planned or potential future use on this band? (~~Yes~~ / No)

The 3 400-3 600 MHz band currently used for FSS and BWA. However, sharing between these two applications is difficult to achieve, therefore this frequency is under refarming process to only allocated Fixed Satellite Service in this band. BWA services is reallocated to frequency 3 300 MHz and will be terminated at the end of 2012.

If you answered “Yes” to Question 4 above, please answer the following questions.

**Question 6:** What is/are planned or potential future application/use in this band?

|  |  |  |  |
| --- | --- | --- | --- |
|  | Frequency sub-band | Future application/use | Timeline |
| 1 | - | - | - |

**Question 7:** Please describe systems characteristics of applications planned including details such as spectrum emission mask, in-band transmission power, bandwidth, receiver performance etc. You can provide detail characteristics of applications or the reference ITU-R Report/Recommendation.

System Characteristics for Application 1

**-**

System Characteristics for Application 2

-

 **(3) OTHERS**

**Question 8:** Do you have any expectations or suggestions for the AWG study on this band?

We propose this spectrum to be kept for fixed-satellite service.

Please take note the conclusion of ITU-R M.2109 Report that sharing between IMT-Advanced systems and geostationary satellite networks in the fixed-satellite service in the 3 400-4 200 and 4 500-4 800 MHz frequency bands is difficult to achieve. Furthermore, the use of these frequencies in the future shall ensure that no interference cause to existing FSS and no limitation to development of this FSS.

# Japan

**(1) CURRENT USAGE:**

**Question 1:** What is/are current allocation(s) (e.g., mobile service, fixed service, fixed-satellite service, broadcasting-satellite service, mobile-satellite service and so on) in the 3 400-3 600 MHz band in your country?

|  |  |  |
| --- | --- | --- |
|  | Frequency sub-band | Services |
| 1 | 3 400-3 600 MHz | fixed service |
| 2 | 3 400-3 600 MHz | mobile service |
| 3 | 3 400-3 600 MHz | fixed-satellite service(space-to-Earth) |

**Question 2:** What application(s) (e.g., PPDR, IMT, Broadband Wireless Access, VSAT etc) and associated technologies, (e.g., Wi-Fi, WiMAX, CDMA, W-CDMA etc) is/are currently licensed/used in the 3 400-3 600 MHz band? Which frequency sub-band is used for each application?

fixed-satellite service

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | Frequency sub-band | Applications  | Associated technologies(\*) | Remarks (such as main purpose, etc.) |
| 1 | 3 400 – 3 600 MHz | Satellite News Gathering(point –to-point), any others | DVB-S, -S2, etc. | N/A |
| 2 | 3599-3 600 MHz | Feeder link for Inmarsat | N/A | N/A |

(\*) Please provide if available.

fixed service, mobile service

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | Frequency sub-band | Applications  | Associated technologies(\*) | Remarks (such as main purpose, etc.) |
| 3 | 3 400 – 3 600 MHz | ENG | N/A | N/A |

(\*) Please provide if available.

**Question 3:** Please describe system characteristics of applications currently used including details such as spectrum emission mask, in-band transmission power, bandwidth, receiver performance etc. You can provide detail characteristics of applications or the reference ITU-R Report/Recommendation.

System Characteristics for Application 1 & 2

1. Spectrum emission mask

Diverse

1. In-band transmission power

Diverse

1. Bandwidth

Diverse

1. Receiver performance

The system noise temperature of receiver is typically around 100 K.

Satellite link is designed so as to satisfy the performance objectives taking into consideration of certain portion of receiver system noise power allocated for intra- and/or inter-service interference.

Relevant ITU-R Recommendations and Reports:

* Recommendation ITU-R S.465
Reference radiation pattern of earth station antennas in the fixed-satellite service for use in coordination and interference assessment in the frequency range from 2 to 31 GHz.
* Recommendation ITU-R S.466
Maximum permissible level of interference in a telephone channel of a geostationary-satellite network in the fixed-satellite service employing frequency modulation with frequency-division multiplex, caused by other networks of this service.
* Recommendation ITU-R S.483
Maximum permissible level of interference in a television channel of a geostationary-satellite network in the fixed-satellite service employing frequency modulation, caused by other networks of this service.
* Recommendation ITU-R S.523
Maximum permissible levels of interference in a geostationary-satellite network in the fixed-satellite service using 8-bit PCM encoded telephony, caused by other networks of this service.
* Recommendation ITU-R S.524
Maximum permissible levels of off-axis e.i.r.p. density from earth stations in geostationary-satellite orbit networks operating in the fixed-satellite service transmitting in the 6 GHz, 13 GHz, 14 GHz and 30 GHz frequency bands.
* Recommendation ITU-R S.728
Maximum permissible level of off-axis e.i.r.p. density from very small aperture terminals (VSATs).
* Recommendation ITU-R S.735
Maximum permissible levels of interference in a geostationary-satellite network for an HRDP when forming part of the ISDN in the fixed-satellite service caused by other networks of this service below 15 GHz.
* Recommendation ITU-R S.1323
Maximum permissible levels of interference in a satellite network (GSO/FSS; non-GSO/FSS; non-GSO/MSS feeder links) in the fixed‑satellite service caused by other co-directional FSS networks below 30 GHz.
* Recommendation ITU-R S.1432
Apportionment of the allowable error performance degradations to fixed-satellite service (FSS) hypothetical reference digital paths arising from time invariant interference for systems operating below 30 GHz.
* Recommendation ITU-R S.1528
Satellite antenna radiation patterns for non‑geostationary orbit satellite antennas operating in the fixed-satellite service below 30 GHz.
* Recommendation ITU-R S.1711
Performance enhancements of transmission control protocol over satellite networks.
* Recommendation ITU-R S.1844
Cross-polarization reference gain pattern for linearly polarized very small aperture terminals (VSAT) for frequencies in the range 2 to 31 GHz
* Recommendation ITU-R S. 1855
Alternative reference radiation pattern for earth station antennas used with satellites in the geostationary-satellite orbit for use in coordination and/or interference assessment in the frequency range from 2 to 31 GHz
* Recommendation ITU-R S.1856
Methodologies for determining whether an IMT station at a given location operating in the band 3 400-3 600 MHz would transmit without exceeding the power flux-density limits in the Radio Regulations Nos. 5.430A, 5.432A, 5.432B and 5.433A.
* Report ITU-R M.2109
Sharing studies between IMT Advanced systems and geostationary satellite networks in the fixed-satellite service in the 3 400-4 200 and 4 500-4 800 MHz frequency bands.
* Report ITU-R S.2199
Studies on compatibility of broadband wireless access (BWA) systems and fixed-satellite service (FSS) networks in the 3 400-4 200 MHz band.

System Characteristics for Application 3

1. Bandwidth

Diverse

1. Transmission power

Diverse

Relevant ITU-R Recommendations and Reports:

* Recommendation ITU-R F.1777 System characteristics of television outside broadcast, electronic news gathering and electronic field production in the fixed service for use in sharing studies

**Question 4:** When there are multiple applications licensed in the 3 400-3 600 MHz band, how do you achieve sharing/compatibility between these applications?

Currently, the licensee of transmitting earth station coordinates with the licensee of stations of the broadcasting service on a case-by-case basis so that the earth station concerned does not cause harmful interference to the stations of the broadcasting service.

**(2) FUTURE PLAN:**

**Question 5:** Do you have planned or potential future use on this band? (Yes / No)

Yes

If you answered “Yes” to Question 4 above, please answer the following questions.

**Question 6:** What is/are planned or potential future application/use in this band?

|  |  |  |  |
| --- | --- | --- | --- |
|  | Frequency sub-band | Future application/use | Timeline |
| 1 | TBD | IMT-Advanced | by around 2015 |

**Question 7:** Please describe systems characteristics of applications planned including details such as spectrum emission mask, in-band transmission power, bandwidth, receiver performance etc. You can provide detail characteristics of applications or the reference ITU-R Report/Recommendation.

Currently, we are discussing technical requirements to introduce IMT-Advanced technology.

Relevant ITU-R recommendation is ITU-R M.2012.

**(3) OTHERS**

**Question 8:** Do you have any expectations or suggestions for the AWG study on this band?

We believe that it is beneficial to compile up-to-date situation of this band in APT countries through the AWG study.

# Malaysia

**(1) CURRENT USAGE:**

**Question 1:** What is/are current allocation(s) (e.g., mobile service, fixed service, fixed-satellite service, broadcasting-satellite service, mobile-satellite service and so on) in the 3 400-3 600 MHz band in your country?

|  |  |  |
| --- | --- | --- |
|  | Frequency sub-band | Services |
| 1 | 3400 – 3500 MHz | FIXED FIXED-SATELLITE (space-to-Earth)Amateur MobileRadiolocation 5.4335.282  |
| 2 | 3500 – 3600 MHz | FIXED FIXED-SATELLITE (space-to-Earth)MOBILE exceptaeronautical mobileRadiolocation 5.433 |

**Question 2:** What application(s) (e.g., PPDR, IMT, Broadband Wireless Access, VSAT etc) and associated technologies, (e.g., Wi-Fi, WiMAX, CDMA, W-CDMA etc) is/are currently licensed/used in the 3 400-3 600 MHz band? Which frequency sub-band is used for each application?

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | Frequency sub-band | Applications  | Associated technologies(\*) | Remarks (such as main purpose, etc.) |
| 1 | 3400 – 3600 MHz | Fixed point-to-point system |  | Mainly for backhaul links serving a WiFi, broadband wireless access or cellular base station or remote DSL multiplex |
| 2 | 3400 – 3600 MHz | VSAT |  |  |
| 3 | 3400 – 3600 MHz | FSS Earth Station |  |  |

(\*) Please provide if available.

**Question 3:** Please describe system characteristics of applications currently used including details such as spectrum emission mask, in-band transmission power, bandwidth, receiver performance etc. You can provide detail characteristics of applications or the reference ITU-R Report/Recommendation.

System Characteristics for Application 1

Fixed point-to-point system:

1. The frequency-channeling plan is developed based on 3.5 MHz channel spacing. However, the use of multiple channels of 3.5MHz is allowed to create channel widths of 7MHz or higher for better spectrum efficiency.

Channeling Plan for Point-to-Point Systems



1. ITU-R Recommendation SF.1486 on “Sharing methodology between fixed wireless access systems in the fixed service and very small aperture terminals in the fixed-satellite service in the 3400-3700 MHz band” is referred.
2. CEPT / ERC / Recommendation 14-03 E Annex B on “Harmonised radio frequency channel arrangements and block allocations for low and medium capacity systems in the band 3400 MHz to 3600 MHz” is referred.

System Characteristics for Application 2

VSAT:

|  |  |
| --- | --- |
| **VSAT characteristics** | **Values** |
| Antenna size | 1.8m |
| Receive gain  | 35.7 dBi |
| Noise temperature | 120K |
| Beamwidth (-3dB) | 2.92° |

1. ITU-R Recommendation S.726 : Maximum permissible level of spurious emissions from very small aperture terminals (VSATs)
2. ITU-R Recommendation S.465 : Reference radiation pattern of earth station antennas in the fixed-satellite service for use in coordination and interference assessment in the frequency range from 2 to 31 GHz

**Question 4:** When there are multiple applications licensed in the 3 400-3 600 MHz band, how do you achieve sharing/compatibility between these applications?

For the current implementation, the use of point-to-point systems has to be coordinated with existing and future FSS earth stations to avoid interference.

Even though this band is shared between FSS and point-to-point systems, priority is accorded to FSS. Point-to-point systems should avoid interference to FSS and if required shall be shut down immediately when there is a major interference to FSS earth stations which cannot be mitigated.

**(2) FUTURE PLAN:**

**Question 5:** Do you have planned or potential future use on this band? (Yes / No)

No

If you answered “Yes” to Question 4 above, please answer the following questions.

**Question 6:** What is/are planned or potential future application/use in this band?

|  |  |  |  |
| --- | --- | --- | --- |
|  | Frequency sub-band | Future application/use | Timeline |
| 1 |  |  |  |
| 2 |  |  |  |
|  |  |  |  |

**Question 7:** Please describe systems characteristics of applications planned including details such as spectrum emission mask, in-band transmission power, bandwidth, receiver performance etc. You can provide detail characteristics of applications or the reference ITU-R Report/Recommendation.

System Characteristics for Application 1

System Characteristics for Application 2

**(3) OTHERS**

**Question 8:** Do you have any expectations or suggestions for the AWG study on this band?

# Republic of Korea

**(1) CURRENT USAGE:**

**Question 1:** What is/are current allocation(s) (e.g., mobile service, fixed service, fixed-satellite service, broadcasting-satellite service, mobile-satellite service and so on) in the 3 400-3 600 MHz band in your country?

|  |  |  |
| --- | --- | --- |
|  | Frequency sub-band | Services |
| *1* | *3 400-3 500 MHz* | *FIXED**MOBILE except aeronautical mobile**RADIOLOCATION**Amateur* |
| *2* | *3 500-3 600 MHz* | *FIXED**FIXED SATELLITE(space-to-Earth)**MOBILE except aeronautical mobile* |

**Question 2:** What application(s) (e.g., PPDR, IMT, Broadband Wireless Access, VSAT etc) and associated technologies, (e.g., Wi-Fi, WiMAX, CDMA, W-CDMA etc) is/are currently licensed/used in the 3 400-3 600 MHz band? Which frequency sub-band is used for each application?

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | Frequency sub-band | Applications  | Associated technologies(\*) | Remarks (such as main purpose, etc.) |
| 1 | *3 400-3 500 MHz* | *Radar* |  | *3 400-3 500 MHz is used for the radiolocation service on a primary basis.* |
| 2 | *3 400-3 600 MHz* | *UWB* |  | *The band 3 400-3 600 MHz is reserved for mobile service.* |
|  |  |  |  |  |

(\*) Please provide if available.

**Question 3:** Please describe system characteristics of applications currently used including details such as spectrum emission mask, in-band transmission power, bandwidth, receiver performance etc. You can provide detail characteristics of applications or the reference ITU-R Report/Recommendation.

System Characteristics for Application 1

*Not available*

System Characteristics for Application 2

*Not available*

**Question 4:** When there are multiple applications licensed in the 3 400-3 600 MHz band, how do you achieve sharing/compatibility between these applications?

**(2) FUTURE PLAN:**

**Question 5:** Do you have planned or potential future use on this band? (Yes / No)

*3400-3600MHz is identified for IMT in nine countries of Asia-Pacific Region at WRC-07 including Republic of Korea. Furthermore, Ministry of Science, ICT & Future planning, the republic of Korea announced “Mobile Broadband Plan 2.0” with the aim of securing at least 1190MHz mobile spectrum by 2023. Mobile Broadband Plan 2.0 includes to add at least 160MHz of 1190MHz in the 3.5GHz band by 2018.*

If you answered “Yes” to Question 4 above, please answer the following questions.

**Question 6:** What is/are planned or potential future application/use in this band?

|  |  |  |  |
| --- | --- | --- | --- |
|  | Frequency sub-band | Future application/use | Timeline |
| 1 |  |  |  |
| 2 |  |  |  |
|  |  |  |  |

**Question 7:** Please describe systems characteristics of applications planned including details such as spectrum emission mask, in-band transmission power, bandwidth, receiver performance etc. You can provide detail characteristics of applications or the reference ITU-R Report/Recommendation.

System Characteristics for Application 1

System Characteristics for Application 2

**(3) OTHERS**

**Question 8:** Do you have any expectations or suggestions for the AWG study on this band?

*3400-3600MHz is identified for IMT in nine countries of Asia-Pacific Region at WRC-07. This band is also used for other services such as Fixed Satellite Services in several countries. To find appropriate solutions on the global/regional harmonized mobile usage is expected as one of the important roles of AWG.*

# Singapore

**(1) CURRENT USAGE:**

**Question 1:** What is/are current allocation(s) (e.g., mobile service, fixed service, fixed-satellite service, broadcasting-satellite service, mobile-satellite service and so on) in the 3 400-3 600 MHz band in your country?

|  |  |  |
| --- | --- | --- |
|  | Frequency sub-band | Services |
| 1 | 3400 -3500 MHz | FIXEDFIXED-SATELLITE (space-to-Earth)MOBILE AmateurRadiolocation |
| 2 | 3500 – 3600 MHz | FIXEDFIXED-SATELLITE (space-to-Earth)MOBILE except aeronautical mobileRadiolocation |

**Question 2:** What application(s) (e.g., PPDR, IMT, Broadband Wireless Access, VSAT etc) and associated technologies, (e.g., Wi-Fi, WiMAX, CDMA, W-CDMA etc) is/are currently licensed/used in the 3 400-3 600 MHz band? Which frequency sub-band is used for each application?

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | Frequency sub-band | Applications  | Associated technologies(\*) | Remarks (such as main purpose, etc.) |
| 1 | 3400 – 3600 MHz | Fixed Satellite | VSAT | Downlink |

(\*) Please provide if available.

**Question 3:** Please describe system characteristics of applications currently used including details such as spectrum emission mask, in-band transmission power, bandwidth, receiver performance etc. You can provide detail characteristics of applications or the reference ITU-R Report/Recommendation.

System Characteristics for Application 1

Nil

**Question 4:** When there are multiple applications licensed in the 3 400-3 600 MHz band, how do you achieve sharing/compatibility between these applications?

No multiple applications

**(2) FUTURE PLAN:**

**Question 5:** Do you have planned or potential future use on this band? (Yes / ~~No)~~

Potential future use is for the Wireless broadband services / Mobile Services (IMT).

If you answered “Yes” to Question 5 above, please answer the following questions.

**Question 6:** What is/are planned or potential future application/use in this band?

|  |  |  |  |
| --- | --- | --- | --- |
|  | Frequency sub-band | Future application/use | Timeline |
| 1 | 3400 – 3600 MHz | Wireless Broadband Service / Mobile Services (IMT) | When market and technology are ready and available |

**Question 7:** Please describe systems characteristics of applications planned including details such as spectrum emission mask, in-band transmission power, bandwidth, receiver performance etc. You can provide detail characteristics of applications or the reference ITU-R Report/Recommendation.

To be determined

**(3) OTHERS**

**Question 8:** Do you have any expectations or suggestions for the AWG study on this band?

While Singapore will like AWG to explore more possibilities, we note that it must take into consideration APT member concerns.

# Thailand

**(1) CURRENT USAGE:**

**Question 1:** What is/are current allocation(s) (e.g., mobile service, fixed service, fixed-satellite service, broadcasting-satellite service, mobile-satellite service and so on) in the 3 400-3 600 MHz band in your country?

|  |  |  |
| --- | --- | --- |
|  | Frequency sub-band | Services |
| 1 | 3400-3600 MHz | FSS |
| 2 |  |  |
|  |  |  |

**Question 2:** What application(s) (e.g., PPDR, IMT, Broadband Wireless Access, VSAT etc) and associated technologies, (e.g., Wi-Fi, WiMAX, CDMA, W-CDMA etc) is/are currently licensed/used in the 3 400-3 600 MHz band? Which frequency sub-band is used for each application?

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | Frequency sub-band | Applications  | Associated technologies(\*) | Remarks (such as main purpose, etc.) |
| 1 | 3400-3600 MHz | FSS |  |  |
| 2 |  |  |  |  |
|  |  |  |  |  |

(\*) Please provide if available.

**Question 3:** Please describe system characteristics of applications currently used including details such as spectrum emission mask, in-band transmission power, bandwidth, receiver performance etc. You can provide detail characteristics of applications or the reference ITU-R Report/Recommendation.

Refer to question 2

**Question 4:** When there are multiple applications licensed in the 3 400-3 600 MHz band, how do you achieve sharing/compatibility between these applications?

None.

**(2) FUTURE PLAN:**

**Question 5:** Do you have planned or potential future use on this band? (**Yes** / **No**)

Under Study

If you answered “Yes” to Question 4 above, please answer the following questions.

**Question 6:** What is/are planned or potential future application/use in this band?

Under Study

**Question 7:** Please describe systems characteristics of applications planned including details such as spectrum emission mask, in-band transmission power, bandwidth, receiver performance etc. You can provide detail characteristics of applications or the reference ITU-R Report/Recommendation.

Under Study

**(3) OTHERS**

**Question 8:** Do you have any expectations or suggestions for the AWG study on this band?

To gain benefits for telecom communities, AWG should follow the market trends.

# Vietnam

**(1) CURRENT USAGE:**

**Question 1:** What is/are current allocation(s) (e.g., mobile service, fixed service, fixed-satellite service, broadcasting-satellite service, mobile-satellite service and so on) in the 3 400-3 600 MHz band in your country?

|  |  |  |
| --- | --- | --- |
|  | Frequency sub-band | Services |
| 1 | 3400-3600 | FIXED-SATELLITE\*FIXEDAmateurMobileRadiolocation |

\*) according to the Vietnamese national footnote VTN16: the band 3400-3600 MHz is prior for satellite systems operating in FSS.

**Question 2:** What application(s) (e.g., PPDR, IMT, Broadband Wireless Access, VSAT etc) and associated technologies, (e.g., Wi-Fi, WiMAX, CDMA, W-CDMA etc) is/are currently licensed/used in the 3 400-3 600 MHz band? Which frequency sub-band is used for each application?

|  |  |  |  |
| --- | --- | --- | --- |
|  | Frequency sub-band | Applications  | Remarks (such as main purpose, etc.) |
| 1 | 3400-3600 | * VSAT
* GSM Trunking
* Lease Line
* TVRO (TV Receive only)
* Video Conference
* SNG
* DTH
* CATV Transmission
 | * Providing both air segment and earth facilities as: telephones and broadband Internet with **both ways for rural and mountain areas**, one way Internet for webcasting or streaming services, videoconference services, television broadcast services, television fly way services, GSM trunking services, fix network trunking services, leaseline services, enterprise network and other many application services.
* Providing telecommunication services with respect to coverage area not covered by terrestrial systems or in urban areas.
 |

**Question 3:** Please describe system characteristics of applications currently used including details such as spectrum emission mask, in-band transmission power, bandwidth, receiver performance etc. You can provide detail characteristics of applications or the reference ITU-R Report/Recommendation.

System characteristics of  the[VINASAT-1 Satellite](http://www.vinasat.com.vn/52/103/391.html) in [C Extended Band](http://www.vinasat.com.vn/52/119/419.html):

- Uplink Frequency (Tx):                  6.425 – 6.725 (GHz)
- Downlink Frequency (Rx):              3.400 – 3.700 (GHz)

- Antenna pattern: REC-580.

**Question 4:** When there are multiple applications licensed in the 3 400-3 600 MHz band, how do you achieve sharing/compatibility between these applications?

There is not any application licensed in the 3 400-3 600 MHz band, except FSS.

**(2) FUTURE PLAN:**

**Question 5:** Do you have planned or potential future use on this band? (Yes / No)

The priority is given to use for satellite systems operating in FSS in this band in Viet Nam

 If you answered “Yes” to Question 4 above, please answer the following questions.

**Question 6:** What is/are planned or potential future application/use in this band?

|  |  |  |  |
| --- | --- | --- | --- |
|  | Frequency sub-band | Future application/use | Timeline |
| 1 | 3400-3600 | * VSAT
* GSM Trunking
* Lease Line
* TVRO (TV Receive only)
* Video Conference
* SNG
* DTH
* CATV Transmission
 |  |

Viet Nam has not planed in using other applications other than FSS in this band in the future.

**Question 7:** Please describe systems characteristics of applications planned including details such as spectrum emission mask, in-band transmission power, bandwidth, receiver performance etc. You can provide detail characteristics of applications or the reference ITU-R Report/Recommendation.

Characteristics of FSS comply with the ITU-R Recommendations such as REC-580, REC-465.

 **(3) OTHERS**

**Question 8:** Do you have any expectations or suggestions for the AWG study on this band?

In fact of that, the C-band satellite networks play an important role in cases of disaster. In disaster areas, terrestrial telecommunication systems are often erased. C-band equipments can quickly be dispatched to a disaster area and set up the telecommunication links. With large coverage, satellite operating in the C-band is uniquely able to provide economically for low population density and remote areas.

The rain attenuation is considerable in upper bands such us the Ku and Ka bands in the ASEAN area, especially in Viet Nam. Therefore, the extended C band is the most suitable for Viet Nam to implement FSS systems.

The AWG study on this band should take into account the above issues of FSS in the 3400-
3600 MHz band and other services that might be used in this band shall not constrain on the development of FSS.

1. As of 1 June 2012. [↑](#footnote-ref-1)
2. For No. 1-2 in this table, the lower frequency limits are rounded to the greatest previous MHz integer, and upper frequency limits to the smallest next MHz integer. [↑](#footnote-ref-2)
3. Except for major cities and populated areas in the frequency sub-bands described in line 5, access to the 3 400- 3 600 MHz band is on a first in time coordinated basis under apparatus licensing arrangements. [↑](#footnote-ref-3)
4. Application numbers correspond to those in the Table in Question 2. [↑](#footnote-ref-4)
5. The 3.4 GHz Marketing Plan is available at<http://www.comlaw.gov.au/Details/F2005B00335> [↑](#footnote-ref-5)
6. RALI FX 14 is available from the ACMA website at [http://www.acma.gov.au/WEB/STANDARD/pc=PC\_2580](http://www.acma.gov.au/WEB/STANDARD/pc%3DPC_2580) [↑](#footnote-ref-6)
7. RALI FX 19 is available from the ACMA website at [http://www.acma.gov.au/WEB/STANDARD/pc=PC\_2972](http://www.acma.gov.au/WEB/STANDARD/pc%3DPC_2972) [↑](#footnote-ref-7)