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**APT REPORT ON**

**SURVEY STUDY ON USAGE AND FUTURE PLANS OF THE BANDS 17.7-20.2 GHZ AND 27.5-30 GHZ IN THE ASIA-PACIFIC REGION**

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**APT REPORT ON survey study on USAGE AND FUTURE PLANS OF THE BANDS 17.7-20.2 GHz and 27.5-30 ghz IN THE ASIA-PACIFIC REGION**

1. **Introduction**

There has been an increasing need for broadband mobile-satellite communications in recent years. Some of these needs could be met by allowing earth stations in motion (ESIMs) to communicate with geostationary (GSO) fixed-satellite service (FSS) satellite networks in Ka band. Some administrations have already deployed their ESIMs in the Ka band, such as 29.5-30 GHz/19.7-20.2 GHz, in current operational GSO FSS networks, and/or plan to expand their use in their future satellite systems.

Considering that appropriate technical, regulatory and operational procedures are required for the usage of ESIMs to ensure compatible operations with other satellite networks and incumbent terrestrial services in these bands. Both ITU Radiocommunication Sector (ITU-R) and other regional organizations have made a series of technical, operational and regulatory measures which ESIMs should (shall) comply with.

ITU-R has adopted Reports ITU-R S.2223 - Technical and operational requirements for GSO FSS earth stations on mobile platforms in bands from 17.3 to 30.0 GHz, and ITU-R S.2357 - Technical and operational guidelines for earth stations on mobile platforms communicating with geostationary space stations in the FSS in the frequency bands 19.7-20.2 GHz and 29.5-30.0 GHz, to aid administrations that want to authorize ESIMs by assisting in the prevention of unacceptable interference to other GSO FSS networks and systems of other services operating in the same frequency bands.

Furthermore, WRC-15 has adopted No. 5.527A to clarify that ESIMs can communicate with GSO FSS space stations in the frequency bands 19.7-20.2 GHz and 29.5-30.0 GHz in all three ITU Regions under certain conditions specified in the resolves 1-4 of Resolution 156 (WRC-15).

Meanwhile, WRC-15 has concluded that assignments to stations of GSO FSS satellite networks operating in some frequency bands including 19.7-20.2 GHz (space-to-Earth) and 29.5-30.0 GHz (Earth-to-space) may be used for unmanned aircraft systems (UAS) control and non-payload communication (CNPC) links in non-segregated airspace under certain conditions specified in the resolves 2-19 of Resolution 155 (WRC-15). The usage of UAS CNPC in these bands should take into account the results of the implementation of Resolution 156 (WRC-15) on ESIMs, and Resolution 155 (WRC-15) should to be reviewed at WRC-23, taking actions as appropriate if necessary.

Some regional organizations also take actions on the usage of ESIMs such as CEPT. CEPT has adopted ECC Report 184, ECC/DEC/(13)01 and Harmonized European Standard ETSI EN 303 978, all of which is about the harmonized use and free circulation of ESIMs within the frequency bands 17.3-20.2 GHz and 27.5-30.0 GHz.

On the application of the adjacent 17.7-19.7 GHz and 27.5-29.5 GHz frequency bands in GSO FSS networks, a new Agenda item 1.5 (AI 1.5) is established in WRC-19 study cycle according to Resolution 158 (WRC-15). AI 1.5 is to study the technical and operational characteristics and user requirements of different types of ESIMs that operate or plan to operate within geostationary FSS allocations in the two bands, and also study sharing and compatibility between ESIMs operating with GSO FSS networks and current and planned stations of existing services allocated in the same frequency bands to ensure the protection of existing services. When all these studies are complete and agreed by ITU-R study groups, WRC-19 will be further invited to consider the results of the above studies and take necessary actions, as appropriate.

Based on above, to better understand the usage and the regulation situation of the bands 17.7-20.2 GHz and 27.5-30 GHz in different APT Member countries, this report is to gather information on the spectrum usage and regulation status of the two bands in the Asia-Pacific region. In addition, this Report could also provide information, as applicable, for APG studies under Agenda Item 1.5 of WRC-19.

1. **Scope**

This Report is limited to information gathering on the current spectrum usage and future plans in the Ka-band i.e. 17.7-20.2 GHz and 27.5-30 GHz and its related domestic regulations in the Asia-Pacific Region. This could not only help those administrations who are using or planning to deploy ESIMs to understand the application and coordination regulation situation with other co-primary services, but also could facilitate the national efficient use of these bands.

1. **Definitions**

For the purposes of this Report, the following definitions apply:

ESIMs : Earth stations in motion communicating with the GSO FSS, which shall operate in accordance with Resolution **156** (WRC-15).

1. **Abbreviations**

For the purposes of this Report, the following abbreviations apply:

ITU : International Telecommunication Union

ITU-R : ITU Radiocommunication Sector

FSS : Fixed-satellite service

MSS : Mobile Satellite Service

MS : Mobile Service

FS : Fixed Service

ESIMs : Earth Stations In Motion

1. **ITU Radio Regulations Allocations**

In the Radio Regulations (2016 edition), the frequency bands 17.7-20.2 GHz and 27.5-30.0 GHz are allocated in three Regions as follows:

**17.7-20.2 GHz**

| **Allocation to services** | | |
| --- | --- | --- |
| **Region 1** | **Region 2** | **Region 3** |
| **17.7-18.1**  FIXED  FIXED-SATELLITE (space-to-Earth) 5.484A (Earth-to-space) 5.516  MOBILE | **17.7-17.8**  FIXED  FIXED-SATELLITE (space-to-Earth) 5.517 (Earth-to-space) 5.516  BROADCASTING-SATELLITE  Mobile  5.515 | **17.7-18.1**  FIXED  FIXED-SATELLITE (space-to-Earth) 5.484A (Earth-to-space) 5.516  MOBILE |
|  | **17.8-18.1**  FIXED  FIXED-SATELLITE (space-to-Earth) 5.484A (Earth-to-space) 5.516  MOBILE  5.519 |  |
| **18.1-18.4** FIXED  FIXED-SATELLITE (space-to-Earth) 5.484A 5.516B    (Earth-to-space) 5.520  MOBILE  5.519 5.521 | | |
| **18.4-18.6** FIXED  FIXED-SATELLITE (space-to-Earth) 5.484A 5.516B  MOBILE | | |

| **Allocation to services** | | |
| --- | --- | --- |
| **Region 1** | **Region 2** | **Region 3** |
| **18.6-18.8**  EARTH EXPLORATION-SATELLITE (passive)  FIXED  FIXED-SATELLITE (space-to-Earth) 5.522B  MOBILE except aeronautical mobile  Space research (passive) | **18.6-18.8**  EARTH EXPLORATION- SATELLITE (passive)  FIXED  FIXED-SATELLITE (space-to-Earth) 5.516B 5.522B  MOBILE except aeronautical mobile  SPACE RESEARCH (passive) | **18.6-18.8**  EARTH EXPLORATION-SATELLITE (passive)  FIXED  FIXED-SATELLITE (space-to-Earth) 5.522B  MOBILE except aeronautical mobile  Space research (passive) |
| 5.522A 5.522C | 5.522A | 5.522A |
| **18.8-19.3** FIXED  FIXED-SATELLITE (space-to-Earth) 5.516.B 5.523A  MOBILE | | |
| **19.3-19.7** FIXED  FIXED-SATELLITE (space-to-Earth) (Earth-to-space) 5.523B 5.523C 5.523D 5.523E  MOBILE | | |
| **19.7-20.1**  FIXED-SATELLITE (space-to-Earth) 5.484A 5.484B 5.516B 5.527A  Mobile-satellite (space-to-Earth) | **19.7-20.1**  FIXED-SATELLITE (space-to-Earth) 5.484A 5.484B 5.516B 5.527A  MOBILE-SATELLITE (space-to-Earth) | **19.7-20.1**  FIXED-SATELLITE (space-to-Earth) 5.484A 5.484B 5.516B 5.527A  Mobile-satellite (space-to-Earth) |
| 5.524 | 5.524 5.525 5.526 5.527 5.528 5.529 | 5.524 |
| **20.1-20.2** FIXED-SATELLITE (space-to-Earth) 5.484A 5.484B 5.516B  5.527A  MOBILE-SATELLITE (space-to-Earth)  5.524 5.525 5.526 5.527 5.528 | | |

**27.5-30.0 GHz**

| **Allocation to services** | | |
| --- | --- | --- |
| **Region 1** | **Region 2** | **Region 3** |
| **27.5-28.5** FIXED 5.537A  FIXED-SATELLITE (Earth-to-space) 5.484A 5.516B 5.539  MOBILE  5.538 5.540 | | |
| **28.5-29.1** FIXED  FIXED-SATELLITE (Earth-to-space) 5.484A 5.516B  5.523A 5.539  MOBILE  Earth exploration-satellite (Earth-to-space) 5.541  5.540 | | |

| **Allocation to services** | | |
| --- | --- | --- |
| **Region 1** | **Region 2** | **Region 3** |
| **29.1-29.5** FIXED  FIXED-SATELLITE (Earth-to-space) 5.516B 5.523C 5.523E 5.535A5.539 5.541A  MOBILE  Earth exploration-satellite (Earth-to-space) 5.541  5.540 | | |
| **29.5-29.9**  FIXED-SATELLITE  (Earth-to-space) 5.484A 5.484B 5.516B 5.539 5.527A  Earth exploration-satellite (Earth-to-space) 5.541  Mobile-satellite (Earth-to-space) | **29.5-29.9**  FIXED-SATELLITE (Earth-to-space) 5.484A 5.484B 5.516B 5.539 5.527A  MOBILE-SATELLITE (Earth-to-space)  Earth exploration-satellite (Earth-to-space) 5.541 | **29.5-29.9**  FIXED-SATELLITE (Earth-to-space) 5.484A 5.484B 5.516B 5.539 5.527A  Earth exploration-satellite (Earth-to-space) 5.541  Mobile-satellite (Earth-to-space) |
| 5.540 5.542 | 5.525 5.526 5.527 5.529 5.540 | 5.540 5.542 |
| **29.9-30** FIXED-SATELLITE (Earth-to-space) 5.484A 5.484B 5.516B  5.539 5.527A  MOBILE-SATELLITE (Earth-to-space)  Earth exploration-satellite (Earth-to-space) 5.541 5.543  5.525 5.526 5.527 5.538 5.540 5.542 | | |

**5.484A** The use of the bands 10.95-11.2 GHz (space-to-Earth), 11.45-11.7 GHz (space-to-Earth), 11.7-12.2 GHz (space-to-Earth) in Region 2, 12.2-12.75 GHz (space-to-Earth) in Region 3, 12.5-12.75 GHz (space-to-Earth) in Region 1, 13.75-14.5 GHz (Earth-to-space), 17.8-18.6 GHz (space-to-Earth), 19.7-20.2 GHz (space-to-Earth), 27.5-28.6 GHz (Earth-to-space), 29.5-30 GHz (Earth-to-space) by a non-geostationary-satellite system in the fixed-satellite service is subject to application of the provisions of No. **9.12** for coordination with other non-geostationary-satellite systems in the fixed-satellite service. Non-geostationary-satellite systems in the fixed-satellite service shall not claim protection from geostationary-satellite networks in the fixed-satellite service operating in accordance with the Radio Regulations, irrespective of the dates of receipt by the Bureau of the complete coordination or notification information, as appropriate, for the non-geostationary-satellite systems in the fixed-satellite service and of the complete coordination or notification information, as appropriate, for the geostationary-satellite networks, and No. **5.43A** does not apply. Non-geostationary-satellite systems in the fixed-satellite service in the above bands shall be operated in such a way that any unacceptable interference that may occur during their operation shall be rapidly eliminated.     (WRC‑2000)

**5.484B** Resolution 155 (WRC-15) shall apply. (WRC-15)

**5.515** In the band 17.3-17.8 GHz, sharing between the fixed-satellite service (Earth-to-space) and the broadcasting-satellite service shall also be in accordance with the provisions of § 1 of Annex 4 of Appendix **30A**.

**5.516** The use of the band 17.3-18.1 GHz by geostationary-satellite systems in the fixed-satellite service (Earth-to-space) is limited to feeder links for the broadcasting-satellite service. The use of the band 17.3-17.8 GHz in Region 2 by systems in the fixed-satellite service (Earth-to-space) is limited to geostationary satellites. For the use of the band 17.3-17.8 GHz in Region 2 by feeder links for the broadcasting‑satellite service in the band 12.2-12.7 GHz, see Article **11**. The use of the bands 17.3-18.1 GHz (Earth-to-space) in Regions 1 and 3 and 17.8-18.1 GHz (Earth-to-space) in Region 2 by non‑geostationary-satellite systems in the fixed-satellite service is subject to application of the provisions of No. **9.12** for coordination with other non-geostationary-satellite systems in the fixed-satellite service. Non‑geostationary-satellite systems in the fixed‑satellite service shall not claim protection from geostationary-satellite networks in the fixed-satellite service operating in accordance with the Radio Regulations, irrespective of the dates of receipt by the Bureau of the complete coordination or notification information, as appropriate, for the non-geostationary-satellite systems in the fixed-satellite service and of the complete coordination or notification information, as appropriate, for the geostationary-satellite networks, and No. **5.43A** does not apply. Non-geostationary-satellite systems in the fixed-satellite service in the above bands shall be operated in such a way that any unacceptable interference that may occur during their operation shall be rapidly eliminated.     (WRC‑2000)

**5.516B** The following bands are identified for use by high-density applications in the fixed-satellite service:

17.3-17.7 GHz (space-to-Earth) in Region 1,

18.3-19.3 GHz (space-to-Earth) in Region 2,

19.7-20.2 GHz (space-to-Earth) in all Regions,

39.5-40 GHz (space-to-Earth) in Region 1,

40-40.5 GHz (space-to-Earth) in all Regions,

40.5-42 GHz (space-to-Earth) in Region 2,

47.5-47.9 GHz (space-to-Earth) in Region 1,

48.2-48.54 GHz (space-to-Earth) in Region 1,

49.44-50.2 GHz (space-to-Earth) in Region 1,

and

27.5-27.82 GHz (Earth-to-space) in Region 1,

28.35-28.45 GHz (Earth-to-space) in Region 2,

28.45-28.94 GHz (Earth-to-space) in all Regions,

28.94-29.1 GHz (Earth-to-space) in Region 2 and 3,

29.25-29.46 GHz (Earth-to-space) in Region 2,

29.46-30 GHz (Earth-to-space) in all Regions,

48.2-50.2 GHz (Earth-to-space) in Region 2.

This identification does not preclude the use of these bands by other fixed-satellite service applications or by other services to which these bands are allocated on a co-primary basis and does not establish priority in these Radio Regulations among users of the bands. Administrations should take this into account when considering regulatory provisions in relation to these bands. See Resolution **143 (WRC‑03)**\*.     (WRC-03)

**[[1]](#footnote-1)5.517** In Region 2, use of the fixed-satellite (space-to-Earth) service in the band 17.7-17.8 GHz shall not cause harmful interference to nor claim protection from assignments in the broadcasting-satellite service operating in conformity with the Radio Regulations.     (WRC-07)

**5.519** *Additional allocation:*the bands 18-18.3 GHz in Region 2 and 18.1-18.4 GHz in Regions 1 and 3 are also allocated to the meteorological-satellite service (space-to-Earth) on a primary basis. Their use is limited to geostationary satellites.     (WRC-07)

**5.520** The use of the band 18.1-18.4 GHz by the fixed-satellite service (Earth-to-space) is limited to feeder links of geostationary-satellite systems in the broadcasting-satellite service.     (WRC‑2000)

**5.521** *Alternative allocation:*in Germany, Denmark, the United Arab Emirates and Greece, the band 18.1-18.4 GHz is allocated to the fixed, fixed-satellite (space-to-Earth) and mobile services on a primary basis (see No. **5.33**). The provisions of No. **5.519** also apply.     (WRC-03)

**5.522A** The emissions of the fixed service and the fixed-satellite service in the band 18.6-18.8 GHz are limited to the values given inNos. **21.5A** and **21.16.2**, respectively.     (WRC‑2000)

**5.522B** The use of the band 18.6-18.8 GHz by the fixed-satellite service is limited to geostationary systems and systems with an orbit of apogee greater than 20 000 km.     (WRC‑2000)

**5.522C** In the band 18.6-18.8 GHz, in Algeria, Saudi Arabia, Bahrain, Egypt, the United Arab Emirates, Jordan, Lebanon, Libya, Morocco, Oman, Qatar, the Syrian Arab Republic, Tunisia and Yemen, fixed-service systems in operation at the date of entry into force of the Final Acts of WRC‑2000 are not subject to the limits of No. **21.5A**.     (WRC‑2000)

**5.523A** The use of the bands 18.8-19.3 GHz (space-to-Earth) and 28.6-29.1 GHz (Earth-to-space) by geostationary and non-geostationary fixed‑satellite service networks is subject to the application of the provisions of No. **9.11A** and No. **22.2** does not apply. Administrations having geostationary-satellite networks under coordination prior to 18 November 1995 shall cooperate to the maximum extent possible to coordinate pursuant to No. **9.11A** with non-geostationary-satellite networks for which notification information has been received by the Bureau prior to that date, with a view to reaching results acceptable to all the parties concerned. Non-geostationary-satellite networks shall not cause unacceptable interference to geostationary fixed-satellite service networks for which complete Appendix **4** notification information is considered as having been received by the Bureau prior to 18 November 1995.     (WRC-97)

**5.523B** The use of the band 19.3-19.6 GHz (Earth-to-space) by the fixed-satellite service is limited to feeder links for non-geostationary-satellite systems in the mobile-satellite service. Such use is subject to the application of the provisions of No. **9.11A**, and No. **22.2** does not apply.

**5.523C** No. **22.2** shall continue to apply in the bands 19.3-19.6 GHz and 29.1-29.4 GHz, between feeder links of non-geostationary mobile-satellite service networks and those fixed-satellite service networks for which complete Appendix **4** coordination information, or notification information, is considered as having been received by the Bureau prior to 18 November 1995.     (WRC-97)

**5.523D** The use of the band 19.3-19.7 GHz (space-to-Earth) by geostationary fixed-satellite service systems and by feeder links for non-geostationary-satellite systems in the mobile-satellite service is subject to the application of the provisions of No. **9.11A**, but not subject to the provisions of No. **22.2**. The use of this band for other non-geostationary fixed-satellite service systems, or for the cases indicated in Nos. **5.523C** and **5.523E**, is not subject to the provisions of No. **9.11A** and shall continue to be subject to Articles **9** (except No. **9.11A**) and **11** procedures, and to the provisions of No. **22.2**.     (WRC‑97)

**5.523E** No. **22.2** shall continue to apply in the bands 19.6-19.7 GHz and 29.4-29.5 GHz, between feeder links of non-geostationary mobile-satellite service networks and those fixed-satellite service networks for which complete Appendix **4** coordination information, or notification information, is considered as having been received by the Bureau by 21 November 1997.     (WRC-97)

**5.524** *Additional allocation:* in Afghanistan, Algeria, Saudi Arabia, Bahrain, Brunei Darussalam, Cameroon, China, Congo (Rep. of the), Costa Rica, Egypt, the United Arab Emirates, Gabon, Guatemala, Guinea, India, Iran (Islamic Republic of), Iraq, Israel, Japan, Jordan, Kuwait, Lebanon, Malaysia, Mali, Morocco, Mauritania, Nepal, Nigeria, Oman, Pakistan, the Philippines, Qatar, the Syrian Arab Republic, the Dem. Rep. of the Congo, the Dem. People’s Rep. of Korea, Singapore, Somalia, Sudan, South Sudan, Chad, Togo and Tunisia, the frequency band 19.7-21.2 GHz is also allocated to the fixed and mobile services on a primary basis. This additional use shall not impose any limitation on the power fluxdensity of space stations in the fixed-satellite service in the frequency band 19.7-21.2 GHz and of space stations in the mobile-satellite service in the frequency band 19.7-20.2 GHz where the allocation to the mobile-satellite service is on a primary basis in the latter frequency band. (WRC-15)

**5.525** In order to facilitate interregional coordination between networks in the mobile-satellite and fixed-satellite services, carriers in the mobile-satellite service that are most susceptible to interference shall, to the extent practicable, be located in the higher parts of the bands 19.7-20.2 GHz and 29.5-30 GHz.

**5.526** In the bands 19.7-20.2 GHz and 29.5-30 GHz in Region 2, and in the bands 20.1-20.2 GHz and 29.9-30 GHz in Regions 1 and 3, networks which are both in the fixed-satellite service and in the mobile-satellite service may include links between earth stations at specified or unspecified points or while in motion, through one or more satellites for point-to-point and point-to-multipoint communications.

**5.527** In the bands 19.7-20.2 GHz and 29.5-30 GHz, the provisions of No. **4.10** do not apply with respect to the mobile-satellite service.

**5.527A**  The operation of earth stations in motion communicating with the FSS is subject to Resolution 156 (WRC-15). (WRC-15)

**5.528** The allocation to the mobile-satellite service is intended for use by networks which use narrow spot-beam antennas and other advanced technology at the space stations. Administrations operating systems in the mobile-satellite service in the band 19.7-20.1 GHz in Region 2 and in the band 20.1-20.2 GHz shall take all practicable steps to ensure the continued availability of these bands for administrations operating fixed and mobile systems in accordance with the provisions of No. **5.524**.

**5.529** The use of the bands 19.7-20.1 GHz and 29.5-29.9 GHz by the mobile-satellite service in Region 2 is limited to satellite networks which are both in the fixed-satellite service and in the mobile-satellite service as described in No. **5.526**.

**5.535A** The use of the band 29.1-29.5 GHz (Earth-to-space) by the fixed-satellite service is limited to geostationary-satellite systems and feeder links to non-geostationary-satellite systems in the mobile-satellite service. Such use is subject to the application of the provisions of No. **9.11A**, but not subject to the provisions of No. **22.2**, except as indicated in Nos. **5.523C** and **5.523E** where such use is not subject to the provisions of No. **9.11A** and shall continue to be subject to Articles **9** (except No. **9.11A**) and **11** procedures, and to the provisions of No. **22.2**. (WRC-97)

**5.537A** In Bhutan, Cameroon, Korea (Rep. of), the Russian Federation, India, Indonesia, Iran (Islamic Republic of), Iraq, Japan, Kazakhstan, Malaysia, Maldives, Mongolia, Myanmar, Uzbekistan, Pakistan, the Philippines, Kyrgyzstan, the Dem. People’s Rep. of Korea, Sudan, Sri Lanka, Thailand and Viet Nam, the allocation to the fixed service in the band 27.9-28.2 GHz may also be used by high altitude platform stations (HAPS) within the territory of these countries. Such use of 300 MHz of the fixed-service allocation by HAPS in the above countries is further limited to operation in the HAPS-to-ground direction and shall not cause harmful interference to, nor claim protection from, other types of fixed-service systems or other co-primary services. Furthermore, the development of these other services shall not be constrained by HAPS. See Resolution **145 (Rev.WRC‑12)**.    (WRC‑12)

**5.538** *Additional allocation:*the bands 27.500-27.501 GHz and 29.999-30.000 GHz are also allocated to the fixed-satellite service (space‑to‑Earth) on a primary basis for the beacon transmissions intended for up-link power control. Such space-to-Earth transmissions shall not exceed an equivalent isotropically radiated power (e.i.r.p.) of +10 dBW in the direction of adjacent satellites on the geostationary-satellite orbit.      (WRC-07)

**5.539** The band 27.5-30 GHz may be used by the fixed-satellite service (Earth-to-space) for the provision of feeder links for the broadcasting-satellite service.

**5.540** *Additional allocation:*the band 27.501-29.999 GHz is also allocated to the fixed-satellite service (space-to-Earth) on a secondary basis for beacon transmissions intended for up-link power control.

**5.541** In the band 28.5-30 GHz, the earth exploration-satellite service is limited to the transfer of data between stations and not to the primary collection of information by means of active or passive sensors.

**5.541A** Feeder links of non-geostationary networks in the mobile-satellite service and geostationary networks in the fixed-satellite service operating in the band 29.1-29.5 GHz (Earth-to-space) shall employ uplink adaptive power control or other methods of fade compensation, such that the earth station transmissions shall be conducted at the power level required to meet the desired link performance while reducing the level of mutual interference between both networks. These methods shall apply to networks for which Appendix **4** coordination information is considered as having been received by the Bureau after 17 May 1996 and until they are changed by a future competent world radiocommunication conference. Administrations submitting Appendix **4** information for coordination before this date are encouraged to utilize these techniques to the extent practicable.     (WRC‑2000)

**5.542** *Additional allocation:* in Algeria, Saudi Arabia, Bahrain, Brunei Darussalam, Cameroon, China, Congo (Rep. of the), Egypt, the United Arab Emirates, Eritrea, Ethiopia, Guinea, India, Iran (Islamic Republic of), Iraq, Japan, Jordan, Kuwait, Lebanon, Malaysia, Mali, Morocco, Mauritania, Nepal, Oman, Pakistan, Philippines, Qatar, the Syrian Arab Republic, the Dem. People’s Rep. of Korea, Somalia, Sudan, South Sudan, Sri Lanka and Chad, the band 29.5-31 GHz is also allocated to the fixed and mobile services on a secondary basis. The power limits specified in Nos. **21.3** and **21.5** shall apply.    (WRC‑12)

**5.543** The band 29.95-30 GHz may be used for space-to-space links in the Earth exploration-satellite service for telemetry, tracking, and control purposes, on a secondary basis.

1. **Current national frequency allocations in the Ka-band**

Most of the APT countries responding to the questionnaire applied the spectrum allocation as specified in Table of Frequency Allocation in Article 5 of the Radio Regulations e.g. FS, FSS, MS, MSS, EESS. At the same time, some countries responding have allocated the Ka-band spectrum to FS and FSS only.

1. **Current usage and future plan in the Ka-band**

Base on the response to the questionnaire from 11 administrations, in the frequency bands 17.7-20.2GHz and 27.5-30.0 GHz, 8 administrations have deployed and one plans to deploy satellite systems. It is worth noting that, 6 administrations(Japan, New Zealand, China, Australia, Singapore, Vietnam) plan to deploy ESIMs in 19.7-20.2GHz and 29.5-30GHz bands, Korea plan to deploy 5G IMT in around 2019, and Japan will conduct studies to introduce 5G IMT in 27.5-29.5GHz bands

The overview of the current usage and future plan in the Ka-band is as the follow table.

| **Country** | **Band**  **(GHz)** | **Sub-bands**  **(GHz)** | **Current Applications** | **Plan** |
| --- | --- | --- | --- | --- |
| Japan | 17.7-20.2 | 17.7-18.72 | Wireless access system  Fixed radiocommunications  Satellite communications (downlink) |  |
| 18.72-18.8 | Satellite communications (downlink) |  |
| 18.8-19.3 | Wireless access system(19.22-19.7GHz)  Fixed radiocommunications(19.22-19.7GHz)  Satellite communications (downlink) |  |
| 19.3-19.7 | Wireless access system  Fixed radiocommunications  Satellite communicationns (downlink) |  |
| 19.7--20.2 | Satellite communications (downlink) | ESIMs |
| 27.5-30 | 27.5-29.5 | Satellite communications (uplink) | 5G (under study) |
| 29.5--30.0 | ESIMs |
| New Zealand | 17.7-20.2 | 17.7–19.7 | Fixed links  Ka-band FSS downlink |  |
| 19.7–20.2 | Ka-band FSS downlink (including ESIM) | ESIMs |
| 27.5-30 | 27.5–28.35 | Previously planned for Local Multipoint Distribution Services (LMDS) | LMDS |
| 27.5–29.5 | Ka-band FSS uplink |  |
| 29.5–30 | Ka-band FSS uplink (including ESIM) | ESIMs |
| Iran | 17.7-20.2 | 17.7--19.7 | Point to Point Link for Backhaul |  |
| 27.5-30 | 27.9-28.5 | Point to Point Link for Backhaul |  |
| China | 17.7-20.2 | 17.7-19.7 | Geostationary FSS satellite systems  Microwave relay systems |  |
| 19.7-20.2 | Geostationary FSS satellite systems | ESIMs |
|  | 27.5-29.5 | Geostationary FSS satellite systems |  |
| 27.5-30 | 29.5-30 | ESIMs |
| Australia | 17.7-20.2 | 17.7-18.1 | * Satellite services including subscription television, free-to-air television, voice, internet and radio services. * VSAT downlinks (class license) * Broadband to premises | FS |
| 18.1-18.4 | * FSS Earth receive for gateway downlinks * Very large number of fixed services (mostly telecommunications carriers for network backhaul) * VSAT downlinks (class license) (18.1-18.2 GHz) * Broadband to premises |
| 18.4-18.8 | * Very large number of fixed services (mostly telecommunications carriers for network backhaul) * FSS Earth receive for gateway downlink * Broadband to premises |
| 18.8-19.3 | * FSS Earth receive for gateway downlink * VSAT downlinks (class licence) * Broadband to premises |
| 19.3-19.7 | * Very large number of fixed services (mostly telecommunications carriers for network backhaul) * FSS Earth receive for gateway downlinks and TT&C * Broadband to premises |
| 19.7-20.2 | * VSAT downlinks (class licence) * FSS Earth receive for gateway downlinks * Broadband to premises | ESIMs |
| 27.5-30 | 27.5 –28.5 | * Body scanners at international airports * FSS Earth transmit for gateway uplinks * Broadband to premises | FS |
| 28.5 –29.1 | * Body scanners at international airports * VSAT uplinks (class licence) * FSS Earth transmit for gateway uplinks * Broadband to premises |
| 29.1 –29.5 | * Body scanners at international airports * FSS Earth transmit for gateway uplinks * Broadband to premises |
| 29.5 – 29.9 | * Body scanners at international airports * FSS Earth transmit for gateway uplinks and TT&C * VSAT uplinks (class licence) * Broadband to premises | ESIMs |
| 29.9 – 30 | * Body scanners at international airports * FSS Earth transmit for gateway uplinks * VSAT uplinks (class licence) * Broadband to premises |
| Singapore | 17.7-20.2 | 17.7 –19.7 | Island-wide fixed service |  |
| 19.7 – 20.2 | Fixed satellite | ESIMs |
| 27.5-30.0 | 27.5-29.5 | Fixed satellite |  |
| 29.5 – 30.0 | ESIMs |
| Korea | 17.7-20.2 | 17.7-18.4 | P-P, unlicensed |  |
| 18.4-18.6 | P-P | - |
| 18.6-18.8 | P-P, experiment |  |
| 18.8-19.3 | P-P, Maritime, unlicensed |  |
| 19.3-19.7 | P-P |  |
| 19.7-20.2 | Satellite |  |
| 27.5-30 | 27.5-29.5 | Experimental station for 5G | 5G service |
| 29.5-30.0 | Satellite |  |
| Thailand | 17.7-20.2 | 17.7 – 20.2 | Broadband Satellite | FS |
| 27.5-30 | 27.5-30.0 | Broadband Satellite |  |
| Vietnam | 17.7-20.2 | 17.7-19.7 | Point-to-point link | Satellite systems(including ESIMs) |
| 19.7-20.2 | **-** |
| 27.5-30 | 27.5-30.0 | **-** |
| Malaysia | 17.7-20.2 | 17.7-18.1 | * Point to point Fixed Service (FS) * Broadband VSAT, Backhaul, Satellite news gathering |  |
| 18.1-18.8 | * Point to point Fixed Service (FS) * Gateway for satellite broadband |  |
| 18.8-19.7 | * Point to point Fixed Service (FS) * Broadband VSAT, Backhaul, Satellite news gathering |  |
| 19.7-20.2 | * Gateway for satellite broadband |  |
| 27.5-30 | 27.5-29.1 | * Local Multipoint Communications Service (LMCS) * Gateway for satellite broadband * Devices using Ultra-Wideband (UWB) Technology |  |
| 29.1-29.5 | * Local Multipoint Communications Service (LMCS) * Broadband VSAT, Backhaul, Satellite News Gathering * Devices using Ultra-Wideband (UWB) Technology |  |
| 29.5-30.0 | Gateway for satellite broadband |  |
| Indonesia | 17.7-20.2 | 17.7-18.1 | P-P, P-P private |  |
| 18.1-18.4 | - |  |
| 18.4-18.6 | P-P, GSM/DCS |  |
| 18.6-18.8 | P-P, P-P private, GSM/DCS |  |
| 18.8-19.3 | P-P |  |
| 19.3-19.7 | P-P |  |
| 19.7-20.1 | N/A |  |
| 20.1-20.2 | N/A |  |
| 27.5-30 | 27.5-28.5 | satellite, earth station for research |  |
| 28.5-29.1 | - |  |
| 29.1-29.5 | - |  |
| 29.5-29.9 | satellite |  |
| 29.9-30.0 | - |  |

* 1. **Japan**

Satellite communication systems are deployed in 17.7-20.2 and 27.5-30.0 GHz. The bands 17.7-18.72 GHz and 19.22-19.7 GHz are currently used by terrestrial systems e.g. fixed radiocommunication system and wireless access system. The license duration for various applications in Japan is 5 years.

The band 27.5-29.5 GHz has also been assigned to mobile service in Japan. Japan will conduct studies to introduce of 5G (IMT-2020) within 27.5-29.5 GHz band.

Currently, Japan is conducting technical study to introduce ESIM (mainly for ship and aircraft) within 19.7-20.2 and 29.5-30.0 GHz bands.

* 1. **New Zealand**

The bands 17.7–20.2 GHz (space-to-Earth direction) and 27.5–30 GHz (Earth-to-space direction) are available for FSS, limited to fixed earth stations, in New Zealand. Downlink or uplink licence for fixed earth stations can be considered by the regulator on a case-by-case basis.

The frequency band 17.7–19.7 GHz is heavily used for fixed links in New Zealand. Such use is subject to administrative licensing regime and it is primarily for telecommunications backhaul.

The license for these bands is considered on a case by case basis.

The frequency band 27.5-28.35 GHz is a portion of a wider frequency band 26.4-28.35 GHz that was sold via auction in 1998 to private spectrum right holders, and the spectrum rights will expire January 2018.. This band was previously planned for Local Multipoint Distribution Services (LMDS).

New Zealand is also undertaking changes to permit ESIM communicating with FSS networks in the band 19.7-20.2 GHz (space-to-Earth direction) and 29.5-30 GHz (Earth-to-space direction). Downlink reception in the band 19.7-20.2 GHz for ESIM does not require a licence whereas uplink transmission for ESIM is expected to be covered by new provisions in a general user radio licence (GURL) from Q4 2016. New Zealand has no plan to deploy ESIMs in the bands 17.7-19.7 GHz and 27.5-29.5 GHz yet.

GURL provides for certain classes of radio transmitters to be used without the need for the user to obtain an individual licence in New Zealand. This is similar to a licence-exempt regime where frequency use is on a no-interference no-protection basis.

* 1. **Iran**

The bands 17.7-19.7 GHz and 27.5-29.5 GHz are being used by terrestrial systems under Fixed Service (Point to Point Links for Backhaul).The commercial operators of these bands are cellular mobile, fixed wireless access and fixed communication providers.

In the future, the band 27.5-29.5 GHz may be used by HAPS (High Altitude Platform Stations).

Iran has not deployed or plans to deploy Earth Stations in Motion (ESIMs) in the Ka-band.

* 1. **China**

The whole bands of 17.7-20.2 GHz and 27.5-30 GHz are being used by GSO satellite systems in China. Microwave relay systems are being deployed in 17.7-19.7 GHz frequency band, and some other FS systems are being deployed in 27.5-30 GHz frequency band.

LEO FSS satellite constellations are planned to be lunched in future, which will use the above two bands17.7-20.2 GHz and 27.5-30 GHz providing broadband services. And parts of the two bands 19.7-20.1GHz and 29.5-29.9GHz are planned to be used by the LEO satellite constellations in MSS on a secondary basis.

Earth stations at fixed points have already been deployed and will be deployed more in future in the whole bands of 17.7-20.2 GHz and 27.5-30 GHz.

The bands 19.7-20.2 GHz and 29.5-30 GHz are planned to be used by ESIMs and the platforms include ships, aircrafts and vehicles. As for the bands 17.7-19.7 GHz and 27.5-29.5 GHz, this Administration will consider whether to use the two bands by ESIMs according to the study result of WRC-19.

China believes that there are no differences for deployment of ESIMs in the bands 19.7-20.2 GHz & 29.5-30 GHz and 17.7-19.7 GHz & 27.5-29.5 GHz as the two different parts of Ka-band is within the operational characteristics of satellite service. Considering the different usage status of terrestrial service, there may be different in the management policies in future.

* 1. **Australia**

All parts of the bands are being used by satellite systems in Australia. Applications include VSATs for services including subscription television, free-to-air television, voice, internet, broadband to premises and radio services; gateway Earth stations; and, telemetry, tracking and control. Domestic regulatory arrangements of Earth station in motion in the bands 19.7–20.2 GHz and 29.5–30.0 GHz is also currently being considered by the Australian regulator (Australian Communications and Media Authority – ACMA). In responses to the consultation (for example see submission from [GVF](http://www.acma.gov.au/~/media/Spectrum%20Engineering/Issue%20for%20comment/IFC%2012%202016/GVF%20submission.pdf)) it was suggested that arrangements for ESIMs need to be developed to support both GSO and NGSO FSS satellites. The ACMA is also aware of interest from the satellite industry in having arrangements for ESIMs across the wider Ka band and that such arrangements are in place in some countries (e.g. USA and EU). Australia is yet to consider such arrangements.

The satellite bands 18.1- 18.8 GHz and 19.3-19.7 GHz are also used together with FS. Particularly, the bands 18.29125-18.68895 GHz and 19.30125-19.69875 GHz are heavily used for fixed point-to-point services mostly by telecommunications carriers for network backhaul.

The band 24.25-30 GHz is used by body scanners at international airports around Australia.

In Australia, there are planning rules for fixed services in the 17.7-19.7 GHz and 27.5-29.5 GHz frequency bands.

The Australian regulator, the Australian Communications and Media Authority, has undertaken [public consultation](http://www.acma.gov.au/theACMA/regulatory-arrangements-for-stations-in-motion) on proposed arrangements to support licensing of use of the frequency bands 19.7–20.2 GHz and 29.5–30.0 GHz by earth stations in motion communicating with geostationary space stations in the FSS in accordance with the requirements of ITU Resolution **156 (WRC-15)**. The type of platform is unspecified (it includes ships, aircraft and land vehicles).

Australia considers there are differences in ESIMs being deployed or planned to be deployed in both the 19.7-20.2 GHz & 29.5-30 GHz and 17.7-19.7 GHz & 27.5-29.5 GHz bands. The 19.7-20.2 GHz & 29.5-30 GHz bands are subject to the ITU Resolution 156 (WRC-15). The 17.7-19.7 GHz & 27.5-29.5 GHz bands contain terrestrial and satellite service allocations in all three ITU Regions with heavy terrestrial use in Australia in parts of these bands. The 17.7-19.7 GHz & 27.5-29.5 GHz bands are subject to study under ITU Resolution 158 (WRC-15) and WRC-19 agenda item 1.5.

The decision of WRC-15 (Resolution 156 (WRC-15)) may serve as a suitable starting point for the development of regulations for the rest of the bands while noting that all existing services with an allocation in the band should be appropriately protected.

* 1. **Singapore**

The band 19.7-20.2 GHz and 27.5-30 GHz are being used by FSS and its license is based on annual renewal. Similarly, the license for the island wide FS in the bands 17.7-19.7 GHz is also based on annual renewal. In addition, IDA understands that some countries are proceeding to conduct trials in the 27.5-29.5 GHz band for IMT services although it is not being studied at WRC-19. This will be one area in which IDA will track closely before we develop plans for the 27.5-29.5 GHz for terrestrial services.

With regard to the 29.5-30.0 GHz band, based on the ITU Radio Regulations, this band is not opened up for terrestrial or fixed services for the Asia Pacific region. As such, there is currently no plan to use the 29.5-30.0 GHz band for terrestrial services.

The bands involved are a portion of the 29.5-30 GHz band for user terminal transmission and a portion of 19.7-20.2 GHz band for user terminal reception. There are plans to install ESIMs user terminals on vessels and aircrafts. Starting from 2016, there are plans to install ESIM user terminals across various models of Singapore-based aircrafts and on approximately 1,000 vessels within the next 5 years.

IDA understands that ESIMs are planned to be deployed only in the 19.7-20.2/29.5-30GHz range, but the 19.2-19.7GHz and 29.0-29.5GHz band may be utilised to provide flexible capacity as needed. As such, there is no difference in the required operational characteristics of the user terminals. However, further studies will be required to address coexistence issues in the 17.7-19.7 GHz & 27.5-29.5 GHz bands and this will be undertaken by ITU Working Party 4A and addressed under Agenda Item 1.5.

* 1. **Korea**

The bands 19.7-20.2 GHz and 29.5-30.0 GHz are used for FSS for broadband communication and public services in Korea.

The bands 17.7-19.7 GHz and 27.0-29.5 GHz are used for FS and MS applications. Especially MS in the band 27-29.5 GHz, experiment stations are granted to test new radio access technologies for 5G mobile and this band will be identified for new mobile service application such as 5G mobile in around 2019. The bands 17.70-17.74GHz and 19.26-19.30GHz are used for wireless LANs or Point-to-Point communication, in accordance with technical requirements related to conformity compliance.

Additionally, the band 18.8-19.3 GHz is also used by maritime services.

Korea has not deployed or plans to deploy Earth Stations in Motion (ESIMs) in the Ka-band. Nevertheless, Korea highlights that, unlike a typical FSS application, ESIM applications include mobility operation, so the mobility characteristics should be additionally taken into account in the operational characteristics and/or sharing / compatibility studies with IMT-2020.

On the other hand, on January 19, 2017, the Ministry of Science, ICT and Future Planning (MSIP) issued ‘K-ICT Spectrum Plan’ which is an official roadmap for pioneering domain of future frequencies in Korea including 5G spectrum. According to the K-ICT Spectrum Plan, the Republic of Korea also considers 28GHz frequency ranges for the 5G spectra. The Korean regulator plans to provide 3 GHz bandwidth in the band 26.5-29.5 GHz by 2018 when 5G systems are available, at the latest by 2021. Moreover, additional 1 GHz bandwidth in the band above 24.25 GHz will be allocated by 2026 taking into account WRC-19 results.

The Korean operators already submitted contribution about the K-ICT Spectrum Plan to the last RAN4 #82 and 3GPP TSG RAN#74 meeting [1]. And the Korean government provided the updated spectrum needs for IMT under WRC-19 agenda item 1.13 in ITU-R WP 5D 26th meeting [2].

* 1. **Thailand**

The whole of the Ka-band uplink spectrum as well as the band 19.7-20.2 GHz are exclusively used by GSO satellite networks for broadband applications, while the band 17.7-19.7 GHz is allocated on a co-primary basis to FS. The frequency plan for FS in the band 17.7-20.2 GHz is shown in Figure 1. A part of spectrum has been used for fixed link applications. There is no frequency plan and assignment for terrestrial services in the band 27.5-30 GHz in Thailand.

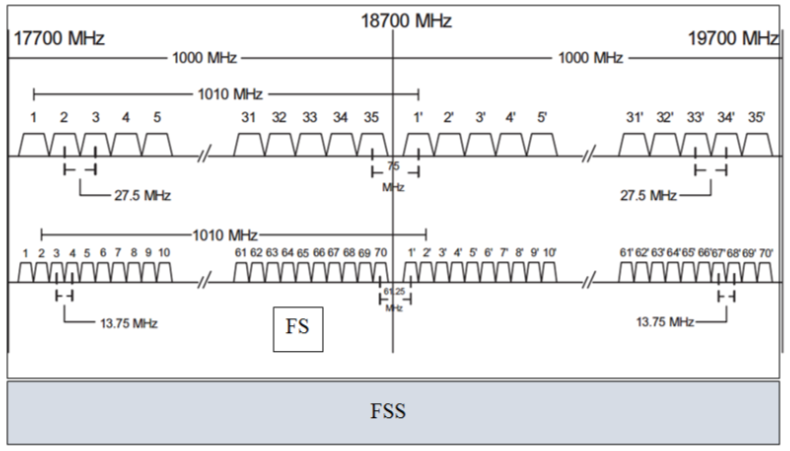


Figure Channeling plan for FS

Additionally, the bands 18.113-18.488 GHz, 18.717-18.723 GHz, 18.9 GHz, 19.550-19.850 GHz, 19.901-20.101 GHz, 27.2-27.8 GHz, 28.33 GHz, 28.225-28.475 GHz, 29.217-29.223 GHz, and 29.250-29.750 GHz are being used by satellite systems in Thailand. The applications are TT&C, Studying on Small Multi-Mission Satellite: SMMS and Experiment on connecting with ALOS and WINDS.

Thailand has not deployed or plans to deploy Earth Stations in Motion (ESIMs) in the Ka-band.

* 1. **Vietnam**

There are a number of point-to links using the band 17.7-19.7. Many of these links are used for mobile back-haul.

In the future, satellite systems are going to use part of the bands 17.7-20.2 GHz and 27.5-30 GHz to provide broadband applications.

Vietnam has deployed Earth Stations in Motion (ESIMs) in the Ka-band.

* 1. **Malaysia**

In Malaysia, the bands 19.7-20.2 GHz and 29.5-30 GHz are being used by FSS for gateway for satellite broadband applications. The band 17.7-19.7 GHz is being used by point to point FS and FSS, and the band 27.5-29.5 GHz is being used by Local Multipoint Communications Service (LMCS), FSS and by devices using Ultra-Wideband (UWB) technology.

Malaysia has not deployed ESIMs in the Ka-band.

* 1. **Indonesia**

The bands 19.7-20.2 GHz and 27.5-30 GHz are used for FSS in Indonesia. Based on the national regulation (INS 30 of Ministerial Decree 21/2014) the bands 17.7-19.7 GHz and 27.5-29.5 GHz are used for point-to-point communication system.

1. **Views of some APT countries toward Harmonization Measures Questionnaire**
   1. **Japan**

No details available from the questionnaire.

* 1. **New Zealand**

In the frequency band 17.7–19.7 GHz, satellite downlink receive licence for fixed earth stations can be considered on a case-by-case basis, subject to coordination with existing fixed links. Procedures for evaluating interference from FSS to FS can be found in Public Information Brochure [*PIB 38*](http://www.rsm.govt.nz/online-services-resources/publications/pibs/38)*: Radio Licence Certification Rules*.

Since the frequency band 26.4-28.35 GHz was sold via auction in 1998 to private spectrum right holders, satellite uplink licences for fixed earth stations in the frequency band 27.5–28.35 GHz can only be issued by the private spectrum right holders based on commercial arrangements.

In the frequency band 28.35-29.5 GHz, satellite uplink licences for fixed earth stations can be considered by the regulator on a case-by-case basis.

* 1. **Iran**

The band 27.5-29.5 GHz may be used for terrestrial and satellite services by geographical separation.

* 1. **China**

Harmonization measures are by conducting EMC study between terrestrial and satellite services.

There is no specific policy in China for now, the operations of satellite systems in the bands 19.7-20.2 GHz & 29.5-30 GHz and 17.7-19.7 GHz & 27.5-29.5 GHz comply with the ITU-R Radio Regulations. This administration is considering to update the “Interim Measures on Administration of the Setup and Use of Earth Station on Mobile Platform within Fixed Satellite Service Communication Network (MIIT, issued on January 21, 2013)” to authorize the use part of the Ka-band 19.7-20.2 GHz & 29.5-30 GHz.

* 1. **Australia**

Australia’s [Radiocommunications Assignment and Licensing Instruction (RALI) MS38](http://www.acma.gov.au/~/media/Spectrum%20Engineering/Information/Word%20Document/RALI%20MS%2038%20docx.docx) describes procedures for the frequency coordination of FSS Earth station transmitters operating in the 27.0-30.0 GHz band with:

* terrestrial fixed service receivers;
* Earth exploration-satellite service (EESS) (space-to-Earth) receivers; and
* space research service (SRS) (space-to-Earth) receivers.

This RALI also specifies requirements for FSS Earth station transmitters to avoid causing interference to licensed body scanners.

Australia achieves or plans to achieve sharing/compatibility of terrestrial and satellite services in the 17.7-20.2 GHz band is achieved via spectrum planning and/or coordination agreements. In some segments, satellite Earth stations do not require individual licensing. However, in bands shared between satellite and terrestrial services, individual services are coordinated on a case-by-case basis based on relevant ITU documents and/or Australian domestic policies.

In the 17.7-18.2 GHz, 18.8-19.3 GHz, 19.7-20.2 GHz, 28.5-29.1 GHz and 29.5-30 GHz segments, satellite Earth stations do not require individual licensing and Earth stations are authorised via the [Radiocommunications (Communication with Space Object) Class Licence 2015](https://www.legislation.gov.au/Details/F2015L01486). These segments are therefore suited to large scale deployment of Earth stations at this stage. As mentioned above, Australian domestic regulatory arrangements of Earth station in motion in the bands 19.7–20.2 GHz and 29.5–30.0 GHz is currently being considered by the Australian regulator (ACMA).

In the 18.2-18.8 GHz, 19.3-19.7 GHz, 27.5-28.5 GHz and 29.1-29.5 GHz segments, satellite Earth stations are individually licensed. These segments are therefore generally not suited to large scale deployment of Earth stations at this stage.

Australia also develops new domestic policies as a need arises – a draft new policy Australia is developing is on ESIMs in the 19.7-20.2 GHz and 29.5-30 GHz bands and can be seen at <http://www.acma.gov.au/theACMA/regulatory-arrangements-for-stations-in-motion>.

* 1. **Singapore**

As coexistence studies are being conducted at ITU Working Party 4A and coordination procedures are contained in the ITU RR Appendices, IDA will use these parameters as a reference to achieve coexistence.

However, noting that there are island-wide uses of FS in parts of the 17.7-19.7GHz band, coexistence between FSS and FS in this band may be difficult to achieve.

For any satellite systems the company will have to secure either a Facilities Based Operator or a Service Based Operator licence, depending on whether or not there are any infrastructure being deployed in Singapore (e.g. gateway, control hub, etc). Following that, the company will then have to obtain a radiocommunication licence to get IDA’s approval on the frequency bands and operational parameters.

* 1. **Korea**

It should be possible to coexist between terrestrial and satellite services due to large path losses including building loss, vegetation loss and so on in those bands. The Republic of Korea can help to achieve sharing/compatibility between terrestrial and satellite services taking into account realistic path loss and scenarios in those frequencies if required.

The bands 19.7-20.2 GHz and 29.5-30.0 GHz are used for FSS and the bands 17.7-19.7 GHz and 27-29.5 GHz are used for terrestrial services. Especially the band 26.5-29.5 GHz will be used for mobile service (5G IMT) trial at PyeongChang Winter Olympic Games in Feb. 2018.

In addition, on January 19, 2017, the Ministry of Science, ICT and Future Planning (MSIP) issued ‘K-ICT Spectrum Plan’ which is an official roadmap for pioneering domain of future frequencies in Korea including 5G spectrum. According to the K-ICT Spectrum Plan, the Republic of Korea also considers 28GHz frequency ranges for the 5G spectra. The Korean regulator plans to provide 3 GHz bandwidth in the band 26.5-29.5 GHz by 2018 when 5G systems are available, at the latest by 2021. Moreover, additional 1 GHz bandwidth in the band above 24.25 GHz will be allocated by 2026 taking into account WRC-19 results.

The Korean operators already submitted contribution about the K-ICT Spectrum Plan to the last RAN4 #82 and 3GPP TSG RAN#74 meeting [1]. And the Korean government provided the updated spectrum needs for IMT under WRC-19 agenda item 1.13 in ITU-R WP 5D 26th meeting [2].

* 1. **Thailand**

The allocation of services in Thailand is based on national table of frequency allocation.

The regulation for compatibility between terrestrial and satellite services in Thailand is developed based on the following references:

* International Telecommunication Union, “Radio Regulations: Article 5 – Frequency allocations”, 2012.
* International Telecommunication Union, “Radio Regulations: Article 21 – Terrestrial and space services sharing frequency bands above 1 GHz”, 2012.
* Provisional Final Acts, World Radiocommunication Conference (WRC-15), 2-27 November 2015
* ITU-R Recommendation S.465
* ITU-R Recommendation SM.1448
* ITU-R Recommendation SF.1006

Thailand plans to have the compatibility between terrestrial and satellite services regulation active by 2016.

* 1. **Vietnam**

No details available from the questionnaire.

* 1. **Malaysia**

The frequency band 17.7 to 19.7 GHz is deployed ubiquitously for point to point FS systems and the usage has increased significantly as backhaul to support mobile networks and access infrastructures. Currently the operation for FSS earth stations (in Ka Band) is protected within designated areas only (via geographical separation). Use of this band is on sharing basis with FS. The use of Ka-band’s FSS earth station (outside the designated areas) would be on non-protection basis.

* 1. **Indonesia**

It is believed that it should be possible to coexist between terrestrial and satellite services due to large path losses including building loss, vegetation loss and so on in those bands but further studies is required for technical requirements related to conformity compliance.

1. **The views of some APT countries on technical and operational requirements of ESIMs applications in the Ka-band**

Responses to the questionnaire also included views of APT countries of the technical and operational requirements of ESIMs applications in the Ka-band, as follows.

In the view of China, the deployment of ESIMS should be in compliance with Resolution **156** (WRC-15). Additionally, in reference to Recommendation ITU-R M.1643, the following requirements should be considered in the operation of ESIMs:

1. In order to protect other satellite networks and systems, ESIMs networks shall be operated in such a manner that the aggregate off-axis e.i.r.p. levels produced by all co-frequency earth stations of each network are not greater than the levels that have been coordinated for the typical earth station(s) pertaining to FSS networks where FSS transponders are used;
2. ESIMs that use closed loop tracking of the satellite signal need to employ an algorithm that is resistant to capturing and tracking adjacent satellite signals. ESIMs shall immediately inhibit transmissions when they detect that unintended satellite tracking has happened or is about to happen;
3. ESIMs networks shall operate under the control of a Network control and monitoring centers (NCMCs) or equivalent facility. ESIMs must be able to receive at least enable transmission and disable transmission commands from the NCMC. ESIMs must automatically cease transmissions immediately on receiving any parameter change command, which may cause harmful interference during the change, until it receives an enable transmission command from its NCMC. In addition, it should be possible for the NCMC to monitor the operation of an ESIM to determine if it is malfunctioning;
4. ESIMs shall be self-monitoring and should a fault which can cause harmful interference to FSS or terrestrial networks be detected, the ESIMs must automatically cease its transmissions.

Additionally, Australia notes that ITU-R has developed documents (e.g. ITU-R Reports) on technical and operational requirements of ESIMs applications in Ka-band, which Australia believes to be a useful source of information on this issue. WRC–15 accepted that ESIMs are part of the FSS for particular frequency bands. The technical and operational requirements of ESIMs in Ka-band should be consistent with those for FSS and reflect the requirement to appropriately protect all existing services with an allocation in the band.

The Australian regulator, the Australian Communications and Media Authority, has undertaken [public consultation](http://www.acma.gov.au/theACMA/regulatory-arrangements-for-stations-in-motion) on proposed arrangements to support licensing of use of the frequency bands 19.7–20.2 GHz and 29.5–30.0 GHz by earth stations in motion communicating with geostationary space stations in the FSS in accordance with the requirements of ITU Resolution **156 (WRC-15)**.

Singapore highlights that WRC-15 approved a new resolution, Resolution **156** (WRC-15), to define the use of the frequency bands 19.7-20.2 GHz and 29.5-30.0 GHz by ESIMs. As such, ESIM operations will have to comply with this resolution. Singapore is of the view that technical and operational parameters to be imposed on the mobile satellite terminals should be in conformance with harmonised standards (e.g. EN ETSI 303 978).

Korea highlights that ESIM application includes mobility operation so adapted technical and operational requirements that take such an operation into account are necessary.

Thailand emphasizes that the introduction of ESIMs applications in Ka-band shall not cause interference to incumbent services. Malaysia further highlights that the operation of ESIMs should not impose any additional constraint and limitation to the deployment of incumbent services.

In the meantime, Vietnam believes that ESIMs applications in Ka-band is needed to provide the service with the high availability and stability.

I.R. of Iran is in the view that the deployment of ESIMS should be in compliance with Resolution **156** (WRC-15). There is a need to clearly mentioned that the operation of in-motion terminals communicating with geostationary space stations in the fixed-satellite service allocations is not contemplated in the Radio Regulations, and therefore can only occur under RR No. 4.4, which states that such terminals shall not cause harmful interference to, and shall not claim protection from harmful interference caused by, a station operating in accordance with the provisions of the Constitution, the Convention and the Radio Regulations.

Indonesia believes that, unlike a typical FSS application, the ESIM applications includes mobility operation. Hence, the mobility characteristics should be taken into account when defining the technical and operational requirements.

1. **Key ESIM characteristics**

ESIM characteristics for the frequency bands 17.7-19.7 GHz (space-to-Earth) and 27.5-29.5 GHz have not been defined yet. Some characteristics related to the adjacent bands 19.7-20.2 GHz and 29.5-30.0 GHz may be derived from Resolution **156** (WRC-15)[[2]](#footnote-2), but responses to the questionnaire were not restricted to this source and applicability of these characteristics to the frequency bands 17.7-19.7 GHz (space-to-Earth) and 27.5-29.5 GHz should be further assessed.

In general, pointing accuracy to the target GSO and off-axis uplink e.i.r.p density will be important. Additionally, some other key ESIM characteristics include antenna diameter, max e.i.r.p, equivalent power flux density levels, automatic self-monitoring and network control capability. These coexistence characteristics are critical to mitigate interference to/from other services/networks.

Other key ESIMs characteristics may be identified considering that the ESIM application includes mobility operation.

Another consideration is the capability of satellites to deal with rain attenuation.

1. **Conclusion**

This report reflects the current and future usage of the Ka-band services from the respondents to the questionnaire. It is anticipated that future developments and studies will occur within ITU-R.

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**ANNEX 1 RESPONSES TO THE QUESTIONNAIRE ON THE Usage and future plans of the bands 17.7-20.2 GHz and 27.5-30 GHz in THE Asia-Pacific Region**

1. **Abbreviations**

In this questionnaire, the following abbreviations are used:

ESIM : Earth Stations in Motion

MS : Mobile Service

FS : Fixed Service

FSS : Fixed Satellite Service

MSS : Mobile Satellite Service

E-s : Earth-to-space

s-E : space-to-Earth

EESS (P) : Earth exploration-satellite service (passive)

srs (p) : space research service(passive) (secondary allocation)

1. **usage IN THE KA-BAND**

**Question 1:** What are the current allocations (e.g. mobile service (MS), fixed service (FS), fixed-satellite service (FSS), mobile-satellite service (MSS)), applications and licensee in the bands 17.7-20.2 GHz and 27.5-30 GHz in your country?

| **Band**  **(GHz)** | **Sub-bands**  **(GHz)** | **Service Allocations**  *\*secondary allocation in lower case* | **Applications** | **Commercial Operator** | **License duration** |
| --- | --- | --- | --- | --- | --- |
| **Japan** | | | | | |
| 17.7-20.2 | 17.7-17.85 | FS  FSS (s-E)  FSS (E-s)  MS | Wireless access system  Fixed radiocommunications  Satellite communications (downlink) | Commercial /Non-commercial use | 5 years |
| 17.85-17.97 | FS  FSS (s-E)  FSS (E-s) |
| 17.97-18.1 | FS  FSS (s-E)  FSS (E-s)  MS |
| 18.1-18.4 | FS  FSS (s-E)  FSS (E-s)  MS |
| 18.4-18.6 | FS  FSS (s-E)  MS |
| 18.6-18.72 | FS  FSS (s-E)  EESS (p)  srs (p) |
| 18.72-18.8 | FS  FSS (s-E)  EESS (p)  srs (p)  ms | Satellite communications (downlink) |
| 18.8-19.3 | FS  MS  FSS(s-E) | Wireless access system  (19.22-19.7GHz)  Fixed radiocommunications(19.22-19.7GHz)  Satellite communications (downlink) |
| 19.3-19.7 | FS  MS  FSS (s-E)  FSS (E-s) | Wireless access system  Fixed radiocommunications  Satellite communicationns (downlink) |
| 19.7-20.1 | FS  FSS (s-E)  ms  mss (s-E) | Satellite communications (downlink) |
| 20.1-20.2 | FS  FSS (s-E)  ms  MSS (s-E) |
| 27.5-30 | 27.5-28.5 | FSS (E-s)  fs  ms | Satellite communications (uplink) | Commercial use | 5 years |
| 28.5-29.5 | FSS (E-s)  fs  ms  eess (E-s) |
| 29.5-29.9 | FSS (E-s)  mss (E-s)  fs  ms  eess (E-s) |
| 29.9-30.0 | FSS (E-s)  MSS (E-s)  eess (E-s) |
| **New Zealand** | | | | | |
| 17.7-20.2 | 17.7–19.7 | FS | Fixed links | Currently in use by telecommunications operators to provide backhaul for wired and cellular network | On going |
| FSS | Ka-band FSS downlink | Satellite downlink receive licence for fixed earth stations can be considered on a case-by-case basis, subject to coordination with existing fixed links. | On a case-by-case basis |
| 19.7–20.2 | FSS | Ka-band FSS downlink (including ESIM) | Satellite downlink receive licence for fixed earth stations can be considered on a case-by-case basis.  Satellite downlink for ESIM does not require a licence. | On a case-by-case basis |
| 27.5-30 | 27.5–28.35 | FS  MS | Previously planned for Local Multipoint Distribution Services (LMDS) | The frequency band 26.4-28.35 GHz was sold via auction in 1998 to private spectrum right holders. | Spectrum rights expiring in January 2018 |
| 27.5–29.5 | FSS | Ka-band FSS uplink | In the frequency band 27.5-28.35 GHz, any satellite uplink licences for fixed earth stations can only be issued by the private spectrum right holders based on commercial arrangements.  In the frequency band 28.35-29.5 GHz, satellite uplink licences for fixed earth stations can be considered by the regulator on a case-by-case basis. | On a case-by-case basis |
| 29.5–30 | FSS | Ka-band FSS uplink (including ESIM) | Satellite uplink licence for fixed earth stations can be considered on a case-by-case basis.  Satellite uplink for ESIM is expected to be permitted from Q4 2016 through a general user radio licence (GURL).  NOTE:  GURL provides for certain classes of radio transmitters to be used without the need for the user to obtain an individual licence in New Zealand. This is similar to a licence-exempt regime where frequency use is on a no-interference no-protection basis. | On a case-by-case basis |
| Iran | | | | | |
| 17.7-20.2 | 17.7-18.6 | FSS  MS  FS | Point to Point Link for Backhaul | Cellular  Mobile  Operators;  FWA (Fixed  Wireless  Access)  Operators;  FCP (Fixed  Communication Provider)  Operators | 15  6  10 |
| 18.6-18.8 | FSS  MS (except aeronautical Mobile)  FS  EESS (Passive)  SRS (Passive) |
| 18.8-19.7 | FSS  MS  FS |
| 19.7-20.1 | FSS  MS  FS  mss | - | - | - |
| 20.1-20.2 | FSS  MS  FS  MSS | - | - | - |
| 27.5-30 | 27.9-28.5 | FSS  MS  FS | Point to Point Link for Backhaul | Cellular  Mobile  Operators;  FWA (Fixed  Wireless  Access)  Operators;  FCP (Fixed  Communication Provider)  Operators | 15  6  10 |
| 29.5-29.9 | FSS  eess  mss  ms  fs | - | - | - |
| 29.9-30 | FSS  MSS  eess  ms  fs | - | - | - |
| China | | | | | |
| 17.7-20.2 | 17.7-18.1 | FS  FSS (s-E) (E-s) MS | Geostationary FSS satellite  systems | China Satcom  CAST  NEWSTAR  etc. | - |
| Microwave relay systems | Telecommunication operators | - |
| 18.1-18.4 | FS  FSS (s-E) (E-s) MS METEOROLOGICAL-SATELLITE (s-E)  5.519 | Geostationary FSS satellite  systems | China Satcom  CAST  NEWSTAR  etc. | - |
| Microwave relay systems | Telecommunication operators | - |
| 18.4-18.6 | FS  FSS (s-E)  MS | Geostationary FSS satellite  systems | China Satcom  CAST  NEWSTAR  etc. | - |
| Microwave relay systems | Telecommunication operators | - |
| 18.6-18.8 | EESS (passive)  FSS (s-E)  SPACE RESEARCH (passive) | Geostationary FSS satellite  systems | China Satcom  CAST  NEWSTAR  etc. | - |
| Microwave relay systems | Telecommunication operators | - |
| 18.8-19.3 | FS  MS  FSS (s-E) | Geostationary FSS satellite  systems | China Satcom  CAST  NEWSTAR  etc. | - |
| Microwave relay systems | Telecommunication operators | - |
| 19.3-19.7 | FS  MS  FSS (s-E) (E-s) | Geostationary FSS satellite  systems | China Satcom  CAST  NEWSTAR  etc. | - |
| Microwave relay systems | Telecommunication operators | - |
| 19.7-20.1 | FSS (s-E)  FS  MS  mss (s-E) | Geostationary FSS satellite  systems | China Satcom  CAST  NEWSTAR  etc. | - |
| 20.1-20.2 | MSS (s-E)  FSS (s-E)  FS  MS | Geostationary FSS satellite  systems | China Satcom  CAST  NEWSTAR  etc. | - |
| 27.5-30 | 27.5-28.5 | FS  MS  FSS (E-s) | Geostationary FSS satellite  systems | China Satcom  CAST  NEWSTAR  etc. | - |
| 28.5-29.1 | FS  MS  FSS (E-s)  eess (E-s) | Geostationary FSS satellite  systems | China Satcom  CAST  NEWSTAR  etc. | - |
| 29.1-29.5 | FS  MS  FSS (E-s)  eess (E-s) | Geostationary FSS satellite  systems | China Satcom CAST  NEWSTAR  etc. | - |
| 29.5-29.9 | FSS (E-s)  eess (E-s)  mss (E-s)  fs  ms | Geostationary FSS satellite  systems | China Satcom  CAST  NEWSTAR  etc. | - |
| 29.9-30 | MSS (E-s)  FSS (E-s) EESS (E-s)  fs  ms | Geostationary FSS satellite  systems | China Satcom  CAST  NEWSTAR  etc. | - |
| Australia | | | | | |
| 17.7-20.2 | 17.7-18.1 | FS  FSS(s-E) (E-s)  MS  AUS87 | * Satellite services including subscription television, free-to-air television, voice, internet and radio services. * VSAT downlinks (class license) * Broadband to premises | FSS: nbnco, Optus, Lockheed Martin, Inmarsat, O3B, and non-commercial use by Department of Defence | Licenses for fixed point-to-point services and gateway earth stations are typically 1 or 5 years with the assumption of renewal.  VSAT receivers are not individually licensed. |
| 18.1-18.4 | FS  FSS(s-E) (E-s)  MS  AUS87 | * FSS Earth receive for gateway downlinks * Very large number of fixed services (mostly telecommunications carriers for network backhaul) * VSAT downlinks (class license) (18.1-18.2 GHz) * Broadband to premises | FSS: nbnco and non-commercial use by Department of Defence  FS: Optus (20%), Vodafone (16%), nbnco (12%), Telstra (7%) and 200 smaller licensees | Licenses for fixed point-to-point services and gateway earth stations are typically 1 or 5 years with the assumption of renewal. |
| 18.4-18.6 | FS  FSS (s-E)  MS  AUS87 | * Very large number of fixed services (mostly telecommunications carriers for network backhaul) * FSS Earth receive for gateway downlink * Broadband to premises | FSS: ITS Global and non-commercial use by Department of Defence  FS: Optus (15%), Telstra (14%), nbnco (13%), Vodafone (9%) and 198 other licensees | Licenses for fixed point-to-point services and gateway earth stations are typically 1 or 5 years with the assumption of renewal. |
| 18.6-18.8 | EES (P)  FS  FSS (s-E)  MS (except aeronautical mobile)  srs (p)  AUS87 | * Very large number of fixed services (mostly telecommunications carriers for network backhaul) * FSS Earth receive for gateway downlink * Broadband to premises | FSS: Universal Space Network and non-commercial use by Department of Defence  FS: Telstra (82%), Optus (5%), Vertical telecoms (4%) and 33 other licensees. | Licenses for fixed point-to-point services and gateway earth stations are typically 1 or 5 years with the assumption of renewal. |
| 18.8-19.3 | FS  FSS(s-E)  MS  AUS87 | * FSS Earth receive for gateway downlink * VSAT downlinks (class licence) * Broadband to premises | FSS: nbnco, O3B and non-commercial use by Department of Defence | Licenses for gateway earth stations are typically 1 or 5 years with the assumption of renewal.  VSAT receivers are not individually licensed. |
| 19.3-19.7 | FS  FSS (s-E) (E-s)  MS  AUS87 | * Very large number of fixed services (mostly telecommunications carriers for network backhaul) * FSS Earth receive for gateway downlinks and TT&C * Broadband to premises | FSS: nbnco, Iridium and non-commercial use by Department of Defence  FS: Optus (17%), Telstra (14%), nbnco (11%), Vodafone (11%) and 308 other licensees | Licenses for fixed point-to-point services and gateway earth stations are typically 1 or 5 years with the assumption of renewal. |
| 19.7-20.1 | FSS(s-E)  mss (s-E)  AUS87 | * VSAT downlinks (class licence) * FSS Earth receive for gateway downlinks * Broadband to premises | FSS: nbnco, Inmarsat, iPSTAR, Universal Space Network and non-commercial use by Department of Defence | Licenses for gateway earth stations are typically 1 or 5 years with the assumption of renewal.  VSAT receivers are not individually licensed. |
| 20.1-20.2 | FSS(s-E)  MSS(s-E)  AUS87 | * VSAT downlinks (class licence) * FSS Earth receive for gateway downlinks * Broadband to premises | FSS: Inmarsat, iPSTAR, Universal Space Network and non-commercial use by Department of Defence | Licenses for gateway earth stations are typically 1 or 5 years with the assumption of renewal.  VSAT receivers are not individually licensed. |
| 27.5-30 | 27.5 –28.5 | FS  FSS (E-s)  MS | * Body scanners at international airports * FSS Earth transmit for gateway uplinks * Broadband to premises | FSS: nbnco, O3B, Universal Space Network, Christmas Island Internet Administration, iPSTAR, ITC Global | Licenses for body scanners and gateway earth stations are typically 1 or 5 years with the assumption of renewal. |
| 28.5 –29.1 | FS  FSS (E-s)  MS  eess (E-s) | * Body scanners at international airports * VSAT uplinks (class licence) * FSS Earth transmit for gateway uplinks * Broadband to premises | FSS: nbnco, O3B | Licenses for body scanners and gateway earth stations are typically 1 or 5 years with the assumption of renewal.  VSAT receivers are not individually licensed. |
| 29.1 –29.5 | FS  FSS (E-s)  MS  eess (E-s) | * Body scanners at international airports * FSS Earth transmit for gateway uplinks * Broadband to premises | FSS: nbnco, Iridium | Licenses for body scanners and gateway earth stations are typically 1 or 5 years with the assumption of renewal. |
| 29.5 – 29.9 | FSS (E-s)  eess (E-s)  mss (E-s) | * Body scanners at international airports * FSS Earth transmit for gateway uplinks and TT&C * VSAT uplinks (class licence) * Broadband to premises | FSS: nbnco, iPSTAR, Inmarsat | Licenses for body scanners and gateway earth stations are typically 1 or 5 years with the assumption of renewal.  VSAT receivers are not individually licensed. |
| 29.9 – 30 | FSS (E-s)  MSS (E-s)  eess (E-s) | * Body scanners at international airports * FSS Earth transmit for gateway uplinks * VSAT uplinks (class licence) * Broadband to premises | FSS: iPSTAR, Inmarsat | Licenses for body scanners and gateway earth stations are typically 1 or 5 years with the assumption of renewal. |
| AUS87 (Australian footnote) = Radio astronomy facilities operated by the CSIRO at the Paul Wild Observatory Narrabri (latitude 30° 18' 46.40" S, longitude 149° 33' 0.44" E), the Parkes Observatory (latitude 32° 59' 54.25" S, longitude 148° 15' 48.65" E) and the Mopra Observatory Coonabarabran (latitude 31° 16' 04.12" S, longitude 149° 05' 58.72" E) and by the University of Tasmania at the Mount Pleasant Observatory Hobart (latitude 42° 48' 12.92" S, longitude 147° 26' 25.86" E) and the Ceduna Observatory (latitude 31° 52' 03.69" S, longitude 133° 48' 35.40" E), and at the Canberra Deep Space Communication Complex (latitude 35° 23' 54.46" S, longitude 148° 58' 39.66" E) conduct passive observations in the frequency bands 1.2–1.8 GHz, 2.2–2.7 GHz, 4.5–6.7 GHz, 8–10 GHz and 16–26 GHz using receivers that are highly sensitive to interference. The Paul Wild and Mopra observatories also operate in the bands 30–50 GHz and 75–115 GHz. | | | | | |
| Singapore | | | | | |
| 17.7-20.2 | 17.7 – 18.4 | FS / FSS / MS | Island-wide fixed service | Yes | 31 January 2017  (Annual renewal) |
| 18.4 – 19.7 | FS / FSS / MS | Island-wide fixed service | Yes | 31 December 2016  (Annual renewal) |
| 19.7 – 20.2 | FSS | Fixed satellite | Yes | 31 March 2017  (Annual renewal) |
| 27.5-30.0 | 27.5 – 29.5 | FS / FSS / MS | Fixed satellite | Yes | 31 May 2017  (Annual renewal) |
| 29.5 – 29.9 | FS | Fixed Satellite | Yes | 31 May 2017  (Annual renewal) |
| 29.9 – 30.0 | FS / FSS / MS | Fixed satellite | Yes | 30 Sep 2016  (Annual renewal) |
| Korea | | | | | |
| 17.7-20.2 | 17.7-18.1 | FS, MS, FSS (s-E) (E-s) | P-P, unlicensed | Service Providers, Unlicensed users | - |
| 18.1-18.4 | FS, MS, FSS (s-E) (E-s) | P-P, unlicensed | Service Providers | - |
| 18.4-18.6 | FS, FSS (s-E) | P-P | - | - |
| 18.6-18.8 | FS, EESS, FSS (s-E), srs (p) | P-P, experiment | Service Providers | - |
| 18.8-19.3 | FS, MS, FSS (s-E) | P-P, Maritime, unlicensed | Service Providers, Unlicensed users | - |
| 19.3-19.7 | FS, MS, FSS (s-E) | P-P | Service Providers |  |
| 19.7-20.1 | FSS (s-E), MSS (s-E) | Satellite | Service Providers |  |
| 20.1-20.2 | FSS ((s-E) (E-s))  MSS ((s-E) (E-s)) | Satellite | Service Providers |  |
| 27.5-30 | 27.0-27.5 | FS, MS,  FSS (E-S), ISL | Wireless CATV, [5G] Mobile | Mobile operators, manufacturers, research institutes | License for experiment stations |
| 27.5-28.5 | FS, MS,  FSS (E-S) | [5G] Mobile | Mobile operators, manufacturers, research institutes | License for experiment stations |
| 28.5-29.1 | FS, MS,  FSS (E-S) | [5G] Mobile | Mobile operators, manufacturers, research institutes | License for experiment stations |
| 29.1-29.5 | FS, MS,  FSS (E-S) | [5G] Mobile |  | License for experiment stations |
| 29.5-29.9 | FSS (E-S) | Satellite | Service Providers |  |
| 29.9-30.0 | FSS (E-S),  MSS (E-S) | Satellite | Service Providers |  |
| Thailand | | | | | |
| 17.7-20.2 | 17.7 – 18.6 | FS/FSS/MS | Broadband Satellite  THA1 | Service Providers | Active |
| 18.6-18.8 | FS/FSS/MS except AMS, EESS, and SRS | Broadband Satellite  THA1 | Service Providers | Active |
| 18.8-19.7 | FS/FSS/MS | Broadband Satellite  THA1 | Service Providers | Active |
| 19.7-20.2 | FSS/MS | Broadband Satellite | Service Providers | Active |
| 27.5-30 | 27.5-29.5 | FS/FSS/MS | Broadband Satellite | Service Providers | Active |
| 29.5-30 | FSS/MS/EESS | Broadband Satellite | Service Providers | Active |
| THA1 | The diagram below shows the channeling plan for FS with channel bandwidths at 27.5 MHz and 13.75 MHz. This allocation is a co-primary shared access with FSS. | | | | |
| Vietnam | | | | | |
| 17.7-20.2 | 17.7-18.1 | FS  FSS (s-E) (E-s)  MS | Point-to-point link | Mobile operator | **-** |
| 18.1-18.4 | FS  FSS (s-E) (E-s)  MS | Point-to-point link | Mobile operator | **-** |
| 18.4-18.6 | FS  FSS (s-E)  MS | Point-to-point link | Mobile operator | **-** |
| 18.6-18.8 | FS  FSS (s-E)  MS (except aeronautical mobile)  EESS (p)  srs (p) | Point-to-point link | Mobile operator | **-** |
| 18.8-19.3 | FS  FSS (s-E)  MS | Point-to-point link | Mobile operator | **-** |
| 19.3-19.7 | FS  FSS (s-E) (E-s)  MS | Point-to-point link | Mobile operator | **-** |
| 19.7-20.1 | FSS (s-E)  mss (s-E) | **-** | **-** | **-** |
| 20.1-20.2 | FSS (s-E)  MSS (s-E) | **-** | **-** | **-** |
| 27.5-30 | 27.5-28.5 | FS  FSS (E-s)  MS | **-** | **-** | **-** |
| 28.5-29.1 | FS  FSS (E-s)  MS  eess (E-s) | **-** | **-** | **-** |
| 29.1-29.5 | FS  FSS (E-s)  MS  eess (E-s) | **-** | **-** | **-** |
| 29.5-29.9 | FSS (E-s)  eess (E-s)  mss (E-s) | **-** | **-** | **-** |
| 29.9-30 | FSS (E-s)  MSS (E-s) eess (E-s) | **-** | **-** | **-** |
| Malaysia | | | | | |
| 17.7-20.2 | 17.7-18.1 | FS  FSS  MS | * Point to point Fixed Service (FS) * Broadband VSAT, Backhaul, Satellite News Gathering | Commercial and non-commercial | Active |
| 18.1-18.6 | FS  FSS  MS | * Point to point Fixed Service (FS) * Gateway for satellite broadband | Commercial and non-commercial | Active |
| 18.6-18.8 | FS  FSS  MS  EESS | * Point to point Fixed Service (FS) * Gateway for satellite broadband | Commercial and non-commercial | Active |
| 18.8-19.7 | FS  FSS  MS | * Point to point Fixed Service (FS) * Broadband VSAT, Backhaul, Satellite news gathering | Commercial and non-commercial | Active |
| 19.7-20.1 | FS  FSS  MS | * Gateway for satellite broadband | Commercial | Active |
| 20.1-20.2 | FS  FSS  MS  MSS | * Gateway for satellite broadband | Commercial | Active |
| 27.5-30 | 27.5-29.1 | FS  FSS  MS | * Local Multipoint Communications Service (LMCS) * Gateway for satellite broadband * Devices using Ultra-Wideband (UWB) Technology | Commercial | Active |
| 29.1-29.5 | FS  FSS  MS | * Local Multipoint Communications Service (LMCS) * Broadband VSAT, Backhaul, Satellite News Gathering * Devices using Ultra-Wideband (UWB) Technology | Commercial | Active |
| 29.5-29.9 | FSS | Gateway for satellite broadband | Commercial | Active |
| 29.9-30.0 | FSS  MSS | Gateway for satellite broadband | Commercial | Active |
| Indonesia | | | | | |
| 17.7-20.2 | 17.7-18.1 | FS, MS, FSS (up & down) | P-P, P-P private | Service Providers, Mobile Operators | - |
| 18.1-18.4 | FS, MS, FSS (up & down) | - | - | - |
| 18.4-18.6 | FS, MS, FSS (down) | P-P, GSM/DCS | Network Providers | - |
| 18.6-18.8 | FS, EESS, FSS (down), MS (exc. aeronautical) SRS (passive) | P-P, P-P private, GSM/DCS | Service Providers, Mobile Operators | - |
| 18.8-19.3 | FS, MS, FSS (down) | P-P | Manufactures, Mobile Operators | - |
| 19.3-19.7 | FS, MS, FSS (down) | P-P | Service Providers, Mobile Operators | - |
| 19.7-20.1 | FSS (down), MSS (down) | N/A | N/A | - |
| 20.1-20.2 | FSS (down)  MSS (down) | N/A | N/A | - |
| 27.5-30 | 27.0-27.5 | FS, MS,  FSS (up), ISL | - | - | - |
| 27.5-28.5 | FS, MS,  FSS (up) | satellite, earth station for research | Service Providers, Research Institutes | License for experiment stations |
| 28.5-29.1 | FS, MS,  FSS (up), EESS (up) | - | - | - |
| 29.1-29.5 | FS, MS,  FSS (up), EESS (up) | - | - | - |
| 29.5-29.9 | FSS (up), EESS (up), MSS (up) | satellite | Satellite Operator | - |
| 29.9-30.0 | FSS (up),  MSS (up), EESS (up) | - | - | - |
|  |  |  |  |  |  |

**Question 2:** Which parts of the bands 17.7-20.2 GHz and 27.5-30 GHz are being used by satellite systems in your country? What kinds of satellite services/applications are currently being deployed or planned to be deployed?

|  |  |
| --- | --- |
| Japan | Satellite communication systems are deployed in 17.7-20.2 and 27.5-30.0 GHz. |
| New Zealand | The bands 17.7–20.2 GHz (space-to-Earth direction) and 27.5–30 GHz (Earth-to-space direction) are available for FSS, limited to fixed earth stations, in New Zealand. Downlink or uplink licence for fixed earth stations can be considered by the regulator on a case-by-case basis.  New Zealand is also undertaking changes to permit ESIM communicating with FSS networks in the band 19.7-20.2 GHz (space-to-Earth direction) and 29.5-30 GHz (Earth-to-space direction). Downlink reception in the band 19.7-20.2 GHz for ESIM does not require a licence whereas uplink transmission for ESIM is expected to be covered by new provisions in a general user radio licence (GURL) from Q4 2016.  GURL provides for certain classes of radio transmitters to be used without the need for the user to obtain an individual licence in New Zealand. This is similar to a licence-exempt regime where frequency use is on a no-interference no-protection basis. |
| Iran | As mentioned in the above table, we are currently using those bands for Fixed service (Point to Point Link for Backhaul). In the future, the band 27.5-29.5 GHz may be used by HAPS (High Altitude Platform Stations). |
| China | The whole bands of 17.7-20.2 GHz and 27.5-30 GHz are being used by GSO satellite systems in China.  The LEO FSS satellite constellations are planned to be lunched in future, which will use the above two bands17.7-20.2 GHz and 27.5-30 GHz providing broadband services. And parts of the two bands 19.7-20.1GHz and 29.5-29.9GHz are planned to be used by the LEO satellite constellations in MSS on a secondary basis.    Earth stations at fixed points have already been deployed and will be deployed more in future in the whole bands of 17.7-20.2 GHz and 27.5-30 GHz. ESIMs are planned to be deployed in the bands 19.7-20.2GHz and 29.5-30GHz in the near future. |
| Australia | All parts of the bands are being used by satellite systems in Australia. Applications include VSATs for services including subscription television, free-to-air television, voice, internet, broadband to premises and radio services; gateway Earth stations; and, telemetry, tracking and control. Domestic regulatory arrangements of Earth station in motion in the bands 19.7–20.2 GHz and 29.5–30.0 GHz is also currently being considered by the Australian regulator (Australian Communications and Media Authority – ACMA). In responses to the consultation (for example see submission from [GVF](http://www.acma.gov.au/~/media/Spectrum%20Engineering/Issue%20for%20comment/IFC%2012%202016/GVF%20submission.pdf)) it was suggested that arrangements for ESIMs need to be developed to support both GSO and NGSO FSS satellites. The ACMA is also aware of interest from the satellite industry in having arrangements for ESIMs across the wider Ka band and that such arrangements are in place in some countries (e.g. USA and EU). Australia is yet to consider such arrangements. |
| Singapore | Currently, part of these bands are already allocated to satellite users. |
| Korea | The bands 19.7-20.2 GHz and 29.5-30.0 GHz are used for FSS for broadband communication and public services in Korea. |
| Thailand | The bands 17.7-20.2 GHz and 27.5-30 GHz are being used by GSO satellites networks for broadband applications.  The bands 18.113-18.488 GHz, 18.717-18.723 GHz, 18.9 GHz, 19.550-19.850 GHz, 19.901-20.101 GHz, 27.2-27.8 GHz, 28.33 GHz, 28.225-28.475 GHz, 29.217-29.223 GHz, and 29.250-29.750 GHz are being used by satellite systems in Thailand. The applications are TT&C, Studying on Small Multi-Mission Satellite: SMMS and Experiment on connecting with ALOS and WINDS. |
| Vietnam | Satellite systems are going to use part of the bands 17.7-20.2 GHz and 27.5-30 GHz to provide broadband applications. |
| Malaysia | Please refer Table 1 above. |
| Indonesia | The bands 19.7-20.2 GHz and 27.5-30 GHz are used for FSS in Indonesia. |

**Question 3:** Which part(s) of 17.7-20.2 GHz and 27.5-30 GHz frequency bands are being used or planned to be used by terrestrial systems in your country? What kind of terrestrial services/applications are currently being deployed or planned to be deployed?

|  |  |
| --- | --- |
| Japan | 17.7-18.72 GHz and 19.22-19.7 GHz bands are currently used by terrestrial systems (Fixed radiocommunication system and wireless access system).  27.5-29.5 GHz band is assigned to mobile service in Radio Regulations on international allocation and in Frequency Assignment Plan in Japan.  Japan will conduct studies to introduce of 5G (IMT-2020) within 27.5-29.5GHz band. |
| New Zealand | The frequency band 17.7–19.7 GHz is heavily used for fixed links in New Zealand. Such use is subject to administrative licensing regime and it is primarily for telecommunications backhaul.  The frequency band 27.5-28.35 GHz is a portion of a wider frequency band 26.4-28.35 GHz that was sold via auction in 1998 to private spectrum right holders. This band was previously planned for Local Multipoint Distribution Services (LMDS). |
| Iran | The bands 17.7-19.7 GHz and 27.5-29.5 GHz are being used by terrestrial systems under Fixed Service (Point to Point Link for Backhaul). |
| China | Microwave relay systems are being deployed in 17.7-19.7GHz frequency band, and some other FS systems are being deployed in 27.5-30GHz frequency band. |
| Australia | 18.29125-18.68895 GHz and 19.30125-19.69875 GHz are heavily used for fixed point-to-point services mostly by telecommunications carriers for network backhaul. 24.25-30 GHz is used by body scanners at international airports around Australia. In Australia, there are planning rules for fixed services in the 17.7-19.7 GHz and 27.5-29.5 GHz frequency bands. |
| Singapore | There are fixed services operating in the 17.7 – 19.7GHz band on an island-wide basis. In addition, IDA understands that some countries are proceeding to conduct trials in the 27.5 -29.5GHz band for IMT services although it is not being studied at WRC-19. This will be one area in which IDA will track closely before we develop plans for the 27.5 – 29.5 GHz for terrestrial services.  With regard to the 29.5 – 30.0GHz band, based on the ITU Radio Regulations, this band is not opened up for terrestrial or fixed services for the Asia Pacific region. As such, there is currently no plan to use the 29.5-30.0 GHz band for terrestrial services. |
| Korea | The bands 17.7-19.7 GHz and 27.0-29.5 GHz are used for FS and MS applications. Especially MS in the band 27-29.5 GHz, experiment stations are granted to test new radio access technologies for 5G mobile. According to the K-ICT Spectrum Plan, the Republic of Korea also considers 28GHz frequency ranges for the 5G spectra. The Korean regulator plans to provide 3 GHz bandwidth in the band 26.5-29.5 GHz by 2018 when 5G systems are available, at the latest by 2021.. The bands 17.70-17.74GHz and 19.26-19.30GHz are used for wireless LANs or Point-to-Point communication, in accordance with technical requirements related to conformity compliance. |
| Thailand | The frequency plan for FS in the band 17.7-20.2 GHz is shown in the diagram in the answer to Question1. A part of spectrum has been used for fixed link applications. There is no frequency plan and assignment for terrestrial services in the band 27.5-30 GHz in Thailand. |
| Vietnam | There are a number of point-to links using the band 17.7-19.7. Many of these links are used for mobile back-haul. |
| Malaysia | Please refer Question 1 above. |
| Indonesia | Current used are described in the table above. Based on our national regulation (INS 30 of Ministerial Decree 21/2014) the bands 17.7-19.7 GHz and 27.5-29.5 GHz are used for point-to-point communication system. |

**Question 4:** How do you achieve or plan to achieve sharing/compatibility between terrestrial and satellite services (provide technical characteristics if applicable) in the bands 17.7-20.2 GHz and 27.5-30 GHz?

|  |  |
| --- | --- |
| Japan | N/A |
| New Zealand | In the frequency band 17.7–19.7 GHz, satellite downlink receive licence for fixed earth stations can be considered on a case-by-case basis, subject to coordination with existing fixed links. Procedures for evaluating interference from FSS to FS can be found in Public Information Brochure [*PIB 38*](http://www.rsm.govt.nz/online-services-resources/publications/pibs/38)*: Radio Licence Certification Rules*.  Since the frequency band 26.4-28.35 GHz was sold via auction in 1998 to private spectrum right holders, satellite uplink licences for fixed earth stations in the frequency band 27.5–28.35 GHz can only be issued by the private spectrum right holders based on commercial arrangements.  In the frequency band 28.35-29.5 GHz, satellite uplink licences for fixed earth stations can be considered by the regulator on a case-by-case basis. |
| Iran | The band 27.5-29.5 GHz may be used for terrestrial and satellite services by geographical separation. |
| China | To conduct EMC study between terrestrial and satellite services. |
| Australia | [Radiocommunications Assignment and Licensing Instruction (RALI) MS38](http://www.acma.gov.au/~/media/Spectrum%20Engineering/Information/Word%20Document/RALI%20MS%2038%20docx.docx) describes procedures for the frequency coordination of fixed-satellite service (FSS) Earth station transmitters operating in the 27.0-30.0 GHz band with:   * terrestrial fixed service receivers; * Earth exploration-satellite service (EESS) (space-to-Earth) receivers; and * space research service (SRS) (space-to-Earth) receivers.   This RALI also specifies requirements for FSS Earth station transmitters to avoid causing interference to licensed body scanners.  Australia achieves or plans to achieve sharing/compatibility of terrestrial and satellite services in the 17.7-20.2 GHz band is achieved via spectrum planning and/or coordination agreements. In some segments, satellite Earth stations do not require individual licensing. However, in bands shared between satellite and terrestrial services, individual services are coordinated on a case-by-case basis based on relevant ITU documents and/or Australian domestic policies.  For example, in the 17.7-18.2 GHz, 18.8-19.3 GHz, 19.7-20.2 GHz, 28.5-29.1 GHz and 29.5-30 GHz segments, satellite Earth stations do not require individual licensing. A licence is required for the relevant space-based receiver or transmitter to communicate with multiple Earth stations in these segments.  Australia also develops new domestic policies as a need arises – a draft new policy Australia is developing is on ESIMs in the 19.7-20.2 GHz and 29.5-30 GHz bands and can be seen via [this link](http://www.acma.gov.au/theACMA/regulatory-arrangements-for-stations-in-motion)  (http://www.acma.gov.au/theACMA/regulatory-arrangements-for-stations-in-motion). |
| Singapore | As coexistence studies are being conducted at ITU Working Party 4A and coordination procedures are contained in the ITU RR Appendices, IDA will use these parameters as a reference to achieve coexistence.  However, noting that there are island-wide use of Fixed Services in parts of the 17.7 – 19.7GHz band, coexistence between Fixed Satellite Service and Fixed Services in this band may be difficult to achieve. |
| Korea | It should be possible to coexist between terrestrial and satellite services due to large path losses including building loss, vegetation loss and so on in those bands. The Republic of Korea can help to achieve sharing/compatibility between terrestrial and satellite services taking into account realistic path loss and scenarios in those frequencies if required. |
| Thailand | The regulation for compatibility between terrestrial and satellite services in Thailand is developed based on the following references:   * International Telecommunication Union, “Radio Regulations: Article 5 – Frequency allocations”, 2012. * International Telecommunication Union, “Radio Regulations: Article 21 – Terrestrial and space services sharing frequency bands above 1 GHz”, 2012. * Provisional Final Acts, World Radiocommunication Conference (WRC-15), 2-27 November 2015 * ITU-R Recommendation S.465 * ITU-R Recommendation SM.1448 * ITU-R Recommendation SF.1006     We plan to have the compatibility between terrestrial and satellite services regulation active within 2016. |
| Vietnam | N/A |
| Malaysia | The frequency band 17.7 to 19.7 GHz is deployed ubiquitously for point to point FS systems and the usage has increased significantly as backhaul to support mobile networks and access infrastructures.  Currently the operation for FSS earth stations (in Ka Band) is protected within designated areas only (via geographical separation). Use of this band is on sharing basis with FS.  The use of Ka-band’s FSS earth station (outside the designated areas) would be on non-protection basis. |
| Indonesia | It should be possible to coexist between terrestrial and satellite services due to large path losses including building loss, vegetation loss and so on in those bands but need further studies for technical requirements related to conformity compliance. |

**Question 5:** Have you deployed or plan to deploy Earth Stations in Motion (ESIMs) in the Ka-band?

|  |  |
| --- | --- |
| Japan | Yes |
| New Zealand | Yes |
| Iran | No |
| China | Yes |
| Australia | Yes |
| Singapore | Yes |
| Korea | No |
| Thailand | No |
| Vietnam | Yes |
| Malaysia | No |
| Indonesia | N/A |

**Question 6:** What are the specific bands being involved and what kinds of platforms are used e.g. ships, aircraft and land vehicles?

|  |  |
| --- | --- |
| Japan | Currently, Japan is conducting technical study to introduce ESIM (mainly for ship and aircraft) within 19.7-20.2 and 29.5-30.0 GHz bands. |
| New Zealand | New Zealand is planning to permit ESIM communicating with FSS networks in the band 19.7-20.2 GHz (space-to-Earth direction) and 29.5-30 GHz. (Earth-to-space direction), and covering all moving platforms, from Q4 2016 onwards. |
| Iran | None |
| China | The bands 19.7-20.2GHz and 29.5-30GHz are planned to be used by ESIMs and the platforms include ships, aircrafts and vehicles.  As for the bands 17.7-19.7GHz and 27.5-29.5GHz, this Administration will consider whether to use the two bands by ESIMs according to the study result of ITU-R. |
| Australia | The Australian regulator, the Australian Communications and Media Authority, has undertaken [public consultation](http://www.acma.gov.au/theACMA/regulatory-arrangements-for-stations-in-motion) on proposed arrangements to support licensing of use of the frequency bands 19.7–20.2 GHz and 29.5–30.0 GHz by earth stations in motion communicating with geostationary space stations in the fixed-satellite service in accordance with the requirements of ITU Resolution **156 (WRC-15)**.  The type of platform is unspecified (it includes ships, aircraft and land vehicles). |
| Singapore | The bands involved are a portion of the 29.5-30GHz band for user terminal transmission and a portion of 19.7-20.2GHz band for user terminal reception. There are plans to install ESIMs user terminals on vessels and aircrafts. Starting from 2016, there are plans to install ESIM user terminals across various models of Singapore-based aircrafts and on approximately 1,000 vessels within the next 5 years. |
| Korea | Not available |
| Thailand | N/A |
| Vietnam | N/A |
| Malaysia | N/A |
| Indonesia | N/A |

**Question 7:** If ESIMs are deployed or planned to be deployed in both the 19.7-20.2 GHz & 29.5-30 GHz and 17.7-19.7 GHz & 27.5-29.5 GHz bands, are there any difference in the operational characteristics and/or management policies in the two different parts of Ka-band? If yes, please explain.

|  |  |
| --- | --- |
| Japan | N/A |
| New Zealand | New Zealand has no plan to deploy ESIMs in the bands 17.7-19.7 GHz and 27.5-29.5 GHz yet. |
| Iran | None |
| China | There is no difference between the two different parts of Ka-band in the operational characteristics of satellite service. Considering the different usage status of terrestrial service, there may be different in the management policies in future. |
| Australia | Australia considers there are differences in ESIMs being deployed or planned to be deployed in both the 19.7-20.2 GHz & 29.5-30 GHz and 17.7-19.7 GHz & 27.5-29.5 GHz bands. The 19.7-20.2 GHz & 29.5-30 GHz bands are subject to the ITU Resolution 156 (WRC-15). The 17.7-19.7 GHz & 27.5-29.5 GHz bands contain terrestrial and satellite service allocations in all three ITU Regions with heavy terrestrial use in Australia in parts of these bands. The 17.7-19.7 GHz & 27.5-29.5 GHz bands are subject to study under ITU Resolution 158 (WRC-15) and WRC-19 agenda item 1.5.  The decision of WRC-15 (Resolution 156 (WRC-15)) may serve as a suitable starting point for the development of regulations for the rest of the bands while noting that all existing services with an allocation in the band should be appropriately protected. |
| Singapore | IDA understands that ESIMs are planned to be deployed only in the 19.7-20.2/29.5-30GHz range, but the 19.2-19.7GHz and 29.0-29.5GHz band may be utilised to provide flexible capacity as needed. As such, there is no difference in the required operational characteristics of the user terminals. However, further studies will be required to address coexistence issues in the 17.7-19.7 GHz & 27.5-29.5 GHz bands and this will be undertaken by ITU Working Party 4A and addressed under Agenda Item 1.5. |
| Korea | Unlike a typical FSS application, ESIM applications include mobility operation, so the mobility characteristics should be additionally taken into account. |
| Thailand | N/A |
| Vietnam | N/A |
| Malaysia | N/A |
| Indonesia | Unlike a typical FSS application, ESIM applications include mobility operation, so the mobility characteristics should be additionally taken into account. |

**Question 8:** What are your country’s current policies on the operations of satellite systems in the bands 19.7-20.2 GHz & 29.5-30 GHz and 17.7-19.7 GHz & 27.5-29.5 GHz?

|  |  |
| --- | --- |
| Japan | N/A |
| New Zealand | Refer to answers provided in Question 2. |
| Iran | Those bands are not being used by satellite services yet. |
| China | There is no specific policy in China for now, the operations of satellite systems in the above frequency bands comply with the ITU-R Radio Regulations.  This administration is considering to update the “Interim Measures on Administration of the Setup and Use of Earth Station on Mobile Platform within Fixed Satellite Service Communication Network (MIIT, issued on January 21, 2013)” to authorize the use part of the Ka-band 19.7-20.2 GHz & 29.5-30 GHz. |
| Australia | In the 17.7-18.2 GHz, 18.8-19.3 GHz, 19.7-20.2 GHz, 28.5-29.1 GHz and 29.5-30 GHz segments, satellite Earth stations do not require individual licensing and Earth stations are authorised via the [Radiocommunications (Communication with Space Object) Class Licence 2015](https://www.legislation.gov.au/Details/F2015L01486). These segments are therefore suited to large scale deployment of Earth stations at this stage. As mentioned above, Australian domestic regulatory arrangements of Earth station in motion in the bands 19.7–20.2 GHz and 29.5–30.0 GHz is currently being considered by the Australian regulator (ACMA).  In the 18.2-18.8 GHz, 19.3-19.7 GHz, 27.5-28.5 GHz and 29.1-29.5 GHz segments, satellite Earth stations are individually licensed. These segments are therefore generally not suited to large scale deployment of Earth stations at this stage. |
| Singapore | For any satellite systems the company will have to secure either a Facilities Based Operator or a Service Based Operator licence, depending on whether or not there are any infrastructure being deployed in Singapore (e.g. gateway, control hub, etc.). Following that, the company will then have to obtain a radiocommunication licence to get IDA’s approval on the frequency bands and operational parameters. |
| Korea | The bands 19.7-20.2 GHz and 29.5-30.0 GHz are used for FSS and the bands 17.7-19.7 GHz and 27-29.5 GHz are used for terrestrial services. Especially the band 26.5-29.5 GHz will be used for mobile service (5G IMT) trial at PyeongChang Winter Olympic Games in Feb. 2018. |
| Thailand | Allocate all services based on national table of frequency allocation |
| Vietnam | N/A |
| Malaysia | Please refer the answer in Question 4 above. |
| Indonesia | N/A |

**Question 9:** Further to question (8), are these laws, decrees, legal instruments publicly available? If yes, please provide website hyperlink.

|  |  |
| --- | --- |
| Japan | N/A |
| New Zealand | In order to fully cover the definition of ESIM, new provisions applicable to ESIM in the band 19.7-20.2 GHz and 29.5-30 GHz will be included from Q4 2016 onwards in the following three General User Radio Licences applicable to satellite uplink transmission – one for terrestrial, one for aeronautical and one for maritime:  <http://www.rsm.govt.nz/about-rsm/spectrum-policy/gazette/gurl/satellite-services>  <http://www.rsm.govt.nz/about-rsm/spectrum-policy/gazette/gurl/aeronautical-purposes>  <http://www.rsm.govt.nz/about-rsm/spectrum-policy/gazette/gurl/maritime-purposes> |
| Iran | No |
| China | N/A |
| Australia | Some Australian documents of such types are:  [Radiocommunications (Communication with Space Object) Class Licence 2015](https://www.legislation.gov.au/Details/F2015L01486)  [Radiocommunications (Australian Space Objects) Determination 2014](https://www.legislation.gov.au/Details/F2014L01586)  [Radiocommunications (Foreign Space Objects) Determination 2014](https://www.legislation.gov.au/Search/Radiocommunications%20$LB$foreign) |
| Singapore | <https://www.ida.gov.sg/Policies-and-Regulations/Industry-and-Licensees/Licensing/Online-Licence-Application> |
| Korea | On January 19, 2017, the Ministry of Science, ICT and Future Planning (MSIP) issued ‘K-ICT Spectrum Plan’ which is an official roadmap for pioneering domain of future frequencies in Korea including 5G spectrum. According to the K-ICT Spectrum Plan, the Republic of Korea also considers 28GHz frequency ranges for the 5G spectra. The Korean regulator plans to provide 3 GHz bandwidth in the band 26.5-29.5 GHz by 2018 when 5G systems are available, at the latest by 2021. |
| Thailand | <http://www.nbtc.go.th/wps/wcm/connect/NBTC/d6351071-9c52-4940-ac5a-3d9a53d49317/NTFA+2558+unofficial+translation-17092558.pdf?MOD=AJPERES&CACHEID=d6351071-9c52-4940-ac5a-3d9a53d49317> |
| Vietnam | Circular 13/2013/TT-BTTTT of Ministry of Information and Communication on frequency arrangements for fixed and mobile service in the frequency range (30-30000) MHz. | |
| Malaysia | Spectrum Plan:  <http://www.mcmc.gov.my/skmmgovmy/media/General/pdf/Spectrum-Plan2014.pdf>  Standard Radio System Plan (SRSP):   1. Requirements for Fixed Service Line of Sight Radio-Relay Systems Operating in the Frequency Band 17.70 Ghz to 19.70 GHz:   <http://www.mcmc.gov.my/skmmgovmy/files/attachments/SRSP527_FS_Issue_4_15_10_09.pdf>   1. Requirements for Local Multipoint Communications Service (LMCS) Operating in the Frequency Band From 24.25 GHz to 27.0 Ghz, 27.0 Ghz To 29.5 GHz and 31.00 GHz To 31.3 GHz:   <http://www.mcmc.gov.my/skmmgovmy/files/attachments/SRSP509LMCS.pdf>   1. Requirements for Devices using Ultra-Wideband (UWB) Technology Operating in the Frequency Bands of 30 MHz to 960 MHz, 2.17 GHz to 10.6 GHz, 21.65 GHz to 29.5 GHz and 77 GHz to 81 GHz   <http://www.mcmc.gov.my/skmmgovmy/files/attachments/SRSP549_UWB.pdf> |
| Indonesia | Under development |

**Question 10:** In your opinion, what are the technical and operational requirements of ESIMs applications in Ka-band?

|  |  |
| --- | --- |
| Japan | N/A |
| New Zealand | N/A |
| Iran | None |
| China | First of all, Resolution 156 (WRC-15) should be followed. Moreover, refer to Recommendation ITU-R M.1643, the following requirements should be considered in the operation of ESIMs:   1. In order to protect other satellite networks and systems, ESIMs networks shall be operated in such a manner that the aggregate off-axis e.i.r.p. levels produced by all co-frequency earth stations of each network are not greater than the levels that have been coordinated for the typical earth station(s) pertaining to FSS networks where FSS transponders are used; 2. ESIMs that use closed loop tracking of the satellite signal need to employ an algorithm that is resistant to capturing and tracking adjacent satellite signals. ESIMs shall immediately inhibit transmissions when they detect that unintended satellite tracking has happened or is about to happen; 3. ESIMs networks shall operate under the control of a Network control and monitoring centers (NCMCs) or equivalent facility. ESIMs must be able to receive at least enable transmission and disable transmission commands from the NCMC. ESIMs must automatically cease transmissions immediately on receiving any parameter change command, which may cause harmful interference during the change, until it receives an enable transmission command from its NCMC. In addition, it should be possible for the NCMC to monitor the operation of an ESIM to determine if it is malfunctioning; 4. ESIMs shall be self-monitoring and should a fault which can cause harmful interference to FSS or terrestrial networks be detected, the ESIMs must automatically cease its transmissions. |
| Australia | Australia notes that ITU-R has developed documents (e.g. ITU-R Reports) on technical and operational requirements of ESIMs applications in Ka-band, which Australia believes to be a useful source of information on this issue.  WRC–15 accepted that ESIMs are part of the FSS for particular frequency bands. The technical and operational requirements of ESIMs in Ka-band should be consistent with those for FSS and reflect the requirement to appropriately protect all existing services with an allocation in the band.  The Australian regulator, the Australian Communications and Media Authority, has undertaken [public consultation](http://www.acma.gov.au/theACMA/regulatory-arrangements-for-stations-in-motion) on proposed arrangements to support licensing of use of the frequency bands 19.7–20.2 GHz and 29.5–30.0 GHz by earth stations in motion communicating with geostationary space stations in the FSS in accordance with the requirements of ITU Resolution **156 (WRC-15)**. |
| Singapore | IDA understands that WRC-15 drafted a new resolution, Resolution 156 (WRC-15), to define the use of the frequency bands 19.7-20.2 GHz and 29.5-30.0 GHz by ESIMs. As such, ESIM operations will have to comply with this resolution.  In addition to the above, IDA is also of the view that technical and operational parameters to be imposed on the mobile satellite terminals should be in conformance with harmonised standards (e.g. EN ETSI 303 978). |
| Korea | ESIM application includes mobility operation so adapted technical and operational requirements that take such an operation into account are necessary. |
| Thailand | The introduction of ESIMs applications in Ka-band shall not cause interference to incumbent services. |
| Vietnam | ESIMs applications in Ka-band is needed to provide the service with the high availability and stability. |
| Malaysia | The operation of ESIMs should not impose any additional constraint and limitation to the deployment of incumbent services. |
| Indonesia | ESIM application includes mobility operation so adapted technical and operational requirements that take such an operation into account are necessary. |

**Question 11:** In your opinion, what ESIMs characteristics are of top importance for the operation of ESIMs in the FSS Ka-band in your country? (e.g. antenna diameter, off-axis e.i.r.p. density levels, tracking and pointing accuracy, network control and monitoring center, cost, etc.)

|  |  |
| --- | --- |
| Japan | N/A |
| New Zealand | Antenna diameter, off-axis e.i.r.p., equivalent power flux density levels and tracking/pointing accuracy. |
| Iran | None |
| China | The key characteristics of ESIMs in China include off-axis e.i.r.p. density levels, tracking and pointing accuracy, automatic self-monitoring and network control capability. |
| Australia | Australia is of the view the parameters listed here are important parameters. Australia considers there may be additional parameters and/or information that may also be useful for the operation of ESIMs in the FSS Ka-band in Australia. Resolution 156 (WRC-15) provides appropriate parameters and important requirements for the use of the frequency bands 19.7–20.2 GHz and 29.5–30.0 GHz by earth stations in motion communicating with geostationary space stations in the FSS . In general pointing accuracy to the target GSO and off-axis uplink e.i.r.p density will be important. |
| Singapore | Coexistence characteristics to mitigate interference to/from other services/networks are important, for example the off-axis e.i.r.p density levels, max e.i.r.p. and pointing accuracy. |
| Korea | ESIM application includes mobility operation so it is important to take mobility operation into account. |
| Thailand | N/A |
| Vietnam | The capability of satellite to deal with rain attenuation is the most importance for the operation of ESIMs in the FSS Ka-band in my country |
| Malaysia | Please refer the answer in Question 10 above. |
| Indonesia | ESIM application includes mobility operation so it is important to take mobility operation into account |

1. **Others**

**Question 12:** Do you have any suggestions for satellite use of the bands 17.7-20.2 GHz and 27.5-30.0 GHz to be studied by AWG?

|  |  |
| --- | --- |
| Japan | N/A |
| New Zealand | N/A |
| Iran | None |
| China | N/A |
| Australia | Not at this time. Studies of ESIMs are under the purview of ITU-R Study Group 4, and the Group will be coordinating with Study Group 5. |
| Singapore | No further suggestions. |
| Korea | APT members are invited to take into account the responses provided above for future studies. |
| Thailand | Compatibility with other services |
| Vietnam | The compatibility between satellite service and fixed service should be studied by AWG. |
| Malaysia | N/A |
| Indonesia | APT members are invited to take into account the responses provided above for future studies. |

\_\_\_\_\_\_\_\_

1. \* *Note by the Secretariat:*  This Resolution was revised by WRC-07. [↑](#footnote-ref-1)
2. Resolution **156** (WRC-15) provides appropriate parameters and important requirements for the use of the frequency bands 19.7–20.2 GHz and 29.5–30.0 GHz by earth stations in motion communicating with geostationary space stations in the fixed-satellite service. [↑](#footnote-ref-2)