COMMUNICATIONS ALLIANCE LTD

COMMUNICATIONS ALLIANCE

SATELLITE SERVICES WORKING GROUP

Input on Australian positions for satellite-related WRC-23 agenda items

Position Paper

11 November 2022

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Preamble

The Communications Alliance Satellite Services Working Group (SSWG), whose members represent the national and overseas providers of communications satellite services in Australia, will participate in the ITU's World Radiocommunication Conference (WRC-23) next year.

This paper presents, for consideration by Government, the SSWG's preferred Australian stance on each of the WRC-23 Agenda Items. In some cases, as always, there is ongoing debate within SSWG on these positions and this has been reflected in the comments. The paper also does not purport to represent the views of Communications Alliance members that are not also members of the SSWG.

Agenda Item Positions

Agenda Item 1.2 3.3 – 10.5 GHz Potential IMT Identification Regionally & Globally

to consider identification of the frequency bands 3300 – 3400 MHz, 3600 – 3800 MHz, 6425 – 7025 MHz, 7025 – 7125 MHz and 10.0 – 10.5 GHz for International Mobile Telecommunications (IMT), including possible additional allocations to the mobile service on a primary basis, in accordance with Resolution 245 (WRC 19)

The frequency bands subject to agenda item 1.2 are:

- 3 300 – 3 400 MHz and 3 600-3 800 MHz (Region 2)
- 3 300 – 3 400 MHz (amend footnote in Region 1)
- 6 425 – 7 025 MHz (Region 1)
- 7 025 – 7 125 MHz (globally)
- 10.0 – 10.5 GHz (Region 2)

3600 – 3800 MHz (Region 2)

Regarding the 3.6 – 3.8 GHz band (Region 2), the SSWG believes that the IMT community has not adequately demonstrated an ability to protect existing services, either technically or politically (most allocation decisions are driven domestically), as FSS will no longer be able to utilise this band in countries that deploy IMT services in this band.

The SSWG supports No Change (NOC) to the RR, except suppression of Resolution 245 (WRC-19), which refers to Method 3A contained in the current draft CPM text under Agenda Item 1.2.

7025 – 7125 MHz (globally)

The SSWG's main focus is on the 7025 – 7125 MHz frequency band, as this is the only band with a potential Region 3 IMT identification, since it considers possible regulatory changes on a global basis. A number of Australian satellite operators and service providers need their existing Fixed Satellite Services (FSS) protected in the 7025 – 7075 MHz band.

The SSWG supports the protection of existing primary services and to allow their future development. Australia's current position is that it could support the global identification of IMT in the 7025 – 7125 MHz band if the ITU-R studies show that coexistence is technically

feasible and subject to appropriate regulatory and technical conditions being in place to protect existing primary services in this band (and in adjacent bands, as appropriate) now and into the future. Such technical feasibility has not been demonstrated. In the ITU-R there are some studies showing excessive interference and some studies showing interference below the criterion. In our view, those studies which show interference below the criterion are flawed – being based on the selection of multiple unrealistic assumptions that serve to underestimate the actual interference that would occur to FSS uplinks. The studies which show excessive interference include assumptions that may underestimate interference, such as a very low density of IMT base station deployment, but still show excessive interference.

The SSWG notes some moves by members of the IMT community within APT discussions to widen the scope (bandwidth) of the IMT claim in the 7 GHz band. This is not justified, nor acceptable, and is also beyond the scope of the Agenda Item.

The SSWG also notes that a new band (i.e. 6425 – 7125 MHz) for Wi-Fi is being sought globally. Our members are of the view that this application not only provides greater economic benefits than IMT, but it is also able to protect existing services by virtue of its lower power requirements and mainly indoor operation.

The SSWG submits that the Australian position on the 7 GHz band should be No Change (NOC) to the RR except suppression of Resolution 245 (WRC-19) which refers to Method 5A contained in the current draft CPM text under Agenda Item 1.2.

6425 – 7025 MHz (Region 1)

Although the 6425 – 7025 MHz band is only under consideration for IMT in Region 1, it is important to recognise that IMT operation in Region 1 can cause interference to satellites providing service in Australia and the rest of Region 3. A number of Australian satellite operators and service providers operate Fixed Satellite Services (FSS) in the 6425 – 6725 MHz band on satellites that cover both Region 1 and Region 3. At least one operator uses the feeder uplinks (under the FSS allocation) to support its L-band operations. MSS users in Australia and elsewhere are likely to be impacted by any interference from IMT operations in Region 1 in this band, if received by GSO satellites such as the satellite located at 64E. Others have uplinks to their GSO satellites covering both Region 1 and 3, for example a satellite at 68.5E. These uplinks, which operate under Australian radiocommunications licences, need to be protected from IMT deployment in Region 1 so that their C-band and L-band uplink and downlink services in Australia and in other Region 3 areas are not unduly affected.

The same compatibility issues for the band 7025-7125 MHz apply also for this band. In particular some studies show that harmful interference would be caused by IMT systems to FSS uplinks, and those studies which show interference below the criterion are based on erroneous modelling and assumptions.

The SSWG believes the Australian position on the 6425 – 7025 MHz band (Region 1) should ensure the protection of the fixed satellite service space stations serving Australian citizens, and this is best accomplished by supporting the No Change option (Method 4A).

Agenda Item 1.3 3.6 – 3.8 GHz Possibilities upgrading MS (Region 1) to primary allocation

to consider primary allocation of the band 3600-3800 MHz to mobile service within Region 1 and take appropriate regulatory actions, in accordance with Resolution 246 (WRC 19)

The 3400 – 4200 MHz (space-to-Earth) band paired with the 5925 – 6725 MHz (Earth-to-space) band has historically been used for satellite operations for the past 40 years or so.

C-band spectrum is unmatched for comprehensive, wide area satellite coverage, with hemispherical and global coverage beams which are implementable thanks to the favourable propagation characteristics of the band. The wide area coverage simplifies the ground infrastructure required to provide connectivity between remote points and contributes to lowering the total cost of ownership of a telecommunications solution, compared to an equal-reach terrestrial microwave network. C-band is also resilient to service disruptions, due to its good propagation performance in intense rain.

Region 1 includes Africa, which uses C-band extensively, due to the characteristics identified above, for communication networks, with a significant positive large impact on African countries' economies, social development and the efficiency of government actions.

Despite this being a Region 1 issue, the SSWG notes that some satellites serving Australia also serve the African continent. Therefore, beside FSS satellite operations in Region 1 need to be protected as mandated in Resolution 246 (WRC-19), it is also important to implement a regulatory framework to protect FSS satellite operations in Region 3 from possible primary mobile service deployment in Region1. Furthermore, it should be noted that IMT identification is out of scope under this agenda item.

The SSWG supports No Change (NOC) to the RR except suppression of Resolution 246 (WRC-19) which refers to Method A contained in the current draft CPM text under Agenda Item 1.3.

Agenda Item 1.6 Sub-orbital vehicles

to consider, in accordance with Resolution 772 (WRC 19), regulatory provisions to facilitate radiocommunications for sub-orbital vehicles

There is no formal definition of sub-orbital flight, although it has been assumed in Report ITU-R M.2477 to be an intentional flight of a vehicle expected to reach the upper atmosphere with a portion of its flight path that may occur in space, without completing a full orbit around the Earth before returning back to the surface of the Earth. There is no internationally agreed legal delimitation between space and atmosphere and the definition of a sub-orbital vehicle is not agreed internationally.

Sub-orbital vehicles include space launch vehicles, scientific research rockets, space tourism rockets and - in the future - space planes intended to carry passengers on trans-continental flights. Globally, there are many new commercial companies operating in these fields, including in Australia.

One intention of the Agenda item is to safely integrate Sub-orbital vehicles (SoVs) into the same airspace as conventional aircraft during their transition to and from space, in order to minimise the airspace disruption.

In addition, SoVs are intended to operate at higher altitudes than conventional aircraft, including into space during short periods of time without reaching an orbit, and potentially fly at speeds up to several times the speed of sound.

With the rapid development of the various sub-orbital flight concepts, such as hypersonic flight and reusable carrier rocket technology, suborbital flight has become an operational reality and supports a wide range of fields, including training and education, space transportation, satellite launch, tourism, and scientific research.

There are spectrum requirements for radiocommunication between stations on board SoVs and terrestrial/space stations providing functions including voice/data communications, navigation, surveillance, and telemetry, tracking and command (TT&C).

Australia supports ITU-R studies of spectrum needs for communications between stations on board SoV and terrestrial/space stations and of appropriate modification, if any, to the Radio

Regulations with the understanding that new allocations or changes to the existing allocations in Article 5 of the Radio Regulations are excluded.

Australia supports the development of new Radio Regulation to enable SoVs to operate in certain defined services, subject to causing no additional constraints to other services and systems, and subject to causing no additional interference to other services and systems.

It has generally been agreed that the ITU-R studies have identified that the issue to be resolved is not whether aircraft systems could be used successfully in SoVs technically, but how to overcome the regulatory issues due to constraints with the Article 1 definitions of the Radio Regulations for services that the systems operate under. There are currently two proposed approaches to resolve this issue:

- Resolving that SoVs can operate as terrestrial or earth stations for short periods of time, even when above the 'major portion of the earth's atmosphere', or
- Consider that SoV systems must operate as space stations, when above the 'major portion of the earth's atmosphere'.

The first approach, supported by USA, Brazil and Inmarsat, would require changes to the Radio Regulations to ensure that stations on SoVs can operate as terrestrial or earth stations, even when temporarily in space. Services currently being proposed include MSS, RNSS and AM(R)S.

The second approach, identified by France means that the systems operating on SoVs would be required to operate outside of the Article 5 frequency allocations, since the necessary space service allocations do not exist.

The SSWG supports Boeing Australia and Inmarsat's view in that terrestrial and earth stations can operate for short periods of time above the 'major portion of the earth's atmosphere'. This approach will allow sub-orbital vehicles to operate in shared airspace with conventional aircraft, subject to new rules and regulations that would be developed by ICAO. The adoption of new regulations for sub-orbital vehicles should facilitate the full range of anticipated types of vehicles, whether they will operate in shared airspace with conventional aircraft or in segregated airspace.

Agenda Item 1.8 Unmanned Aircraft Systems and FSS

to consider, on the basis of ITU R studies in accordance with Resolution 171 (WRC 19), appropriate regulatory actions, with a view to reviewing and, if necessary, revising Resolution 155 (Rev.WRC 19) and No. 5.484B to accommodate the use of fixed-satellite service (FSS) networks by control and non-payload communications of unmanned aircraft systems

An unmanned aircraft system (UAS) consists of:

- a geostationary satellite operating in FSS frequency bands specified by Resolution 155 (Rev. WRC-19);
- an associated remote Earth station, called 'unmanned aircraft control station' (UACS);
- Earth stations on-board unmanned aircraft (UA).

The Figure below illustrates interconnection between the above elements.

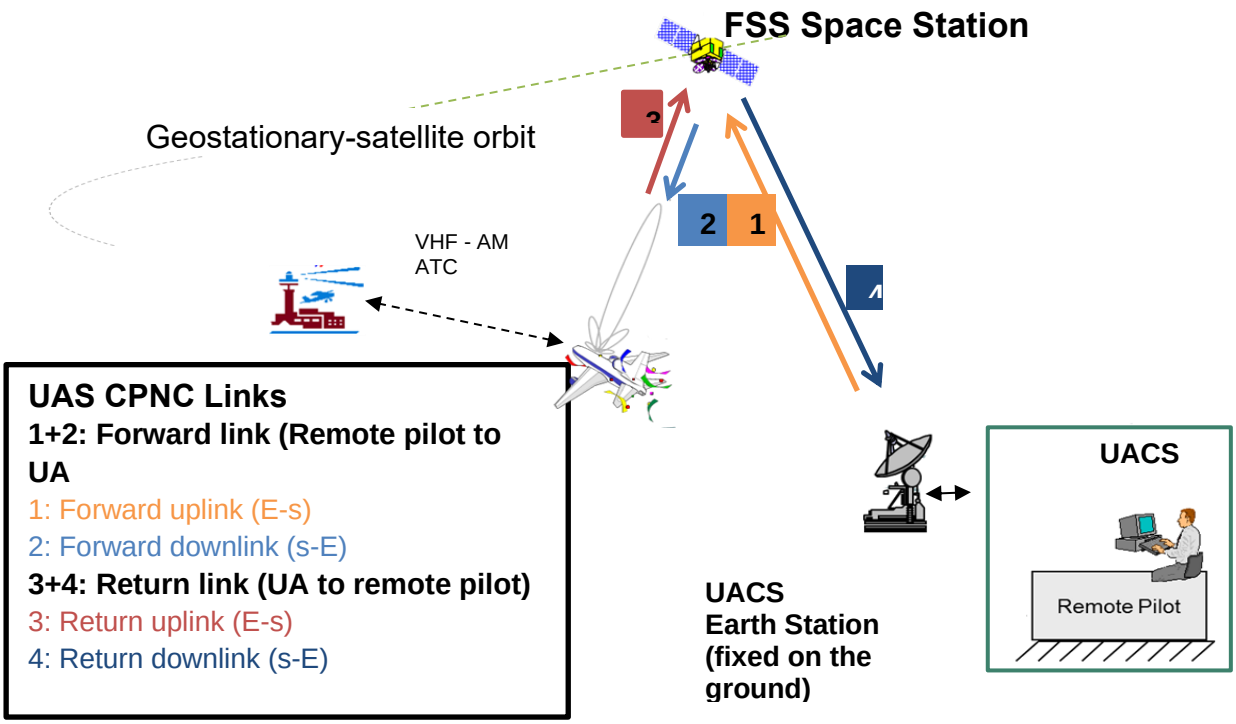


Figure 1: Elements of UAS architecture using the FSS (Source: Draft CPM text)

Australia supports progressing work in the ITU-R on technical and regulatory issues to accommodate the use of FSS for UAS CNPC and supports the Key Principles for UAS CNPC operation as outlined in the draft CPM text being finalised by WP 5B. Australia also supports the development of the Standards and Recommended Practices (SARPs) by the ICAO to be established for the use of FSS networks by UAS CNPC link.

The SSWG endorses the importance of appropriately separating the work of ICAO and ITU, as FSS networks with which UAS CNPC communicate will not have safety status in the ITU context. The SARPs established by ICAO for UAS CNPC should have no impact on existing agreements for FSS networks between notifying administrations reached during the coordination process, nor future coordination of FSS networks, in accordance with RR Articles 9 and 11.

Agenda Item 1.11 GMDSS modernisation and e-navigation

to consider possible regulatory actions to support the modernisation of the Global Maritime Distress and Safety System and the implementation of e-navigation, in accordance with Resolution 361 (Rev.WRC 19)

Resolution 361 identifies three issues to be studied which can be solved independently. Australia's preliminary position on these issues is:

Issue A/resolves 1 – GMDSS modernisation

The SSWG supports regulatory action to progress the modernisation of the GMDSS, taking into consideration the decisions of International Maritime Organisation (IMO).

Issue B/resolves 2 – e-navigation

The SSWG supports, taking into consideration the decisions of the IMO, implementation of e-navigation in the Radio Regulations.

Issue C/resolves 3 – new satellite systems

The SSWG supports No Change on this issue.

The Chinese systems in question have not coordinated. During the September 4A meeting evidence was presented showing interference into the Globalstar network, so 11.41 cannot be relied upon.

The Chinese Chair of the 1.11 drafting group confirmed during the meeting that the Chinese systems could not coordinate.

The SSWG is strongly of the view that Australia should support NOC as to do otherwise would encourage Administrations to ignore the Radio Regulations and operate uncoordinated.

To agree to the request for entry into the Table would also de facto give the Chinese systems a level of protection from non-GMDSS systems despite being uncoordinated.

Finally, a Draft Resolution proposed by China which seeks to absolve them from coordination should be rejected.

In relation to the GMDSS modernisation under Issue A, the IMO has removed non-406 MHz satellite emergency position indicating radio beacons (EPIRBs), leaving only satellite EPIRBs operating on 406 MHz. Consequently, satellite EPIRBs operating on 1.6 GHz (1645.5 – 1646.5 MHz) and EPIRBs using VHF-DSC (Very High Frequency Digital Selective Calling) operating at 156.525 MHz no longer form a part of the GMDSS. Given the removal of 1.6 GHz EPIRBs by the IMO and noting that the use of the 1.6 GHz EPIRB has already ceased operation, WRC-23 may consider possible changes to the Radio Regulations related to use of the 1645.5 – 1646.5 MHz (Earth-to-space) band for EPIRBs, to permit new maritime radiocommunications under GDMSS modernisation. The SSWG is yet to form a position on this issue.

Agenda Item 1.15 Possible use the band 13 GHz for A-ESIM and M-ESIM (GSO Ku FSS)

to harmonise the use of the frequency band 12.75 – 13.25 GHz (Earth-to-space) by earth stations on aircraft and vessels communicating with geostationary space stations in the fixed-satellite service globally, in accordance with Resolution 172 (WRC 19)

Aeronautical and maritime routes usually rely on satellite connectivity. In addition, ships and aircraft need automated digital data processing for their operation. The need for services provided by earth stations on board aircraft (A-ESIM) and on vessels (M-ESIM) continues to grow with the increasing demand for internet-based applications for the aviation and maritime industry, including their passengers. The satellite user terminal can provide the internet broadband connectivity to the Internet while in motion around the globe. The availability of the 12.75 – 13.25 GHz band for the use by A-ESIM and M-ESIM would provide additional capacity for the growing needs in this sector and hence to improve these services.

A-ESIM and M-ESIM communicating with a GSO FSS satellite involve the transmission links depicted in Figure 1.

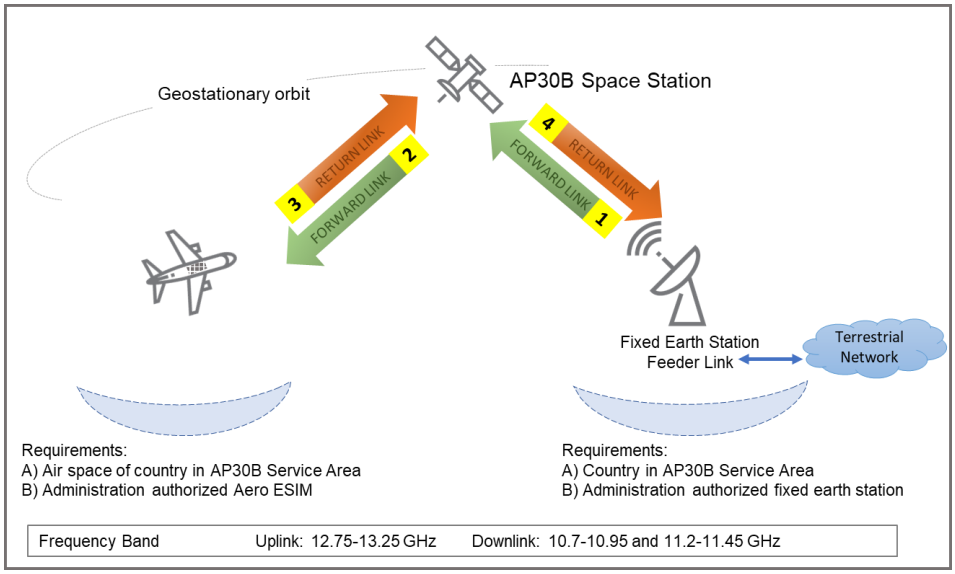


Figure 2: System operation in the context of operation under Appendix 30B

As per the above Figure, link 3 operating in the 12.75 – 13.25 GHz frequency band will be used for transmission from A-ESIM or M-ESIM to a GSO Appendix 30B space station. The operation under link 3 is the subject of ITU-R studies under Agenda Item 1.15.

The ITU-R technical studies have mostly been completed. The services under study are the primary Fixed Service (FS), Mobile Service (MS), FSS in AP30B and secondary FSS non-GSO operating within the band as well as the primary Earth Exploration Satellite Service (EESS) (active) and Aeronautical Radionavigation Service (ARNS) operating in the adjacent 13.25 – 13.4 GHz band.

The SSWG is of the view that protection for other systems is assured and believes Australia should support A-ESIM and M-ESIM operations in the 12.75-13.25 GHz band. Therefore, the SSWG supports Method B contained in the current draft CPM text under Agenda Item 1.15 which refers to a new WRC Resolution with technical, operational, and regulatory conditions for the operation of A-ESIM and M-ESIM communicating with GSO space stations in the fixed-satellite service in the frequency band 12.75 – 13.25 GHz and consequential suppression of Resolution 172 (WRC-19).

Agenda Item1.16 ESIM (non-GSO Ka FSS)

to study and develop technical, operational and regulatory measures, as appropriate, to facilitate the use of the frequency bands 17.7 – 18.6 GHz and 18.8 – 19.3 GHz and 19.7 – 20.2 GHz (space-to-Earth) and 27.5 – 29.1 GHz and 29.5 – 30 GHz (Earth-to-space) by non-GSO FSS earth stations in motion, while ensuring due protection of existing services in those frequency bands, in accordance with Resolution 173 (WRC 19)

Australia supports measures identified in Resolution 173 (WRC 19) that facilitate the use of non-GSO earth-stations in motion (ESIM) in the fixed-satellite service in the identified frequency bands. Such use must ensure protection of services allocated in the bands and, as appropriate, in the adjacent bands, and shall not cause unacceptable interference to territories of those administrations mentioned in No. 5.542 operating terrestrial services in the 29.5 – 30.0 GHz band under an additional secondary allocation.

Australia supports the use of PFD limits for the purpose of providing protection to terrestrial services. Further, studies to ensure non-GSO FSS ESIM deployment in the 17.7 – 18.6 GHz and 18.8 – 19.3 GHz (space-to-Earth) bands will not result in increased adjacent band interference to EESS (passive) operations in the 18.6 – 18.8 GHz band, should be finalised.

Resolution 169 (WRC-19) was developed for GSO ESIM which operate under similar conditions to non-GSO ESIM. As such, for the protection of terrestrial services, similar provisions could be applied to non-GSO ESIMs, including minimum distance from the shore for M-ESIM and pfd limits for A-ESIM. ITU-R studies have been using these methodologies for the development of the protection values for terrestrial services.

While some countries have raised concerns relating to this Agenda Item, the SSWG believes that these issues could be addressed by the regulatory measures identified in the draft Resolution. For the specific concern raised about the impact to secondary terrestrial service, particularly in the 29.5 – 30 GHz band, the SSWG is of the view that they are unfounded and have no real basis.

There is also an objection from the space science community due to reflections from the sea from non-GSO satellite transmissions. However, this issue is not linked to the ESIM question as the band in question is in the frequency range 18.6 – 18.8 GHz in the downlink direction, which is not to be used by non-GSO FSS system. Therefore the introduction of ESIM into the service offering by non-GSO FSS system will not change that interference environment in 18.6 – 18.8 GHz based on studies that have shown that the out-of-band operation of non-GSO FSS system does not degrade the sharing condition within the 18.6 – 18.8 GHz band. The SSWG believes that the new ESIM application should not be a cause of concern to the space science community in the 18.6 – 18.8 GHz band.

The SSWG position is that Australia should fully support the introduction of non-GSO ESIM and should also resist attempts to over complicate the future studies on pfd that could follow the WRC.

Agenda Item 1.17 Inter-satellite service / inter-satellite links

to determine and carry out, on the basis of the ITU R studies in accordance with Resolution 773 (WRC 19), the appropriate regulatory actions for the provision of inter-satellite links in specific frequency bands, or portions thereof, by adding an inter-satellite service allocation where appropriate

The SSWG shares the view that these satellite-to-satellite links shall operate in the same direction of transmission as provided in the current allocations for the fixed-satellite service (FSS) in the frequency bands under consideration.

Studies of the operation of these satellite-to-satellite links have been grouped into ‘within the cone’ and ‘outside of the cone’ of coverage. The conical volume of space defined by the ‘within the cone’ concept is when the apex is at the service provider space station (GSO) and base does not extend beyond the edge of coverage of the Earth as viewed by the service provider space station. Serious concern has been expressed by many countries and sector members in relation to the use of the ‘expanded cone’ concept and actual and/or potential difficulties including unacceptable interference to other FSS use.

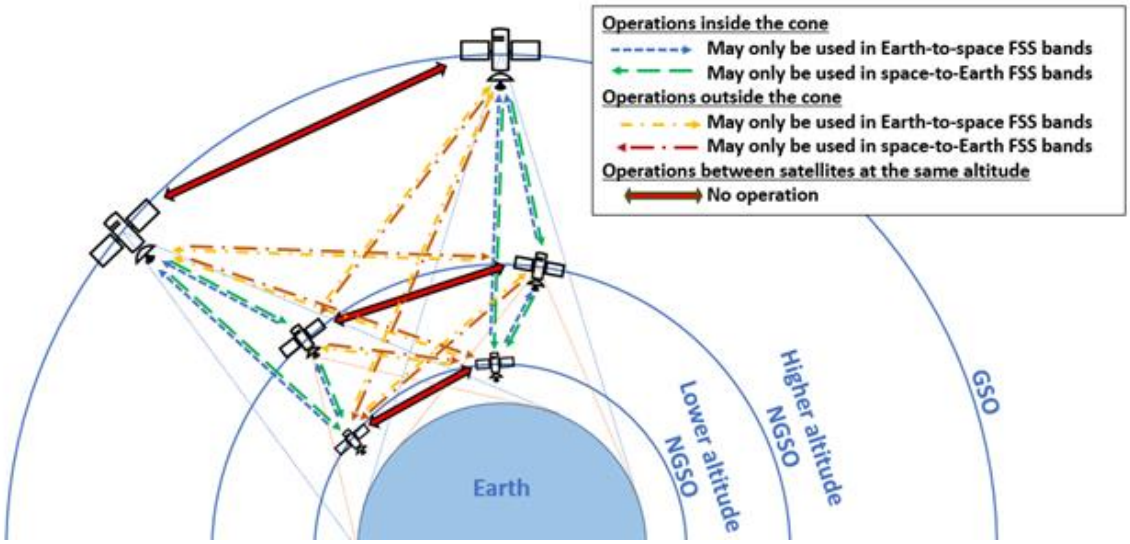


Figure 3: Inside and outside the cone concept (source: draft CPM text)

The SSWG is of the view that three main points need to be satisfied in this Agenda Item:

- that sufficient pfd is available to participating networks to enable operation of the service.
- that non-participating GSO systems are protected from unacceptable interference, without placing undue constraints on participating services.
- that MSS Feeder links are fully protected from unacceptable interference.

Agenda Item 1.18 Narrowband MSS for IoT (L and S bands)

to consider studies relating to spectrum needs and potential new allocations to the mobile-satellite service for future development of narrowband mobile-satellite systems, in accordance with Resolution 248 (WRC 19)

Noting that this is a Region 1 and 2 issue, Australia has recently released a plan for Narrowband MSS in the 2 GHz bands. An allocation for a 'narrowband low-power' MSS would result in the inefficient use of spectrum. The non-GSO MSS operators on the SSWG do not favour the bespoke Australian arrangements and given the increasing demand for new spectrum for MSS voice and data communications it would be more effective if the Australian position is to adopt generic MSS spectrum use and to look at harmonising future MSS allocations.

Additionally, in other Regions such as CITEL and ATU there is a proposal for a No Change (NOC) approach and Suppression of the Resolution 248 (WRC-19), some other Regions like Europe, have preliminary decided a NOC on all bands except 2010 – 2025 MHz and will define their position at their next Conference Preparatory Group meeting in February 2022.

The SSWG does not believe, in the absence of standards and studies, that this new allocation can be supported and as such our position is No Change (NOC) and Suppression of the Resolution 248 (WRC-19).

Agenda Item 1.19 New FSS allocation Reg 2

to consider a new primary allocation to the fixed-satellite service in the space-to-Earth direction in the frequency band 17.3-17.7 GHz in Region 2, while protecting existing primary services in the band, in accordance with Resolution 174 (WRC-19);

As this is a Region 2 issue, Australia has no position on the proposed new primary allocation but is monitoring developments to ensure protection for existing Appendix 30A satellite networks. This objective was shared by other Region 3 administrations expressing concern during the September 2022 Working Party 4A meeting during finalisation of the Draft CPM text, leading to multiple alternatives in the Method to change the Radio Regulations. While Australia's position has not changed, this discussion can be expected to continue and may escalate as the agenda item comes closer to conclusion.

The SSWG supports close review of the CPM text and the input sharing studies to ensure protection of existing Appendix 30A satellite networks.

Agenda Item 7 Satellite regulatory issues

to consider possible changes, in response to Resolution 86 (Rev. Marrakesh, 2002) of the Plenipotentiary Conference, on advance publication, coordination, notification and recording procedures for frequency assignments pertaining to satellite networks, in accordance with Resolution 86 (Rev.WRC 07), in order to facilitate the rational, efficient and economical use of radio frequencies and any associated orbits, including the geostationary-satellite orbit

The SSWG supports consideration of possible changes to improve advance publication, coordination, notification and recording procedures for space services in the Radio Regulations, provided that such changes do not result in modification of frequency allocations in Article 5 of the Radio Regulations.

Agenda Item 7 Topic E: improved procedures under RR AP30B for new ITU member states

To study the possibility to grant new ITU Member States the same privilege as those granted to administrations having no assignments in the Appendix 30B List, or under coordination, as adopted in Resolution 170 (WRC-19).

Australia supports the possibility to grant new ITU Member States the same conditions as those granted to administrations having no assignments in the Appendix 30B List, or assignments listed under 6.1, as adopted in Resolution 170 (WRC-19). Which is aligned with method E2 of the current Draft CPM Text.

Agenda Item 7 Topic F: Excluding uplink service area in AP 30A for R1&3 and AP 30B

To study excluding the territory of an administration from the feeder link/uplink service area of satellite networks in RR Appendix 30A for Regions 1 and 3, and in RR Appendix 30B.

Australia supports that In Appendix 30A, an Administration can request the exclusion of its territory from the feeder-link service area of a satellite network of other Administrations.

Australia also supports the introduction of new provisions under Article 4 of RR Appendix 30A and Article 6 of RR Appendix 30B to request a notifying administration of a satellite network having relative satellite antenna gain derived from the minimum ellipse required to cover the service area of equal to or less than −20 dB over the territory of other administration to accept uplink interference emanating from the territory of other administration if so requested. The minimum ellipse is determined by the set of test points contained in the RR Appendices 30 and 30A or RR Appendix 30B satellite network using the relevant BR software application.

Both positions are covered in method F3 of the current Draft CPM Text.

Agenda Item 7 Topic H: Enhanced protection of RR Appendices 30/30A in Regions 1 and 3 and RR Appendix 30B

Enhanced protection of Appendices 30/30A in Region 1 and 3 and Appendix 30B: 'the implicit agreement' and 'the EPM degradation tolerance'.

With respect to the implicit agreement, Australia supports replacing the implicit agreement in case of no comments in due time of affected Regions 1 and 3 BSS Plan assignments or Appendix 30B allotments on an additional use/system, with a new regulatory solution allowing the administration of the additional use/system to operate until the national assignment/allotment is brought into use in line with method H1C of the current Draft CPM Text.

Agenda Item 9. 1cUse of IMT system for fixed wireless broadband

9 to consider and approve the Report of the Director of the Radiocommunication Bureau, in accordance with Article 7 of the Convention;

9.1 on the activities of the Radiocommunication Sector since WRC 19:

***Topic c:** Study the use of International Mobile Telecommunication system for fixed wireless broadband in the frequency bands allocated to the fixed services on primary basis, in accordance with Resolution 175 (WRC 19)*

WRC-19 agreed to include this topic for study under agenda item 9.1 with the common understanding that topics included under agenda item 9.1 cannot and should not lead to changes of the Radio Regulations. This understanding is aligned with the guidelines of CPM23-1 (CA/251) that only a short summary of the results for Chapter 5 of the CPM Report should be developed under this topic, and that there should be no related Methods and Regulatory or Procedural considerations.

Australia supports ITU-R studies in accordance with Resolution 175 (WRC-19). Australia also supports the modification of existing or, if required, the development of new ITU-R Recommendations, Reports and/ or Handbooks as a result of these studies. Australia supports

the suppression of Resolution 175 (WRC-19) and opposes any changes to the Radio Regulations being made under this topic.

Australia is of the view that the term 'fixed wireless broadband' is understood to mean fixed wireless access supporting broadband applications. The use of IMT as a technology for the deployment of fixed wireless broadband is no different to the use of any other radio interface technologies for fixed wireless broadband in bands allocated to the fixed service on a primary basis provided that such use is in accordance with the Radio Regulations.

The SSWG does not support a broad reclassification of 'fixed service' bands as fixed wireless broadband. In bands where FS share with FSS, the sharing scenarios would be very different and would result in the exclusion of many FSS systems.

The SSWG supports Australia position under Agenda Item 9.1 topic C that there should be no changes to the Radio Regulations, except for the suppression of Resolution 175. SSWG is also of the view that there is no need to prolong this topic as another new Agenda item to the next WRC-27 since elements of this topic could already be covered by an existing (or an amended) ITU-R Question under the purview of ITU-R Study Group 5.

The draft CPM text presents two Alternatives to address the issue of a response to the objectives of Resolution **175 (WRC-19)** which are contained in the conclusion section. Most Administrations support Alternative 2, which states that there is no need to have any draft new or revised Resolution on this matter in the draft CPM text and that doing so would be outside the scope of the Resolution **175 (WRC-19)** and consequently is not compliant with Resolution ITU-R 2-8, Annex 1 (Working methods), § A1.2.8. Meanwhile, few Administrations support Alternative 1, which considers that Resolution **175 (WRC-19)** needs to be revised to continue conducting the studies requested by WRC-23 agenda item 9.1, topic c).

Based on the recent development of ITU-R studies under Agenda Item 9.1 topic c), below are the SSWG views under Agenda Item 9.1 topic C:

a. Support Approach 2 to address issue for the use of IMT technology using primary FS bands by updating appropriate existing ITU-R Recommendations/Reports/ Handbooks. There is no need to develop new regulatory provisions in the Radio Regulations and thus Agenda item 9.1 topic c) should not lead to any changes to the Radio Regulations.

b. Support Alternative 2 to address the issue of a response to the objectives of Resolution **175 (WRC-19)** reflecting the fact that there is no need to have any draft new or revised Resolution.

Agenda Item 9.2

on any difficulties or inconsistencies encountered in the application of the Radio Regulations; (limited to the Report of the Director of the Radiocommunication Bureau on any difficulties or inconsistencies encountered in the application of the Radio Regulations and the comments from administrations)

Issue – review of Article 21.5

*ITU-R is invited to study, as a matter of urgency, the applicability of the limit specified in **No. 21.5** of the Radio Regulations to IMT stations, that use an antenna that consists of an array of active elements, with a view to recommend ways for its possible replacement or revision for such stations, as well as any necessary updates to **Table 21-2** related to terrestrial and space services sharing frequency bands.*

*Furthermore, the ITU-R is invited to study, as a matter of urgency, verification of **No. 21.5** regarding the notification of IMT stations that use an antenna that consists of an array of active elements, as appropriate (WRC-19 Document 550)*

Radio Regulations **No. 21.5** sets a power limit for terrestrial stations to enable sharing frequency bands with space services above 1 GHz.

No. 21.5 states that 'The power delivered by a transmitter to the antenna of a station in the fixed or mobile services shall not exceed +13 dBW in frequency bands between 1 GHz and 10 GHz, or +10 dBW in frequency bands above 10 GHz, except as cited in **No. 21.5A**. (WRC-2000)'.

This issue is complex and historical in nature with the first work on this Article having taken place in the 1960s. It is apparent from the discussion in the ITU-R that some administrations would apply this limit to IMT stations using array antennas in a very liberal way, e.g. by applying the limit to each radiating element, rather than to the antenna as a whole. This misinterpretation would allow IMT stations to be deployed and notified with power many tens of dBs higher than previously assumed in ITU-R studies. Such a relaxation of the limit could cause interference to satellite uplinks many dBs higher than the protection criteria, ultimately preventing the long-term use of satellite services in the same bands.

Article **21.3** provides a limitation on the radiated power of fixed and mobile stations, an EIRP limit of +55 dBW. This limit is much too high to adequately protect satellite uplinks, which can be seen when this limit is compared with a typical EIRP of a FSS VSAT, which is typically around 50 − 55 dBW. Hence the interference level from a single fixed or mobile station, even if compliant with **No. 21.3**, could be at a level similar to and even higher than the wanted signal level. Hence **No. 21.3** provides no assurance of protection of satellite uplinks, leaving the **No. 21.5** limit as the only potential protection measure.

The SSWG is of the view that for deployment of fixed and mobile stations, including IMT, that use active antenna system (AAS) in bands shared with FSS uplink, particularly 24.25 – 29.5 GHz, should conform to Article 21.5 based on the 'total radiated power' (TRP), which is defined as the integral of the power transmitted from all antenna elements in different directions over the entire radiation sphere. The SSWG has strong concerns with the interpretation that the limit in Article 21.5 would only need to be met by the conducted power delivered to each active transmitting element within the AAS because this would potentially result in a greater interference power towards the satellite receiver. Such an interpretation, in the view of the SSWG, does not follow the guidance provided by chairmen of ITU-R Study Groups 4 and 5 that '*the preliminary results reached in WP 5D should not impact the protection of satellite services*'. For the 26 GHz band, in particular, we would support 200 MHz as the reference bandwidth, provided it was accompanied by an equivalent reduction in transmitted power for IMT systems with lower power, so as to ensure no increase in noise in the FSS receiver. The 200 MHz bandwidth was assumed in the ITU studies conducted before WRC-19, would provide adequate protection to satellite uplinks and would allow some margin for development of IMT technology.

The issue related to the application of Article 21.5 applies to all satellite uplink bands where fixed and mobile stations may use array antennas. While the current focus is on the 26 GHz band, it is clear that the same issue exists in other bands. Hence, the ITU will need to study the issue also for other bands .

The proper application of the ITU Article 21 limits is vital to the long-term use of satellite uplinks in certain bands, and Australia should prioritise finding an effective solution to this issue.

Agenda Item 10: Possible Future WRC Agenda Items

to recommend to the Council items for inclusion in the agenda for the next WRC, and to give its views on the preliminary agenda for the subsequent conference and on possible agenda items for future conferences, in accordance with Article 7 of the Convention

Proposal – Additional FSS (space-to-Earth) in 17.3-17.7 GHz in Region 3

The SSWG observes that there is a slight spectrum difference between uplink and downlink pairing in Ka band in Region 3. This results in less spectrum for downlink and particularly this issue is more critical for non-GSO that has 200 MHz less downlink spectrum than GSO due to restricted access to 18.6 – 18.8 GHz band as per No. 5.522B.

Considering that there has been positive progress for WRC-23 AI 1.19 that would likely gain access to 17.3 – 17.7 GHz downlink band for Region 2, whereas Region 1 already has this portion for downlink (under HDFSS, refer to No. 5.516B, since 2003), the SSWG supports this proposal for a new Agenda item that would expect to help Region 3 in gaining the same portion of spectrum for downlink similar to Regions 1 and 2, thereby providing a global harmonisation in the 17.3 – 20.2 GHz frequency range for downlink in the Ka band.

Proposal - Q/V Band GSO & non-GSO ESIM Study

The SSWG supports the inclusion of Resolution 176 (WRC-19) as one of the future WRC-27 agenda items and in addition, would like to extend the scope of ITU-R studies contained in Resolution **176 (WRC-19)**. Resolution **176 (WRC-19)** calls for studies on the use of the 37.5 – 39.5 GHz (space-to-Earth), 40.5 – 42.5 GHz (space-to-Earth), 47.2 – 50.2 GHz (Earth-to-space) and 50.4 – 51.4 GHz (Earth-to-space) frequency bands by aeronautical and maritime earth stations in motion communicating with geostationary space stations in the fixed-satellite service.

ESIM contribute to the United Nations Sustainable Development Goal 9 on industry, innovation, and infrastructure by connecting vessels, aircraft and land vehicles and ensuring their safety and security and that of their passengers, cargo, and systems. The ITU-R has addressed aeronautical and maritime earth stations in motion (ESIM) operating with GSO FSS satellites at several previous WRCs, which have adopted technical and regulatory regimes to allow such operations. In the Radio Regulations, Resolution **902 (WRC-03)**, and relevant parts of Resolutions **156 (WRC-15)** and **169 (WRC-19)** define technical and regulatory rules to allow GSO FSS networks to communicate with ESIM to provide broadband communications.

Advances in satellite manufacturing and earth station technology have made ESIM more widespread and more practical. Consequently, the utilisation of Ku and Ka-band frequency spectrum for providing ESIM connectivity is growing exponentially to meet user demands, which may lead to scarcity in spectral resources in these bands. On the other hand, the rapidly increasing use of non-geostationary satellite orbits (non-GSO), such as medium Earth orbits (MEO) and low Earth orbits (LEO), represents an important innovation in satellite technology enabled by enhanced satellite design, manufacturing and launch service capabilities. WRC-23 Agenda Item 1.16 aims to study and develop technical, operational and regulatory measures, as appropriate, to facilitate the use of the some of the frequency bands between 17.7 and 30 GHz by non-GSO FSS earth stations in motion, while ensuring due protection of existing services in those frequency bands, in accordance with Resolution **173 (WRC-19)**. Studies done under WRC-23 Agenda Item 1.16 indicate that the same frequency band can be used by both GSO and non-GSO systems to provide connectivity for ESIM.

While Resolution **176 (WRC-19)** was developed for GSO only, enhancements in antenna and terminal technology have enabled the usage of the 50/40 GHz frequency bands for both GSO FSS networks and non-GSO FSS systems. Non-GSO satellite constellations in these frequency bands enable the provision of broadband connectivity for a variety of

applications and with increased flexibility/security and decreased latency. More of such non-GSO systems are planned to be deployed to meet the increasing consumer demand for access to broadband connectivity, regardless of location. One service area of noticeable growth for non-GSO systems is to provide broadband connectivity to users on-board vessels and aircraft.

Technical and operational issues and regulatory provisions for the operation of non-GSO FSS satellite systems in these frequency bands to ensure protection of GSO satellite networks has been addressed in WRC-19 under Resolution **159 (WRC-15)** having as a result a stable regulatory framework developed through the new Resolutions 769 and 770 and provisions 22.5L and 22.5M of the Radio Regulations.

Therefore Resolution **176 (WRC-19)** is proposed for modification at WRC-23 to facilitate deployment of ubiquitous broadband connectivity to ESIM in the 37.5 – 39.5 GHz (space-to-Earth), 40.5 – 42.5 GHz (space-to-Earth), 47.2 – 50.2 GHz (Earth-to-space) and 50.4 – 51.4 GHz (Earth-to-space) frequency bands to enable and facilitate deployment of these services by ESIM communicating with both GSO and non-GSO satellites, while making sure that other allocated services are protected.

The SSWG supports this proposal for inclusion in the draft agenda for WRC-27. SSWG supports to extend the scope of Resolution 176 (WRC-19) to also address ESIM communicating with non-GSO space stations.

Proposal – IMT for 2030 and beyond

The SSWG noted that a draft proposal for a possible new WRC agenda item was discussed at the fourth meeting of APG-23 in August 2022 with interest expressed by the IMT community to study somewhere in the frequency range 7 to 24 GHz for new IMT identification. It was noted that this proposal was criticised at APG23-4 because it lacked justification.

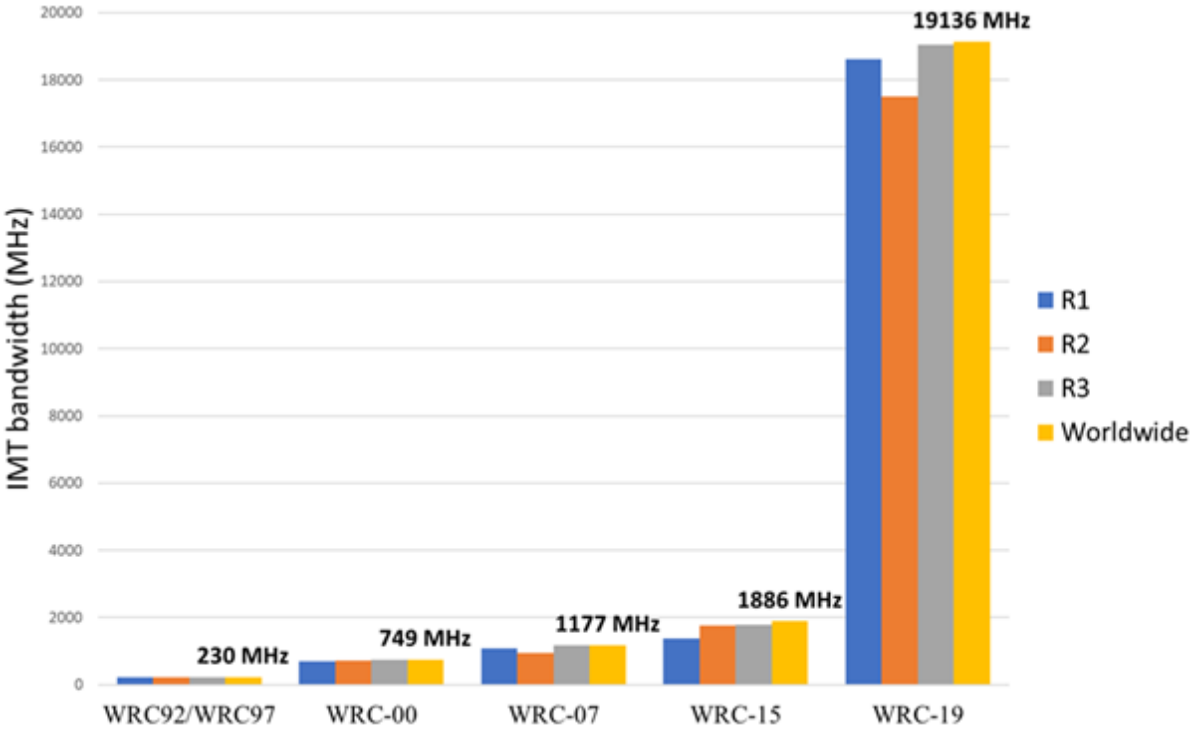
The SSWG opposes this proposal on the ground that IMT had identified more than 17 GHz of spectrum at WRC-19 in mm-Wave bands, and has already around 2 GHz of spectrum in lower bands. It is prudent that this spectrum should be utilised efficiently by IMT before seeking expansion to new frequency bands. There is a need to have a more pragmatic and balanced approach to start utilising and/or refarming what is available. Further reasons for SSWG's opposition of this proposal are given in Annex 1.

Moreover, the target band for study in the draft proposal lies in the 7 to 24 GHz frequency range, which is a large frequency range that covers many incumbent services including the heavily utilised core satellite band. Annex 2 provides the current and future usage by satellite services of the 7 to 24 GHz frequency range. The SSWG is of the view that the draft proposal should be justified with real demand for new IMT band that otherwise could not be fulfilled by bands already identified for IMT. In the absence of such justification, the draft proposal should be opposed.

Annex 1 - Proposal – IMT for 2030 and beyond

As detailed in this document under Agenda Item 10, 'Possible Future WRC Agenda Items', the SSWG believes that future IMT identification study proposals for the 7 to 24 GHz frequency range are not justified for the following reasons:

1) The chart below shows the total amount of spectrum identified for IMT for every WRC. The utilisation of this IMT spectrum needs to be addressed and assessed before asking for more IMT spectrum. Currently, there are still quite significant amounts of this spectrum (i.e. more than 18 GHz) that is identified for IMT and would need to be assessed whether it is being utilised and licensed. It is important to avoid spectrum warehousing since spectrum is a finite resource which needs to be used efficiently and effectively.



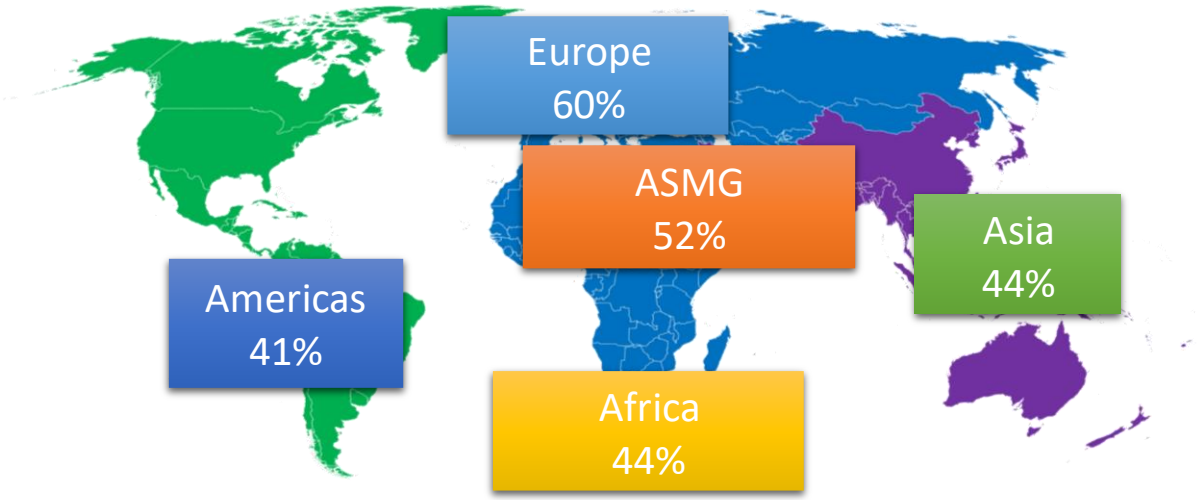
https://www.itu.int/en/ITU-R/seminars/rrs/2017-Africa/Documents/Plenary/03_%20WRC-15%20Outcomes.pdf

2) Referring to the outcome of WRC-19, there is already significant amounts of spectrum identified for IMT with a total of 17.25 GHz of which 14.75 GHz has been identified for IMT globally. In addition, during this WRC-23 study cycle, there is a total of 2.2 GHz of spectrum which will be considered for possible IMT identification in regional/global basis in Agenda Item 1.1 (WRC-23), Agenda Item 1.2 (WRC-23), and Agenda Item 1.5 (WRC-23)

3) The work on IMT-2030/6G vision including 6G detailed standards at WP 5D are expected to be completed by 2030 while the candidate radio-interface technology proposals are expected to be evaluated before then.

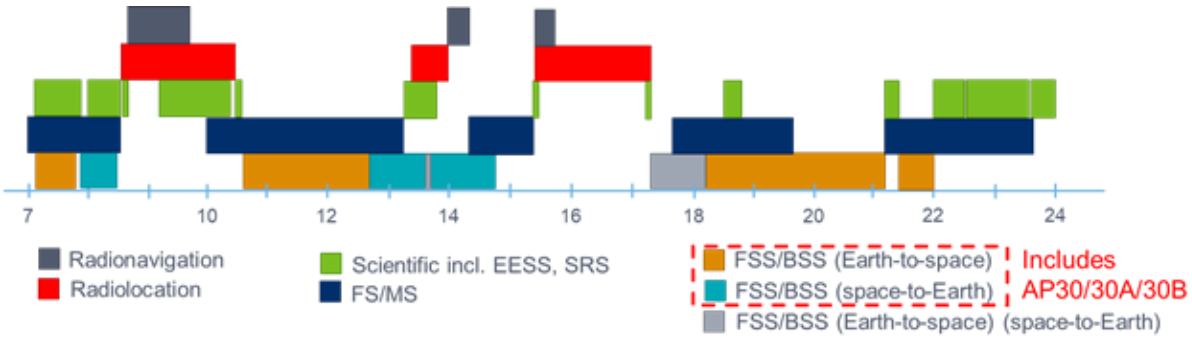
4) On average globally, only 50% of the available IMT identified spectrum below 5 GHz is licensed and the Asia Pacific region on average has only licensed/utilised 44% of the available IMT identified spectrum below 5 GHz. Refer to the LS Telcom study in the link and map below.

https://www.lstelcom.com/fileadmin/content/lst/marketing/media/2019_Study_LicensingUseofMobileSpectrum.pdf



5) As per the OFCOM discussion paper released this year (i.e. https://www.ofcom.org.uk/__data/assets/pdf_file/0017/232082/mobile-spectrum-demand-discussion-paper.pdf), OFCOM is of the view that current IMT/mobile spectrum bandwidth is broadly sufficient to meet future demand until 2030 with the greater level of uncertainty beyond 2030.

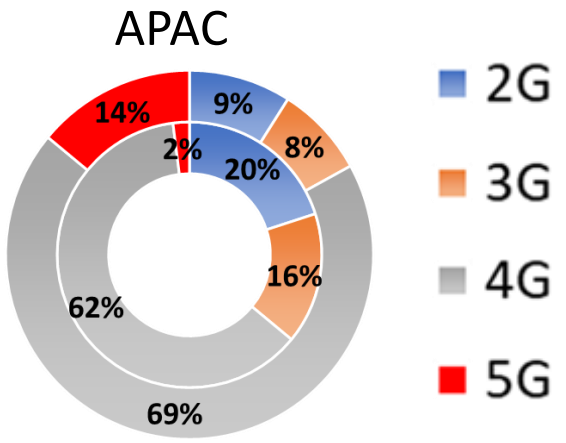
6) The chart below indicates all of the services currently in the 7 to 24 GHz frequency range on primary basis. The 7 to 24 GHz frequency range is congested with critical applications while as per current ITU-R studies and IMT deployment practices, IMT will require exclusive spectrum access and it is not feasible for IMT to co-exist in any significant extent with other primary services.



Spectrum in the 7-24 GHz range is congested with critical applications

7) As per GSMA website (GSMA | The Mobile Economy - The Mobile Economy), it is indicated (refer to the below chart) that 5G technology adoption rate in Asia Pacific region is only 14% by 2025. This slow evolution of 5G technology seems contrary to the high spectrum needs advocated by mobile industry.

   Meanwhile, 2G and 3G technology are expected to be in decline by 2025 and therefore, spectrum refarming would be a viable option that should be further considered.



Note: inner circle (2020) outer circle (2025)

Annex 2 - Current & Future Satellite Usage in the 7 – 24 GHz band

Frequency Range (GHz)	Region 1 Current Use	Region 2 Current Use	Region 3 Current Use	Future Trends
7.25 – 7.75	Government / military satellite networks as well as commercial use. Weather monitoring. Space Research. Radar applications. Maritime satellite terminals.		Military satellite networks.	Militaries around the world continue to rely on and operate in this band.
7.75 – 7.9				
7.9 – 8.025	Government / military and commercial use.			Militaries around the world continue to rely on and operate in this band.
8.025 – 8.400	Government / military and commercial use. Gateway downlinks for non-GSO Earth Exploration satellites. Small sats, including nano and pico sats.			Militaries around the world continue to rely on and operate in this band. In Region 3, current use is increasing.
8.4 – 10.0	Weather monitoring, air traffic control, maritime vessel traffic control, defence tracking and vehicle speed detection for law enforcement. Space Research and active radars on board non-GSO in the Earth Exploration Satellite Service.			
10 – 10.5	Weather monitoring, air traffic control, maritime vessel traffic control and active radars on board non-GSO in the Earth Exploration Satellite Service.			

10.7 – 10.95	Globally harmonised for FSS. Heavy usage by government and commercial operators by GSO networks and non-GSO systems. All ITU Member States given guaranteed access to their own orbital slots through ITU Appendix 30B Plan. These are permanently reserved for these member states to be used at any time they desire. Domestic satellite networks (VSAT, SNG, CBH, HEST, LEST, DTH, DTT, TVRO).	Globally harmonised for FSS All ITU Member States given guaranteed access to their own orbital slots through ITU Appendix 30B Plan. These are permanently reserved for these member states to be used at any time they desire. Government and commercial use. Domestic GSO satellite networks (VSAT, SNG, CBH).	Use of this band is intensifying with more Video via FSS to remain strong in many regions. Land, aero and maritime ESIMs to deploy. Expansion into High Throughput Satellites, incl. Software Defined Satellites (SDS). LEO systems to deploy.
10.95 – 11.2	Globally harmonised for FSS. This band is heavily used by GSO and non-GSO satellites for all type of satellite services. Domestic and international satellite networks, including High Throughput Satellites (VSAT, SNG, video distribution (incl. cable TV feeds and direct to home reception), mobile terminals (incl. aeronautical and maritime), CBH, emergency communications/ disaster relief).		The current use is expected to continue and grow and more focus on High Throughput Satellites, with increasing throughput, are expected. Video via FSS to remain strong, VSAT and other data networks important. Use of aeronautical and maritime mobile terminals well established over many years and use increasing with ESIMs. LEO systems to deploy (non-GSO satellite networks to co-exist with GSO through epfd limits)
11.2 – 11.45	Globally harmonised for FSS. All ITU Member States given guaranteed access to its own satellite capacity through ITU Appendix 30B Plan to be available to be used at any time they so desire. Government and commercial use by GSO networks and non-GSO systems. Domestic satellite networks (VSAT, HEST, LEST, SNG, CBH, DTH, DTT, TVRO).	Globally harmonised for FSS All ITU Member States given guaranteed access to its own GSO satellite capacity through ITU Appendix 30B Plan to be available to be used at any time they so desire. Government and commercial use.	Video via FSS to remain strong in many regions. Land, maritime, aero ESIMs to deploy. LEO systems to further deploy. Expansion into High Throughput Satellites, incl. Software Defined Satellites (SDS). Market for current applications expected to grow.

			Domestic GSO satellite networks (VSAT, SNG, CBH). non-GSO satellite networks co-existing with GSO through epfd limits.	
11.45 – 11.7	Globally harmonised FSS. This band is heavily used by GSO and non-GSO satellites for all type of satellite services. Domestic and international satellite networks, including High Throughput Satellites for VSAT, HEST, LEST, SNG, video distribution (incl. cable TV feeds and direct to home reception), mobile terminals (incl. aeronautical and maritime terminals), CBH, emergency communications/ disaster relief).			The current use is expected to continue and grow and more focus on High Throughput Satellites, with increasing throughput, are expected. Video via FSS to remain strong in many regions, VSAT and other data networks important in some regions, Use of aeronautical and maritime mobile terminals well established over many years and use increasing with ESIMs. LEO systems to deploy (non-GSO satellite networks to co-exist with GSO through epfd limits).
11.7 – 12.2	Globally harmonised for satellites use. Heavily used for DTT, DTH, non-GSO FSS and FSS-like services, including aero mobility, maritime, network services, broadband, enterprise, trunking, VSAT and CBH. AP30/30A downlink – equitable access planned band (BSS).	Globally harmonised for satellites use. Heavily used as primary FSS band for GSO and non-GSO in the Americas including DTT, DTH, blanket licensing for aero mobility, maritime connectivity, broadband, enterprise, trunking, VSAT, CBH.	Globally harmonised for satellites use. All ITU Member States given guaranteed access to its own satellite capacity through ITU Appendix 30 Plan to be available to be used at any time they so desire. Predominantly domestic government and commercial use (depending on country). TV and radio broadcast (cable TV feeds and direct to hope reception) and associated feederlinks. Heavily NGOS FSS and FSS-like services, including aero mobility, maritime, network	BSS Video to remain strong in many regions. Land, aero, maritime ESIMs to deploy using LEO systems. Software Defined Satellites (SDS). Market for current applications expected to grow. Further expansion of HTS in Region 2.

			services, broadband, enterprise, trunking, VSAT and Backhaul.	
12.2 – 12.5		Used for DTH, GSO and non-GSO FSS and FSS-like services, including blanket licensing for aero mobility, maritime, network services and CBH. AP30/30A downlink – equitable access planned band (BSS).	Heavily used by GSO and non-GSO satellites for all type of satellite services. non-GSO satellite networks co-existing with GSO through epfd limits.	BSS Video to remain strong in many regions, Aero ESIMs to deploy, LEO systems to deploy. Use of High Throughput Satellites, incl. Software Defined Satellites (SDS).
12.5 – 12.75	Globally harmonised for satellites use. Primary Ku downlink band heavily used by GSO and non-GSO satellites for all type of satellite services, incl. for VSAT, HEST, LEST, SNG, video distribution (cable TV feeds and direct to home reception), mobile terminals (incl. aeronautical and maritime terminals), CBH, emergency comms/ disaster relief).			For FSS, current use is expected to continue and grow and more focus on High Throughput Satellites, with increasing throughput, are expected. Video via FSS to remain strong in many regions, VSAT and other data networks important in some regions, Use of aeronautical and maritime mobile terminals well established over many years and use increasing. Use of High Throughput Satellites, incl. Software Defined Satellites (SDS).
12.75 – 13.25	Globally harmonised for FSS. All ITU Member States given guaranteed access to its own satellite capacity through ITU Appendix 30B Plan to be available to be used at any time they so desire. Government and commercial use by GSO networks and non-GSO systems. Domestic satellite networks (VSAT, HEST, LEST, SNG, CBH).		Globally harmonised for FSS. All ITU Member States given guaranteed access to its own GSO satellite capacity through ITU Appendix 30B Plan to be available to be used at any time they so desire. Government and commercial use. Domestic GSO satellite networks (VSAT, SNG, CBH).	Planned use for IFC and maritime. Video via FSS to remain strong in many regions, Land, aero and maritime ESIM to deploy. Expansion into High Throughput Satellites, mobile terminals (incl. aeronautical and maritime). Software Defined Satellites (SDS) and LEO systems to further deploy – noting that non-GSO satellite networks to co-exist with GSO through epfd limits.
13.25 – 13.4	-	-	-	-

13.4 – 13.65	FSS downlink only.			New FSS band since 2015 – new satellites designed with this band.
13.65 – 13.75	-			-
13.75 – 14.0	Globally harmonised for FSS. Military/NATO use in the 13.75-14 GHz band for radar applications. Global uplink band for GSO/non-GSO use. FSS government and commercial use for feeder links, Gateways, backhaul, VSATS.			Revise current ITU radio regulation to alleviate operational limitations. Extend mobility applications.
14.0 – 14.5	Globally harmonised for FSS. Primary Ku uplink band globally – used heavily by thousands of GSO and non-GSO satellites for all types of services.			Heavy use by all FSS/MSS applications. Use of mobile terminals, including aeronautical and maritime mobile terminals, well established over many years and use is increasing. Increased use of High Throughput Satellites, incl. Software Defined Satellites (SDS).
14.5 – 14.8	Feeder links for BSS AP30/30A uplink – equitable access planned band (feeder link BSS).	FSS use with limitation on antenna size in a number of countries.	Some countries including in high rain-rate areas are given guaranteed access to BSS feederlinks through ITU Appendix 30A Plan. In other countries, ITU Radio Regulations also open up for FSS uplinks other than BSS feeder links. Predominantly domestic government and commercial use (depending on country) for BSS feederlinks.	Opened up for new FSS applications since 2015 – new satellites designed with this band .
14.8 – 15.35	-	-	-	-
15.35 – 17.3	-	-	-	-
17.3 – 17.7	BSS feederlinks & FSS downlinks.	BSS feederlinks & DTH downlinks.	BSS feederlinks (ITU Appendix 30A Plan) in 17.3-18.1 GHz range.	New FSS downlink allocation in Region 2 to be decided at WRC-23.

	AP30/30A uplink – equitable access planned band (BSS).	AP30/30A uplink – equitable access planned band.		Use increasing and more non-GSO systems using the band. Expected heavy use for HTS and broadband. BSS video and associated feederlinks to remain strong.
17.7 – 17.8	High Throughput Satellites, GSO and non-GSO co-existing through coordination procedures (broadband connections, VSATs, land, maritime and aeronautical ESIMs. Feeder (Gateway) downlinks. Government and commercial use. AP30/30A uplink – equitable access planned band (BSS).		BSS feederlinks (ITU Appendix 30A Plan) in 17.3-18.1 GHz range. High Throughput Satellites, GSO and non-GSO co-existing through epfd limits. (broadband connections, VSATs, land, maritime and aeronautical ESIMs). Government and commercial use.	Further development of current use, including GSO High Throughput Satellites with increasing capacity, ESIMs (land, maritime and aeronautical), and more non-GSO systems using the band with increasing number of satellites in constellations. BSS video and associated feederlinks also to remain strong.
17.8 – 18.1	High Throughput Satellites, GSO and non-GSO co-existing through coordination procedures (broadband connections, VSATs, land, maritime and aeronautical ESIMs). Government and commercial use. AP30/30A uplink – equitable access planned band.	High Throughput Satellites, GSO and non-GSO co-existing through epfd limits (broadband connections, VSATs, land, maritime and aeronautical ESIMs). Government and commercial use.	BSS feederlinks (ITU Appendix 30A Plan) in 17.3-18.1 GHz range. High Throughput Satellites, GSO and non-GSO co-existing through epfd limits. (broadband connections, VSATs, land, maritime and aeronautical ESIMs). Government and commercial use.	Further development of current use, incl. GSO High Throughput Satellites with increasing capacity, ESIMs (land, maritime and aeronautical), and more non-GSO systems using the band with increasing number of satellites in constellations. BSS video and associated feederlinks also to remain strong.
18.1 – 18.8	High Throughput Satellites, GSO and non-GSO co-existing through epfd limits (broadband connections, VSATs, land, maritime and aeronautical ESIMs. Feeder (Gateway) downlinks. Government and commercial use.			Further development of current use, incl. GSO High Throughput Satellites with increasing capacity, ESIMs (land, maritime and aeronautical), and more non-GSO systems using the band with increasing number of satellites in constellations.
18.8 – 19.3	High Throughput Satellites, GSO and non-GSO co-existing through coordination procedures (broadband connections, VSATs, land, maritime and aeronautical ESIMs. Feeder (Gateway) downlinks. Government and commercial use.			Further development of current use, incl. GSO High Throughput Satellites with increasing capacity, ESIMs (land,

				maritime and aeronautical), and more non-GSO systems using the band with increasing number of satellites in constellations.
19.3 – 19.7	High Throughput Satellites, GSO and non-GSO co-existing through coordination procedures (broadband connections, VSATs, land, maritime and aeronautical ESIMs. Feeder (Gateway) downlinks. Government and commercial use.			Further development of current use, incl. GSO High Throughput Satellites with increasing capacity, ESIMs (land, maritime and aeronautical), and more non-GSO systems using the band with increasing number of satellites in constellations.
19.7 – 20.2	High Throughput Satellites, GSO and non-GSO co-existing through epfd limits (broadband connections, VSATs, land, maritime and aeronautical ESIM. Feeder (Gateway) downlinks. Government and commercial use.			Further development of current use, incl. GSO High Throughput Satellites with increasing capacity, ESIMs (land, maritime and aeronautical), and more non-GSO systems using the band with increasing number of satellites in constellations.
20.2 – 21.2	Government/military satellite networks. Fixed and mobile terminals: in all three regions.			
21.2 – 21.4	-			-
21.4 – 22	BSS downlinks.	-	BSS downlinks.	Definitive regulatory provisions for BSS in this band was not established until at WRC-12. Few satellites still to use this band.
22.55 – 23.55	Allocation for Inter-satellite links.			Links between LEO satellites and between LEO satellites and GSO satellites.
22 – 23.6	-			-
23.6 – 24	-			-

Abbreviations:

DTH	Direct To Home
DTT	Digital Terrestrial Television
CBH	Cellular Backhaul
HEST	High E.I.R.P Satellite Terminals
IFC	In-flight connectivity
LEST	Low E.I.R.P Satellite Terminals
HTS	High Throughput Satellite
SDS	Software Defined Satellite
ESIM	Earth Station in Motion
VSAT	Very Small Aperture Terminal
TVRO	Television Receive Only
SNG	Satellite News Gathering

Communications Alliance Satellite Services Working Group membership

Amazon Web Services
EchoStar Global Australia
Foxtel
FreeTV
GVF
Inmarsat
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