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SATELLITE SERVICES WORKING GROUP

SUBMISSION
to the

Australian Communications and Media Authority's (ACMA)

Draft Five-year spectrum outlook 2023–28 and 2023–24 work program

12 May 2023

CONTENTS

INTRODUCTION

The Communications Alliance Satellite Services Working Group (SSWG) welcomes the opportunity to provide this submission in response to the Australian Communications and Media Authority's *Five-year spectrum outlook 2023–28 and 2023–24 work program* Draft for consultation (the *draft FYSO*).

The SSWG thanks the ACMA for the opportunity to comment on this year's draft FYSO work plan and believes this is one of the most valuable spectrum planning initiatives the ACMA has embarked on.

The ACMA faces a considerable challenge in accommodating the increasingly diverse and often conflicting demands for finite spectrum resources in its spectrum management program. The draft FYSO provides helpful insight into the ACMA's forward spectrum planning for the period 2023-28 and the manner in which the ACMA seeks to meet this challenge and implement Government policy priorities, including through its 2023–2024 work program.

Satellite communications are rapidly evolving and play an increasingly important role in meeting Australia's communications needs. Ensuring spectrum of sufficient quantity and quality is available to satellite operators will be essential to realising the public benefits of satellite services to Australia. This has been recognised by the Government, including through recent statements of the Minister for Communications and in the ACMA's own Statement of Intent.[1] The SSWG welcomes the priority afforded to satellite communications in the draft FYSO.

The ubiquity of satellite coverage enables satellite operators to cater to a wide variety of users, traditionally in areas not served by terrestrial networks. Rapid satellite network deployments and recent advances in spacecrafts and service performance will enable satellite technologies to cater to even broader market demand in the future. The draft FYSO notes that satellite technology and the market remain highly dynamic and SSWG welcomes confirmation that 'Australia's spectrum management framework is well placed to accommodate these developments.'[2]

From a policy perspective, satellite services can provide immediate support to delivering the Government's communications objectives relating to 'Closing the Gap' and enhanced regional connectivity and development. The deployment of new technologies, such as 'direct to mobile handset', present the Government with a real opportunity to reform outdated regulatory arrangements relating to the Universal Service Obligation (USO) and redirect this funding to support satellite-based services.

The SSWG encourages the ACMA and the Government more broadly to maintain and expand the momentum started by the establishment of the LEOSat Working Group to investigate where and how satellite services can best meet the communications needs of Australians. The SSWG understands that the ACMA must have regard to domestic and international trends affecting spectrum use in preparing its spectrum plans. The SSWG supports the ACMA's continued proactive engagement through the ITU and other international fora to prosecute the case for the identification of spectrum use that supports satellite services in Australia.

The SSWG welcomes a light touch regulatory framework to support the entry and take up of satellite services. However, the SSWG would encourage the ACMA to ensure that the benefits of lower administrative burden are weighed against the need for transparency and

[1] Minister Rowland quoted in *CommsDay* 3 May 2023, p.8 and ACMA Statement of Intent, p.2
[2] Draft FYSO, p.16

accountability in spectrum use that aids cooperation and timely and effective coordination among satellite operators and with non-satellite communications services providers. In this context, SSWG would welcome greater clarity as to the regulatory criteria that may inform co-existence decision-making and notions of changing 'optimal use'.

This targeted submission focuses on those areas of the draft FYSO that the SSWG members consider affect satellite interests and warrant further consideration by the ACMA. In summary, the SSWG suggests that the ACMA:

1. Maintain a position for WRC 23 agenda items that are supportive of satellite services.
2. Move the 13 GHz and 40/46/47 GHz bands to the initial investigation stage.
3. Progress the review of the 1.5 GHz band and the Extended MSS L-band to the preliminary replanning stage.
4. Recognise the importance of 7 – 24 GHz for satellite services where satellite operators are already struggling to accommodate the growing service demand while sharing spectrum among themselves.
5. Undertake planning to extend the ACMA's existing self-coordinated light-licencing framework for the 70/80 GHz band to support the early introduction of satcom services in this band in Australia.
6. Not introduce 'interference protection pricing' to satellite receiver apparatus licences.

The SSWG members would welcome the opportunity to discuss this submission in further detail with the ACMA if and when required.

This submission does not necessarily represent the views of Telstra, who is lodging its own submission.

About Communications Alliance

Communications Alliance is the primary communications industry body in Australia. Its membership is drawn from a wide cross-section of the communications industry, including carriers, carriage and internet service providers, content providers, platform providers, equipment vendors, IT companies, consultants and business groups.

Its vision is to be the most influential association in Australian communications, co-operatively initiating programs that promote sustainable industry development, innovation and growth, while generating positive outcomes for customers and society.

The prime mission of Communications Alliance is to create a co-operative stakeholder environment that allows the industry to take the lead on initiatives which grow the Australian communications industry, enhance the connectivity of all Australians and foster the highest standards of business behaviour.

For more details about Communications Alliance, see http://www.commsalliance.com.au.

Part 2: 2023 – 24 Annual Work Program

1 Monitoring stage

Bands being studied under WRC-23 agenda item 1.2

The SSWG notes that this agenda item is examining the possibility of *identifying* five frequency bands for International Mobile Telecommunications (IMT). Only one of the five bands, 7025 to 7125 MHz, is being considered for possible IMT identification in Region 3 (and therefore for Australia), while the adjacent 6425 to 7075 MHz band is under consideration for a possible IMT *identification* in Region 1.

With regard to the possibilities of IMT identification in other frequency bands in other Regions, the SSWG is of the view that Australia should consider the impact of such possible IMT identifications to existing services in Region 3. Therefore, the SSWG opposes the possible IMT identification for the other frequency bands which are not intended for Region 3, since it is out of scope of WRC-23 Agenda Item 1.2.

13 GHz (12.75 – 13.25 GHz)

Today, Earth Stations In Motion (ESIM) are being used around the world by airlines on commercial and private planes, by the maritime sector on cargo, tanker, ferry and passenger vessels, and land transportation on trains, buses, and other motor vehicles. The increasing demand from airline and cruise passengers, government and enterprise sectors is resulting in a rapid growth for broadband connectivity demand for in-flight and cruise ship use.

As indicated in the draft FYSO 2023-28, the 12.75 – 13.25 GHz band is the frequency band being considered under WRC-23 agenda item 1.15. The SSWG supports Australia's view to establish a new ITU-R regulatory framework (including technical and operational requirements) that improves the efficiency of use of the 12.75 – 13.25 GHz band by facilitating Aeronautical Earth Stations in Motion (A-ESIM) and Maritime Earth Stations in Motion (M-ESIM) to use the frequency band. The framework for this type of ESIM use must ensure protection of services allocated in the 12.75 – 13.25 GHz band and should not impact the usability of the allotments in the Appendix 30B Plan, and assignments in the List under Appendix 30B of the Radio Regulations.

The SSWG supports the current Australian views under WRC-23 Agenda Item 1.15 and supports the continuation of Australia's active role to the development of ITU-R study under WRC-23 Agenda Item 1.15 through international meetings (i.e. WP 4A meetings & WRC-23) and regional meetings (i.e. APG23 meetings). Therefore, the SSWG would encourage the ACMA to support the completion and adoption of the regulatory framework at WRC-23, and their consequent regulatory introduction into Australia. Noting the comments in this section, the SSWG would encourage the ACMA to consider moving this band into the 'Initial investigation stage' after WRC-23.

40 GHz (37 – 43.5 GHz), 46 GHz (45.5 – 47 GHz), 47 GHz (47.2 – 48.2 GHz)

As the ACMA mentioned in this draft FYSO, it is aware of interest from the satellite industry for access to this and the adjacent 48.2 – 50.2 GHz and 50.4 – 52.4 GHz bands. The SSWG would like to further update the ACMA that some satellite operators have imminent plans to use these and the adjacent 48.2 – 50.2 GHz and 50.4 – 52.4 GHz bands between gateway stations in Australia, geostationary (GSO) satellites and non-GSO satellites. This may include uncoordinated class licence and coordinated earth station use.

Australia provided an input to APG23-5 for APT members to consider a preliminary agenda item for WRC-27 to study and develop technical, operational and regulatory measures, to facilitate the potential use of the frequency bands 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) by aeronautical and maritime earth stations in motion (A-ESIM and M-ESIM) communicating with geostationary and non-geostationary space stations in the fixed satellite service,

Examples of other countries and regions allocating the bands 37.5 – 43.5 GHz, 47.2 – 50.2 GHz and 50.4 – 51.4 GHz for fixed satellite service (FSS):

- In Europe, the Electronic Communications Committee (ECC) has published its decision for the use of bands 47.2 – 50.2 GHz and 50.4 – 52.4 GHz by the FSS (Earth-to-space)[3], and bands 37.5 – 39.5 GHz and 39.5 – 40.5 GHz by FSS (space-to-Earth)[4]. This is to facilitate the high-density fixed satellite service (HDFSS) intended to be deployed on an uncoordinated basis for direct customer access within the frequency range 37.5 – 40.5 GHz, 47.2 – 50.2 GHz and 50.4 – 52.4 GHz, for very high data throughput on satellite systems to provide necessary backhaul capabilities for broadband connectivity for aircraft and vessels. The FSS gateway stations also utilise these frequency bands for feeder links. There is also new decision currently being developed for the use of band 40.5 – 43.5 GHz, for mobile/fixed communication networks (MFCN) and coordinated earth stations.

- In the United States, there is exclusive FSS spectrum in the Region 2 for HDFSS in the 48.2 – 50.2 GHz band, through footnote in ITU Radio Regulation (RR) No. 5.516B. The FSS gateways are permitted to operate in this band[5]. The Q/V bands are made available for FSS use in geographic areas.

Since a number of satellite operators already have plans for these bands in Australia, the SSWG would request that the adjacent bands be included in the FYSO Work Plan and serious consideration be made to move the consideration of these bands into the 'Initial investigation stage'.

While the bands above 37.5 GHz were identified at WRC-19 for IMT, some recent developments should give regulators cause for thought on any new IMT bands above 4.0 GHz:

- Firstly the (then) acting FCC Chair questioned the viability of mmWave spectrum[6] to support 5G services. Given the recent allocation of the 26 GHz band, the ACMA should not embark on any further disruptive 5G allocations above 4.0 GHz.

- In any case, 5G (IMT) can be disruptive when it enters a spectrum environment. Vendors and operators often expect 'clear' spectrum. Higher bands do not look as useful for mobile coverage, but do provide viable spectrum for space services, particularly FSS. The ACMA should not proceed to allocate any further space service bands to IMT, at least until current spectrum in low/mid bands are fully utilised.

[3] CEPT ECC Decision (21)01, https://docdb.cept.org/download/3733.
[4] CEPT ERC Decision (00)02, https://docdb.cept.org/download/3724.
[5] Reference to Section 25.136 of the FCC's rules.
[6] Rosenworcel's MWC appearance hints at shifting spectrum policy. LightReading. 5G and beyond. https://www.lightreading.com/5g/rosenworcels-mwc-appearance-hints-at-shifting-spectrum-policy/d/d-id/775691

The SSWG understands, however, that the ACMA is aware of commercial and technical justifications for real deployment of satellite systems using these frequency ranges in the Q/V bands. In addition, the Minister for Communications recently convened the *LEOSat Working Group* which is aimed at looking at the benefit that can be gained via high throughput satellite technologies, especially in the area of digital inclusion.

The high gain, narrow beamwidth directional nature of Q/V band antenna beams, together with high elevation angles for transmitting to satellites, results in small coordination zones that facilitates sharing with FS.

With the aim of providing high capacity means of communication, even to the most isolated regions, these Q/V bands are vital for the future development of satellite services. A large number of satellite network filings has been submitted to the ITU containing these Q/V bands. At present, tens of Q/V-band satellites have been manufactured and plans are underway for future satellites intending to use these bands for gateway links and possibly for user terminals as well.

The SSWG requests that the ACMA preserve these Q/V bands for space services and other services that successfully share these bands.

2 Initial investigation stage

6 GHz (5925 – 7125 MHz)

The SSWG understands the ACMA's desire to maximise the economic return from this spectrum, via the possible introduction of new terrestrial technologies, but underlines the importance that this is done in a way that fully takes into account the Fixed Satellite Service (FSS) use of the band. For example, in the 6425 to 7125 MHz ('upper 6 GHz') portion of the band, which is still in the early stages of replanning, the SSWG members that operate Earth-to-space links and/or space-to-Earth links see difficulties in sharing these links with new primary wide area terrestrial services. Most SSWG members are of the view that sharing with a secondary service would be preferable. This view is not shared by all SSWG members.

If the ACMA decided to *identify* part of the upper 6 GHz frequency range for terrestrial IMT in Australia when replanning the band 6425 – 7125 MHz, there could be challenges in achieving harmonious sharing between FSS uplinks and the terrestrial IMT services; as indicated in studies submitted in relation to WRC-23 Agenda 1.2 including that by the Global Satellite Operators Association (GSOA).

Furthermore, noting that some administrations are currently proceeding to accommodate WAS/RLANs in the band, we note that sharing with a secondary service, potentially using AFC will be far more feasible. In this regard, most SSWG members are of the view that sharing between WAS/RLANs with appropriate technical conditions and FSS uplinks would allow continued licensing of other co-primary services such as feeder downlinks in the MSS. On the other hand, most SSWG members are of the view that IMT use in any part of the 6425 to 7125 MHz band will likely be achieved via exclusive spectrum licensing and is likely to restrict further FSS licensing in Australia and should be opposed. However, we have some concerns that smaller WISP operators may not fully understand the requirements. Therefore, we urge the ACMA to carefully monitor RLAN deployment to ensure FSS downlinks including MSS feeder links are fully protected.

The above notwithstanding, the SSWG supports allocating the entire 1200 MHz to RLANs as soon as practical with the following caveats:

- that RLAN (Wi-Fi) systems are not granted any protection from satellite earth station transmitters;
- to ensure protection of space station receivers, RLAN use is limited to 'low power indoor' and 'very low power' applications, with power limits no higher than those in the lower 6 GHz band; and
- to ensure full protection of the terrestrial receivers of MSS feeder links

The SSWG will continue to monitor developments on the upper 6 GHz frequency range regionally and internationally and the SSWG looks forward to participating in the ongoing re-planning work on the upper 6 GHz portion of this important band and anticipates providing further input on the difficulties of sharing FSS links with new terrestrial applications during the planned consultation phase in Q2, 2024.

3 Preliminary replanning stage

1.5 GHz (1427 – 1518 MHz)

The SSWG supports the ACMA in progressing the review of the 1.5 GHz band to the preliminary replanning stage. The extended MSS L-band (1518 – 1559 MHz and 1668 – 1657 MHz) have been allocated to MSS in all ITU regions and are used by GSO systems globally. The IMT signals operating in the range of 1492 – 1518 MHz have potential impact on MSS operating in the adjacent band 1518 MHz. Many MSS applications are used for disaster relief and safety purposes, and hence the SSWG would recommend that the ACMA consider allocating initially only the 1427 – 1492 MHz band for IMT, in order to minimise the interference impact to the MSS terminals and noting that, in general, there remains little demand from the mobile industry for use of this band.

Extended MSS L-band (1518 – 1525 MHz and 1668 – 1675 MHz)

The SSWG supports the ACMA in progressing the review of the extended MSS L-band to the preliminary replanning stage. Satellites which make these bands available for MSS in Australia are now in orbit. Terminals that are capable of using these bands are already in use by MSS L-band users in Australia which currently are limited to operate only in the standard L-band (1525 – 1559 MHz and 1626.5 – 1660.5 MHz).

The systems using L Band, including Iridium and Inmarsat provide high value services including safety of life to Australians throughout the Commonwealth and in the waters around it. It is vital to protect these services from interference generated by city based IMT services.

Access to the extended L-band in Australia is important to L-band operators in the SSWG, to address the growing demands on capacity and applications from emergency responders, military users and diverse industries, including the transportation, energy, and agriculture sectors. To allow MSS L-band users in Australia to fully utilise their current and future terminals, the SSWG would encourage the ACMA to expedite the allocation of this band for MSS in Australia. The SSWG notes that the ACMA has decided to release an Options Paper for the extended L-band (1518 – 1525 MHz and 1668 – 1675 MHz) for mobile satellite service (MSS) in Q2 2023. The SSWG looks forward to the consultation paper and will provide feedback.

4 Implementation stage

2 GHz (1980 – 2010 MHz and 2170 – 2200 MHz)

The SSWG supports the ACMA decision to proceed with licensing the 1980 – 2005 / 2170 – 2190 MHz bands (S-band) so that MSS operators can provide important and innovative mobile satellite services (MSS) to all Australians.

A combination of space based MSS services and a Complimentary Terrestrial Component (CTC) in the same bands will provide seamless connectivity everywhere while providing enhanced services to small remote communities. Attaining true digital inclusion depends on the flexibility offered by the combination of delivery modes available and the SSWG urges the ACMA to not building any unnecessary regulatory burdens and to fully explore all sharing options at the band edges so as to not limit the potential of these systems.

The SSWG also supports making additional spectrum in the L-band available for MSS, as the ACMA has proposed. In addition, the SSWG urges the ACMA to consider making additional MSS spectrum available in the near future and support such efforts at this year's 2023 World Radiocommunication Conference (WRC-23) as a future agenda item for WRC-27.

In particular SSWG urges the ACMA to consider the bands 2010 – 2025 MHz and 2160 – 2170 MHz and/or 2200 – 2215 MHz with an open mind. While these bands are already in use for terrestrial or other services in Australia, they leave a huge area in the bush unserved, an area that MSS could service with no impact on the terrestrial networks but with great benefit to the people who live 'out in the bush'.

MSS, in both the L and S-Bands, provide ubiquitous services which complement terrestrial systems and can ensure seamless communications anywhere and anytime. Not only does MSS provide voice communications but it can also support IoT services and is vital for safety of lives and provide service when terrestrial networks may be down, such as after a major cyclone or other disaster.

Based on the foregoing, the SSWG is fully supportive of the ACMA proposal to make the S-band available in the 2024/2025 timeframe. This will make global spectrum available for innovative MSS services and connectivity. In addition, making the additional spectrum proposed in the L-band spectrum will further advance services such as IoT and Direct-to-Device (D2D) in the near term.

As the ACMA begins its analysis of allocation methods for S-band MSS spectrum, it is important that the ACMA looks at licensing methods other than auctioning. Auctions for satellite spectrum do not make economic or practical sense.

For economies of scale, it is vital when seeking to deliver ubiquitous services at an affordable price point, MSS operators must seek allocations in many Administrations globally. The complexity of multiple licensing regimes is costly, but auctions bring about another level of uncertainty, and thus cost, to the global licensing model.

Where government priority is digital inclusivity, particularly for Australia's most remote and thus geographically disadvantaged people, auctioning spectrum may find services become too expensive for these potential consumers, or worse, unavailable. Auctions may be economically efficient for terrestrial services where there is high demand for spectrum in highly populated areas, and operators have flexibility to use different blocks. However, auctions are not suitable for use in sparsely populated parts of the country or when a global allocation is needed.

Instead, the ACMA should adopt a licensing approach that is reasonable and looks to ensuring that licensee has the capabilities to build out its network, including economically. The first step for this is for the ACMA to consider a flexible approach to the S and L-bands that would allow MSS providers to provide the service that they provide in other countries in Australia as well. A second step would be to adopt a reasonable licensing fee that takes into account the social value of servicing unserved populations.

Similarly, ACMA should seek comment on a number of areas that should be required to be an operator. These include:

- the applicant being an Australian legal entity;
- the applicant (or its Parent) having experience as an MSS operator;
- the applicant having Australia-wide coverage by a given date; and
- the applicant to have at least one device available for sale in Australia within a given period following satellite deployment.

Further, the SSWG also urges the ACMA to make sufficient spectrum available for each S-band licensee. Because 3GPP systems require paired 5 MHz blocks, the SSWG urges that the ACMA make available the 2 x 25 MHz of spectrum to support at least two operators, and prevent spectrum hoarding by capping the maximum amount of spectrum able to be acquired by any one operator at 2 x 15 MHz. The flexibility for MSS operations to adjust as demand increases is particularly important as D2D services are being implemented by a variety of MSS operators.

As has been recognised by the ACMA, the existing MSS S and L-band allocations are not sufficient to support the capacity that would be required to deliver the 3GPP- 5G NTN (Non-Terrestrial-Network) services or 6G NTN services in the future. In fact, estimates for MSS spectrum requirements are around another 20 MHz (paired) globally. Accordingly, we urge ACMA to support a possible WRC-27 agenda item proposal on the allocation of additional MSS spectrum for bands below 5 GHz. We urge the ACMA to not restrict such a proposal to technical limits such as use or power limits (which contributed to the complication of WRC-23 Agenda item 1.18), but to support a generic MSS allocation that individual administrations can then licence for whatever service or application that serves its needs. As the ACMA itself has recognised itself in the S-band, administrations are best qualified to make such determinations and 'full' MSS systems are capable of supporting narrowband applications such as IoT. Allocating spectrum solely to narrowband applications may result in denial of more traditional robust mobile satellite services to those that need them most.

It is the view of the SSWG that MSS is by far the best way to provide 'everywhere' mobile telephone and IoT services in Australia and to ensure everyone has access to these regardless of where they live or work. The SSWG supports the decision of the ACMA to proceed with allocating the S-Band MSS spectrum. We ask that this be done as one 15 MHz pair and one 10 MHz pair so as to meet 3GPP spectrum bands, or as 2 x 5 MHz increments up to 15 MHz to fit the minimum requirements of 3GPP. We also ask that the ACMA take into consideration the need for a global allocation to maximise economies of scale and the fact that auctioning these bands may threaten that or indeed result in unaffordable services or worse, no services at all.

3.4 – 4 GHz

Several SSWG members operate C-band gateway and ubiquitous FSS receive earth stations in metropolitan and other areas of Australia to support the maritime, mining, energy, defence, telecommunications and government industries. These gateways and ubiquitous FSS receive earth stations have been providing vital communication links for decades to

remote and regional areas in Australia and the Asia Pacific, especially in tropical and oceanic areas, often where no other telecommunications options are available.

The SSWG continues to have significant concerns with regards to ongoing access to satellite C-band downlink spectrum in Australia with the planned introduction of Wireless Broadband (WBB) Australia-wide into the 3.4 – 4.0 GHz band which we have raised on a number of occasions through submissions to ACMA consultation papers.

Contrary to the draft FYSO comments on this band, uncertainty still surrounds the future of the C-band gateway and ubiquitous FSS receive earth stations in metropolitan and regional areas. The ACMA is planning to release its public consultation document that will impact these earth stations in (late?) Q2 2023 with AWL licences for LA WBB and future licences for FSS earth stations being introduced in Q1 2024.

Major concerns are:

- The treatment of 'incumbent' licensed FSS receive earth stations when LA WBB services are licensed in the 3750/3800 – 4000 MHz band. Since 22 July 2020, new and varied licences in the 3700 – 4000 MHz range Australia-wide have been subject to Embargo 78, with exemptions granted at the discretion of the ACMA. The understanding during the consultation process was that licences issued under this exemption were considered as incumbent licences. Therefore, such licensed FSS receive earth stations could remain licensed once AWLs were issued for WBB stations. In the case of spectrum licence allocations (3700 – 3750/3800 MHz), incumbent FSS licences would be cancelled at the end of the five-year spectrum licence reallocation period. In recent discussions, the ACMA has indicated that incumbent licences are those issued before 22 July 2020, and services licensed via an Embargo 78 exemption are treated as temporary licences that will cease before the AWL licences are issued, so prospective AWL licensees have a clear picture of incumbency.

  As has been mentioned in previous CA SSWG submissions, FSS carriers typically vary on an annual basis so current FSS licences represent the status of FSS carriers in the band. The SSWG is of the opinion that licences issued since 22 July 2020 need to be treated as incumbent licences as such licenses indicate actual FSS usage in the band.

  Further, the ACMA has not yet advised FSS licensees of the licensing arrangements that will be implemented, including pricing, for FSS when the WBB AWL Licensing framework is introduced for incumbent and future FSS receive earth stations. The SSWG would request that where the ACMA seeks to introduce any changes to FSS licensing arrangements, it should provide reasonable time to FSS to prepare for the changes to support the continuation of FSS receive earth stations operations.
- The SSWG is also concerned with the assumed custom RF filtering to be used for FSS Earth Station receivers and the proposed date for which the filters will be considered to be installed. Specifically in the draft *Frequency coordination and licensing procedures for Area-Wide Licences (AWL) in the 3400 – 4000 MHz band* (page 22, RALI MS47), it stated that 'For earth receive stations licensed on or after 16 July 2022, the filter is to be assumed to apply below the lower and above the upper frequency limits of the licence.' In the companion Consultation Paper[7] (page 75), it was proposed that FSS operators will be given a 'reasonable period of time' to obtain customised filters before the upper frequency filter limits are assumed for coordination. It now appears that the 'reasonable period of time' only applies to the

[7] ACMA's *'Draft allocation and technical instruments for the upcoming 3.4 and 3.7 GHz bands auction'* consultation paper (issued Feb 2023).

Earth Station receiver licences issued before 16 July 2022. The SSWG has significant concern with this plan and suggests that the upper frequency filter limits should only apply after 16 July 2027, in all cases, to give FSS operators a 'reasonable period of time' to source and install customised filters to avoid major disruption to services provided within Australia. Furthermore, it seems unreasonable that a condition be placed on a service before the condition was communicated to the affected parties.

- The ACMA is considering that Area Wide Licences (AWLs) be used for licensing FSS Earth station receivers in metro and regional areas in the band 3750/3800 – 3950 MHz band. The ACMA is proposing that 'the intent is, for FSS receivers operating under any AWL framework in these areas, that FSS operators license sufficient spectrum and geographic areas such that the potential interference from neighbouring (in location and in frequency) LA WBB AWLs is acceptable to the FSS licensee, by accepting the appropriate device boundary criteria and unwanted emissions limits for the spectrum space'.

  The SSWG suggests that, not only is the area needed to meet this requirement disproportionately large, but it is also totally unnecessary for FSS given the nature of the service. By forcing AWLs onto FSS, satellite service providers would effectively be made to take up a coverage area much larger than their needs leading to possible uneconomical costs linked to this licensing scheme. In this regard, the SSWG urge the ACMA to share the proposed AWL cost applied to FSS before taking any decision on the licensing scheme in the band 3750/3800 – 3950 MHz for FSS in metropolitan and regional areas.

We urge the ACMA to seriously reconsider the potential unintended consequences of imposing a license type that is unsuitable for a particular technology type (in this case, FSS). It is envisaged that imposing AWLs in this manner would invariably and systematically disadvantage FSS vis-à-vis other technologies in the same region and band, which we do not believe the ACMA intends to do. The result could be FSS being driven out entirely of that region/band.

The satellite community presented a technical paper indicating that it is more spectrum efficient for Earth Stations to continue to be licensed through site-specific ALs with a coordination procedure. As the ACMA has identified that spectrum licence arrangements are not suited for a multi-operator restricted cell LA WBB use-case (i.e. multiple scattered small cells), likewise AWLs are not suitable for FSS where they are often single sites and no wide area terrestrial coverage is required.

If the ACMA persists with the impractical requirement that FSS receive earth stations in metro and regional area be licensed as AWLs, the SSWG is very concerned about the likely cost to FSS operators. With the pricing model for AWLs for FSS receive earth stations in metro and regional areas likely to be the same or similar to what is proposed for the remote areas, the use of population as a multiplier would make the FSS receive earth station AWL model not feasible from a business point of view.

5 Five-year spectrum outlook

Impact of additional IMT/6G spectrum identification on core satellite bands in 7-24 GHz

The draft FYSO has indicated that the ACMA is aware and participating in ITU-R processes regarding interest by some parties in spectrum in the 7 – 24 GHz range for a possible IMT identification through a future WRC agenda item (i.e., WRC-27).

The SSWG would like to highlight the congested nature of the 7 – 24 GHz frequency range and highlight the importance of this frequency range for satellite services.

As shown in the figure below, representing the frequency allocation within ITU Radio Regulations Article 5, the 7 – 24 GHz frequency range is allocated to numerous types of services, which often share the same spectrum.

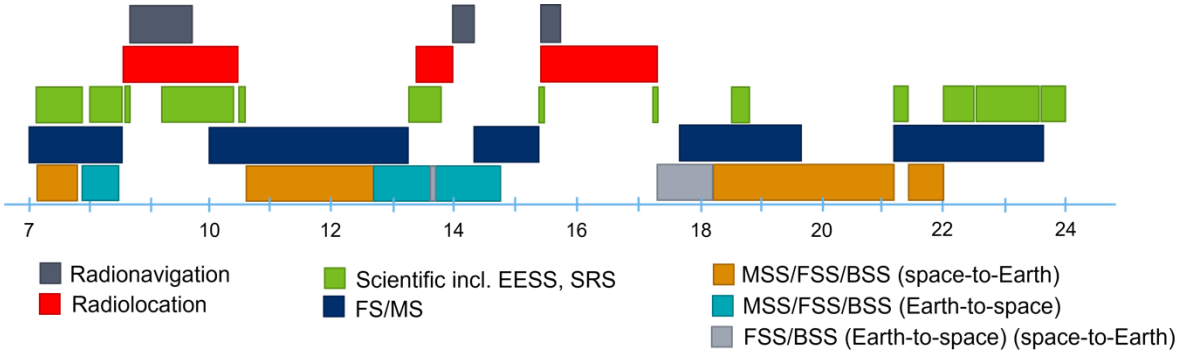

Figure 1: Frequency allocations with the 7-24 GHz range

In addition to being very congested, parts of the frequency range are used for critical strategic applications, such as radiolocation and security services. Furthermore, parts of this band are also extensively used for fixed satellite service (FSS) and fixed service (FS) (e.g. point-to-point and point-to-multipoint) deployments globally that cannot share with IMT that requires exclusive spectrum access. The difficulties in identifying any bands with large contiguous bandwidth to meet the requirement of IMT within this frequency range was the main reason for the exclusion of this frequency range for IMT during WRC-15 when determining the scope of the WRC-19 Agenda item 1.13. This reasoning concurs with one of the conclusions contained in the Plum Consulting study report[8] on opportunities for 6G in the 7 – 24 GHz frequency range. The Global Satellite Operators Association (GSOA) in a paper to the 5th Meeting of the APT Conference Preparatory Group for WRC-23 (APG23-5/INF-25) identified in detail that the 7 – 24 GHz frequency range is heavily used for the current satellite applications and will be more intensively used in future development. Therefore, it would be difficult to identify a large contiguous spectrum available for IMT/6G use.

In addition, the table on the following page indicates the number of satellites utilising the 7 – 24 GHz band, in particular satellites with Ku-band transponders starting from 10 GHz up to 15 GHz.

Satellite Systems Using Ku-Band

Satellite Operator	Coverage[9]	Type	Satellites Name	Number Of Satellites
Intelsat	Americas	GEO	Galaxy 11, Galaxy 16, Galaxy 17, Galaxy 18, Galaxy 19, Galaxy 28, Galaxy 30, Galaxy 31, Galaxy 32, Galaxy 33, Galaxy 35, Galaxy 36,	21 in operation

[8] 7 – 24 GHz opportunities for 6G – final report by Plum Consulting (https://plumconsulting.co.uk/opportunities-for-6g-in-7-24-ghz/, 25 Nov 2022). This is a study funded by the UK Spectrum Policy Forum.

[9] Coverage is a simplification, as satellites are often designed to cover oceans with part of continents on both sides.

			Galaxy 3C, Horizons 1, Horizons 2, Intelsat 16, Intelsat 21, Intelsat 23, Intelsat 34, Intelsat 902, Intelsat 904	
			Galaxy 37/Horizons 4, Intelsat 40e, Intelsat 42, Intelsat 43	4 future (being manufactured)
	Europe, Africa, Middle East	GEO	Intelsat 10-02, Intelsat 14, Intelsat 17, Intelsat 20, Intelsat 25, Intelsat 28, Intelsat 32e, Intelsat 35e, Intelsat 37e, Intelsat 38, Intelsat 39, Intelsat 901, Intelsat 905, Intelsat 906	14 in operation
			Intelsat 41	1 future (being manufactured)
	Asia	GEO	Horizons 3e, Intelsat 1R, Intelsat 10, Intelsat 15, Intelsat 18, Intelsat 19, Intelsat 22, Intelsat 33e	8 in operation
			Intelsat 44	1 future (being manufactured)
SES	EMEA	GEO	ASTRA 1G, ASTRA 1KR, ASTRA 1L, ASTRA 1M, ASTRA 1N, ASTRA 2E, ASTRA 2F, ASTRA 2G, ASTRA 3B, ASTRA 4A, ASTRA 5B, SES-5, Monacosat	13 in operation
	EMEA	GEO	ASTRA 1P, ASTRA 1Q	2 future (under procurement)
	North America	GEO	AMC-1, AMC-3, AMC-6, AMC-15, AMC-21, ASTRA 2C, CIEL-2, QUETZSAT-1, SES-1, SES-2, SES-3, SES-11, SES-15	13 in operation
	Global	GEO	ASTRA 2A, NSS-6, NSS-7, NSS-11, NSS-12, SES-4, SES-6, SES-7, SES-8, SES-9, SES-10, SES-12, SES-14, SES-17	14 in operation
	Global	GEO	SES-26	1 future (under procurement)
Eutelsat	Europe, Africa, Middle East	GEO	EUTELSAT 12WE, EUTELSAT 8WB, EUTELSAT 7WA, EUTELSAT 5WB, EUTELSAT 3E, EUTELSAT 7B, EUTELSAT 7C, EUTELSAT 9B, EUTELSAT 10B, HOT BIRD 13B, HOTBIRD 13C, HOTBIRD 13E, HOTBIRD 13F, HOTBIRD 13G, EUTELSAT 16A, EUTELSAT 21B, EUTELSAT 33E, EUTELSAT 36B, EUTELSAT 36C, EUTELSAT QUANTUM	20 in operations
	Asia	GEO	EUTELSAT 70B, EUTELSAT 172B	2 in operations

	Americas	GEO	EUTELSAT 65WA, EUTELSAT 113WA, EUTELSAT 115WB, EUTELSAT 117WA, EUTELSAT 117WB, EUTELSAT 133WA, EUTELSAT 139WA	7 in operations
	Global	GEO	EUTELSAT 36D, EUTELSAT FLEXSAT	2 future satellites
	Europe, Africa, Middle East	GEO	KONNECT, KONNECT VHTS, KASAT	3 satellites having TTC in Ku band
Rascomstar	Africa+South Europe	GEO	RQ1R@2.9°E	1 in operation
Hispasat	Europe, North Africa, Americas	GEO	HISPASAT-30W-5, HISPASAT-30W-6, HISPASAT-36W-1	3 in operation
	Europe, Americas	GEO	AMAZONAS-2, AMAZONAS-3, AMAZONAS-5, HISPASAT-74W-1	4 in operation
		GEO	AMAZONAS-NEXUS	1 future (just launched, reaching GSO)
OneWeb	Global	LEO	ONEWEB-xxx	618 in operation
			Completion of Gen-1 by end of March 2023	36 to be launched
Telenor	Europe	GEO	Thor 5, Thor 6, Thor 7	3 in operation
Nilesat	MENA, Africa	GEO	Nilesat 201, Nilesat 301	2 in operation
Yahsat	EMEA and Asia	GEO	Al Yah 1	1 in operation
ARABSAT	EMEA	GEO	ARABSAT-5A, -6A, BADR4, BADR5, BADR6, BADR7, HellasSat-2, HellasSat-3, & HellasSat-4	9 in operation
	EMEA	GEO	ARABSAT-7A, BADR-8	2 to be launched
Dish	Americas	GEO	ECHOSTAR XVI, ECHOSTAR X, ECHOSTAR XI, ECHOSTAR XIV, TERRESTAR-1	5 in operation
EchoStar	Americas	GEO	ECHOSTAR IX, AMC-2, ECHOSTAR-105	3 in operation
Telesat	Americas	GEO	Anik F1, Anik F1R, Anik F2, Anik F3, Anik G1, Nimiq 4, Nimiq 5, Nimiq 6, Telstar 14R, Telstar 19 VANTAGE	10 in operation

	Americas, Europe, Middle East, Africa	GEO	Telstar 11N, Telstar 12 VANTAGE	2 in operation
	Asia	GEO	Telstar 18 VANTAGE	1 in operation
Optus	Asia	GEO	Optus C1/Optus D1/Optus D2/Optus D3/Optus 10	5 in operation
	Asia	GEO	Optus 11	1 future satellite
Chinasat	Asia	GEO	Chinasat 6D, Chinasat 9, Chinasat 9B, APSTAR 6C	4 in operation
	Asia Pacific	GEO	APSTAR 5C, APSTAR 6D, APSTAR 9	3 in operation
	Asia, Europe	GEO	Chinasat 10	1 in operation
	Asia, Africa, Middle East	GEO	Chinasat 11, APSTAR 7	2 in operation
	Asia Pacific, Africa, Europe,	GEO	Chinasat 12	1 in operation
	Africa	GEO	Chinasat 15	1 in operation
	Asia Pacific, North America	GEO	Chinasat 19	1 in operation
	Asia & Middle East	GEO	Chinasat 6E, Chinasat 10R, Chinasat 9C	3 future satellites
AsiaSat	APAC	GEO	AsiaSat 4, AsiaSat 5, AsiaSat 7, AsiaSat 9	5 in operation
	EMEA		AsiaSat 8	
JSAT/SJC	APAC	GEO	JCSAT-110A, JCSAT-110R, JCSAT-4B, JCSAT-3A, JCSAT-5A, JCSAT-17, SUPERBIRD-C2, JCSAT-1C, JCSAT-2B, SUPERBIRD-B3, JCSAT-12, JCSAT-16	12 in operation
MEASAT	APAC	GEO	MEASAT-3A, MEASAT-3B, MEASAT-3D	3 in operation
ARSAT	America	GEO	ARSAT-1, ARSAT-2	2 in operation
Space-X	Global	LEO	STARLINK-xxx	>3000 in operation
NIGCOMSAT	Africa, Europe	GEO	NIGCOMSAT-1R	1 in operation
PT. Bank Rakyat Indonesia (Persero), Tbk.	Asia	GEO	BRIsat	1 in Operation
TURKSAT	Europe, Africa, Middle East, Central & Southern Asia	GEO	TURKSAT-3A TURKSAT-4A TURKSAT-4B TURKSAT-5A TURKSAT-5B	5 in operation
			TURKSAT-6A	1 Future Satellite (being manufactured)

Based on the above table, there are around 200 GSO Ku-band operational satellites and more than 3500 NGSO Ku-band operational satellites worldwide. Meanwhile, around 70 out of 200 GSO Ku-band operational satellites have coverage over the Asia Pacific region including Australia. In addition, Optus are currently operating 5 GSO Ku-Band satellites and there are currently around 20 GSO Ku-band satellites covering Australia and there will be more satellites launched in the near future which one of those future GSO Ku-band satellites owned by Optus.

The 7 – 24 GHz frequency range includes some of the core satellite bands in which satellite operators are already struggling to accommodate the growing service demand while sharing the resource among themselves. Compared to when this frequency range was considered for IMT at WRC-15 and decided not to be included, thousands of LEO satellites and GSO new generation satellites (e.g., HTS and VHTS) have since then started operating in this frequency range, making compatibility with incumbent services even harder to achieve. Satellite deployments within this range are characterised by gateways, fixed VSATs, and ubiquitous earth stations, including ESIM, which provide a multitude of services, including direct-to-consumer services for media, broadband connectivity, cellular backhaul, and mobility. Satellite use represents a massive global market which, due to the international nature of the operation, requires an extensive level of global harmonisation, which would be undermined with an IMT identification in the same bands. This frequency range includes ITU Radio Regulations Appendices 30/30A/30B planned bands for guaranteeing equitable access to orbit spectrum resources for all ITU Member States. Several WRC-23 Agenda Items study the various satellite applications (e.g., ESIMs, ISLs, UAS) in those bands, indicating even more usage by the satellite industry planned.

Co-frequency sharing between IMT and other services is extremely difficult, given the ubiquitous nature of IMT deployment. Identification for IMT often means disruption or migration of existing services within the band and in the adjacent band, as indicated in one of the conclusions from the Plum Consulting study report cited above and as proven in practice in many countries deploying IMT in C-band. More than 14 GHz of IMT spectrum in the mm-wave bands today is mostly unused. Coupled with the fact that 6G use cases and its quality-of-service requirements are not yet being defined, the SSWG (other than Optus) disagrees with the development of an agenda item for WRC-27 to conduct ITU-R studies for possible IMT identification in the 7 – 24 GHz frequency range.

14 GHz (14.0 – 14.5 GHz)

Regarding Ku band (14.0 – 14.5 GHz) GSO land based ESIM, some Asia Pacific countries including Australia have allowed the operations of Ku-band GSO ESIM including land based ESIMs also known as VMES (Vehicle Mounted Earth Stations) in their territory as indicated in APT Report# 110. As per APT Report# 110, the ACMA has indicated that operation of ESIM is able to be authorised in 10.7 – 12.75 GHz and 14 – 14.5 GHz via space and space receive licenses in concert with the Space Object Class License subject to meeting licensing assessment procedures. In addition to APT Report# 110, the below table shows the developments of VMES in other regional organisations.

	GSO Ku Band			
Terminal Type	USA (FCC)	CEPT (ECC)	Europe (ETSI)	International (ITU)
VMES	CFR 47 §25.226	ECC/DEC 18(04) published in 2019	EN 302 977	Recommendation ITU-R S.1857

Land based ESIM considered in the ECC Decision 18(04) are to be deployed with GSO satellite networks already in operation or may be deployed in the future. The ECC Decision 18(04) addresses the harmonised use, exemption from individual licensing, and free circulation and use of land based ESIM operating on Ku-band GSO satellite networks. This ECC Decision provides a regulatory framework for authorising land based ESIM on the condition that such deployment will not cause harmful interference to other authorised services.

The regulatory framework specifies that land-based ESIM should be exempt from individual licensing and offered free circulation and use. The other authorised services within the CEPT are limited to the fixed service (FS) in the 14.25 – 14.5 GHz band, deployed in limited number of administrations, and radio astronomy service (RAS) in the 14.47 – 14.5 GHz band, where astronomy observations are carried out at a limited number of observatories within the CEPT. The technical conditions established for land based ESIM to maintain compatibility with FS and RAS are also described in this ECC Decision.

Technical studies carried out by the CEPT have identified the technical solutions to protect the FS in the 14.25 – 14.5 GHz band and RAS in the 14.47 – 14.5 GHz band. Such protection is achieved by ceasing transmissions from land based ESIM in the frequency bands that overlap the frequency assignments of FS and/or RAS stations when the land based ESIM enter or are located within the zones identified for the protection of FS and/or RAS stations ('protection zones').

During consultation on the ACMA's business operating procedure (BOP) for Ka band ESIM in 2021, the SSWG also submitted commentary on arrangements for Ku ESIM arrangements introduced in August 2020. The ACMA has responded in its outcome that the issue will be considered in a possible revision of the BOP at a later time. As indicated by the input from the SSWG to the draft FYSO for 2022-27, Ku-band (14.0 - 14.5 GHz) non-GSO ESIM have already been authorised in Europe via an ECC decision for CEPT countries and it is anticipated that work will commence in the ITU-R to develop international regulations for their use in due course. Similarly, the U.S. FCC has adopted rules that permit non-GSO ESIM operations in the Ku-band. The table below summarises those various regional decisions.

	Non-GSO Ku Band		
Terminal Type	USA (FCC)	CEPT (ECC)	Europe (ETSI)
ESIM	CFR 47 §25.228	ECC Report 279 ECC/DEC 18(05) ECC/DEC 19(04)	EN 302 980 EN 302 981

In this regard, the SSWG recommends adding revision of the BOP on Ku-band ESIM for both GSO and non GSO to the 2023-24 annual work program.

70/80 GHz (71-76 GHz / 81-86 GHz)

As indicated in the input by the SSWG to the draft FYSO for 2022-27, the 70/80 GHz band is an internationally allocated co-primary band for the fixed-satellite service (FSS), and footnote 561 of the Australian table includes specific protections for the FSS downlink in 74 – 76 GHz from the fixed service. A number of operators have filed with the ITU for next-generation satellite systems with 70/80 GHz gateway links, demonstrating a strong interest in deploying in the band in the very near term to meet growing consumer demand for high-speed, low-latency broadband. The 70/80 GHz band will be essential to next-generation satellite systems

and therefore it is critical that the ACMA take urgent action in the 2023-24 annual work program to make this spectrum available for the fixed-satellite service.

As the ACMA and many other regulators around the world have recognised, the unique 'pencil beam' properties of links in the 70/80 GHz band warrant a flexible, self-coordinated approach to licensing in the band. Indeed, the ACMA has already licenced many short point-to-point fixed services in this band using a self-coordinated approach described in RALI FX20. Expanding this model to incorporate satcom gateways – which also will use high-gain, narrow beams with small coordination zones – would further enhance the efficient use of this important band to serve consumers across the country. This extension can be accomplished with minor, straightforward changes to the ACMA's existing satellite and 70/80 GHz frameworks.

Considering the co-primary status of FSS systems in the band, the strong operator interest, and the low risk of interference between 'pencil beam' links in the band, the SSWG recommends that the ACMA urgently undertake planning in its 2023-24 annual work program to extend its existing self-coordinated light-licencing framework for the 70/80 GHz band to support the early introduction of satcom services in this band in Australia.

6 Licensing

Drone spectrum regulation

The SSWG concurs with the ACMA that there is increasing interest in the use of drones and that spectrum is likely to be needed for both payload communications, and for Control and Non-Payload Communications (CNPC). The SSWG satellite operators already provide communications for a variety of aircraft types, including drones, using L-band MSS. Also Ka-band may be used in the future for larger drones with high bandwidth requirements. Hence, any work to develop new regulations for drones may need to take account of the potential use of L-band MSS and Ka-band ESIMs for some applications.

7 Pricing

The SSWG provided a submission to the ACMA 'Proposed changes to apparatus licence pricing structures' consultation. The SSWG opposes the introduction of 'interference protection pricing' to satellite receiver apparatus licences. Earth station receivers are highly sensitive to interference from co-frequency or co-located terrestrial transmitters due to the application they are performing and/or their incompatibility in signal characteristics to the interferer. The issue is more about incompatible service co-allocations than 'inefficient' spectrum use. Radiocommunication receivers do not exhibit 'inefficient' spectrum use unless incompatible transmitters are introduced. This issue should be avoided at the service allocation or application level and not by penalising legitimate radiocommunication receiver assignments.

In Australia, space system licences have significantly higher annual licence tax levels than other licence types for the same frequency band of operation:

- Earth stations are charged ten times the tax compared to scientific assigned licences,
- Earth stations are charged two to three times the tax compared to fixed point-to-point, fixed point-to-multipoint and television outside broadcast station licences.

It is understood that Australia has one of the highest licence fee structures for satellite services in the world. The SSWG would like to remind the ACMA of the research carried out by Plum Consulting to conduct an international comparison of licensing fees for the ACMA in

2016. Figure 2 on the following page compares Plum's findings with the 2020 Australian earth licence fees by population density area and in three common FSS frequency bands (C, Ku and Ka-band). It was evident that Australia had significantly higher fees than all the other countries surveyed. While the ACMA's recent pricing reforms addressed the Ku and Ka-band fees to a certain degree, and to some extent the C-band nominal transmit band (5000 to 8500 MHz), the C-band Earth Receiver Station licence tax continues to be excessive. Further increasing the licence tax rate for Earth receive licences based on the 'interference protection pricing' proposal would be a significant disincentive for satellite service providers and operators to operate satellite services in Australia.

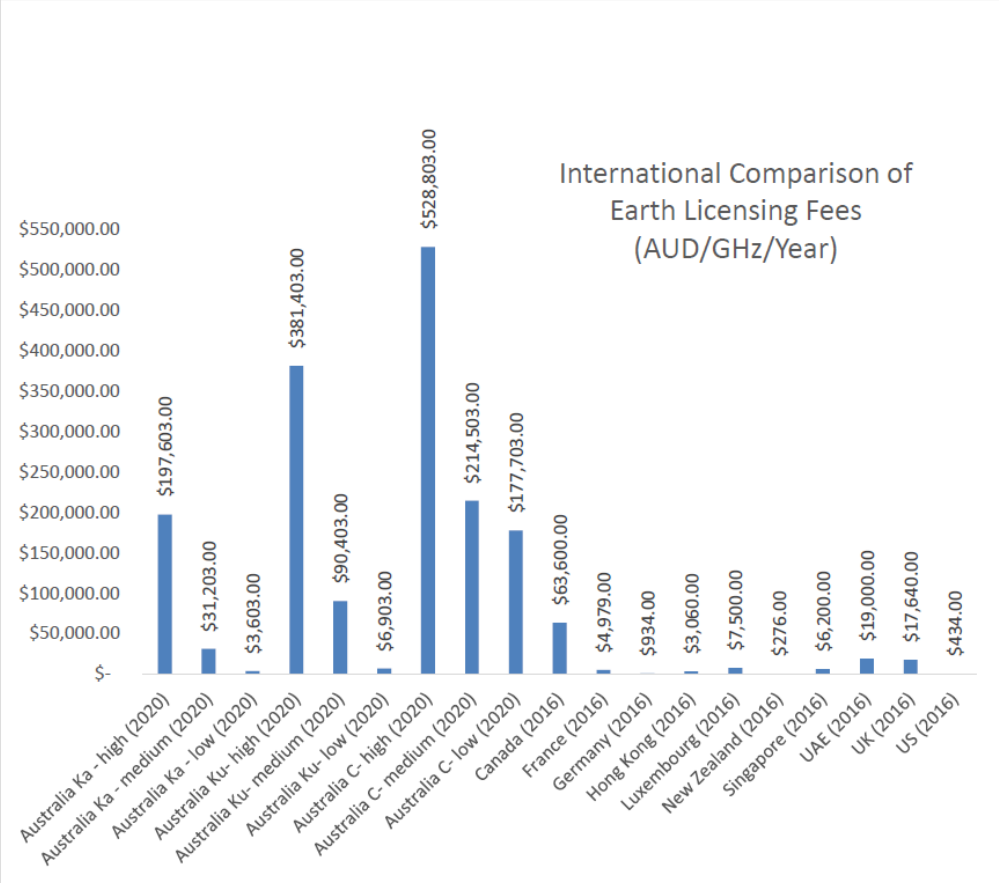

Figure 2: International comparison of earth station licensing fees[10]

[10] See Attachment E to ACMA, IFC 19-2016, *Review of Taxation Arrangements for Satellite Services* Consultation Paper (Aug. 2016).

Communications Alliance Satellite Services Working Group membership

Amazon Web Services
EchoStar Global Australia
Foxtel
FreeTV
Globalstar
Global VSAT Forum (GVF)
Inmarsat
Intelsat
Ipstar
Iridium
King & Wood Mallesons
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