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AUSTRALIAN COMMUNICATIONS AND MEDIA AUTHORITY

FIVE-YEAR SPECTRUM OUTLOOK 2016–20

THE ACMA'S SPECTRUM MANAGEMENT WORK PROGRAM

COMMUNICATIONS ALLIANCE

SATELLITE SERVICES WORKING GROUP SUBMISSION

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INTRODUCTION

The Communications Alliance Satellite Services Working Group (SSWG) welcomes the opportunity to provide this submission on the Australian Communications and Media Authority's *Five-year spectrum outlook 2016–20: The ACMA's spectrum management work program* (the *FYSO*).

Executive Summary

The Communications Alliance SSWG acknowledges that the FYSO is a useful document and has proven to be of value to both the ACMA and to its client base of stakeholders. In our highly dynamic and rapidly evolving market, the FYSO is becoming more essential for our members to stay across the ACMA's execution of the Government spectrum policies and implementation of spectrum-related activities under its Work Program.

With this in mind, the SSWG proposes some changes to the structure of the FYSO going into the future, highlighting the importance of the timeliness of the information being made available to the industry.

The format of the SSWG response presented in this submission is in two parts. The first Part provides general commentary on the FYSO. This is followed in the second Part by a detailed response to the fifteen questions posed in the FYSO under *Issues for comment*.

The first Part comprises three sections. The first section provides general commentary on the structure of the FYSO, including the linkage to the World Radiocommunications Conference (WRC), issues concerning the profile of the satellite industry and the ACMA Working Methods.

The second section looks at the following five areas of the ACMA's role in managing Australia's spectrum: timing, transparency, neutrality, priorities and the cost of regulation.

The third section provides commentary on a number of specific issues that the SSWG saw the need to be drawn out which were not necessarily covered by the questions posed in the FYSO.

About Communications Alliance

Communications Alliance is the primary telecommunications 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, equipment vendors, IT companies, consultants and business groups.

Its vision is to provide a unified voice for the telecommunications industry and to lead it into the next generation of converging networks, technologies and services. The prime mission of Communications Alliance is to promote the growth of the Australian communications industry and the protection of consumer interests by fostering the highest standards of business ethics and behaviour through industry self-governance. For more details about Communications Alliance, see http://www.commsalliance.com.au.

1 GENERAL COMMENTS

The ACMA Five Year Spectrum Outlook (FYSO) rolling program report is a useful concept introduced by the ACMA. In its time, it has proven to be of value to both the ACMA and to its client base of stakeholders.

This particular version comes at a time of anticipated change for the ACMA and its accountability and relationships, pending Government decisions on the ACMA review and the proposed new regulatory environment. As our industry comprises stakeholders both using spectrum and involved in the management of spectrum, the SSWG sees the information being provided by the FYSO as an important planning tool. Our members have observed the evolution of this document over a number of years and some concern has been raised as to the utility of the information as presented in its current format. Specific issues will be drawn out in the following sections with some suggestions for changes for future editions.

Of note the SSWG believes that the quality and detail of the information being provided in the FYSO can be enhanced through better integration of the various sections in the document. For which the SSWG encourages the ACMA to adequately resource the FYSO, particularly over the next few years where there will be a high dependency on spectrum management in a highly dynamic and rapidly evolving market.

1.1 FYSO structure

The FYSO in its current format presents itself as an annual report incorporating a rolling five-year policy implementation plan together with a four-year work spectrum management program with its origin in the WRC outcomes. It is understood that the challenge in presenting information on Australia's entire radiofrequency spectrum for all spectrum stakeholders is in deciding how best to structure the information into a readily digestible format with the available resources to collate and present it.

The SSWG represents a wide cross-section of satellite spectrum interests and is in a position to offer a user perspective in how they see the FYSO fulfilling industry's need and to meet its desired function. The FYSO is an accumulation of useful information for stakeholders and it would be useful at this point in time to step back to get an understanding of the needs of the users. As a report it seems to meet the regulatory obligations but more importantly, from an industry point of view, the primary benefit would be able to use the FYSO as a planning document.

In its current format it takes time for readers to distil the relevant information to understand the impact to their products and services, to manage resources and to project future business cases. From an industry perspective the FYSO is currently not serving its purpose. It has considerable duplication of information in Parts 1, 2, 3 and 4. For readers of the FYSO it requires reading of several Parts to appreciate all the matters relevant to some bands. If the FYSO is the ACMA's spectrum overall management program for the period 2016 to 2020, a better approach would be to list all the issues pertinent to each frequency band and indicate the various work items being undertaken.

Other changes worth considering in future editions:

a) separating out the longer-term strategic policy component of the FYSO from the Work Program (see Section 2.1 *Timing* below).

b) tying in other related ACMA activities, for example, relevant aspects of the ACMA Research Program.

c) a one/two page calendar providing the continuity of relevant ACMA spectrum activities and the resources being allocated.

d) stronger linkages to the activities of the WRC, particularly leading up to WRC-19. See Section 1.2 below.

1.2 The World Radio Conference

Agenda Items for a World Radio Conference span a wide range of frequency bands and this is the case for WRC-19. The ACMA's WRC-19 Preparatory Group will be addressing a large number of WRC-19 Agenda Items including those mentioned in the FYSO, and potentially more. It would be of great assistance if the Five Year Spectrum Outlook identified where this is a link to a WRC Agenda Item as each band is presented in future editions of the FYSO, thus indicating the overarching influence that a WRC Agenda Item may have on future outcomes for each frequency band.

1.3 Profile Of Satellite Communications

The satellite industry seems to suffer from a lack of profile and status in Australia. The ACMA could assist in recognition of the appropriate status of satellite communications through public staging of conferences, and Issues For Comment (IFCs) etc. The value and intensity of High Throughput Satellites (HTS) system developments, broadband and narrow band applications (IoT), advances in speed, latency, and bandwidth of contemporary GSO and NGSO solutions are not being given the regulatory recognition they deserve in the total picture. There is a need to broaden the focus of the regulator wherever possible.

1.4 ACMA Working Methods

The ACMA is encouraged to develop timing and a framework of activity which is closer to the real needs of industry. The ACMA believes that it is doing a good job, but in fact it falls short of the best approach through the lack of regulatory timeliness and lack of proper transparency. A better solution is presented to the ACMA in Section 2.1 *Timing* below.

The ACMA appears to have shed expertise in the highly specialised satellite coordination group. Recent examples show how resources are lacking when participation in events such as the WRC, Administration Coordination Meetings and to some extent ITU-R working party meeting force what should be business as usual (BaU) onto the back burner. Routine communication to the ITU, for example, is often delayed such that tempo is lost when responses appear at the last possible moment. This lack of priority is not only appears tardy but can negatively affect outcomes where timing and deadlines are important factors. The ACMA should be encouraged to devote more resources towards maintaining a good level of response in BaU operations.

2 ACMA's role in managing spectrum

2.1 TIMING

The SSWG sees the inclusion of a 12-month Work Program in this edition of the FYSO as a welcome addition but one of the disappointments within industry is in its timing. The release of the FYSO for 2016-20 (and associated Work Program for 2016-17) in October 2016 and a comments submission date of January 2017 poses some challenges for the industry.

Industry, business and other stakeholders are under a discipline of investment decisions ahead of a financial year and regulatory certainty is a vital factor. Otherwise critical time and investment confidence is lost because of incompatible regulatory timing.

With this in mind, the SSWG suggests a slightly modified approach to the FYSO, aligning the document updates with existing industry and regulatory cycles already in place. Taking into account that the WRC is held every four years, and that the ACMA updates the Australian Radiofrequency Spectrum Plan (ARSP) on a similar cycle, the policy and visionary component of the FYSO should be separated out and updated with a view to the future of four years or beyond. This would then provide industry with a focused annual work program, under a longer term and stable strategic framework, with which it can then manage its resources aligned to the calendar/fiscal year.

Therefore a better structure and timing would assist the industry by the following format:

- a strategic and visionary outlook document with at least a four-year horizon.
- a twelve-month detailed Work Program.

2.2 TRANSPARENCY

The ACMA's general approach to consultation on a periodic or occasional basis is to issue an IFC or draft document which is the product of basic desk research and other supporting information gathering, then to append numerous questions which have the intention of building up the regulator's knowledge and appreciation of positions from stakeholders. Following this there is often little which provides sufficient public closure to the process, including a summary of the ACMA's acceptance or otherwise of proposals made during the submission phase, and the influence on the ACMA's final judgement.

Best practice regulation comprises:

- An initial or preliminary view by the regulator;
- Request for comments, which may be a tailored set of questions;
- A final view decided by the regulator.

Having a consistent approach in making consultation outcomes publicly available would be of great benefit. These outcomes would comprise a final documented view of the regulator's decisions and the rationales behind these decisions. This would provide the necessary transparency for those involved in the consultation to understand how the regulatory outcomes had been reached.

This approach would also lessen the need for follow-up bilaterals between the ACMA and individual stakeholders although bilaterals could still take place if individuals wanted a better understanding on specific outcomes.

It is also understood that some time ago Parliament adopted expectations in relation to Senate, House of Representatives and Joint Committee enquiries where after a prescribed time period, the ACMA would need to publish whether or not it is proceeding with its preliminary views and on what basis those decisions have been made.

With respect to the 'spectrum management decision-making framework' the ACMA identifies the consultative process as primarily consisting of the RadComms conferences, spectrum tune-ups, discussion papers, etc. While the consultative process in the current framework has been somewhat helpful, it nonetheless has an ad hoc quality. Often industry will be made aware of activities and projects for the first time at Radcomms, spectrum tune-ups and in the FYSO.

The SSWG is of the view that engagement between the ACMA and industry sectors; satellite, mobile, broadcast, etc. would benefit from spectrum policy, planning and management matters being regularly and transparently discussed at their formative stages in a consultative forum. Such a consultative forum, while similar in aim to the former Radiocommunications Consultative Committee (RCC), would play an active and effective role in the ACMA's spectrum planning and management decision-making framework.

Rather than being an addition, and therefore an extra burden, to the ACMA's framework, the new forum would need to help streamline the consultative process. The completion of the Spectrum Review and the consequential new Radiocommunications Act may mean that the spectrum policy elements in the ACMA's framework may become the purview of DoCA. In this event, the new ACMA consultative forum's terms of reference need only be amended to reflect the same. The SSWG suggests that the Department of Communications and the Arts could form a similar forum to consult with industry, and the ACMA, on spectrum policy matters.

2.3 NEUTRALITY

Neutrality relates to an expectation of equal consideration. Reading through the current FYSO leaves an impression of MBB being the dominating driver within the ACMA's portfolio of activities.

The ACMA needs to devote a broader sensitivity to other services and industries, that use the spectrum resource, including those which form an equally or at least important part of the broadband future. The regulator is there to take into account and be responsive to all stakeholders.

As the national communications regulatory body, the ACMA is expected to be an independent regulator, acting in the public interest[1], that is seen to be neutral, balancing its role in considering demands for future technologies and applications in spectrum use against existing uses today. The lack of detail and structure in the FYSO does not illustrate this.

2.4 PRIORITISATION OF SATELLITE WORK IN THE WORK PROGRAM

In terms of priorities in the Work Program, the SSWG would argue for a better treatment of satellite elements of the work program, and encourages the ACMA to develop a more level and neutral playing field. Resource constraints can otherwise strangle the satellite business from a regulatory perspective.

The priorities in the Work Program that the ACMA articulates in the FYSO should be commensurate with the resource availability.

International participation

It is disappointing, for example to see that the ACMA will be devoting resources to WP5D and not WP4A/4C. It is uncertain whether the lack of information in the FYSO on the WP4A work is an oversight. If not, this creates the impression of a bias towards terrestrial mobile activities over satellite studies.

Even where industry itself might attend ITU-R meetings on satellite studies, the attendees can be constrained from involvement due to the lack of presence of the ACMA, to the extent where a Delegation from Australia might not even be registered. The ACMA has, at times, appeared to demonstrate a lack of confidence in not allowing industry representatives to

[1] See the *Introduction to the ACMA* at http://www.acma.gov.au/theACMA/About/Corporate/Authority/introduction-to-the-acma

lead an Australian Delegation if those people are consultants working for the industry. Having said that, the SSWG recommends that wherever possible, as a matter of principle, the Government should be representing Australia and heading Government delegations. This is most important from a policy dimension.

Other examples of possible bias in priorities taking over are in the Tables provided by the ACMA in the FYSO. This is despite some activities coming to market years even before the MBB services, e.g. ESIMs in the 27.5 to 29.5 GHz Ka band spectrum. These satellite services are ready for the marketplace and have the potential to offer significant benefits but are not achieving any profile in the Tables.

As a minimum the ACMA should monitor the progress within WP4A to make sure that the protection criteria being discussed with regards to sharing between IMT and FSS services are such that adjacent bands do not cause harmful interference to FSS services. This discussion is currently being undertaken within the next WP4A meeting with regards to Agenda Item 1.13.

2.5 COST OF REGULATION

The Government is sensitive to the need for ongoing efforts to reduce the cost of regulation.

A prime consideration is a lack of synchronisation between regulation and market needs. This leads to a need for improved timing, as noted above.

A better two-way understanding is important to ensure confidence in regulation, as this influences investment decisions as well as regulatory decision making. In addition, an expectation of neutral treatment creates an environment which would otherwise be costly.

Considering the satellite industry, the ACMA might like to give consideration to either an Occasional Paper or a Spectrum Tune-up in 2017 on the subject of advances in contemporary satellite services and technologies, regulation and licensing, leading into the broadband/IOT environment. This would assist a better dialogue and understanding between the regulator and the industry.

3 COMMENTS ON SPECIFIC ISSUES

A number of issues are of vital interest to the satellite industry. In some cases, good progress has been made in getting regulatory support and priority - largely through Communications Alliance and industry engagement. However the gains that have been made need constant attention to be sustained through to completion. Some observations which could be borne in mind, as we respond to the Questions, are as follows.

3.1 Ka SPECTRUM BAND PRICING

The ACMA's announcement on Ka-band pricing last week came more than three years after the SSWG began making a case for a review of satellite spectrum pricing methodologies, particularly in the Ka-band.

The SSWG has been concerned for some time that some Australian satellite spectrum taxes were very high in comparison with pricing in other countries, a view that has now been endorsed by the ACMA review, and that this was hampering investment in the sector in Australia.

The ACMA has acknowledged that making Australia's pricing structure more aligned with international norms should mean that Australia will be able to derive greater value from the space sector going forward. The SSWG and Communications Alliance more generally have

publicly welcomed the tax reductions announced recently, but the SSWG remains concerned that the ACMA has decided that a further reduction of licence fees is not justified in Australia-wide and high-density areas.

The SSWG considers that the reasoning that supported the larger reduction for medium density licence fees also supports the larger reduction for the Australia-wide and high-density licence fees, since in both cases there were identical findings of lack of congestion.

While the SSWG agrees that parts of the Ka-band are being actively considered for 5G services by the ITU and other jurisdictions such as the USA and South Korea, it does not agree that this, somehow, justifies more moderate licence fee reductions than originally contemplated as this treats fees for the entire 17.3 to 31.5 GHz band the same. For example, the FSS uplink from 29.5 to 31 GHz is not being considered seriously for 5G and is not on the WRC-19 agenda. The 26 GHz band is on the WRC-19 agenda, so it can legitimately be treated differently by the ACMA. The 28 GHz band, however, is not. As a matter of principle, the SSWG considers that the ACMA should not be setting fees for utilising spectrum in Australia based on allocation decisions in other jurisdictions.

It is regrettable that the vibrant and growing satellite services will, as a result of this decision, be burdened with higher licence fees in the entire 17.3 to 51.4 GHz band, even those frequencies not currently being considered for 5G.

3.2 REGULATORY FRAMEWORK FOR ESIMS

Development of the licensing framework for Earth Stations In Motion (ESIMs) at 29.5 to 30 GHz by the ACMA through the implementation of ITU-R Resolution 156 (WRC-15) has slowed down and been given only a medium priority with completion by end-2017. The ACMA is urged to bring the completion date forward to mid-2017.

The framework for 27.5 to 29.5 GHz licensing in accordance with ITU-R Resolution 158 (WRC-15) does not feature well in the Work Program. Services are, however, appearing in Australia. The Alliance considers that the Work Program should be either anticipating or matching the pace of international developments.

ESIMs for aeronautical communications (Wi-Fi) should also be given the forward attention it needs by the ACMA in order to encourage these services in Australian airline flights in either Ka or Ku band. This is to ensure that Australian airline services are not left behind in comparison with services being offered by leading international airlines.

The SSWG therefore remains concerned that the apparatus licensing fee regime as applied to such moving terminals is cumbersome and complicated and needlessly penalises operators of such systems by treating them identically to fixed terminals. If a spectrum denial approach is applied, it is clear that neither aeronautical terminals flying above a certain altitude over Australian airspace, nor maritime terminals beyond a certain distance from the shore, create significant spectrum denial areas for co-frequency terrestrial services.

In recognition of this the ACMA is again encouraged to create, as a first step, an 'aeronautical' and a 'maritime' fee category for ESIMs/AMSS/ESV licences that is equivalent to remote density (or, at worst, low density) fee categories – regardless of whether the terminal is operating in C-band, Ku-band or Ka-band. As indicated in Communications Alliance's submission on taxation arrangements for satellite services, an aircraft terminal flying over Sydney above 3,000 metres /10,000 feet or at the gate will not deny the use of the same spectrum on the ground, and thus should not attract the high-density fee. Moreover, these systems are disabled for aircraft take-offs and landing and passengers are only given access when the aircraft is above 3,000 metres / 10,000 feet. Similarly, maritime vessels operating ESVs do not deny access to spectrum to land based systems when the vessel is at least 125 km from the shore (Ku-band) and 330 km from the shore (C-band) in accordance with

ITU-R regulations. As Australia argued, albeit unsuccessfully, for these protection limits to be lowered at WRC-15 it is reasonable to conclude that the ACMA considers that these distances could be much shorter before there is any risk of interference and spectrum denial.

3.3 28 GHZ AND IMT

The 28 GHz (the band 27 or 27.5 to 29.5 GHz) is most important to future Ka Band satellite communications in Australia and many parts of the world. Whilst the USA and Korea are proposing IMT services in this band, the satellite industry needs to hold the line to only 24.5 to 27.5 GHz (and higher mm wave bands) for IMT as decided at WRC 15. The ACMA is showing signs of being tempted towards these proposals, and could succumb in its present mindset.

The SSWG recommends that the ACMA follows the official Australian view based on the agreed outcomes as decided at WRC-15.

3.4 S-BAND ALLOCATIONS

Both Inmarsat and Omnispace in the past have strongly argued the virtues of this band for ongoing Mobile Satellite Services (MSS) applications. Inmarsat is heavily invested in Europe through Alphasat and will bring this region into service in the near future. Omnispace is seeking ACMA Earth and Earth Receive Apparatus licences for its existing satellite earth station at Ningi in Queensland.

A key matter is sharing studies in ITU-R Resolution 212 (Rev. WRC-15) which is being jointly studied by WP4A and WP5D. The SSWG encourages the ACMA to adopt a fair and neutral approach to the studies and their outcomes.

Australia has an S-band MSS filing (SIRION-1). There is increasing interest in the use of the MSS S-band to provide new services, both from large and small satellite networks. The existing ACMA Embargo 23 should be reviewed to support the increasing interest in providing S-band MSS services.

The SSWG notes the apparent disconnect between some views already advanced and developed in Australian Radiocommunication Study Groups (ARSGs) and the WRC and how these views are linked within the FYSO and work program.

3.5 C-BAND

The SSWG wishes to draw to the ACMA's attention the already well defined stakeholder interests as presented in its November 2016 submission on the ACMA *Future Use of the 1.5 GHz And 3.6 GHz Bands* Discussion Paper. [2]

The 3400 to 4200 MHz C-Band has been a cornerstone of many satellite services for decades. In addition to its key function in providing connectivity within and to areas of high rain fall, where other available bands are inappropriate, C-band is used for a number of critical functions

The SSWG notes that there is strong, sustained demand for the 3600 to 3700 MHz band for Fixed Satellite Services Earth Stations (FSS-ES) in the foreseeable future to support MSS feeder links (such as for the new Inmarsat-6 series) and HTS implementations (such as for Intelsat EPIC). This is evident in the services still being provided in this band at multiple teleports in various major cities in Australia, notwithstanding the embargo against the deployment of

[2] Communications Alliance Satellite Services Working Group submission on the ACMA Future Use of the 1.5 GHz And 3.6 GHz Bands Discussion Paper - November 2016

new earth stations in this band. Indeed, if anything, the true demand for use of this band in Australia has been suppressed by the embargo that has been in place for 10 years.

In a global context there are more than 169 commercial satellites which use 3.4 GHz to 4.2 GHz C-band spectrum today and of those, 69 satellites carry some portion of 3400 to 3700 MHz band. Hundreds of millions of households depend on C-band for television programming including events such as the World Cup and the Olympics. Billions of dollars already invested in this technology and the ground infrastructure by satellite operators with over $15 billion spent by industry in the past five years launching 52 C-band satellite and $10 billion of additional investment to launch 35 new satellites by 2017.

Once satellites are launched into space, they remain active for up to 20 years and the frequencies cannot be changed aboard the spacecraft.

MSS operators wholesale services to customers in Australia who have ongoing requirements. In addition future innovation in the band is envisaged.

It is also worth noting that the SSWG members also see an ongoing need for access to the 3700 to 4200 MHz band for fixed satellite downlinks for the foreseeable future at the various teleports in Australia.

The SSWG envisages that there will be demand for FSS-ESs to continue operating in the 3600 to 3800 MHz band in the future. For example, if the band is re-farmed for IMT services, it may not be possible for satellite earth stations to relocate to new bands or alternative means of delivery. One option to enable such services to continue operating is to implement adequate measures to protect incumbent services and ensure their commitment and quality of services to their customers is continued unimpeded to ensure long term stability within this band for satellite operators.

The SSWG believes that the right level of geographical separation and other mitigations can reduce the burden on mobile deployment while ensuring regulatory compliance with interference management criteria. For many years the mobile community has been seeking access to this band on the basis that they can share with FSS earth stations and so the onus should be on the mobile operators to take action to ensure that they can meet the interference criteria.

3.6 L-BAND

In Australia, the 1525 to 1559 MHz band is used for MSS downlinks and is used by Inmarsat, Thuraya and other MSS operators to provide services in Australia. These services are also used by Australian ships and aircraft throughout the world. Interest in this band is driven by the use of the adjacent frequency band, 1518 to 1559 MHz, which is used by MSS downlinks.

The lower part of the MSS band, 1518 to 1525 MHz, is referred to as the 'extended L-band downlink'. This band is not currently used in Australia for MSS operations by Inmarsat or Thuraya, but is planned to be used in the near future, on the next generation of Inmarsat satellites, Inmarsat 6.

This band provides additional capacity for L-band MSS systems which is vital to meet the continuing and increasing demand for MSS services, including narrow band M2M applications and wider bandwidths to support broadband applications.

The L-band spectrum including 'extended L-band' is currently in use by Inmarsat on the 'Alphasat' satellite, which provide coverage of Europe, the Middle East and Africa. New Inmarsat-6 satellites are currently being built by Airbus that, like Alphasat, will have extended L-band capability. The first of the satellites is planned to be launched around 2019. It is therefore likely that Inmarsat will seek to operate MSS services in the band 1518 to 1525 MHz in Australia in the near future.

The SSWG understands that both MSS operators will request that in considering possible refarming actions for incumbent services in the 1.5 GHz band, the ACMA should also take into account that the band 1518 to 1525 MHz may be used for MSS services in the near future.

Current Inmarsat and Thuraya terminals are designed to be capable of operating anywhere in the world and hence are capable of receiving on any frequency within the full downlink band, 1518 to 1559 MHz. This means that MSS terminals operating in Australia and elsewhere could suffer harmful interference from mobile broadband systems if deployed in the band 1427 to 1518 MHz. It was with this concern in mind that WRC-15 agreed that compatibility studies between IMT and MSS are necessary and should be taken into account in the frequency arrangements for IMT in the 1.5 GHz band. The need for these studies is recorded in Resolution 223 (Rev. WRC-15).

Those ITU-R technical studies are currently underway in ITU-R Working Parties 5D and 4C and are not yet concluded. The CEPT has already conducted studies on this compatibility issue and a draft CEPT Electronic Communications Committee Report (ECC Report) is currently going through the approval process. These studies are based on the assumption that the 1427 to 1518 MHz band would be used by terrestrial mobile systems for 'Supplementary Downlink' (SDL). Hence the study considers potential interference from transmitting mobile base stations to receiving MSS terminals. The interference situation would be similar for an FDD arrangement for which the base station transmit band would be just below 1518 MHz. Studies so far have not considered potential interference from IMT user terminals, and so would not cover the possible use of TDD systems or FDD arrangements for which the band below 1518 MHz is used for the user terminal emissions.

The draft ECC Report contains the results of extensive studies but does not provide precise recommendations on compatibility measures required to ensure adequate protection. However, it is apparent from the studies that a guard band of at least 3 MHz is necessary to avoid harmful interference to MSS operations. Even with a 3 MHz guard band, special requirements would need to be placed on IMT base stations and MSS terminals. IMT base stations transmitting below 1518 MHz would require in-band and out-of-band EIRP limits. MSS terminals would be required to implement improved filtering so as to limit the harm caused by IMT base station blocking of the MSS terminal receiver.

In addition, the incumbent Australian satellite operator AsiaSpace operates the existing ASIABSS Broadcasting-satellite service, providing L-band satellite digital radio services to Asia, in the 1467 to 1492 MHz global allocation. China is very active in the ITU-R regarding the 1467 to 1492 MHz band for BSS (Sound). Optus has advised in various ACMA consultations regarding the 1.5 GHz band, that it continues to press for retaining up to 12.5 MHz in rural and remote areas of Australia for future BSS(Sound). This is the only frequency band allocated for this type of service in Australia.

3.7 Q AND V–BANDS

The Q Band (33 to 50 GHz) and V Band (50 to 75 GHz) form part of the mm wave spectrum bands which have been nominated by WRC 15 for future IMT use. WRC 19 Agenda Item 1.13 nominates the bands which should be studied. Again there are some proposals from the FCC and Korea. Some of the bands were already allocated for primary FSS and primary mobile usage at previous WRCs. This should form the guidance to study priorities. Many satellite operators have already filed for some of the Q and V bands, and the ACMA is encouraged to support these initiatives.

3.8 SPECTRA

The opening up of the new SPECTRA software system to Accredited Persons (APs) is a positive step. However, it has caused the ACMA to call for the bulk of coordination and licensing applications work to be outsourced in this way, and the ACMA has greatly reduced its own internal resources in coordination and licence applications.

The SSWG has some concerns that the charges levied by APs have become more expensive than the previous charges by the ACMA for these services. There may be a need to have a closer look at the market for APs and whether there are any barriers preventing the market from working optimally.

Possibly recognising this, and partly because the Government is pressing for greater customer involvement, the ACMA has suggested (in the current FYSO) that licensed carriers take up more coordination license application work using SPECTRA. This should be strongly encouraged and accelerated as a positive step to breaking down regulatory red tape through greater customer involvement.

3.9 RE-FARMING AND RE-LOCATION

The ACMA has consulted with industry in the past on a proposal for the 3.6 GHz band to be re-farmed for MBB services.[3]

The SSWG has strongly argued over recent years against the forced re-location of its satellite facilities to low density population areas in the so called 'Satellite Parks' and maintains that position. The need to establish new facilities in remote areas, to connect those new facilities to the major cities, and to relocate or purchase new equipment would require many millions of dollars in capital expenditure. Finding or relocating personnel for duty at such locations will also be difficult and expensive

The SSWG opposes re-farming the bands if this means that FSS-ESs from the 3.6 GHz band would need to be vacated. Clearly sharing arrangements would be needed to ensure that those existing FSS-ESs do not suffer harmful interference from MBB systems.

Satellite earth station operators may have only a limited or indirect ability to choose which frequencies they receive from the entire 3400 to 4200 MHz C-band. This is because they need to connect to a transmitter, often in other continents, via a satellite. The frequencies that they use may be determined by the operators of the transmitting station, or by the satellite operator based on the propagation characteristics of the bands or availability of satellite capacity. The exact commercial agreements, and technical constraints, shared among these parties will vary from case to case. In some cases, the frequencies to be used may also change from time to time, leading some earth station operators to seek flexibility to access the entire C-band.

In addition to in-band sharing arrangements, if any part of the 3.6 GHz band is to be re-farmed for MBB, the SSWG would recommend implementing a guard band in which MBB must not transmit in order to protect FSS-ESs operating at 3700 MHz and above.

3.10 CONNECTED CARS

Connected and autonomous vehicles will change the way in which many of us commute. The development of Intelligent Transport Systems (ITS) and self-driving vehicles is rapidly advancing towards commercialization, with higher levels of automation on the road

[3] ACMA Future use of 1.5 GHz and 3.6 GHz bands Discussion paper.
http://www.acma.gov.au/theACMA/future-use-of-the-1_5-ghz-and-3_6-ghz-bands

expected by 2020. A key challenge therefore is how to produce, an economic and resilient communication system with very high reliability demanded by such systems. The satellite industry is currently developing satellite systems operating within the Ku-band FSS allocations to meet the requirements of connected and autonomous vehicles. Such activity should be promoted within the ACMA going forward.

As the connected car environment is yet to be fully defined, with much at the proof-of-concept stage, the SSWG suggests that the ACMA can contribute to the debate at this point in time through the hosting of seminars and workshops, together with participation in APT forums such as the APT Wireless Group Intelligent Transport Systems (AWG ITS).

FYSO ISSUES FOR COMMENT

The ACMA has invited comments on the issues set out in the *Five-year spectrum outlook 2016–20* or any other issues relevant to spectrum demand analysis and strategic direction.

Question	SSWG comment
Issue for comment: 5G To assist the ACMA in its considerations about 5G in the context of its broader mobile broadband work program (see Part 3), comment (along with supporting evidence) is sought on the following questions:	
1. When, or under what circumstances, would it be appropriate for potential 5G millimetre wave (mmW) bands to progress beyond 'monitoring' in the ACMA's mobile broadband work program?	For technologies and applications that are going to be widely adopted for implementation in these bands, deployment of new technology has shown us that verifiable and completed standardisation is required, with appropriate Standards and specifications in place. Without having the technical characteristics (e.g. spectrum masks, filtering, out-of-band emission specifications) any change in status needs to be qualified until the relevant information is available, either nationally or globally. In the past we often have to park decisions until we see national and international standards setting and adopted by overseas regulators. Although the relevant standards are maturing over the next few years, preparations should be put in place but some caution needed until standardisation of technologies has been completed. Since satellite is an important part of the 5G ecosystem, licensing and access to sufficient spectrum is the key issue for us. This means not just access to traditional satellite bands, like the C, Ku, and Ka bands, but also access to higher frequencies including V and Q bands. The demand for broadband satellite services continues to grow significantly and the satellite industry must have the spectrum available to meet this demand. 5G aims at using a broad range of frequency bands; some spectrum will be exclusive, some shared, some unlicensed. Typically, C band and mmW bands will be shared spectrum with terrestrial mobile services as a new entrant. How other services, such as satellite, will be adequately protected in the bands for future operations and continued deployment remains to be determined and as a consequence, sharing studies should be prioritised and accelerated to determine the parameters for

	coexistence. We note that the international agenda (standards, trials, etc) for early 5G bands is advancing rapidly with initial deployments in pioneer 3.6 GHz and 26 GHz (24.25 to 27.5 GHz) planned from 2018 onwards. The SSWG recommends that the pioneer mmW band (26 GHz) is moved into the initial investigation phase including engagement in the WRC studies as a matter of priority. Therefore, harmonization of spectrum allocations for all wireless applications (not only terrestrial mobile) is a priority. Intelsat also consider that the consensus positions reached in the World Radio Conferences (WRC-15 in particular) should be considered as the basis for global harmonization. Unfortunately, we see attempts to break away from the decisions reached in WRC-15. This leads to fragmentation in spectrum allocations, which doesn't serve anyone well. This fragmentation leads to uncertainty which impedes growth and innovation.
2. What is the relative priority of investigation of mmW bands versus other potential mobile broadband bands below 6 GHz?	Over the next two years, 5G developments will most likely focus on agreeing to the standards and demonstrating equipment and potential use cases, including for the role of satellite as an enabler of inclusive and ubiquitous 5G services for a wide range of services including media and entertainment. From 2018, initial commercial roll-out is expected in spectrum below 1 GHz and in the 3.4 to 3.8 GHz part of the C-Band, followed closely by commercial roll-out in the 26 GHz pioneer mmW band. It is important to note that sub 6 GHz and mmW bands are complementary and international planning points to the initial deployments occurring in both of these bands. As such, equal priority is ascribed to bands below 6 GHz and this mmW band. The ACMA needs to carefully study the impact this would have on existing services and find mitigating ways to protect the incumbent from new entrants. Such practice has taken place within the CEPT process to make sure the 3.4 to 3.8 GHz band is harmonised for IMT within Europe whilst making sure that existing FSS earth stations and indeed other services are protected. The SSWG also believes protection of maritime services in L-band needs to be considered urgently. Refer to the earlier Communications Alliance submission on the *Future Use of the 1.5 GHz And 3.6 GHz Bands*.[4]

[4] Communications Alliance Satellite Services Working Group submission on the ACMA Future Use of the 1.5 GHz And 3.6 GHz Bands Discussion Paper - November 2016

3. What disposition should the ACMA adopt in progressing possible 5G mmW bands? Specifically, is a traditional approach appropriate, where Australia would wait until there were clear signs of a harmonised, widespread ecosystem developing in a band before it was seriously considered domestically? Or should a more proactive approach be adopted that would potentially make available bands very early in a more speculative manner? What are the benefits and risks to each approach?	The SSWG is aware that much of the work in the mmW bands is likely to conclude prior to the end of the current WRC cycle leading up to WRC-19. It notes that it is important that Australia is not get left behind in this process and needs to be a part of key decisions being made. In practice this means supporting contributions and debate at study meetings. For the ACMA a proactive but cautionary approach is recommended as many uncertainties still belie 5G development. It is prudent to wait for the technical parameters at the very least in order to understand what protection/sharing studies need to take place as this process is already being dealt within the Study Groups in ITU-R. It would be useful to continue to monitor developments and take signals from Europe and Ofcom. The SSWG highlights the importance to the satellite services industry of ensuring the necessary and appropriate coordination with spectrum incumbents. The challenge for the ACMA is to strike a balance in setting a regulatory framework for Australia which is typically predicated by the decisions of the WRC and in meeting the needs of the various industry sectors.
4. What bands are the most mature in terms of possible early moves on 5G mmW bands?	Within Europe, the EU through the RSPG has identified 3.4 to 3.8 GHz (part of the existing satellite 'C-Band') as the 'primary band suitable for the introduction of 5G use in Europe even before 2020'. The 3.4 to 3.6 GHz band is more readily usable than 3.6 to 3.8 GHz where Ofcom is already consulting on the auction design; but even when this spectrum has been awarded to industry, with the potential for mobile operators to utilise carrier aggregation and supplemental downlinks, and with increasing provision of public Wi-Fi, it is expected that at some point the 3.6 to 3.8 GHz spectrum will also be required to meet growing data demand. The second band garnering some interest independent of the WRC process is in the 25 to 30 GHz spectrum range. Although the FCC has taken the lead in making spectrum available for 5G networks in a very specific part of the 28 GHz frequency band (e.g. 27.5 to 28.35 GHz), much of the Ka band in the US and Canada is still specifically designated for FSS, consistent with the need for satellite services generally and in the 5G ecosystem. However it is important that where technically feasible the option to protect existing satellite earth stations from undue interference continues to be needed given the

	importance of the traffic that is carried and the benefits that satellite connectivity provides to Australian businesses, consumers and government. The satellite operations in this band represent considerable investment to support high value contracts of lengthy duration and it would be unreasonable to remove protection from harmful interference. The existing fixed links and satellite use appear to be partly in more remote areas, which may improve potential for sharing, with mobile use in urban areas where greatest capacity is expected to be needed. The SSWG therefore proposes that mobile operators be required to coordinate their deployments in 3.4 to 3.8 GHz with incumbents, which we would expect to provide limited constraint on 5G deployment.
5. What technical considerations are relevant to possible early moves on 5G mmW bands? For example, what is the minimum contiguous bandwidth considered suitable for individual licences and the industry as a whole? Are some of these considerations flexible in order to support an early move?	Although this question is not for the satellite industry to answer, the SSWG notes that it still remains unclear what bandwidth requirement is being considered for 5G. The SSWG would like to draw to the ACMA's attention ITU-R Recommendation M.2083-0 which notes that 'bandwidths to support the different usage scenarios, e.g. enhanced mobile broadband, ultra-reliable and low-latency communications, and massive machine type communications) would vary .. requiring several hundred MHz up to at least 1 GHz'[5] and that 'there would be a need to consider wideband contiguous spectrum above 6 GHz'.
6. What spectrum sharing and incumbency considerations will be most relevant to 5G mmW bands (acknowledging that the answer will depend on the specific band under consideration)?	Spectrum needs are addressed under Resolves 1 of Resolution 238. Frequency bands under study, in an attempt to meet the spectrum needs, are addressed under Resolves 2 of Resolution 238. It is important to respect Resolution 238 and to differentiate on the one hand 'spectrum needs', and on the other hand 'frequency bands under study in an attempt to meet the spectrum needs'. Some of the 5G systems operating in mmW bands may employ beamforming technology based on large multi-element phased arrays. The beamed emissions from 5G base-stations will be quite narrow in azimuth and elevation, will be rapidly moving in three dimensions to specifically focus on user devices in the local coverage area, and may even be controlled to avoid specific targets such as other fixed radiocommunications stations requiring protection and satellites at higher elevation

[5] ITU-R M.2083-0 (09/2015) *IMT Vision — Framework and overall objectives of the future development of IMT for 2020 and beyond*. *Page* 9. Section 2.5.2

	angles. This creates the opportunity for greater use of geographic separation to be used for sharing, subject to the outcome of future sharing studies.
7. Do the mmW bands offer opportunities for new spectrum sharing and/or licensing approaches? If so, what opportunities should be investigated?	According to Resolves 1 to Resolution 238, spectrum needs should be estimated for the frequency range 24.25 to 86 GHz (as reflected in Question 3 above). Question 4 addresses the possibility of breaking down spectrum needs, i.e. if one is in a position to estimate spectrum needs according to sub-frequency ranges within the range 24.25 to 86 GHz (through more detailed information). In this case, it is to be noted that existing services in the bands 37 to 43.5 GHz, 45.5 to 50.2 GHz and 50.4 to 52.6 GHz are similar and some of these services use, or plan to use, paired bands. Therefore considering the characteristics of existing services in the bands 37 to 43.5 GHz, 45.5 to 50.2 GHz and 50.4 to 52.6 GHz is relevant. Furthermore, from the IMT technology perspective, it is not clear what would be the physical difference between 43.5 GHz and 45.5 GHz, or between 50.2 GHz and 52.6 GHz. These frequency ranges are comparable and close enough physically, and could therefore be grouped when considering spectrum needs. Therefore, it would make sense to express spectrum needs according to the following frequency ranges: • 24.25 to 27.5 GHz and 31.8 to 33.4 GHz • 37 to 43.5 GHz, 45.5 to 50.2 GHz and 50.4 to 52.6 GHz • 66 to 76 GHz and 81 to 86 GHz The opportunity exists for a greenfields approach which envisions, for example, ESIMs being introduced within a harmonised licensing framework – either on a regional or global basis – which takes into account sharing studies and leads to the possible free circulation of terminals. Any further developments by ITU-R Task Group TG 5/1, which is looking at spectrum ranges, and is scheduled to next meet during 15-22 May 2017, could be taken into account. With respect to the 32 GHz band which has been placed at Priority 2 by many organisations, it is noted that this band is relatively small in comparison to other bands and therefore present less opportunity for operators, particularly when considering use by multiple operators in the band.

	It is noted that assignments and class licences are already in place for particular point-to-point / short distance applications for the 71 to 76 GHz band and the 81 to 86 GHz band. The SSWG is aware that there is a lot more opportunity for sharing in the mmW bands with beam forming technology for mobile technology, targeting individual handsets. The radio environment is much more intelligent with services being able to be aware of each other. Therefore there exists an opportunity for licensing arrangements and technical frameworks which allow multiple parties to share the same bands.
Issue for comment: IoT To assist the ACMA in its considerations on IoT, comment (along with supporting evidence) is sought on the following questions:	
8. Are there any spectrum bands that should be further investigated by the ACMA for potential future use for IoT applications? Why? The ACMA in particular seeks views on possible opportunities in the VHF band for IoT.	There are currently several European decisions and reports on regulatory and technical matters related to GSO satellite earth stations in Ku-band, and such material will assist the development of the work proposed here, i.e. a new regulatory framework on Ku-band earth stations operating to FSS GSO systems that provide connectivity to cars as this is one vertical where the satellite industry in being very innovative towards where autonomous vehicles will change the way in which many of us commute. Satellite systems currently provide IoT services, used for example in asset tracking and for monitoring of power infrastructure. Satellite systems are used to extend coverage beyond that of terrestrial networks. Satellite systems are likely to have a role in the 'connected car', as a means of providing a communications channel for cars in remote areas, and as a means of efficiently distributing data to large numbers of users. All of the current satellite communication bands could be used for IoT applications, but the L-band is particularly suited to applications requiring low bandwidth, low power, and small terminals. It is not envisaged that any new satellite bands are required specifically for IoT, as IoT applications can work alongside other satellite applications. More generally the SSWG notes that suitable spectrum allocations and services already exist for IoT and recommends that the ACMA avoids allocating dedicated spectrum for IoT applications. The SSWG has not identified any obvious demand for IoT in the VHF band at this stage.

9. Are there any sectors of industry that require increased engagement from the ACMA regarding spectrum for IoT applications	The SSWG would like to see endorsement from the ACMA for the satellite component within Intelligent Transport Systems (ITS). This could initially be achieved through the APT AWG. The IoT Alliance Australia (IoTAA), in which the ACMA is actively involved, is the peak Australia IoT body that provides access to a wide cross-section of IoT service providers, vendors, consultants and suppliers as well as business, universities and consumer groups. Further information is available from www.iot.org.au.
Issue for comment: DSA To assist the ACMA in its considerations on the issues surrounding dynamic spectrum access, comment (along with supporting evidence) is sought on the following questions:	
10. When, or under what circumstances, would it be appropriate to move beyond monitoring international regulatory and technical developments and consider implementation of arrangements in Australia?	The SSWG understands Dynamic Spectrum Access (DSA) to be a spectrum management tool based on Cognitive Radio (CR), Software Defined Radio (SDR) and Software Defined Network (SDN) technologies, all of which are very much in development. The three technologies on which DSA is based will affect hardware, including transmitter, receiver and antenna, and software, design. The SSWG does not see the need for the ACMA to move beyond monitoring international regulatory and technical developments at this stage As has been observed by the ACMA and described in the FYSO, DSA technologies are yet to mature to the point where early implementations in other countries lead to the development of well-defined regulatory frameworks which could be translated to international standardisation and deployments. Once technical development of DSA leads to widespread regulatory certainty, potential implementation arrangements of DSA to meet Australian requirements could be established. Various solutions and applications may emerge in no prescribed order or timing, but the possibility is that DSA will create an easier sharing environment. DSA has generic application and the potential to assist co-existence of new and incumbent services. It would be difficult to prescribe exact circumstances and timing for DSA application, except to say that the proponents of IMT would do well to provide convincing evidence from trials and studies which would add confidence to greater sharing potential.

11. Are there specific industry sectors and applications where DSA is likely to be a candidate for early opportunity for adoption?	DSA as described in FYSO does not indicate to which service the various applications of DSA and the required device registration may be assigned as a secondary application to a specific service – fixed / mobile. The examples provided in FYSO are for specific bands and devices / applications which have been assigned on a licensed, licence exempt and unlicensed basis. Rather than considering which industry sectors might introduce DSA applications; an approach with greater certainty for all stakeholders would be for the ACMA to take a band by band analysis to determine appropriate introduction of DSA in Australia. Industry sectors and applications where DSA is likely to have an impact is any sector or application involving the sharing of spectrum. The SSWG notes that the opportunity to deploy DSA already exists in spectrum licensed space where the licensee may use DSA techniques to increase their own utilisation of the spectrum, or agree to allow a third party to use DSA techniques to access the spectrum.
12. Are there simple changes that can be made to the regulatory framework that would better allow facilitation of trials of DSA approaches and development of implementation arrangements?	For a regulatory framework which mirrors DSA applications, the ACMA has established the *Radiocommunications (Low Interference Potential Devices) Class Licence 2000* (the LIPD Class Licence). If implementation of DSA on a secondary basis is to be considered, perhaps the framework established for the LIPD Class Licence would be appropriate as the model or a benchmark framework to facilitate trials in Australia? In general though, it is understood that where at least two licensees share a band, the DSA system used would have to operate in accordance with ACMA license conditions. To do this may involve incorporating aspects of the associated RALI into elements of the CR software.
13. Are there any spectrum bands, services and/or applications, in particular that will be, or should/shouldn't be, targeted in Australia for trials or initial implementation of DSA frameworks?	Many other devices registered and licenced for secondary use in the bands allocated to fixed and mobile applications in Australia are often led by technology trends and frequency bands as adopted in other countries. Otherwise manufacturing costs would be higher of the devices for spectrum bands only assigned in Australia. Therefore potential candidate bands are likely to mirror those assigned in other countries. A simple form of DSA is that intended to be used in managing access to TV white space in the US. The available frequencies vary by geographic area; access is gained by the Wireless Regional Area Network (WRAN) base station (BS) consulting a

	database of frequencies by area. The BS needs to comply with IEEE 802.22, a standard for broadband wireless access using Cognitive Radio technology and spectrum sharing in TV white spaces, published in 2011. The Cognitive Radio functions include: spectrum management; geolocation, for which a GPS receiver is required; and spectrum sensing capabilities. The spectrum management function is to determine the TV channel to be used based on inputs from the other CR functions. The geolocation function requires the BS to know its location, and the location of devices to which it connects; and be able to access a database of geolocations to determine certain operating conditions. The spectrum sensing function is required so the BS can detect the presence or otherwise of other licensed transmission, e.g. wireless microphone, in the immediate vicinity. Incumbent low power systems, such as wireless microphone, are required to transmit a beacon signal, according to the IEEE 802.22.1 amendment, to indicate their presence.
Issue for comment: 5G, IoT and DSA Are there any impediments or restrictions arising from the regulatory framework that would impact on the deployment of 5G, IoT and DSA?	Over the next two years, 5G developments will most likely focus on agreeing to the standards and demonstrating equipment and potential use cases, including for the role of satellite as an enabler of inclusive and ubiquitous 5G services for a wide range of services including media and entertainment. The SSWG believes it is very important for the ACMA to not support any IMT terrestrial wireless use that is outside the bands identified for IMT.
Issue for comment: The ACMA's approach to the 12-month work plan The ACMA welcomes feedback on our proposed approach to the development of the 12-month work plan, including its format and content. The ACMA is also keen to receive feedback on the proposed communication channels for notifying stakeholders of progress on and changes to the work plan.	The 12-month work plan is a welcome addition to the FYSO but it would assist industry if both the WP and the FYSO were delivered in final form ahead of the financial year i.e. in line with accepted business practice. The Work Plan is a welcome inclusion to the FYSO, and works in hand with the annual reporting requirement for the ACMA which will feature in the impending legislation where it deals with accountability of the regulator. An important requirement from industry is timeliness which impacts on investment confidence and planning capabilities for enterprises. Both the Work Plan and FYSO should be completed in advance of the initial financial year and this would be a discipline which would be well received by industry, so that regulation is not an impediment to business. As it stands, the release of the Work Program and FYSO in October with comments due in January of the current Financial Year (which is July to June) could become more commercially sanguine and synchronised with the business cycle.

	The format, as a Table, is most helpful as a quick guide, and the reference to priorities is useful in understanding where the ACMA is placing its resources. Feedback should be able to rectify misplaced or inappropriate priorities. For instance in the current Table some satellite activities have a lower priority to MBB services despite the fact the satellite services are already afoot in the market place, whilst many MBB services will take some years to gestate. The current situation has it whereby the ACMA uses Occasional Papers and IFCs to inform itself on topics which ultimately feed into the host FYSO document. This process could be developed better by providing closure through a final output (or Views) regarding the ACMA's considerations of submissions (to OPs and IFCs) – this would be regulatory best practice (i.e. Preliminary Views – Submissions – Final Views). At the moment, what appears in the FYSO is the only clue to the ACMAs final views and these might be considerably abridged to fit the document. With regard to communications channels, the Spectrum Tune-ups and Radcomms are the main face-to-face forums of industry public platforms, together with ARSG activities. Occasional Papers and IFCs have great utility – and it would be timely to include the subject topic of contemporary and developing satellite services in the coming year.

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