Five-year spectrum outlook

2018–22

The ACMA’s spectrum management
work program—consultation draft

MAY 2018

Canberra

Red Building
Benjamin Offices
Chan Street
Belconnen ACT

PO Box 78
Belconnen ACT 2616

T +61 2 6219 5555
F +61 2 6219 5353

Melbourne

Level 32
Melbourne Central Tower
360 Elizabeth Street
Melbourne VIC

PO Box 13112
Law Courts
Melbourne VIC 8010

T +61 3 9963 6800
F +61 3 9963 6899

Sydney

Level 5
The Bay Centre
65 Pirrama Road
Pyrmont NSW

PO Box Q500
Queen Victoria Building
NSW 1230

T +61 2 9334 7700 or 1800 226 667
F +61 2 9334 7799

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Written enquiries may be sent to:

Manager, Editorial and Design
PO Box 13112
Law Courts
Melbourne VIC 8010
Email: info@acma.gov.au

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# Foreword

Spectrum is a critical input to Australian communications and media industries as more and more services and activities are relying on wireless connectivity. The Australian Communications and Media Authority (ACMA) needs an accurate understanding of changes in technology and market demand, both for new and existing spectrum uses, to inform the way we plan and make spectrum available. We rely heavily on spectrum users themselves to keep us informed.

The ACMA has consulted annually with industry about its spectrum management priorities through its five-year spectrum outlook (FYSO) since 2008–09. Last year, we took steps to align the FYSO with the Spectrum Review’s recommendation for a spectrum work program. The work program will cover at least five financial years, be updated and published each financial year after consultation with the minister, and reflect consideration of submissions from stakeholders prior to finalising the work program.

This year’s work program is informed by feedback we received in response to the key initiatives outlined in the 2017–21 work program, including the approach to developing an annual work program, a forward allocation work program and our planned approach to implementation of the Spectrum Review recommendations. Changes to this year’s FYSO are intended to further improve its utility to stakeholders. As a response to the feedback we received on last year’s work program, in this year’s FYSO we have provided:

* a summary work program so that key work streams, activities and proposed timelines for engagement can be more easily referenced. This will make it easier for stakeholders to track the ACMA’s progress on activities
* a holistic treatment of all major band (re)planning activities to support the establishment of new spectrum uses. This replaces the previous focus on replanning activities driven by the ACMA’s mobile broadband strategy
* more comprehensive attention to the wide set of existing spectrum uses where annual planning activity is directed to optimising use within existing regulatory frameworks. Separately, we continue to adopt a five-year planning horizon to track where there are new or changed spectrum uses under consideration and development both in Australia and internationally, with updates on relevant band planning activity provided in the work program
* revised allocation scenarios in response to the strong feedback we received

revised timing for the Spectrum Review implementation work, reflecting the ongoing development and drafting of the Radiocommunications Bill legislative reform package by the Department of Communications and the Arts (DoCA).

In Part 1 of the FYSO, we provide an overview of the technology, market, and policy drivers likely to shape the demand for, and supply of, spectrum over the next five years. In Part 2, we provide detailed information about the ACMA’s planned work priorities, with a focus on the 2018–19 financial year and beyond, where relevant to spectrum planning, forward allocation and Spectrum Review implementation, noting that each of these work streams reflect multi-year activities.

# At a glance—2018–19 work program

Here are the key activities proposed for 2018–19. Opportunities for consultation and engagement with the ACMA are highlighted in the timelines to provide stakeholders with information for their planning purposes.

Please note that the following abbreviations are used throughout:

* Quarter 1 (Q1): 1 July – 30 September
* Quarter 2 (Q2): 1 October – 31 December
* Quarter 3 (Q3): 1 January – 31 March

Quarter 4 (Q4): 1 April – 30 June.

1. Planning—establishing new planning frameworks

| Planning stage | Project priorities | Proposed timelines |
| --- | --- | --- |
| Monitoring | 600 MHz (617–698)3.3 GHz (3300–3400)3.8 GHz (3700–4200)4.5 GHz (4400–4500)4.8 GHz (4800–4990)Bands under study at WRC-19 agenda items 1.16 and 1.135G bands considered internationally other than under WRC-19 1.1340–50 GHz  | Continue to monitor domestic and international developments in these bands to identify usage trends |
| Initial investigation | 2 GHz (1980–2010 and 2170–2200 MHz)28 GHz (27.5–29.5 GHz)Extended MSS L band(1518–1525 and 1668–1675 MHz) | Further consideration of work on this band deferred until 2019–20 Q1: Consult on proposals for apparatus licensed fixed wireless broadband use outside metro areasQ3–4: Review of the extended MSS L band, simultaneously with the 1.5 GHz band preliminary replanning noted below |
| Preliminary replanning | 26 GHz (24.25–27.5 GHz)1.5 GHz (1427–1518 MHz) | Q1: Consult on detailed frequency, area and licensing configuration options Q3–4: Recommence consideration of band for mobile broadband use |
| Re-planning | 3.6 GHz with 5.6 GHz850 MHz expansion band (809–824 MHz and 854–869 MHz)900 MHz (890–915 MHz and 935–960 MHz) | 2018–19: Finalise proposed arrangements for transition of site-based point-to-multipoint uses outside of metropolitan areas from the 3.6 GHz to the 5.6 GHz band Decision paper outlined transition milestones for incumbent services making way for new mobile broadband. Allocation timeframes tied to those of the 900 MHz band (assuming 900 MHz is ultimately reallocated)Considering options for timing of band reorganisation, including potential clearance and reallocation processes |

1. Planning—optimising established planning frameworks.

| Planning area | Project priorities | Proposed timelines |
| --- | --- | --- |
| Broadcasting analog and digital radio | Make final decisions on Licence Area Plan variations for AM to FM conversion in Burnie, Devonport, Queenstown, Scottsdale and BathurstConsult on proposals for AM to FM conversion for Lithgow, Bega, Cooma, Goulburn and NowraDecide on extension of the determination of the low power open narrowcasting (LPON) sub-band | Q1 Q2 Q2 |
| Satellite | Earth stations—codify frequency co-ordination of earth stations with point-to-point links (in the 6 and 6.7 GHz bands) | Q1  |
| Satellite | Space objects:Finalise changes to Radiocommunications (Communication with Space Object) Class Licence 2015 and Radiocommunications (Foreign Space Objects) Determination 2014Consider feasibility of inclusion of 10.7–11.7 GHz in Communications Space Objects Class Licence | Q1 Q4  |
| Satellite | ESIMs—review regulatory arrangements for earth stations in motion (ESIM) in Ku band | Q2  |
| Satellite | Regulatory arrangements:General review of licensing procedures for space-based communications systemsCommence update of regulatory arrangements for small satellites | Q2 Q2 |
| Satellite | Consider applications for test and demonstration purposes in the 2 GHz band | Ongoing |
| Satellite | Manage filing and coordination of Australian satellite systems | Ongoing  |
| Low interference potential devices (LIPD) | Finalise consultation, which commenced late 2017 by Q4 2017–18. Further reviews of LIPD regulatory arrangements subject to considerations of requests from industry  | Ongoing  |
| Internet of Things (IoT) | Facilitation of early access to the 928–935 MHz band for low power wide area IoT applications | Ongoing  |

1. Major price-based allocations

|  |  |
| --- | --- |
| Project priorities | Proposed timelines |
| 3.6 GHz | Q4 2017–18: Final applicant information pack releasedQ2 2018–19 (October): Auction commences |
| 26 GHz | Q2 2018–19: ACMA planning decision\*Q3 2018–19: Reallocation decision |
| 850/900 MHz | Q2 2018–19: Finalisation of reconfiguration method for 900 MHz band and associated timeframes |
| 1.5 GHz | Q3 2018–19: ACMA planning options development Q1 2019–20: ACMA planning decision\* |

\*Based on Scenario 1 in the forward allocation work plan

1. Regulatory review and reform (Spectrum Review implementation)

| Project priorities | Proposed timelines |
| --- | --- |
| Annual work program | Q1: Publish final programQ4: Consult on draft work program |
| Planning and technical frameworks | Consult on revised arrangements following the release of 2nd Exposure Draft Radiocommunications Bill package |
| Licensing and licensing transition | Consult on revised arrangements following the release of 2nd Exposure Draft Radiocommunications Bill package |
| Pricing review implementation | Consult on revised arrangements following the release of 2nd Exposure Draft Radiocommunications Bill package |
| Equipment rules | Consult on revised arrangements following the release of 2nd Exposure Draft Radiocommunications Bill package |
| Accreditation arrangements  | Consult on revised arrangements following the release of 2nd Exposure Draft Radiocommunications Bill package |

1. Licensing

| Project priorities | Proposed timelines |
| --- | --- |
| Mobile phone jammers regulatory arrangements | Q1: Review of instruments due to expire in November 2018 |
| Body scanners in airports | Q1: Finalise consultations and consider changes to the current applicable licensing during 2018–19. |
| Renew amateur certificates of proficiency arrangements | Q2: Finalise arrangements for certificates of proficiency before expiry of the current deed with WIA (February 2019) |
| VHF marine radio use | Q4: Consider changes to the channels specified for maritime radio  |
| 400 MHz band  | Ongoing transition of licences to appropriate segments of the 400 MHz band before the completion of the final milestone in 2019–20 |
| Review of licensing arrangements for drones and prohibitions and exemptions for drone jamming | Q4: First stage review  |

1. Pricing

|  |  |
| --- | --- |
| Project priorities | Proposed timelines |
| Commercial broadcasting tax arrangements  | Q1: First tax assessment |
| Preparation for review of *Commercial Broadcasting (Tax) Act 2017* | Q4: Information to be issued about planned arrangements for the review required to be conducted after 1 July 2019 |
| 400 MHz opportunity cost pricing | Continued monitoring of band use |
| Apparatus licence taxes | Annual updates for CPI from 1 April each year |
| Spectrum licence taxes | Q1: Adjustments for new spectrum-licensed bands |

1. Compliance and enforcement

| Project priorities | Proposed timelines |
| --- | --- |
| Audit of mobile handset compliance outcomes  | Q1: Report publication |
| Gold Coast Commonwealth Games Readiness priority compliance area  | Q1: Report publication |

1. International engagement

| Project priorities | Proposed timelines |
| --- | --- |
| Fourth meeting of the APT Conference Preparatory Group for WRC-19 (APG 19-4) | Q3 (7–12 January 2019) |
| Second Conference Preparatory Meeting for WRC-19 (CPM 19-2) | Q3 (18–28 February 2019) |

## Consultation and feedback

We are requesting your feedback on this draft 2018–22 FYSO and any other comments you would like to contribute by **Friday** **15 June 2018.** The feedback you provide will inform and refine the priority activities included in the finalised 2018–22 spectrum work program. We aim to publish a final version of the work program in the first quarter of the 2018–19 financial year. We look forward to your comments.

### Consultation question

1. What further improvements could be made to the FYSO to make it easier for stakeholders to engage with the ACMA on its work program?

# Part 1—Five-year spectrum outlook

## Introduction

Part 1 of this FYSO takes a broad view of trends in technology and spectrum uses that inform the ACMA’s medium-term planning, allocation and reallocation activities.

The ACMA takes account of a range of factors in planning its spectrum management work. We monitor developments in radiocommunications technology, in spectrum use markets and in the broader policy environment to inform our allocation of resources to particular issues and regulatory outcomes.

## **Anticipated change drivers**

Demand for new spectrum and changes to existing arrangements continue to evolve quickly, requiring the ACMA to regularly reassess the priority of its work to reform and update planning arrangements in particular bands, as new opportunities arise to maximise the overall public benefit derived from allocating and using spectrum.

International trends that are driving demand for spectrum include the blurring of distinctions between fixed and mobile broadband, rapid innovations in satellite technologies, and ongoing commercialisation of IoT applications. Technology continues to develop to more efficiently exploit available spectrum, including through more efficient radiocommunications transmission and encoding technologies, as well as antenna technology enhancements that provide greater options in the use of high frequency bands.

The ACMA’s response to these demand pressures is outlined in more detail in the planning and allocation work stream activities. The information incorporates an annual work program component containing details of when we expect tasks to be completed. The five-year component of the work program does not give timing commitments as experience shows the relative priority of work in future years is liable to change. The intention is to alert stakeholders to the pressures likely to shape future annual work programs. It lets the proponents of change know that ACMA is alert to issues, while giving notice to spectrum incumbents about the pressures emerging on planning arrangements in bands they rely on.

### Wireless broadband, including 5G

Demand for spectrum to support wireless broadband continues to be a major driver for changes in highest-value spectrum use across a number of bands. Mobile broadband continues to be the largest but not the only source of demand. We anticipate further spectrum will be needed to support the growth in broadband applications and mobile data in particular.

The current work program, including the forward allocation work plan (see below) and the [ACMA mobile broadband strategy](https://www.acma.gov.au/Industry/Spectrum/Spectrum-projects/Mobile-broadband/mobile-broadband-strategy-and-work-plan), remain the basis for the ACMA’s response to wireless broadband spectrum demand.

The rapid development of the next generation of wireless broadband technology, known as 5G, has emerged as a key driver of change to existing spectrum arrangements. This is the case not only because of the potential for reallocation of additional spectrum bands to support its deployment, but because its particular characteristics, and the characteristics of some of the bands into which it will be introduced, challenge us to consider new ways to plan and license that spectrum.

The definition of 5G has been firming over the past 12 months, both in the International Telecommunication Union Radiocommunication Sector (ITU-R) in terms of defining IMT-2020[[1]](#footnote-2), and in 3GPP in its work on Release 15, which is focusing on the enhanced mobile broadband aspect of 5G.[[2]](#footnote-3)

Defining objectives of 5G that distinguish it from previous developments continue to include:

* support for very low latency and ultra-reliable communications
* enhanced mobile broadband enabling data rates exceeding that of LTE/4G
* an ‘anytime, anywhere, anyone and anything’ capability, which is anticipated to play a role in supporting multiple device M2M communications and a wider deployment of the IoT

its use of broader channel bandwidths than are currently used for wireless broadband services, particularly in the mid and high bands where channel bandwidths of hundreds of MHz are being contemplated.

From a spectrum management perspective, 5G appears certain to utilise spectrum across an unprecedentedly wide range of frequency bands. This will include:

* ‘low-band’ spectrum below 1 GHz, much of which is already used for mobile broadband networks
* ‘mid-band’ spectrum between 1 and 6 GHz

’high bands’, including in the previously unused mmWave bands[[3]](#footnote-4), which are the focus for much of our current wireless broadband-related planning work.

In addition to the use of ‘new’ frequency bands, we expect that many of the bands already available for broadband in Australia will be re-farmed over time by incumbent users for 5G technologies.

Globally, 5G is seen as having potentially revolutionary economy-wide benefits[[4]](#footnote-5), including in areas not traditionally associated with fixed and mobile wireless broadband. On 12 October 2017, the government released the directions paper, [*5G—Enabling the future economy*](https://www.communications.gov.au/departmental-news/5g-enabling-future-economy) and announced that a working group to drive the deployment of 5G mobile technology in Australia would be convened.[[5]](#footnote-6) The directions paper outlines the immediate actions for government to take that will support the timely rollout of 5G in Australia. These include:

* making spectrum available in a timely manner
* actively engaging in the international standardisation process
* streamlining arrangements to allow mobile carriers to deploy infrastructure more quickly

reviewing existing telecommunications regulatory arrangements to ensure they are fit-for-purpose.

The directions paper highlighted that the government will support the 5G rollout in Australia, including by making spectrum available in a timely manner. Since then, the minister has made a reallocation declaration for the 3.6 GHz band, to enable an auction to be held in October 2018 for this first 5G band in Australia.

The government has convened a working group to bring together representatives from across government and industry, including the ACMA. At its first meeting, the group agreed that further exploration of the autonomous vehicles, agricultural and health sectors would provide a good platform to examine the barriers and enablers to 5G use in Australia. Further information on the working group is made available on the website of the Department of Communications and the Arts (DoCA).

The ACMA acknowledges the importance and urgency of addressing the 5G spectrum challenge and is committed to ensuring that Australia is well placed to take advantage of the opportunities offered by 5G.

Each of the broad bands identified for wireless broadband/5G consideration requires a specific approach by the ACMA. This because different considerations apply, such as international harmonisation and standardisation, domestic policy, legacy planning and allocation arrangements, and other incumbency factors.

In the bands below 1 GHz, the ACMA has two primary short- to medium-term objectives:

* working with industry as necessary, optimize the efficient configuration of the 850 and 900 MHz band allocations, mostly already allocated for mobile broadband purposes, including by securing a 1 MHz downshift of the 850 MHz spectrum licences

implement the existing planning decision to make additional spectrum available for mobile broadband in the 850 MHz expansion band.

Beyond these regulator-initiated activities, the ACMA notes the potential for commercial negotiations to achieve a consolidation of licensee holdings between the various bands below 1 GHz. Such a consolidation could deliver benefits of larger contiguous holdings for licensees, likely offering some technical efficiencies, along with reducing the number of bands used with potential infrastructure benefits for licensees.

The mid-bands between 1 and 6 GHz are currently the focus of near-term 5G deployments around 3.4 to 3.7 GHz. Following the completion of the current allocation priority of the 3.6 GHz band, the ACMA sees a major opportunity for efficiency gains through the defragmentation of the current 3.4, 3.5 and 3.6 GHz holdings. This will require both industry commitment and ACMA assistance to achieve. Beyond the 1.5 GHz band, which is likely to be a medium-term candidate for detailed planning review, there are several other potential areas of investigation in the mid-bands. These include the currently speculative considerations of dynamic spectrum access concepts in the 3.3, 4.5 and 4.8 GHz bands.

Spectrum in the 3.8 GHz band from 3.7 GHz to 4.2 GHz has been the subject of considerable interest worldwide, with a number of processes underway considering arrangements in some or all of the band. For example, spectrum between 3700 and 3800 MHz is part of the broader 3400–3800 MHz band being considered as an early 5G band in Europe.

Ofcom has further investigated 3800–4200 MHz as a candidate for more intense spectrum sharing between uses. In the US, the FCC has commenced a Notice of Inquiry into the ‘flexible use in the mid-band’, which includes the 3.7–4.2 GHz range. A common feature of all of these investigations is considering the possibility of more spectrum for wireless broadband in the context of existing spectrum users, particularly the fixed satellite service.

The ACMA is playing close attention to the global environment in this band and will continue to monitor developments as they relate to the Australian environment.

The millimetre waves in the bands above 24 GHz are where the high-band efforts are centred. The near-term priority is investigating the potential for wireless broadband in some or all of the 26 GHz band where much global attention is focused and where there appears to be good opportunities in Australia. The ACMA has also previously committed to investigate the possibility of establishing apparatus-licensed arrangements for point-to-multipoint use in some of the 28 GHz band. This work is part of a suite of measures the ACMA has identified to assist incumbents displaced from the 3.6 GHz band due to its reallocation. Higher in the band, the ACMA has flagged the possibility of changes to class-licensing arrangements to support additional spectrum in the 60 GHz range, which is also being looked at for 5G use around the world.

Along with the ACMA’s efforts to make spectrum available, there are continuing opportunities for spectrum users to enter into commercial arrangements to share infrastructure or spectrum that will realise more efficient spectrum use. Achieving more efficient configuration and use of bands that are already licensed for wireless broadband is a vital adjunct to the clearance and reallocation of new bands to address rising demand for wireless broadband. In part, this obligation must fall on existing licensees, as well as the regulator, to ensure that the market works to achieve defragmentation and reconfiguration of existing holdings to maximise the overall utility of bands.

Planning and licensing activities planned for 2018–19 and beyond, which support wireless broadband services, including 5G, are discussed in further detail in Part 2.

### Machine-to-machine communications and the IoT

The IoT potentially involves unprecedented numbers of wireless and wired interconnections of personal, consumer and industrial devices supporting a range of applications. It is not limited to any specific technology platform and is likely to use frequency allocations across the entire spectrum. For example, 4G and 5G standards have made—or will make—specific provisions for dedicated IoT service delivery, and satellite services are already investing in services and hardware to enable IoT.

Devices providing industrial metering, switching and/or control (including smart infrastructure) are a subset of IoT communications technologies. They require very low data rates and/or very low duty cycles and operate in low power wide area (LPWA) networks. An international market has emerged for LPWA networks and devices that operate in the 900 MHz band. Separately, mobile network operators have been deploying IoT-specific variants of the 4G standard, such as Narrowband IoT (NB-IoT) and Cat-M1.

Planning activity to support IoT applications is outlined further in Part 2.

### Broadcasting

The Spectrum Review recommended that broadcasting spectrum be better integrated into the general spectrum management framework, while maintaining the broadcaster’s access to spectrum to deliver their services. There are some distinctive features of broadcasting planning that affect how demand is managed. In particular:

* future requirements for broadcasting spectrum are likely to depend on government decisions about the development of the sector

the minister is responsible for decisions to vary the Broadcasting Services Bands (BSB).

In relation to television, there has been minimal demand for spectrum for additional television transmitters since the completion of the switchover to digital television, with the only demand being for retransmissions from remote communities, mining companies and caravan parks.

The future spectrum planning requirements for television broadcasting remain unclear as technology advances. The main issue facing the television industry is the expected future obsolescence of the DVB-T[[6]](#footnote-7) transmission standard and the MPEG-2 video compression standard. While upgrading the original MPEG-2 compression standard to MPEG-4 is proceeding using existing broadcaster multiplexes, use of more modern standards, such as DVB-T2 transmission along with HEVC video compression, or the rival ATSC standard, will require separate, dedicated multiplexes. The introduction of DVB-T2 services using HEVC video compression could provide up to a five-fold increase in the number of services that can be carried in a television channel.[[7]](#footnote-8)

Generally, television planning caters for ABC, SBS, three commercial services and one unallotted channel at most sites. The unallotted channel (‘the sixth channel’) is available in most areas for trials of more advanced standards. In 2018, the ACMA issued scientific licences to facilitate the first industry field trial of DVB-T2 and HEVC. The three-month trial commenced in Sydney in April 2018. The trial was conducted by Free TV Australia and Broadcast Australia, with participation from the ABC and SBS. The longer-term use of the unallotted channel, including its potential utility in any migration path to more advanced standards, remains unclear.

Digital radio services make use of two former VHF television channels, which were set aside for this purpose when digital television services were replanned to clear the 700 MHz band. In 2016, the ACMA undertook extensive studies on ways to facilitate the rollout of digital radio to regional licence areas. The key outcome of these studies was that the implementation of digital radio services in all existing licence areas, if desired, would be constrained because the potential demand would exceed the available supply of spectrum under certain conditions. In order to preserve the option of digital radio implementation in all existing licence areas, a number of compromises were identified as being required and these have been set out in the ACMA’s planning principles for the expansion of digital radio to regional areas.

The key compromises were an initial limit on the maximum power level for any transmitter considered in the development of allotment plans and an uneven split of the available spectrum capacity between national and commercial/community broadcaster multiplexes, with the national broadcasters having access to only two of the eight available frequency blocks. This is because national broadcasters are not constrained by licence areas and should be able to deploy single frequency networks over wider areas.

Demand for AM radio spectrum is low due to the high transmission costs, as well as the increasing levels of man-made noise and an international trend for receivers not to incorporate AM tuners. Consequently, the ACMA is in the process of facilitating the conversion to FM of some commercial AM radio services operating in single-owner regional licence areas. Identifying suitable FM spectrum for these services is proving quite challenging in many areas and, in some cases, there may be competing claims over the same frequency. As a result, the planning for these conversions can be complex and time consuming.

Specific planning and licensing activities to support AM to FM conversions are discussed in more detail in Part 2.

### Satellite communications

With growth and innovation in the provision of satellite-delivered telecommunication services and satellite usage in space science services, there is increasing pressure both internationally and domestically to ensure that regulatory arrangements continually evolve to support this change.

Innovations such as the deployment of low-cost, miniaturised space hardware (often referred to as nanosats, cubesats or smallsats), the growth in the use of moving earth stations (also referred to as ‘earth stations in motion’) in the fixed satellite service[[8]](#footnote-9) (FSS) and the development of large constellations satellite systems services are challenging the suitability of existing arrangements. This is resulting in the need to both establish new spectrum access arrangements and refine existing ones.

The ACMA has a detailed program of activity outlined for 2018–19 to address a range of different satellite planning requirements. See the information in the *At a glance—2018–19 work program* summary and detailed planning information in Part 2.

### Government spectrum requirements

The Spectrum Review recommended better integrating the management of public sector spectrum to improve the consistency and integrity of the framework. DoCA conducted a review of Commonwealth Government agency spectrum holdings. As a result, a steering committee has been established, comprising representatives of relevant agencies, that is intended to bring about a reporting regime that will increase transparency of holdings and enable a whole-of-government approach to the management of Commonwealth spectrum. While not a formal member of this committee, the ACMA will provide technical assistance.

Discussions are currently underway between the Commonwealth, led by DoCA and the Department of Home Affairs, and state and territory governments on a public safety mobile broadband (PSMB) capability. The ACMA is continuing to assist government in these considerations, which may have spectrum management implications.

### Dynamic spectrum access

Spectrum sharing is fundamental to effective spectrum management and a key tool in maximising the benefits achieved through use of the spectrum resource. As with all forms of resource sharing, spectrum sharing requires some degree of compromise between multiple spectrum uses (that is, services or applications) or users (individual licensees) accessing the shared spectrum.

Traditionally, spectrum sharing has largely focused on static approaches that establish co-existence arrangements defined through fixed geographic and spectral boundaries. It has been far less common to use dynamic spectrum-sharing approaches, sometimes referred to collectively as dynamic spectrum access (DSA) or dynamic spectrum management. These techniques typically take advantage of time-based changes in spectrum use by spectrum users—that is, some spectrum users may not use all the spectrum, in all geographic areas, all the time.

In practice, DSA approaches have relied on a hierarchical access approach, where lower-tier users[[9]](#footnote-10) dynamically give way to higher-tier users. Clarity on tier rights is important as it provides confidence to each user about the terms of spectrum access, which allows an assessment of whether the access is suitable to their needs.

Tiered sharing works best when the users are complementary in nature—for example, when one user’s usage is intermittent (often the top-tier user) and the lower-tier user can accept that in some circumstances they will need to cease operations for some period of time. If this condition cannot be met, then enough spectrum is needed to ensure there is a high probability of sufficient clear, unused, spectrum being available to meet all user needs. Lower-tier users are unlikely to invest in expensive infrastructure without sufficiently reliable spectrum access.

Limited use of DSA in the past is in part due to technological limitations, spectrum availability factors and user expectations. As such, regulatory frameworks have not been widely developed to facilitate spectrum sharing through DSA. In effect, the complexity and compromises that are currently associated with most dynamic spectrum-sharing arrangements has meant that DSA applications have not yet attracted any strong investor interest in Australia.

Although a number of the DSA frameworks have been proposed or introduced by overseas spectrum regulators, domestic opportunities for full-scale deployment of DSA techniques and regulatory approaches in Australia have not yet presented themselves. The ACMA will continue to monitor international regulatory and technical developments, and implement DSA arrangements when and where appropriate, noting that sharing opportunities in the 3.3, 4.5 and 4.8 GHz bands are being monitored. Further information is outlined in the detailed planning discussion at Part 2.

### Consultation question

1. Are there other technology developments or sources of spectrum demand the ACMA should be aware of in considering spectrum management over the next five years?

# Part 2—Proposed 2018–19 spectrum work program

In Part 2, we provide information about the work streams and activities that the ACMA is proposing to focus on over the 2018–19 financial year. Where elements of planning, allocation and Spectrum Review implementation activities span multiple years, we have identified the relevant timing information. Activities are grouped according to the ACMA’s main spectrum management functions:

* planning
* allocations
* regulatory review and reform with a focus on implementation of the Spectrum Review
* licensing
* pricing
* compliance and enforcement

international engagement.

The ACMA’s spectrum work program remains responsive to short-term changes in spectrum demand, technological developments, government priorities and available resourcing. The planned milestones in this FYSO, especially those relating to 2018–19, are subject to change. The ACMA’s responsibilities in implementing new spectrum management legislation (see *Spectrum Review implementation*, below) will be significant, particularly in the period leading up to commencement of that legislation. As the legislation is settled and the timetable for its consideration by Parliament firms up, the timing and nature of the ACMA’s responsibilities will become clearer, and may affect the other milestones provided here.

Submissions for last year’s FSYO are considered in our approach to the forward year’s work, and we report on the progress achieved since the release of the last FYSO. While some submissions to the 2017–21 FYSO asked for information in calendar year format, we have adopted a single financial year convention for consistency throughout the document.

# Planning

The ACMA aims to optimise planning arrangements in each band for the use or uses that maximise the overall public benefit. Planning arrangements in bands should enable the allocation (or movement) of spectrum to specific users with no, or minimal, further regulatory intervention, and may remain stable over long periods of time.

Where there is evidence of changes in the optimal use or uses of bands, however, the ACMA may identify that there is a net public benefit in the band moving to a new or changed use, or being re-configured to better support an existing use. Consulting where appropriate with existing and future users, the ACMA will then consider how best to accommodate additional uses or users within the available spectrum.

Planning activities are directed into two main streams:

* major band (re)planning activities to support the establishment of new spectrum uses. This may require the re-farming and reallocation of spectrum from an existing use and users to different a use and users

optimising established planning frameworks for existing spectrum use through updating technical coordination arrangements. This can include addressing sharing demands, defragmentation and optimising planning configurations.

Earlier in the FYSO, we outlined the various pressures occurring in the market, technology and policy environment that are influencing demand for spectrum and informing the ACMA’s approach to spectrum management.

Planning is informed by domestic and international demand for spectrum uses, developments in international spectrum harmonisation and technology standardisation paths, and evolution of communications technology. The planning information included in the annual work program reflects expected developments over a five-year time frame. Specific planning activity intended to be conducted during the 2018–19 financial year is also highlighted.

## **Major band (re)planning activities**

This section of the FYSO provides an overview of the ACMA’s work in establishing new planning frameworks, including for re-farming and reallocation. As broadband is not the only driver of potential changes in the optimal use or uses of bands, the section also provides information about other major band replanning activities. Readers interested in the price-based allocation of spectrum resulting from major band re-planning activities should turn to the next chapter, which deals with the ACMA’s forward allocation work plan.

Bands listed are categorised as follows:

* **Monitoring**—Business-as-usual monitoring of international and domestic spectrum usage trends. At this stage, the ACMA maintains an awareness of developments and interest in potential changes to the use of the band that may require substantial planning activities. There is no direct action required by stakeholders at this stage, however, there is an opportunity for stakeholders to keep the ACMA appraised of relevant developments and issues.

In general, the ACMA sees bands and issues included at the monitoring stage as representing potential work items beyond its immediate 12-month work program.

* **Initial investigation**—Initial investigation and scoping of potential options for domestic replanning of a band. This stage normally includes initial consideration of whether the new spectrum use contributes to maximising the overall public benefit derived from use of the spectrum, along with preliminary assessments on coexistence and other technical considerations. Formal public consultation may occur through mechanisms such as public industry meetings (such as spectrum tune-ups) and/or discussion papers where general feedback on issues is sought.
* **Preliminary replanning**—Identification of detailed replanning proposals based on feedback received at the initial investigation stage, along with a detailed consideration of the spectrum uses that would maximise the overall public benefit derived from the spectrum. Considerations are informed by detailed technical coexistence studies and include development of draft, high-level technical planning frameworks. Analysis is undertaken of ongoing incumbent spectrum needs and identification of any mitigations necessary to address the impact potential changes in the planning environment may have on incumbent users. Formal public consultation occurs through mechanisms such as the development of an options paper, where detailed planning options are identified and feedback on issues is sought.
* **Replanning**—Represents the conclusion of the ACMA considerations and identifies planning outcomes expected to maximise the overall public benefit. This includes further development of detailed technical planning frameworks (including further consultation where necessary). Depending on the nature of the existing use of the band, this stage could potentially lead to re‑farming/reallocation activities. Conclusions from the ACMA planning process are communicated in an outcomes paper that may include ACMA decisions on issues within its remit and/or identify preliminary dispositions on future activities subject to further legislative process (for example, decision or actions to be undertaken by the minister).

## What has changed since last FYSO?

Feedback received on last year’s FYSO provided many suggestions for additional bands to be included in the ACMA’s planning work.

Some submissions were critical of the emphasis given to planning for mobile broadband uses and the inclusion of a separate mobile broadband work plan within the FYSO. The ACMA recognises the value of employing a more neutral approach for future discussion of its band replanning work. While mobile broadband has been, and remains both domestically and internationally, the single largest driver of wholesale changes in the use, and hence replanning of bands, the employment of neutral rather than application-specific language recognises that other use cases, including other wireless broadband applications, will also drive the need for major replanning in bands.

The tables of key projects below incorporate, but are not limited to, bands under consideration for broadband use. The amalgamation of all major planning activities acknowledges that mobile broadband services are part of the normal planning processes, while maintaining transparency for all stakeholders on both the mobile broadband and non-mobile broadband-related activities of the ACMA.

Major replanning progress achieved since October 2017 includes:

* **900 MHz band**

In October 2017, the ACMA released a paper setting out the preferred reconfiguration option for the 900 MHz (890–915/935–960 MHz) frequency band in order to transition from the current 2 x 8.2 or 8.4 MHz frequency arrangements to multiples of 2 x 5 MHz. The ACMA expects to firm up on implementation time frames for the reconfiguration of the 900 MHz band during the year to optimise the band’s planning arrangements for LTE services.

* **Cooperative intelligent transport systems (C-ITS) in the 5.9 GHz band**

The ACMA finalised the Radiocommunications (Intelligent Transport Systems) Class Licence 2017 in December 2017 and it was registered in January 2018. The ACMA, therefore, has no current plans to revisit these arrangements in the near term, but will continue to monitor the suitability of the regulatory regime, particularly in light of possible developments regarding V2X technologies.

* **3.6 GHz band**

In October 2017, the ACMA announced the outcomes of the review of the 3.6 GHz frequency band. The decision confirmed that the frequency band be moved to the re-farming stage of the ACMA’s process for the consideration of additional spectrum for mobile broadband uses. In March 2018, the Minister for Communications made a reallocation declaration for the 3.6 GHz frequency band. The ACMA is now conducting relevant processes to allow the band to be available for the issue of spectrum licences in metropolitan and regional Australia. This includes the formation of a technical liaison group (TLG) from March to April 2018 to provide advice on the 3.6 GHz band spectrum licence technical framework.

As part of the outcomes announced for the 3.6 GHz band, there were a number of mitigation measures identified for affected incumbent point-to-multipoint licensees. The ACMA is progressing planning work to put in place a coordinated apparatus-licensed regime for site-based point-to-multipoint uses outside of metropolitan areas in the 5.6 GHz band and intends consulting on the planning arrangements.

* **mmWave spectrum for 5G**

A spectrum tune-up, ‘Spectrum for 5G broadband in mmWave bands’ was held in September 2017. Following this, in October 2017, a number of questions were asked regarding potential licensing and frequency/area allocation options for the 24.25–27.5 GHz frequency band.

1. Monitoring

| Key projects | Activity | Milestones |
| --- | --- | --- |
| 600 MHz(617–698[[10]](#footnote-11) MHz) | The 600 MHz band is currently used by digital television services in Australia and is available for some services under the [Radiocommunications (Low Interference Potential Devices) Class Licence 2015](https://www.comlaw.gov.au/Series/F2015L01438). Monitoring of this band is consistent with the Australian Government’s interest in considering the long-term availability of the television ‘sixth channel’ for non-broadcasting uses.[[11]](#footnote-12) It could also support scenarios in which national broadcasting services were consolidated onto a single multiplex in each area, potentially freeing up an additional channel for broadcasting or other uses. Current TV channel arrangements include spectrum both inside and outside of the 600 MHz band and would require a further re-stack (sometimes referred to as a ‘second digital dividend’) to yield a contiguous block of spectrum in the 600 MHz range. The sixth channel is currently available for trials of more advanced digital television technology. There are no current government or industry plans for technical standards migration of television or the reconfiguration of TV channels. Recent developmentsThe FCC incentive auction (which closed on 30 March 2017) resulted in a repurposing of 84 MHz of spectrum—70 MHz for licensed use and another 14 MHz for wireless microphones and unlicensed use.[[12]](#footnote-13) In addition, the Radio Spectrum Policy Group (RSPG) of the European Commission (EC) has also provided a [long-term strategy for the future of the UHF band](http://rspg-spectrum.eu/wp-content/uploads/2014/03/RSPG14-555final_Request-for-Opinion-UHF-band.pdf), which suggests the band remain available for broadcasting services until at least 2030. It also recommends that the band should be available for downlink-only broadband services on a secondary basis. This outcome is reflected in the [EC’s inception assessment](http://ec.europa.eu/smart-regulation/roadmaps/docs/2015_cnect_017_uhf_en.pdf), but a final decision is still pending.ITU-R Working Party 5D is continuing the revision of Recommendation ITU-R M.1036-5 on frequency arrangements for implementation of the terrestrial component of International Mobile Telecommunications (IMT) in the bands identified for IMT in the Radio Regulations (RR). The draft revision includes arrangements for the frequency band 470–698 MHz. Working Party 5D is aiming to complete the development of frequency arrangement(s) in the frequency band 470–698 MHz at its January 2018 meeting and finalise the revision of the Recommendation for the November 2018 meeting of ITU-R Study Group 5. The AWG finalised a report on frequency arrangements for IMT in the band 470–698 MHz at its September 2017 meeting. The arrangements mirror those put in place by the FCC and are included in Release 15 of the LTE specification as Band 71 by 3GPP.Next stepsGiven the outcome of WRC-15 and ongoing work internationally, the ACMA will continue to monitor international developments in the 600 MHz band. In particular, the implementation of the results of the incentive auction process in the United States (US) will be of key interest. The ACMA will also engage with industry and government on technological evolution of terrestrial digital television, including DVB-T2 and HEVC. Adoption of these technologies is likely to be a prerequisite for any future reallocation of broadcasting spectrum for non-broadcasting uses, though it is also key to the more efficient use of spectrum by the television industry itself. Both the government and the ACMA have emphasised the availability of ‘sixth channel’ spectrum for trialling the new standards.  | Ongoing monitoring |
| 3.3 GHz (3300–3400 MHz) | The 3300–3400 MHz band is currently allocated on a primary basis to the radiolocation service worldwide. In Australia, the radiolocation service in this band is designated to be used principally for the purposes of defence and national security via footnote AUS101A of the Spectrum Plan. The Department of Defence (Defence) is normally consulted in considering non-defence use of this service. At WRC-15, the 3300–3400 MHz band was identified for IMT by a number of countries. This band is already a WiMAX profile band, deployed in some countries.[[13]](#footnote-14) Recent developmentsITU-R Working Party 5D is continuing the revision of Recommendation ITU-R M.1036-5 on frequency arrangements for implementation of the terrestrial component of IMT in the bands identified for IMT in the RRs. The draft revision includes arrangements for the frequency band 3300–3400 MHz. Working Party 5D also commenced studies as called for in Resolution **223 (Rev. WRC-15).** Working Party 5D is aiming to complete these work items by late 2018. The AWG has a work plan to develop a recommendation or report on harmonised frequency arrangement(s) for the 3300–3400 MHz band. Technology standardisation within the 3GPP is also developing, with two bands defined by the 3GPP in July 2017: the first band being 3.3–3.8 GHz and the second being 3.3–4.2 GHz. Next stepsGiven the outcomes of WRC-15, and the potential for economies of scale to develop for equipment, the ACMA will continue to monitor international developments in the 3.3 GHz band. Possible engagement (including through contributions) in international studies as outlined in Resolution **223 (Rev. WRC-15)** will be considered. Noting incumbent use of the band, the ACMA is of the view that this band may be a candidate for consideration of dynamic spectrum-access type arrangements, to promote sharing and increase the utility of the band. If the ACMA pursues this idea, it will engage further with relevant stakeholders. | Ongoing monitoring |
| 3.8 GHz (3700–4200 MHz) | The 3.8 GHz band is allocated on a co-primary basis in Australia to the fixed, fixed-satellite (space-to-earth) and mobile services. The use of the 3700–4200 MHz band has been debated internationally for a number of years. Recently, there has been increasing interest in the lower and lower-adjacent parts of this band for 5G services, particularly given the large bandwidths potentially available in this range. In June 2016, Japan’s Ministry of Internal Affair’s and Communications (MIC) named the 3.6–4.2 GHz band as a nationally suitable candidate band for 5G.[[14]](#footnote-15) This has resulted in increasing support from domestic mobile broadband interests in pursuing this band for mobile broadband. Recent developmentsIn December 2016, the European Commission issued a Mandate to CEPT[[15]](#footnote-16) to develop harmonised technical conditions for the use of the 3400–3800 MHz band for 5G. As a result of this mandate, in March 2018, the Electronic Communications Committee (ECC) consulted on two draft new reports that reviewed the suitability of the current regulatory technical conditions for 5G operation in the 3400–3800 MHz band.[[16]](#footnote-17) Next stepsGiven the increasing interest in the 3.8 GHz band, and the potential for economies of scale to develop for equipment, the ACMA will continue to monitor international developments in this band.  | Ongoing monitoring |
| 4.5 GHz (4400–4500 MHz) | The 4400–4500 MHz band is currently allocated on a co-primary basis to fixed and mobile service worldwide. In Australia, the band is designated to be used principally for the purposes of defence and national security via footnote AUS101 of the Spectrum Plan. Defence is normally consulted in considering non-defence use of this service. Typical use is for aeronautical mobile telemetry for flight testing by aircraft stations.The 4400–4500 MHz band was considered for use for mobile broadband services in the lead up to WRC-15. However, the band was not identified for IMT at WRC-15 despite strong interest from China, Japan and Korea, in particular. Since then, there has been increasing interest in this band, particularly from Region 3 countries. In June 2016, Japan’s Ministry of Internal Affair’s and Communications (MIC) named the 4.4–4.9 GHz band as a nationally suitable candidate band for 5G.[[17]](#footnote-18) There is some support from domestic mobile broadband interests in pursuing this band for mobile broadband in Australia. Recent developmentsIn October 2016, Vodafone and Nokia conducted the first live public 5G demonstration in Australia using the 4.5 GHz band.[[18]](#footnote-19) There have also been a number of 5G trials using the 4.5 GHz band in other Region 3 countries, including in China, Korea and Japan.[[19]](#footnote-20) The 4400–4900 MHz band has been defined as one of Japan’s official 5G bands. Allocation and technical rules for Japan’s official 5G bands are expected in 2018.[[20]](#footnote-21) Next stepsThe ACMA will continue to monitor international developments in this band. Noting incumbent use of the band, the ACMA is of the view that this band may be a candidate for consideration of dynamic spectrum-access type arrangements to promote sharing and increase the utility of the band. If the ACMA pursues this idea, it will engage further with relevant stakeholders. | Ongoing monitoring |
| 4.8 GHz (4800–4990 MHz) | At WRC-15, the 4800–4990 MHz band was identified for IMT by a number of countries, including Uruguay, Cambodia, Lao PDR and Vietnam. Notably, there was also strong interest from China and Japan in identifying the band for IMT. This suggests that a viable ecosystem could develop for mobile broadband systems in this band. The 4800–4990 MHz band is currently allocated on a primary basis for the fixed and mobile services in Australia. The fixed and mobile services in this band are designated to be used principally for the purposes of defence and national security, as defined in footnote AUS101A of the Spectrum Plan. Defence is normally consulted in considering non-defence use of these services. The 4950–4990 MHz band is also allocated to the radio astronomy service on a primary basis under footnote 443 of the Spectrum Plan.At WRC-03, the 4940–4990 MHz band was identified to support public safety services in regions 2 and 3 for use by government agencies responsible for the provision of defence, national security, law enforcement and emergency services.[[21]](#footnote-22) There is some support from domestic mobile broadband interests in pursuing this band for mobile broadband in Australia. However, the ACMA is not aware of any significant interest in this band by regional bodies such as CEPT, CITEL or APT. A number of countries, including Australia, have implemented arrangements in the 4940–4990 MHz band for defence and national security purposes. This is principally to support high-speed localised coverage around an incident or event. The [Radiocommunications (Public Safety and Emergency Response) Class Licence 2013](https://www.comlaw.gov.au/Details/F2013L00827) outlines arrangements for the use of this band, which allows public safety agencies to enhance their ability to perform public safety activities and provide significant flexibility in deployment during emergency response and disaster recovery activities. The 4940–4990 MHz is also included in IEEE standard 802.11y Public Safety WLAN. Recent developmentsITU-R Working Party 5D are continuing the revision of Recommendation ITU-R M.1036-5 on frequency arrangements for implementation of the terrestrial component of IMT in the bands identified for IMT in the RRs. The draft revision includes arrangements for the frequency band 4800–4990 MHz. Working Party 5D is also continuing studies called for in Resolution **223 (Rev. WRC-15)** on the coexistence conditions between IMT and aeronautical mobile service in the band, with work currently underway to develop sharing characteristics for IMT-2020 in this band as part of this work item. Working Party 5D is aiming to complete these work items by late 2018. The AWG has a work plan to develop a recommendation on frequency arrangements for the 4800–4990 MHz band. The current proposal is to finalise the work in late 2018. The 4400–4900 MHz band has been defined as one of Japan’s official 5G bands. Allocation and technical rules for Japan’s official 5G bands are expected in 2018.[[22]](#footnote-23) Next stepsGiven the outcomes of WRC-15, and the potential for economies of scale to develop for equipment, the ACMA will continue to monitor international developments in the 4.8 GHz band. Possible engagement (including through contributions) in international studies as outlined in Resolution **223 (Rev. WRC-15)** will be considered as part of the ACMA’s international engagement processes. Given the nature of incumbent use of the band, the ACMA is of the view that this band may be a candidate for consideration of dynamic spectrum-access type arrangements as a way of sharing and, hence, increasing the utility of the band. If the ACMA pursues this idea, it will engage further with relevant stakeholders.  | Ongoing monitoring |
| Bands being studied under WRC-19 agenda item 1.16:5150–5350 MHz, 5350–5470 MHz, 5725–5850 MHz and 5850–5925 MHz | WRC-19 agenda item 1.16 is to consider issues related to wireless access systems, including radio local area networks (WAS/RLAN), in the frequency bands 5150–5350 MHz (to enable outdoor usage), 5350–5470 MHz, 5725–5850 MHz and 5850–5925 MHz, while ensuring the protection of incumbent services including their current and planned use. There was initially strong interest from the US and the United Kingdom (UK) to investigate use of the 5350–5470 MHz band for RLANs but this appears to have subsided. Europe has also indicated interest in investigating use of the 5725–5850 MHz band for RLANs. Arrangements already exist in Australia for RLANs in the 5150–5350 MHz band (low power indoor use only) and the 5725–5850 MHz band. The ACMA has also received requests to review existing Australian arrangements to align with US arrangements. The 5150–5350 MHz and 5725–5850 MHz bands are also included in the IEEE 802.11 series of standards for WLAN. There are no arrangements in place for RLANs in the 5350–5470 MHz and 5850–5925 MHz bands in Australia.Numerous countries around the world have or are considering identifying the 5850–5925 MHz band for Intelligent Transport Systems (ITS). Recent developmentsITU-R Working Party 5A is continuing work towards WRC-19 agenda item 1.16. Australia has submitted a number of contributions providing the regulatory background to the operation of WAS/RLANs and other input regarding the 5150–5250 MHz segment. Working documents towards preliminary draft new reports are being developed on:* proposed additional mitigation techniques to facilitate sharing between RLAN systems and incumbent services
* technical characteristics and operational requirements of WAS/RLAN in the 5 GHz frequency range.
* use of aggregate RLAN measurements from airborne and terrestrial platforms to support studies under WRC-19 agenda item 1.16
* sharing and compatibility studies of WAS/RLAN in the 5 GHz frequency range.

Working Party 5A is aiming to finalise these reports by mid-2018. In December 2017, the ACMA finalised the Radiocommunications (Intelligent Transport Systems) Class Licence 2017 to support the use of complying wireless ITS technologies and devices in the frequency range 5855–5925 MHz.Next stepsThe ACMA will continue to monitor and, where appropriate, engage with stakeholders via the usual international preparatory process to develop Australian positions on WRC-19 agenda item 1.16. When appropriate, it will develop individual positions on each of the bands being studied and potentially contribute to international sharing and compatibility studies on issues/bands of most interest to Australia, as determined through the WRC-19 agenda item 1.16 coordination group. The ACMA also aims to have representatives attend ITU-R Working Party 5A meetings, as appropriate. |  |
| Bands being studied under WRC-19 agenda item 1.13:31.8–33.4 GHz, 37–40.5 GHz, 40.5–42.5 GHz, 42.5–43.5 GHz, 45.5–47 GHz, 47–47.2 GHz, 47.2–50.2 GHz, 50.4–52.6 GHz, 66–76 GHz and81–86 GHz  | WRC-19 agenda item 1.13 is to consider identification of frequency bands for the future development of IMT, including possible additional allocations to the mobile service on a primary basis. This agenda item is widely acknowledged to be focusing on spectrum harmonisation requirements for 5G mobile broadband technologies. The frequency bands to be considered under this agenda item are 24.25–27.5 GHz, 37–40.5 GHz, 42.5–43.5 GHz, 45.5–47 GHz, 47.2–50.2 GHz, 50.4–52.6 GHz, 66–76 GHz and 81–86 GHz, which have allocations to the mobile service on a primary basis; and 31.8–33.4 GHz, 40.5–42.5 GHz and 47–47.2 GHz, which may require additional allocations to the mobile service on a primary basis. There is strong interest domestically and internationally, particularly in Region 3 countries such as South Korea, Japan and China. In its [draft opinion on spectrum related aspects for next-generation wireless systems (5G)](http://rspg-spectrum.eu/2016/06/public-consultation-on-5g-launched/), released 14 June 2016, the Radio Spectrum Policy Group[[23]](#footnote-24) (RSPG) stated that considerations of bands above 6 GHz for 5G should be limited to the bands listed in WRC-19 agenda item 1.13 in order to strengthen the global harmonisation opportunities, in particular, the bands 24.5–27.5 GHz, 31.8–33.4 GHz and 40.5–43.5 GHz. There are wide and varied ranges of incumbency and co-existence issues associated with each of these bands, which will need to be considered if the bands were to be investigated domestically for mobile broadband in the future.Recent developmentsITU-R Task Group 5/1 (TG 5/1) has continued its work to address WRC-19 agenda item 1.13 under its Terms of Reference ([CA/226 (Annex 9)](http://www.itu.int/md/R00-CA-CIR-0226/en)). Australia has contributed to the meetings of TG 5/1 on the issue of IMT coexistence with FSS uplinks in the 24.25–27.5 GHz band (see documents [5-1/76](https://www.itu.int/md/R15-TG5.1-C-0076/en), [5-1/117](https://www.itu.int/md/R15-TG5.1-C-0117/en), [5-1/193](https://www.itu.int/md/R15-TG5.1-C-0193/en) and [5-1/290](https://www.itu.int/md/R15-TG5.1-C-0290/en)). However, a number of other organisations internationally are considering frequency bands outside those listed for consideration in WRC-19 agenda item 1.13 for the next generation of IMT. At APG19-3, a common view developed, expressing interest in the band 24.5–27.5 GHz. A number of APT member nations also expressed interest in the bands 31.8–33.4 GHz and 37–43.5 GHz.Next stepsThe ACMA will continue to engage with stakeholders via the usual international preparatory process to develop Australian positions on WRC-19 agenda item 1.13. When appropriate, it will develop individual positions on each of the bands being studied and potentially contribute to international sharing and compatibility studies on issues/bands of most interest to Australia as determined through the WRC-19 agenda item 1.13 coordination group. Representatives have attended all ITU-R Task Group 5/1 meetings so far and it is intended that representation continue as appropriate. Developments in Europe and other regions/countries (such as the US) will be monitored for possible early implementation bands for 5G. Early implementation in Australia will depend on factors such as the location, type and number of incumbent services in the band, whether adequate interference management (or sharing) frameworks can be developed, and whether the development of economies of scale are likely. The 24.25–27.5 GHz band has been advanced to the *initial investigation* stage of the process for consideration of additional spectrum for mobile broadband services. For 66–76 GHz, see related work on 64–71 GHz outlined on low interference potential devices in the *Optimising established planning frameworks* section. |  |
| Non agenda item 1.13 bands being considered for 5G | In July 2016, the FCC in the US announced that the 27.5–28.35 GHz, 37–38.6 GHz, 38.6–40 GHz and 64–71 GHz bands would be made available for licensed, unlicensed and shared use for future IMT services.[[24]](#footnote-25) The FCC also released a Further Notice of Proposed Rule Making considering the bands 24.25–24.45 GHz, 24.75–25.25 GHz, 31.8–33.4 GHz, 42–42.5 GHz, 47.2–50.2 GHz, 50.4–52.6 GHz, 71–76 GHz, 81–86 GHz, as well as bands above 95 GHz for future IMT services.[[25]](#footnote-26)Korea is also continuing its support of investigations of the frequency ranges 24.25–29.5 GHz, 31.8–33.4 GHz and 37–40.5 GHz.[[26]](#footnote-27) Japan is investigating use of the 26.5–29.5 GHz; bands of interest for the European Union include 24.25–27.5 GHz and 40.5–43.5 GHz; and in China, 24.25–27.5 GHz and 37–43.5 GHz is the focus of consideration.Given the status of these countries as technology-developing nations, and their advanced consideration of these frequency bands outside the scope of WRC-19 agenda item 1.13, it is appropriate to include these frequency bands to the *monitoring* stage of the process for the consideration of additional bands for mobile broadband. Recent developmentsNone applicable.Next stepsThe ACMA will monitor international developments on all bands being considered or already identified internationally for 5G/IMT. However, it is noted that one of the elements of the ACMA’s spectrum management strategy to address the growth in mobile broadband capacity is engagement in international deliberations to influence the development of domestically-suitable internationally-harmonised spectrum options. The feasibility of early implementation in Australia will depend on factors such as the location, type and number of incumbent services in a band, whether adequate interference management (or sharing) frameworks can be developed, and whether the development of economies of scale are likely. For 64–71 GHz, see related work on 64–71 GHz outlined on low interference potential devices in the *Optimising established planning frameworks* section. |  |
| 40/50 GHz | In addition to interest in spectrum in this range for terrestrial broadband use as part of mmWave 5G, spectrum in the 40/50 GHz range is also of increasing interest for satellite communications. Feedback has indicated that these bands could be used for both gateway and ubiquitous earth station use. The US has established a mix of arrangements supporting wireless broadband and satellite use on shared and exclusive use throughout these bands. However, Europe is focusing on slightly different bands in this range for terrestrial broadband to those established in the US, which overlap arrangements developed for satellite use. Therefore, there may be limited potential for global harmonisation in this range. Next stepsThe ACMA will monitor developments in these bands. It is likely that it would be beneficial for any detailed consideration of the band for satellite communications to occur simultaneously with consideration of the bands for terrestrial wireless broadband. |  |

1. Initial investigation

| Key projects | Activity | Milestones |
| --- | --- | --- |
| ‘Extended MSS L band’ (1518-1525 and 1668-1675 MHz) | WRC-03 and WRC-07 allocated additional spectrum to the mobile satellite service (MSS) to complement existing ‘L band’ allocations used by numerous satellite operators. The upper and lower frequency ranges also have mobile and fixed allocations, while the upper band also has various meteorological, radioastronomy and space research service allocations. In Australia, channel planning arrangements are in place to support use of the band by fixed service Digital Radio Concentrator Systems.Inmarsat has identified an interest in utilising the extended L-band for MSS purposes from around 2020. Next stepsThe ACMA recognises the need to review planning arrangements in these bands to identify the spectrum use or uses that would maximise the overall public benefit, and if appropriate vary spectrum management arrangements to support this use. Given that coexistence with potential broadband use below 1518 MHz is likely to be a substantial consideration, the ACMA is of the view that the simultaneous review of the extended MSS L-band and the 1.5 GHz bands is likely to be appropriate. The ACMA currently expects to recommence consideration of the 1.5 GHz band for domestic use for mobile broadband and consideration of extended MSS L-band in 2018–19. | Discussion paper no earlier than Q3 2018–19 |
| 2 GHz (1980–2010 MHz and 2170–2200 MHz) | As an outcome of the review of the 2.5 GHz band[[27]](#footnote-28), the ACMA developed arrangements to support the introduction of television outside broadcast (TOB) in the frequency ranges 1980–2010 MHz and 2170–2200 MHz on an interim basis. In March 2012, the [Television Outside Broadcast (1980–2110 MHz and 2170–2300 MHz) Frequency Band Plan 2012](https://www.comlaw.gov.au/Details/F2012L00731) (TOB Band Plan) was made. The frequency ranges remain subject to Embargo 23[[28]](#footnote-29) to support TOB and future replanning activities.While the TOB Band Plan potentially facilitates MSS in the 1980–2010 MHz and 2170–2200 MHz bands in Australia, there is a current embargo on services other than TOB operating in these bands. Inmarsat and Omnispace have indicated that they have (or plan to deploy) new 2 GHz band MSS services in the near future. Specifically, Omnispace has expressed an interest in providing services in Australia. Satellite industry representatives have also suggested that services similar to those to be provided by Inmarsat’s proposed satellite (Europasat) can be expected to be deployed in Australia as part of an international footprint in the future. The frequency bands 1980–2010 MHz and 2170–2200 MHz are already allocated to the mobile service and subject to a global IMT identification via footnote 388 of the Spectrum Plan. In Resolution **212 (Rev. WRC-15),** it is noted that these frequency bands are available for use for both the terrestrial component of IMT and the satellite component of IMT.The ITU has defined IMT channel arrangements for the frequency bands 1980–2010 MHz and 2170–2200 MHz. These can be found in ITU-R Recommendation M.1036.[[29]](#footnote-30) In order to include the new arrangements in ITU-R Recommendation M.1036, it was agreed in Resolution **212 (Rev. WRC-15)** to invite study on the possible technical and operational measures to ensure coexistence and compatibility between the terrestrial component of IMT (in the mobile service) and the satellite component of IMT (in the mobile-satellite service) in the frequency bands 1980–2010 MHz and 2170–2200 MHz. These bands are directly adjacent to the existing 2.1 GHz band used for terrestrial mobile voice and broadband services. This work is being conducted as part of WRC-19 agenda item 9.1.1.The ACMA notes that the work of the ITU on this issue is focusing on co-existence of terrestrial and satellite use of the band across international borders, but acknowledges that this work may provide some useful information on how these bands could be shared between uses and users on a geographic basis domestically. In addition, the ACMA is aware of interest in the band for possible direct aircraft to ground operations providing broadband connectivity to aircraft.Recent developmentsITU-R Working Parties 4C and 5D are continuing studies on technical and operational measures to ensure coexistence and compatibility between the terrestrial and satellite components of IMT in the frequency bands 1980–2010 MHz and 2170–2200 MHz in different countries, in response to WRC-19 agenda item 9.1 (issue 9.1.1). Next stepsThe frequency bands 1980–2010 MHz and 2170–2200 MHz will be retained at the *initial investigation* stage. Due to other priorities, further consideration of work on this band will be deferred until 2019–20.The ACMA will also continue to monitor and, where appropriate, engage with stakeholders via the usual international preparatory process to develop Australian positions on international issues related to the frequency bands 1980–2010 MHz and 2170–2200 MHz, particularly in relation to work conducted as part of WRC-19 agenda item 9.1.1. The ACMA remains open to case-by-case consideration of applications for test and demonstration purposes in the parts of the frequency ranges 1980–1985/2170–2175 MHz (guard band between TOB and frequency adjacent spectrum licensing and apparatus licensed public mobile telecommunications services) on a short-term, non-renewal basis, subject to appropriate interference management and resolution conditions.  | Due to other priorities, further consideration of work on this band will be deferred until 2019–20 |
| 28 GHz (27.5–29.5 GHz) | In October 2017, the ACMA announced the preliminary views and outcomes of its [3.6 GHz band review](https://www.acma.gov.au/theACMA/future-approach-to-the-3_6-ghz-band). As part of the outcomes announced, there were a number of mitigation measures identified for affected incumbent point-to-multipoint licensees. This included a commitment from the ACMA to investigate the possibility of developing arrangements as part the 27.5–29.5 GHz (28 GHz) band for use by apparatus-licensed fixed wireless broadband outside of metropolitan areas.Recent developmentsIn March 2018, the Minister for Communications re-allocated the 3.6 GHz band for the issue of spectrum licences in regional and remote areas of Australia.[[30]](#footnote-31) Next steps Following the minister’s reallocation declaration, the ACMA intends to progress its investigation into the suitability of the 28 GHz band for use by apparatus-licensed fixed wireless broadband outside of metropolitan areas. Consultation on this issue is expected to commence in the second half of 2018. | Q1 2018–19 |

1. Preliminary replanning

| Key projects | Activity | Milestones |
| --- | --- | --- |
| 1.5 GHz (1427–1518 MHz) | At WRC-15, the entire 1427–1518 MHz band was harmonised for IMT within regions 2 and 3, while Region 1 identified 1427–1452 MHz and 1492–1518 MHz via regional footnotes. In Region 1, only African and Arab states identified the 1452–1492 MHz range (CEPT did not identify this band due to an ongoing dispute with RCC countries over the protection of Aeronautical Mobile Telemetry services).The ACMA notes that an additional outcome of WRC-15 was Resolution **761 (WRC-15)**. This resolution invites the ITU-R to conduct, in time for WRC-19, the appropriate regulatory and technical studies, with a view to ensuring the compatibility of IMT and the broadcasting-satellite service (BSS) (sound) in the frequency band 1452–1492 MHz in regions 1 and 3, taking into account IMT and BSS (sound) operational requirements.Domestically, the impact on aeronautical telemetry services and fixed services, including the Digital Radio Concentrator System (DRCS), will need to be considered in any re-farming process.As referred to in Resolution **223 (Rev. WRC-15)**, some satellite industry representatives have also pointed out that compatibility with mobile satellite services (MSS) operating above 1518 MHz will need to be considered.There is strong support domestically from mobile broadband representatives for progressing the re-farming of this band. The ACMA released the discussion paper, [*Future use of the 1.5 GHz and 3.6 GHz bands*](https://www.acma.gov.au/theACMA/future-use-of-the-1_5-ghz-and-3_6-ghz-bands-2) in October 2016, with 72 submissions received from industry. In June 2017, the ACMA released a [consultation package](https://www.acma.gov.au/theACMA/future-approach-to-the-3_6-ghz-band) including *Future use of the 1.5 GHz and 3.6 GHz bands—Summary of and response to 3.6 GHz submissions*. This detailed the ACMA’s decision to progress both the 1.5 GHz and 3.6 GHz bands to the *preliminary replanning* stage of the ACMA’s process for consideration of additional spectrum for MBB services.Recent developmentsITU-R Working Party 5D has continued revision of Recommendation ITU-R M.1036-5 on frequency arrangements for implementation of the terrestrial component of IMT in the bands identified for IMT in the RRs. The draft revision includes arrangements for the frequency band 1427–1518 MHz. Working Party 5D is also undertaking studies called for in Resolution **223 (Rev. WRC-15)**. Working Party 5D is aiming to complete these work items by late 2018. The AWG has a work plan to develop a report on frequency arrangements for the 1427–1518 MHz band. The current proposal is to finalise the work at AWG-23 in March/April 2018.Next stepsThe ACMA will continue to monitor and engage with stakeholders via the usual international preparatory process to develop Australian positions on studies under Resolution **223 (Rev. WRC-15)** and Resolution **761 (WRC-15),** and other international issues related to the 1.5 GHz band, such as possible new band plans. The ACMA currently expects to recommence consideration of this band for domestic use for mobile broadband in 2018–19. This will include a discussion paper, which will progress consideration of the band within the *preliminary replanning* stage. The paper would consider MSS use above 1518 MHz and broadband use below 1518 GHz in the same context, in order to develop balanced and optimised compatibility arrangements between these potential uses of the spectrum (see commentary on extended MSS L band in *Table 10: Initial investigation* above).  | Options paper no earlier than Q3 2018–19 |
| 26 GHz (24.25–27.5 GHz) | WRC-19 agenda item 1.13 is to consider identification of frequency bands for the future development of IMT, including possible additional allocations to the mobile service on a primary basis. This agenda item is widely acknowledged to be focusing on spectrum harmonisation requirements for 5G mobile broadband technologies. The 26 GHz band is one of the bands under consideration as part of WRC-19 agenda item 1.13.Following consideration of feedback to the ACMA’s *Five-year spectrum outlook 2016–20*, released in October 2016, the ACMA hosted a spectrum tune-up in September 2017 to solicit further industry views on the use of 26 GHz and other mmWave bands by broadband services. The ACMA also invited formal submissions on the issues raised for discussion at the event. The tune-up also floated some early ACMA thinking on potential technical planning scenarios and posed a number of [questions](https://www.acma.gov.au/theACMA/spectrum-for-broadband-in-mmwave-bands) for industry input—27 [responses](https://www.acma.gov.au/theACMA/-/media/AF3D0BB2F7BB456EB073DD48F1C0FB00.ashx) were received. A key question posed in the tune-up was the appropriateness of accelerating the band through the *initial investigation* phase to the *preliminary replanning* stage. Recent developmentsFollowing the tune-up hosted in September 2017 and consideration of feedback, the ACMA has decided to include the 26 GHz band under *preliminary replanning*.Given the importance of aligning domestic technical arrangements with larger overseas markets so that economies of scale can be achieved and ensuring coexistence with global services such as passive earth observation, the ACMA is looking closely to international developments, particularly in Europe, to assist in determining what conditions are appropriate to consider in any Australian release of the band. In March and April 2018, the Electronic Communication Committee of CEPT (ECC) consulted on a draft decision titled *Harmonised technical conditions for Mobile/Fixed Communications Networks (MFCN) in the band 24.25-27.5 GHz*. This draft decision addressed sharing and compatibility conditions to ensure coexistence with other spectrum users and included technical conditions to achieve this coexistence. It was previously thought that clarity on some key technical coexistence considerations, particularly regarding compatibility with the earth exploration satellite service (EESS) would be resolved in Europe during the first half of 2018, which would have informed domestic considerations in roughly the same period. However, outcomes of the European process are now not expected until sometime in mid-2018.This lack of clarity and uncertainty has contributed to the decision by the ACMA not to progress consideration of the band as fast as contemplated in last year’s FYSO. (See also discussion in the *Forward allocation work plan* for further details). Next stepsThe ACMA is considering what an accelerated process for the 26 GHz band would look like. This includes thinking into a range of potential options for both *what* should be allocated, in terms of specific frequencies and areas, and *how* the band should be allocated, in terms of which licence types should be adopted to meet a range of potentially varying wireless broadband use cases. Specifically, potential approaches are likely to represent combinations of:* allocating all or some fraction of the 26 GHz band (how much and in what part of the band would be informed by technical coexistence considerations)
* different licensing approaches to facilitate access for a number of different potential deployment models. This could include area-based spectrum licensing in either major metropolitan areas only, *or* metro areas *and* regional centres along with(potentially) apparatus and/orclass licensing in various parts of the band and areas.

Internationally, as discussed above in the monitoring section regarding other bands being studied under WRC-19 agenda item 1.13, the ACMA intends to continue engaging with stakeholders via the usual international preparatory process to develop Australian positions on WRC-19 agenda item 1.13, which includes the 26 GHz band. The current Australian Preliminary View considers the 26 GHz band favourably for a possible IMT identification: Based on current studies, the Australian position is that some or all of the 24.25–27.5 GHz frequency band is likely to be a suitable candidate for an IMT identification. Australia will monitor ongoing studies on this band and will revise its opinion on this band as necessary.  | Options paper: Q1 2018–19Decision: Q2 2018–19 |

1. Re-planning

| Key projects | Activity | Milestones |
| --- | --- | --- |
| 850 MHz expansion band (809–824 MHz and 854–869 MHz) | In November 2015, the ACMA released its [*Long-term strategy for the 803–960 MHz band*](http://www.acma.gov.au/~/media/Spectrum%20Licensing%20Policy/Information/Word%20Document/The%20ACMAs%20long-term%20strategy%20for%20the%20803960%20MHz%20band_decision%20paper%20docx.docx) decision paper, signalling an end to the review of this band and commencement of a long-term implementation plan to put those decisions into effect. One of the key decisions arising from the review was that 2 x 15 MHz of 4G-standardised spectrum will be made available for new mobile broadband services from 2024. This spectrum will come from the 850 MHz ‘expansion band’, which is lower adjacent to the current 850 MHz 3G band used by Telstra and VHA. Recent developmentsThe project is now in an *implementation* phase, which is largely geared towards the clearance/relocation of incumbent services operating in the 850 MHz expansion frequencies earmarked for mobile broadband. The implementation plan is contained in the decision paper and the ACMA has established an implementation team to ensure that the milestones of the plan are reached with minimal disruption. As part of this process, in July 2016, a new RALI (FX 22) was put in place to facilitate the transition of single frequency fixed links (SFFLs) and studio-to-transmitter links (STLs) to the new arrangements. Further incremental updates will be made to this and other instructions as the implementation phase progresses.Next stepsThe implementation plan set out in the decision paper contains various milestones for the transition to long-term arrangements by incumbent services. The ACMA is considering a range of options for how and when the 850 MHz expansion band might be allocated. The intent remains to allocate it concurrently with the 900 MHz band, pending further consideration of 900 MHz reconfiguration options (see below). | See forward allocation work plan scenarios for allocation timing options |
| 900 MHz (890–915 MHz and 935–960 MHz) | In October 2017, the ACMA released a paper setting out its preferred reconfiguration option for the 900 MHz (890–915/935–960 MHz) band in order to transition from the current 2 x 8.2 or 8.4 MHz frequency arrangements to multiples of 2 x 5 MHz. The Authority also invited submissions about two related issues, namely the appropriate treatment of the 2 x 1 MHz of spectrum immediately adjacent to and below the existing 850 MHz spectrum licences, and the duration of any spectrum licences issued in 900 MHz or the 850 MHz expansion band. A reconfiguration of licensing in the 900 MHz ‘GSM’ band (890–915/935–960 MHz) into 5 MHz FDD blocks, as well as a related proposal to implement a 1 MHz downshift of the 850 MHz band (to maximise the utility of the adjacent 900 MHz GSM band), was originally proposed under the review of the 803–960 MHz band. Recent developmentsThe ACMA is currently considering responses to its October 2017 paper.Next stepsReconfiguration options for the band remain under consideration, including the above-mentioned clearance and reallocation proposal, in consultation with industry. This includes definition of time frames and any associated transitional arrangements.  | See forward allocation work plan scenarios for allocation timing options |
| 3.6 GHz (3575-3700 MHz)5.6 GHz (5600–5650 MHz) | In October 2017, the ACMA announced the preliminary views and outcomes of its [3.6 GHz band review](https://www.acma.gov.au/theACMA/future-approach-to-the-3_6-ghz-band). As part of the outcomes announced, there were a number of mitigation measures identified for affected incumbent point-to-multipoint licensees. This included:* making part of the 5600–5650 MHz (5.6 GHz) band available under a coordinated apparatus-licensed regime for site-based point-to-multipoint uses outside of metropolitan areas
* a long-term alternative for site-based point-to-multipoint users who provide services that are not conducive to a spectrum-licensed regime and for the use of coordinated apparatus licences to facilitate protection of incumbent Bureau of Meteorology (BoM) radars in the band.

Recent developmentsIn December 2017, the ACMA made a recommendation to the Minister for Communications that he re-allocate the 3.6 GHz band in regional and metropolitan areas for the issue of spectrum licences.In March 2018, the minister re-allocated the 3.6 GHz band for the issue of spectrum licences in regional and remote areas of Australia.[[31]](#footnote-32) Next steps Following on from the minister’s reallocation declaration, the ACMA has progressed planning work to put in place a coordinated apparatus-licensed regime for site-based point-to-multipoint uses outside of metropolitan areas in the 5.6 GHz band. Consultation on proposed arrangements is intended, with final arrangements put in place in the 2018–19 year. This will also include the development of transitional arrangements for affected 3.6 GHz band point-to-multipoint licensees into the 5.6 GHz band.  | Conclusion of TLG process Q4 2017–18 |

### Consultation question

1. Do you have any feedback on the ACMA’s plans for monitoring, initial investigation, preliminary replanning or re-farming of bands?

## Optimising established planning frameworks

In addition to detailed replanning and re-farming, a significant planning priority is the optimisation of existing spectrum-planning arrangements. This is typically achieved through updates to spectrum-planning technical framework such as band plans (either administrative or legislative) and Radiocommunication Assignment and Licensing Instructions (RALIs). These changes are intended to address band and service-specific issues identified within existing frameworks—for example, by addressing technology developments, enabling sharing opportunities and other changes to improve the efficient use of the spectrum.

The ACMA’s optimisation work across a range of different spectrum uses is outlined below.

### Spectrum management advice and considering of out-of-policy requests

In addition to the activities identified below, the ACMA has an ongoing role in providing advice on spectrum arrangements, including advice on out-of-policy requests and considering applications for trial demonstration of new technologies.

### Broadcasting

A common theme from the FYSO submissions was the free-to-air television industry’s need for ongoing access to spectrum. Free TV Australia also suggested that the 600 MHz band be redefined as 614–694 MHz instead of 520–694 MHz. The ACMA has subsequently revised its definition of the 600 MHz band to the 617–698 MHz band. This takes into account outcomes from the US 600 MHz incentive auction. However, any Australian guard bands between the lower edge of the 600 MHz band and the upper edge of ongoing broadcasting would need to be determined as part of any review of the band, taking into account specific Australian circumstances.

Since the restack of television spectrum for the 700 MHz digital dividend, only limited further optimisation work has been necessary in these bands. In contrast, there are significant activities progressing in the radio broadcasting spectrum.

The narrowcasting industry expressed concerns about certainty of access to spectrum for LPON services. The ACMA acknowledges these concerns and will endeavour to make its decision about extension of the determination of the LPON sub-band during 2018, well before the expiry of the current determination in 2020.

The ACMA has been working closely with the radio industry on two key initiatives for regional Australia—expansion of digital radio to regional areas, and the conversion to FM of the heritage commercial AM station in single licensee regional markets

Progress achieved

* In 2017, the ACMA issued long-term digital radio transmitter licences for the national broadcasters in Canberra and Darwin. The national services commenced digital radio broadcasting, in Canberra and Darwin, independently of the trial service, in December 2017.
* In December 2017, the ACMA invited applications from eligible joint venture companies for digital radio multiplex transmitter licences in Canberra and Darwin. It is likely the ACMA will issue licences by mid-2018. This will facilitate the ‘permanent’ licensing of commercial and community digital radio services in those areas.
* The ACMA licensed the national broadcasters' digital radio transmitters in Canberra, Darwin and Hobart, with services commencing in early 2018. The ACMA expects to issue the commercial broadcaster’s licence for Hobart in Q1 2018–19, which will allow service commencement in the second half of 2018. Hobart is likely to be the next location to commence.
* East coast allotment planning for the expansion of digital radio in regional Australia was completed in Q3 2017–18. This will allow regional licensees to make an informed decision about the costs of digital radio infrastructure, and ultimately choose whether they will participate in the provision of digital radio services.
* In March 2018, the ACMA approved Licence Area Plan variations permitting AM to FM conversion in Mandurah and Warrnambool.

In May 2018, the ACMA consulted on proposals to permit AM to FM conversions in Burnie, Devonport, Queenstown, Scottsdale and Bathurst.

Activities planned for 2018–19

Digital radio and AM to FM conversion

Over the next few years, it is likely the main priorities in radio broadcasting will continue to include planning for digital radio rollout and further consideration of AM to FM conversion.

While the ACMA can facilitate the rollout of digital radio services in regional Australia, the establishment and format of digital radio services in any given market is a commercial decision of the relevant incumbent commercial radio broadcasting licensees. Similarly, where and when the ABC and SBS will roll out digital radio services is a decision for those broadcasters. Each digital radio channel plan will reserve a frequency to enable the national broadcasters to provide digital radio services.

The ACMA will continue to prioritise the planning of digital radio and work with industry to expand digital radio services into regional Australia. In 2018–19, we will:

* consult on and finalise the digital radio channel plans for the 15 licence areas identified by industry as the next phase of rollout. The timing for each plan will be aligned with the rollout plans of the broadcasters in each market. In order to ensure priority is given to channel planning in areas where there is a real intention to proceed, the ACMA will seek a clear broadcaster commitment before proceeding. If the ACMA finalises a plan but no application for a multiplex licence is forthcoming, it will be open to the ACMA to make available such a licence to other parties through a price based allocation process
* chair meetings of the Digital Radio Planning Committee for Regional Australia
* finalise in Q1 2018–19 the outcome of proposals permitting AM to FM conversion in Tasmanian licence areas—Burnie, Devonport, Queenstown and Scottsdale and in Bathurst NSW

consider proposals for AM–FM conversions for Lithgow, Bega, Cooma, Goulburn and Nowra in Q2 2018–19.

### Satellite planning

The ACMA continues to engage internationally on the coordination, development and implementation of measures to enhance spectrum usage for satellite communications and space research services. Domestically, our key spectrum planning priorities over the next year are to:

* provide ongoing operational support for Australian-filed satellite networks
* support the deployment of novel satellite systems (particularly small satellites)
* undertake a general review of licensing procedures for space-based communications systems to consider whether existing procedures are commensurate with the risk of interference, including consideration of status of the satellite network in ITU satellite coordination process
* consider and action, if appropriate, identification of possible additional bands for ubiquitous satellite use

review of arrangements for ubiquitous earth stations in motion in the FSS in those parts of Ku band included in the Communication with Space Object Class Licence.

Progress achieved

In 2017, the ACMA finalised consultation on a number of issues to support developments in satellite communications, completing the following projects:

* update to Foreign Space Objects Determination (completed October 2017)
* interim regulatory arrangements (in Business Operating Procedures (BOP) for Ka-band geostationary (GSO) and non-geostationary (NGSO) ESIM (completed October 2017)

a minor update to business operating procedures for licensing space-based communications systems (completed December 2017).

Originally forecast to commence Q4 2017–18, a wider general review of space licensing procedures has been delayed until Q2 2018–19, due to other projects.

The ACMA is reviewing frequency coordination requirements between apparatus-licensed fixed point-to-point links (in the 6 and 6.7 GHz bands) and FSS earth stations communicating with GSO satellites. It was forecast that consultation would begin Q1 2018-19, however, this work has been delayed due to other projects.

Activities planned for 2018–19

Frequency coordination of earth stations and with point-to-point links

The ACMA is progressing the review of frequency coordination requirements between apparatus-licensed fixed point-to-point links (in the 6 and 6.7 GHz bands) and FSS earth stations communicating with GSO satellites. Initial work is focusing on codifying procedures in the 6 and 6.7 GHz fixed point-to-point bands and for communications with GSO satellites. However, the scope of these procedures will be incrementally expanded as required.

Initial consultations are expected to commence no later than the end of Q1 2018–19.

Spectrum arrangements for ‘small satellites’

The ACMA is aware that many of the innovations in the satellite sector are from the use of small satellites, often supporting short-duration missions. Some of these uses are not optimally supported by existing domestic and international regulatory and planning arrangements—although once a ‘small satellite’ is used as part for an ongoing constellation, the spectrum management implications are more analogous to traditional satellite systems and, hence, unique regulatory arrangements are less likely to be required.

Ongoing changes in the space industry suggest that ACMA needs to improve its engagement with a range of new entrant organisations that are typically smaller than it is used to dealing with. Examples include start-up companies and university-based teams with a particular focus on short-duration small satellites.

To better inform and assist innovation and growth in the space industry, there is a need to develop specific information on spectrum management targeted at small organisations, as well as more streamlined ways for such organisations to access spectrum, both for trial and demonstration purposes, and provide a possible pathway to commercialisation.

The ACMA plans to seek the views of industry about what changes can be made to the existing spectrum management framework to support such needs, while ensuring a continuing, stable regulatory environment for ‘traditional’ satellite users.

Depending on stakeholder feedback and project prioritisation, the ACMA expects to commence this work towards the end of Q2 2018–19.

Updating regulatory arrangements for space-based communications systems

The ACMA will continue to monitor trends in the spectrum needs of space-based communications systems, as well as developments in emerging space-based technologies and applications. Further updates (beyond those already undertaken in 2017–18) to regulatory arrangements[[32]](#footnote-33) are likely to be necessary to support continued innovation in the sector. This future work will be depend on stakeholder feedback and its priority relative to other projects in the ACMA’s spectrum work program. Organisations planning new satellite communication systems and intending to use existing systems are encouraged to contact the ACMA to discuss whether such updates are required and the timing of such updates.

One respondent suggested that the Radiocommunications (Communication with Space Object) Class Licence be updated to include additional Ka-band frequency ranges (18.2–18.8 GHz, 19.3–19.7 GHz, 27.5–28.5 GHz and 29.1–29.5 GHz).

These frequency ranges overlap those used for fixed point-to-point links operating in accordance with 18 GHz and 28 GHz fixed link channel plans. With the 28 GHz band is already being used for point-to-point links and possibly point-to-multipoint systems in the future, understanding the impact on terrestrial services (current and future) is an important consideration.

The ACMA intends to monitor deployments with a view to assessing in future years whether such a change is required or viable given the potential impact on terrestrial services.

The ACMA plans to consult on changes to the Radiocommunications (Communication with Space Object) Class Licence 2015 and the Radiocommunications (Foreign Space Objects) Determination 2014. The consultations are expected to commence no later than Q4 2017–18, and changes finalised by the end of Q1 2018–19. This consultation does not include Ku and Ka bands, noting additional work on the review of regulatory arrangements for earth stations in motion in the Ku-band, discussed below.

General review of space licensing procedures

In December 2017, the ACMA completed an initial update of general procedures for licensing space–based communications systems. The ACMA is now undertaking a more detailed review. One of the key purposes of the review is to consider whether in light of trends in spaced-based communications systems if licensing procedures are appropriate and commensurate with the risk of interference, and consider possible updates to business operating procedures for licensing of space-based communications systems.[[33]](#footnote-34) Given issues raised in submissions, some topics in the scope of the review are whether there is a need to include additional measures for:

* when the ITU satellite coordination process are not completed

cases where the satellite network has been recorded in the Master International Frequency Register (MIFR) in accordance with ITU Radio Regulation No. 11.41

A consultation paper is proposed for release in Q2 2018–19.

Review of regulatory arrangements for earth stations in motion (ESIM) parts of Ku-band

Stakeholders sought support for using ubiquitous earth stations in motion (ESIM) in the Ku-band. Progressively, from June 2016, the ACMA has been developing more flexible regulatory and licensing arrangements for NGSO and GSO satellite services operating in the Ka-band, most recently in October 2017. From that work, the ACMA is aware of ESIM interest in other bands—particularly the Ku-band, and intends to investigate in 2018–19.

The ACMA intends to review existing arrangements to identify what (if any) changes are required to existing regulatory and licensing arrangements to support ESIM in the Ku-band for both GSO and NGSO satellite networks.

This work is anticipated to commence after completion of current satellite communication projects and no earlier than the end of Q2 2018–19.

Feasibility of inclusion of 10.7–11.7 GHz in the Communications with Space Objects Class Licence

Some respondents to FYSO suggested that the Radiocommunications (Communication with Space Object) Class Licence be updated to include the 10.7–11.7 GHz band for earth station receivers.

That frequency range is used for fixed point-to-point links (known as the ‘11 GHz band’) and is one of the most heavily used microwave fixed point-to-point link bands in Australia, with over 11,700 links in operation. Earth stations currently operate in this frequency range on an individual coordinated basis.

The possible use of ‘ubiquitous’ user terminals under the class licence would require consideration of the impact on fixed links and investigation of any required technical restrictions on earth station receive use.

While uncoordinated earth receive station use would not pose an interference risk to point-to-point links, a relevant consideration is under what conditions could earth station receivers operate on a uncoordinated basis with an acceptable probability of interference, given that the introduction of class-licensed earth station receivers should not lead to undue constraints on the future deployment and growth of fixed links.

Depending on completion of existing projects, the ACMA intends to investigate the feasibility and discuss the results with industry. The earliest it is anticipated that this could occur is Q4 2018–19.

Filing and coordination of Australian satellite systems.

In accordance with the [Australian procedures for the coordination and notification of satellite systems](http://archive.acma.gov.au/webwr/_assets/main/lib410135/aust_procedures-coordination_notification_of_satellite_systems.pdf), the ACMA has an ongoing role in the filing and coordination of Australian satellite systems with the ITU. This includes:

* assisting Australian satellite operators with ongoing satellite coordination negotiations with other administrations
* assessment of new notices related to progress of existing Australian satellite networks
* filing of new Australian satellite networks

supporting international administration-level satellite coordination meetings with other administrations.

Updating procedures for submission of Australian satellite networks to the ITU.

Australian procedures for the coordination and notification of satellite systems with the ITU were developed in 2012. The ACMA will consider the need for possible updates, drawing on experience in the application of the procedures and input from the Australian satellite operators.

The update will consider whether providing better support to innovations such as the deployment of low-cost, miniaturised space hardware (often referred to as nanosats, cubesats or smallsats), changes in ITU requirements and general improvements, is required.

Depending on progress of other projects, there is a possibility this work could commence in Q4 2018–19.

### Low interference potential devices (LIPD)

In November 2017, the ACMA consulted on a proposed update to the Radiocommunications (Low Interference Potential Devices) Class Licence 2015 (LIPD). As part of the consultation, we sought industry views on whether we should consider class-licensing arrangements similar to those of the US Federal Communications Commission (FCC) in the frequency range 64–71 GHz to provide further options for data communications intended to support future 5G services.

Progress achieved

While submissions to the LIPD supported this work, a few suggested that no decision should be made until after WRC-19.

Responses to the FYSO also supported this work, though similar to responses to the LIPD, there were suggestions that no decision should be made until after WRC-19. The ACMA’s view is that, similar to 26 GHz, there is significant interest in Australia in progressing this work in parallel with ITU consideration, as has been done in a number of other jurisdictions. The ACMA will continue to investigate, with a view to developing a proposal for consideration after the current LIPD update is completed.

Some respondents to the FYSO proposed changes to existing arrangements or additional arrangement around 5 GHz (5150–5350 MHz, 5350–5470 MHz, 5850–5925 MHz) supporting wireless data networks (for example, RLANs and Wi-Fi). With the Intelligent Transport Systems Class Licence supporting ITS systems in 5855–5925 MHz, the ACMA does not support the expansion of LIPD Class Licence arrangements above 5850 MHz.

WRC-19 agenda item 1.16 is to consider issues related to wireless access systems, including radio local area networks (WAS/RLAN), in the frequency bands 5150–5350 MHz (to enable outdoor usage), 5350–5470 MHz, 5725–5850 MHz and 5850–5925 MHz, while ensuring the protection of incumbent services including their current and planned use. In this case, given the considerable uncertainty that changes in RLAN arrangements would have with coexistence with other services, the ACMA does not intend to review class licence arrangements in these bands until the outcomes of WRC19 are known.

The WIA submission advised of a proposal under development to utilise 803–804 MHz for ‘STEM education and experimental purposes’. The ACMA is yet to consider future use of this frequency range. Under the ACMA’s long-term strategy for the 803–960 MHz band, 803–804 MHz is a guard band between the 700 MHz spectrum-licensed band and the 800 MHz band. Considering this proposal would require analysis of the impact on those arrangements. As a general principle, the ACMA looks to harmonise with international arrangements when considering LIPD updates, both for the benefit of economies of scale that harmonisation brings and because spectrum compatibility has typically already been considered elsewhere. Currently, the ACMA is not aware of any similar overseas arrangements in this frequency range or in general. There are existing alternative arrangements offering similar opportunities in other LIPD bands (such as 900 MHz). Consequently, the ACMA does not intend to consider this proposal further in 2018–19.

Activities planned for 2018–19

The ACMA is currently considering submissions and expects to finalise the next LIPD update by the end of 2017–18. Organisations interested in further updates to the LIPD class licence should contact the ACMA to discuss the requirements and timing of such updates. Matters of interest for consideration in future updates include:

* including arrangements similar to those of the FCC in the frequency range 64–71 GHz, to provide further options for data communications intended to support future 5G services
* revising existing arrangements for underground transmitters in the frequency ranges covering the VHF mid- and high-frequency bands and the 400 MHz band to include segments supporting fixed services, in addition to mobile services (as under current arrangements) and spectrum cover by ARSP footnote AUS 91 (420–430 MHz)
* introducing provisions supporting ground penetrating radars similar to FCC Rules Part 15.509 ‘Technical requirements for ground penetrating radars and wall imaging systems’.
* general provision for very low-powered devices similar to FCC Rules Part 15.209 ‘Radiated emission limits; general requirements’, in consideration of the FCC requirements on restricted bands of operation

further alignment of Australian arrangements for ultra-wideband systems with US and European arrangements.

### Amateur radio

Progress achieved

Feedback from last year’s FYSO included suggestions proposing a number of additional frequency bands to be made available for amateur use, or identifying where the allocation status in the Australian Radiofrequency Spectrum Plan changed. In response to those requests:

* 70.0–70.5 MHz—The ACMA considers that operating amateur services in this frequency range is not feasible as it would be inconsistent with ITU Radio Regulations and existing services already operating in the frequency range. This frequency range is used by a variety of fixed and land mobile services as supported under the VHF mid band (70–87.5 MHz). Class-licensed devices authorised under the LIPD Class Licence operate in the frequency range 70–70.24375 MHz.
* extension of the 3776–3800 kHz DX window to above 3800 kHz—The ACMA does not support this change, as it poses considerable disruption to existing users.
* 50–52 MHz upgrade of amateur allocation to primary in Australian Radiofrequency Spectrum Plan—With other priorities (digital radio planning, AM to FM conversions), the ACMA does not intend to consider this matter in the short to medium term.
* Expansion of amateur usage in 1800–1875 kHz up to 2000 kHz—At the ITU level, there is an allocation for the amateur services in 1800–2000 kHz. However, in Australia, 1875–2000 kHz is used by other services. The introduction of amateur services would be a disruption to those services and the views of existing users would need to be sought. At this stage, based on our knowledge of current usage, the ACMA does not consider such expansion possible without impacting existing services.

Secondary allocation at 5.3 MHz (implementation of WRC 15 agenda item 1.4)—In Australia, the band is currently used by some emergency service and law enforcement organisations for mobile operations. Defence also uses these frequencies in support of key capabilities. The ACMA consulted with local stakeholders on this potential allocation in the lead-up to WRC-15. Stakeholder views were varied, with opposition to the allocation, in particular, from Defence, due to the potential for interference to its systems.

Notwithstanding Australia’s concerns, a secondary allocation was ultimately made at WRC-15 and has been added to the Australian Radiofrequency Spectrum Plan. However, this does not oblige the ACMA to enable use of the allocation.

The ACMA considers that the concerns of Defence, as an existing user of band, remain. Relevantly, the Australian Government has recently committed $1.2 billion in support of defence systems that operate in the high frequency part of the spectrum[[34]](#footnote-35).

Activities planned for 2018–19

Expansion of amateur usage in 1800–1875 kHz up to 2000 kHz, and secondary allocation at 5.3 MHz (implementation of WRC-15 agenda item 1.4)

The views of existing users are sought on the feasibility of amateur usage in part of these bands to assist future considerations.

### Ongoing review of spectrum planning, assignment and coordination requirements

The ACMA will continue its ongoing review of the technical [spectrum planning](http://www.acma.gov.au/Industry/Spectrum/Spectrum-planning/About-spectrum-planning/radiofrequency-planning-framework-spectrum-planning-acma) framework. This activity is primarily focused on frequency assignment and coordination frameworks (as specified in apparatus-licensing coordination requirements, with occasional consideration of spectrum-licensing technical frameworks).

The continuing appropriateness of spectrum embargoes is also considered. The objective is to ensure the currency of the spectrum planning framework and ensure it is consistent with current technologies and operational practices.

To provide industry with greater visibility of this work, the ACMA intends to publish a program of review focusing on improvements to frequency coordination requirements.

Activities planned for 2018–19

The ACMA will seek industry comment of a draft program of review in Q4 2017–18, and finalise in Q1 2018–19.

Terrestrial IoT planning

After completing its review of the 803–960 MHz band in 2015, the ACMA decided to make spectrum in the 928–935 MHz band available via class licensing for low power, low duty cycle devices, in manner optimised for low power wide area (LPWA) IoT type applications. The availability of this band is linked with broader replanning activities within the 803–960 MHz band.

Throughout 2017–18, the ACMA has continued to work with industry through the IoTAA, with a view to providing early access to the band by LPWA technologies where possible, subject to device coordination with incumbent fixed links.

### Consultation question

1. Do you have any feedback on optimising established planning frameworks?

# The forward allocation work plan

## Purpose of the allocation work plan

Timely access to spectrum is of increasing importance to an innovative and dynamic communications sector. For incumbent and prospective spectrum users, this forward allocation work program provides information for stakeholders about the planning status and possible allocation timing and sequencing of particular spectrum bands, to better support:

* strategic network planning by spectrum users
* technology deployment planning

information relevant to capital-raising activities.

Specific allocations depend on ACMA and ministerial decisions made during the planning stage, and reflect other relevant government policy considerations about planning priorities. Information from incumbent and prospective spectrum users about the demand for access to specific bands and the timing of any possible allocation will also provide important input to allocation decisions.

There is no certainty that any band will move to allocation until a formal decision has been made to change arrangements in that band. The ACMA emphasises that the information presented here does not in any way pre-empt such formal decisions.

Even once a formal decision has been made to move towards an allocation, the specific design of each allocation (for example, features such as the allocation timing, allocation methodology and lot configuration) are all dependent on a range of planning decisions yet to be made. The ACMA will take account of feedback from industry about likely demand and their priorities for access to particular spectrum bands.

We have developed a revised series of allocation scenarios that respond to the feedback we received about the timing and sequencing options for allocations planned over the next few years*.*

## Feedback

In the 2017–21 FYSO, we sought your views about the inclusion of an allocation work plan as well as feedback about the timing and sequencing of bands prioritised for allocation, outlined in a series of three scenarios.

A summary of the broad themes raised in feedback is provided against each of the consultation questions as background, which informs the ACMA’s response to developing a revised allocation work plan.

**Consultation question from 2017–21 FYSO:
Does the inclusion of a forward allocation work plan by the ACMA assist with the planning of your spectrum and network technology decisions?**

Submitters broadly supported the inclusion of the allocation work plan, with a suggestion to clearly distinguish band reallocation scenarios from other ongoing allocation work.

In the planning chapter of the FYSO, we have sought to clearly distinguish between planning activity associated with spectrum re-farming and reallocation, and other ongoing planning work aimed at optimising the utility of spectrum, within existing planning parameters.

**Consultation question from 2017–21 FYSO:
Do you have any comments on the scenarios? Are there other scenarios you believe warrant identification and particular attention at this time? Why?**

Detailed commentary was received about the allocation scenarios developed by the ACMA, with divergent views received about scope of the bands for inclusion in the allocation work plan, sequencing and timing.

Because each of the three proposed scenarios identified various trade-offs between scope, sequencing and timing, we have provided a summary of the feedback received on each scenario, with a focus on comments from the potential participants in any allocation process.

Submitters also provided multiple suggestions for alternative allocation scenarios that reflected their timing and sequencing preferences for single or multiple bands, or suggestions that the ACMA give further attention to a wider range of different spectrum uses in its planning and allocation activity.

1. Summary of feedback on three allocation scenarios from 2017–21 FYSO

| Submitters | Comments |
| --- | --- |
| **SCENARIO 1** | **In this scenario, allocation of the 3.6 GHz band is prioritised, followed by an allocation of a combined 850 MHz expansion/900 MHz band.**  |
| **General comment** | Disparate views were expressed by the submitters, including the mobile network operators, about the proposed prioritisation of the 5G bands (3.6 GHz and mmWave) relative to the 4G 900 MHz band  |
| **Telstra**  | Not supportive. The auction timelines are too late for 3.6 GHz and 26 GHz.  |
| **Vodafone** | Not supportive. Concerned that separate auction of the 3.6 GHz and 26 GHz bands does not provide the certainty operators are seeking about the availability of both bands to support efficient network deployment. Overall concern that sequential allocation of different spectrum bands is most unusual. |
| **Communications Alliance Satellite Spectrum Working Group**  | Supported by members, with the exception of two mobile network operators who dissented. |
| **Scenario 2** | **In this scenario, 3.6 GHz is allocated first, with mmWave prioritised ahead of the allocation of the 850 MHz expansion/900 MHz bands** |
| **general comment** | Strong support for accelerating the allocation of spectrum to support the introduction of 5G from some mobile network operators and a number of equipment vendors. Contrary views suggested that the prioritisation of mmWave over other bands was premature, noting that planning work is continuing. |
| **Telstra**  | Not completely supportive. While this scenario is more closely aligned with Telstra’s views, the company believes the auction timelines for both the 3.6 GHz and 26 GHz bands are too late for Australia to keep pace with international 5G developments.  |
| **Vodafone**  | Not supportive.  |
| **NBN Co** | Does not support accelerated planning of the spectrum in any of the mmWave bands.  |
| **Facebook** | Facebook supports ACMA’s plan to consider mmWave spectrum options in the 26 GHz band (24.25–27.5 GHz) in 2018-19. |
| **Scenario 3** | **This scenario illustrates what could happen if one or more bands do not proceed to allocation via an auction (administrative reconfiguration and allocation of 900 MHz band and delay in allocation of the 850 MHz expansion band)** |
| **General comment**  | Support expressed for this scenario focused on the prioritisation of the 5G bands (3.6 GHz and mmWave bands), with preferences expressed for staggered but not serial allocations. Contrary views noted that the timing of the allocation was not optimal to facilitate 5G deployments. Main comments received were from the mobile network operators and equipment vendors. |
| **Telstra**  | Not supportive. Telstra does not consider this scenario as being optimal because the two 5G pioneer bands are auctioned too late, the 900 MHz band is not efficiently allocated through a market demand-based process, and allocation of the 850 MHz band is delayed for too long. This scenario is the least efficient and optimal of all the options represented.  |
| **Vodafone**  | Not supportive. Strongly recommends pooling at least the 3.6 GHz and 26 GHz bands, and potentially the 850 MHz expansion band and the 1.5 GHz band, into one combined multi-band auction. This would allow bidders to plan a cohesive deployment strategy for 4.9G/5G and enable the ACMA to realise a fair market value for the different parts of the spectrum. |

**Consultation question from 2017–21 FYSO:
Is there interest in the ACMA running sequential staggered allocations over the next four-year period?**

A wide range of views were expressed about the sequential staggered approach to allocation. While there was general interest in accessing the identified spectrum, support for the sequential staggered allocations was highly qualified. Some submitters queried the speed of the proposed allocation, noting that planning was yet to conclude in the case of the mmWave band, and access may be limited, as some of the identified spectrum is expected to remain encumbered for a few years.

Alternative suggestions to the FYSO’s staggered sequential allocation proposal were to combine allocations of potential complementary and substitutable 5G spectrum bands (3.6 GHz and mmWave) and delay allocations until early in the first half 2019. Another option suggested was to combine all four of the identified bands into a single multi-band auction.

**Consultation question from 2017–21 FYSO:
Which bands would you like to see prioritised for allocation under the planning scenarios? Why?**

In contrast to the other bands, the 1.5 GHz band prioritisation elicited a consistent view from submitters indicating limited demand, but offering general encouragement for the ACMA to continue planning the band and engaging in international studies. There was no consensus about the prioritisation of the other four bands, consistent with submitters’ views about the allocation scenarios.

A summary of submitter’s views is outlined in Table 14 below.

1. Which bands would you like to see prioritised for allocation under the planning scenarios from 2017–21 FYSO?

| Submitter | **3.6 GHz** | 900 MHz | 850 MHz expansion band | mmWave | 1.5 GHz |
| --- | --- | --- | --- | --- | --- |
| Telstra |  | Supports allocation of 900 MHz and a combined allocation of 850 MHz and 900 MHz, but lower priority than 3.6GHz and 26 GHz | Interested in commercial negotiations to achieve the downshift, but allow the ACMA to implement the downshift at 850 MHz licence expiry if commercial agreement not achieved |  |  |
| VHA | Recommends pooling at least the 3.6 GHz and 26 GHz bands, and potentially the 850 MHz expansion band and the 1.5 GHz band, into a multi-band auction  | Strongly opposes reallocation of the 900 MHz band. Simultaneous allocation of 900 MHz and 850 MHz is ill-conceived, as they are not direct substitutes | Accelerate clearance of the 850 band as incumbents no longer represent the highest value use |  |  |
| NBN Co |  |  |  | Does not support accelerating mmWave planning |  |
| Communications Alliance Spectrum Satellite Working Group | Encourage the creation of one or more earth station protection zones on the east coast, the North and continue interest in the West  |  |  | ACMA planning for mmWave (26 GHz) and 1.5 GHz bands should be concluded subsequent to international studies | Planning should also take account of spectrum-sharing studies and satellite as well as mobile broadband |
| AMTA |  |  |  | Supports accelerating timelines for mmWave bands and 5G | Supports continued band planning |
| Inmarsat |  |  |  | Interest in the 2 GHz band for mobile satellite services | Don’t delay 1.5 GHz band access for mobile satellite  |
| ASTRA | Supports the development of east coast earth station protection zones as part of the 3.6 GHz licence framework and take into account protection for all satellite bands |  |  | Considers that the replanning of the mmWave bands should protect the primary allocation of 24.65– 25.25 GHz for BSS earth-to-space |  |
| NSW Telco Authority |  |  | Ensure 5 MHz paired of 850 MHz is not auctioned, so it is available for public safety agencies |  |  |
| Motorola Solutions |  |  | Decision should proceed to allocation with no further delay, given the previous ACMA decision on a PPDR allocation in 800 MHz |  |  |
| Facebook |  |  |  | Support for 5G |  |
| Samsung | Lower bands below 6 GHz (focusing on 3.6 GHz band) but also mmWave bands will be necessary to realize new services in 5G era, taking into account the varied ITU references and global investigations |  |  | mmWave bands are required to provide wider contiguous bandwidth to support the high-data throughput that is an essential characteristic of the full 5G vision |  |
| Qualcomm |  |  |  | Accelerate timeline for release of 5G and mmWave spectrum  |  |
| Cambium Networks |  | There is a lot of unused ‘mobile spectrum’ regionally, e.g., 40 MHz of 900 MHz makes a huge difference to delivering effective rural broadband and another 10 MHz licensed spectrum for narrowband IoT |  |  |  |
| Huawei |  |  |  | Prioritise the mmWave band as complementary to the 3.6 GHz band. |  |

## What we’re proposing

The ACMA completed an auction in December 2017 for a multi-band allocation of unsold spectrum in four bands: 1800 MHz, 2 GHz, 2.3 GHz and 3.4 GHz. It plans to offer the single lot that remained unsold at the conclusion of the auction for administrative allocation in Q1 2018–19.

The remaining set of spectrum bands under consideration for potential future allocation is outlined in Table 15.

1. Spectrum bands under consideration

| Band name | Spectrum parameters | Current use | Comments |
| --- | --- | --- | --- |
| **3.6 GHz band** | 3575–3700 MHz | Point-to-point, FSS (satellite), amateur, regional WISPs | Likely first 5G band.Reallocation declaration made by the minister in March 2018.Proceeding to auction, expected to commence in October 2018. |
| **850 MHz band** | 809–824 MHz and 855–870 MHz | Fixed links, point-to-multipoint, land mobile | Decision to re-farm has been made already, but lengthy clearance process up to 2024. |
| **900 MHz band** | 890–915 MHz and 935–960 MHz | 2G mobile (GSM), 3G, 4G | 2G shutdown imminent. ACMA decision on way forward challenged by two mobile network operators, indicating current use as a 3G band.  |
| **26 GHz band** | 24.25–27.5 GHz | Space research, FSS satellite (ESA, CSIRO, NASA), NBN Co | Second of the 5G bands. Strong market interest expressed in accelerating planning and allocation.ACMA planning focus on 26 GHz band for acceleration. |
| **1.5 GHz band** | 1427–1518 MHz | Point-to-point, some multipoint, Defence | Technology standardisation progressing. Lower level of near-term domestic interest. |

**3.6 GHz**—While some submissions on the 2017–18 allocation scenarios suggested a combined allocation of the 3.6 GHz and mmWave bands, the ACMA recommended to the minister that he make reallocation declarations to proceed with the 3.6 GHz allocation independent of the mmWave bands. The minister made relevant reallocation declarations consistent with this advice on 8 March 2018[[35]](#footnote-36) and the band is now proceeding to an auction, expected to commence in October 2018. Attempting a combined allocation of mmWave and 3.6 GHz bands would have the effect of delaying the 3.6 GHz allocation and would be inconsistent with the minister’s reallocation declarations[[36]](#footnote-37).

**mmWave spectrum**—A number of mmWave bands could be considered for allocation, with strong interest from a number of submitters for early licensing of the 24.25–27.5 GHz band (the 26 GHz band) to follow after the allocation of the 3.6 GHz band. A contrary view, noted by some mobile network operators and incumbent licensees, cautioned against an allocation until technology standardisation, international harmonisation and work on sharing models was more advanced. To examine the suite of planning and allocation issues in a more detailed way, the ACMA is proposing to develop an options paper in Q1 of the 2018–19 financial year to seek views on a set of proposals that the band proceeds to re‑allocation. The paper will deal with licence design as well as outstanding planning issues and options. Further discussion on potential timings and risks are outlined below.

**900 MHz**—In October 2017, the ACMA consulted on its reallocation proposal in [*Reconfiguring the 890−915/935−960 MHz band: Way forward*](https://www.acma.gov.au/Home/theACMA/reconfiguring-the-890-915-935-960-mhz-band-way-forward). Submissions to the FYSO indicated that immediate interest in reallocation of this spectrum is substantially lower than for the mmWave band. Submitters to the 900 MHz reconfiguration consultations also raised concerns about the spectrum available for reallocation, including the role of 900 MHz in 3G regional coverage, and mitigations for consumers migrating from 2G to 3G and 4G technologies. The ACMA has sought additional information from the mobile network operators to inform its consideration of the reconfiguration issues in the band. For the purposes of the allocation work plan, we are proposing that allocation of the 900 MHz /850 MHz ‘expansion’ bands would proceed after the mmWave band, giving additional time to explore the outstanding issues for the 900 MHz band.

**850 MHz**—In late 2015, the ACMA finalised a review of the 803–960 MHz band, deciding to reallocate the 850 MHz ‘expansion’ band for spectrum licences configured for wireless broadband. The band is being cleared progressively, and is expected to be fully cleared by 2024, although a significant portion of the band will be available for use from mid-2021.

The long clearance process means that reallocation of 850 MHz expansion band spectrum is not urgent in itself. However, its value as a complement to, or substitute for, wireless broadband licences in the 900 MHz band makes it important to align 850 MHz reallocation with any reallocation of 900 MHz.

The addition of a 1 MHz guard band between the 850 MHz band base-transmit segment and the 890–915/935–960 MHz base-receive segment is necessary to optimise the utility of the lower segment in the 890–915/935–960 MHz band for wireless broadband. Prior to expiration of the current spectrum licences in 2028, this can only be achieved via a voluntary (negotiated) downshift of the existing 850 MHz band spectrum licences, which are held by VHA and Telstra. The availability of the 1 MHz of spectrum immediately below the 850 MHz base-transmit segment to accommodate the downshift will be critical to these negotiations. The ACMA will consider further how this spectrum might best be brought into play in light of responses to its October 2017 discussion paper on 900 MHz reconfiguration.

**1.5 GHz**—Potential use of the band has been identified for IMT. Ongoing work in international spectrum harmonisation and technology standardisation will clarify the amount of spectrum that could be made available for allocation.

The ACMA is yet to make a decision on the timing of the band allocation and the quantum of spectrum that should be made available for allocation—both elements are influenced by international developments. While inclusion of this band in the allocation work plan was not disputed by stakeholders, it remains a lower priority for immediate allocation.

## Allocation scenarios for comment

Noting the status of planning and allocation decisions for each of the bands under consideration, the ACMA is providing two new allocation scenarios that respond to expressed demand, while providing continued flexibility to adjust timing and sequencing in response to new information.

The *Radiocommunications Act 1992* establishes a set of mandatory processes for allocating spectrum. In the ACMA’s experience, this process takes a minimum of approximately 12.5 months from confirmation of the planning decision to the commencement of an auction (factors that may lengthen the process include the need for more extensive than usual consultation with potential purchasers or the acquisition of new auction tools). Some of these mandatory processes will be streamlined in the new Radiocommunications Bill, which is expected to simplify the decision-making process. The timing of one or more future allocations may straddle the commencement of the new Radiocommunications Bill.

The identification of particular time frames is also informed by consideration of arrangements in adjacent bands if they are currently subject to spectrum licensing.

This is a relevant consideration where there is an intention to align the expiry date of licences in the new band with the expiry date of existing adjacent spectrum licences, in order to facilitate longer-term trading or potential changes to planning arrangements at licence expiry. Where this is the case, the identification of relevant timings is also informed by how late an auction can be postponed before the term of the resulting licences would be unreasonably short.

#### Scenario 1—3.6 GHz prioritised, with 26 GHz next

In this scenario, the ACMA proceeds to allocate 3.6 GHz as outlined, with 26 GHz prioritised ahead of the allocation of the 850 MHz expansion/900 MHz bands (see Table 16).

This scenario responds to the expressed demand to prioritise the 5G bands ahead of other allocations.

Notwithstanding that there is some demand for as early as possible access to 26 GHz spectrum, the broader range of 26 GHz auction timing estimates now included in the scenario reflects the ACMA’s concern that the extent of continuing unresolved planning and licensing design issues for the 26 GHz band may result in delays, either prior to, or after, the decision to proceed with reallocation.

As noted earlier in the planning discussion, indicative timelines for planning decisions on the 26 GHz band have been extended beyond those set out in last year’s FYSO. The reason for the delay reflects that the outcomes of some key technical coexistence considerations internationally are not yet known.

While our understanding of the potential for coexistence with satellite uplinks in the 27–27.5 GHz is largely mature, coexistence with the passive earth exploration satellite service (EESS (passive)) below 24 GHz remains unclear. The conclusion of these coexistence considerations is likely to influence unwanted emission limits on use in the 26 GHz band and, therefore, how much of the band at the lower end is available for any allocation (that is, what guard bands are required). Consideration of these issues continues internationally within relevant groups in the ITU, and in particular within Europe, where a consultation on the 26 GHz band is underway[[37]](#footnote-38). Given the importance and global dimensions of these considerations, these outcomes are expected to inform domestic planning considerations for the band.

Due to the absence of timely international conclusions on these issues, in particular regarding EESS (passive) compatibility, the ACMA’s preferred option is to delay consideration of the 26 GHz band until international clarity and consensus is achieved, with the potential dual advantages of optimising the amount of spectrum available and heading off the risk of potential fragmentation of holdings that could result if the lower part of the band were to be allocated at a later date.

The alternative is to proceed initially with domestic consideration of a subset of the 26 GHz band where coexistence is clear—under some circumstances, this could be as little as 26.5–27.5 GHz initially. A possible third option—that of proceeding with unique, Australian coexistence requirements on devices (that is, unwanted emission performance, noting the aggregate interference contributed from the Australia IMT-2020 environment is likely to be significantly lower than the scenarios under consideration in Europe) is not considered viable due to economy-of-scale considerations.

We expect the effect of delaying until there is an international way forward on the full 26 GHz band will be to extend the auction time frame by an indicative one to two quarters. Committing firmly to a more ambitious auction target date now, before the completion of outstanding studies and planning work, could carry some serious risks. In forming its preliminary view, the ACMA sees major risks in proceeding with only part of the band to start with and revisiting the possibility of additional allocations later. Such an approach is likely to result in fragmented holdings, which could be difficult to rectify in the future. The ACMA’s preference is ‘to do it once and do it right’, meaning we would continue to monitor international studies on coexistence with EESS services before releasing an options paper.

If these studies cannot be resolved in a sufficiently timely manner, the ACMA acknowledges that the balance of the public interest may yet tip—such that it becomes desirable, on balance, to proceed with a multi-stage allocation of the band, with the first stage comprising the upper portion of the band (for example,. 26.5–27.5 GHz, as mentioned above). Under this scenario, the ACMA would need to consider ways to minimise longer-term fragmentation of spectrum holdings, which may be further complicated if studies indicated that additional deployment constraints on the later-released (lower) portion of the band are necessary.

The ACMA is currently preparing a consultation paper outlining the various planning and configuration options for the 26 GHz band, although release timing is related to resolution of the outstanding international issues referred to above. Responses to the consultation will further inform the ACMA’s consideration of the timing of a possible allocation for the band.

As a consequence of accelerating the allocation of the 5G bands, the timing for a combined 850/900 MHz band allocation has been pushed out. The timing outlined in the scenario reflects that reallocation of the 900 MHz band is still under consideration, and also reflects the lower level of interest expressed by stakeholders for the remaining bands, compared with access to bands suitable for 5G. Finally, the ACMA has considered the lower level of urgency expressed by stakeholders for reallocation of the 1.5 GHz band. The scenario reflects the public interest in making spectrum available as soon as practicable once planning arrangements are settled. It is the scenario the ACMA is likely to use for work planning purposes.

1. Scenario 1—3.6 GHz prioritised, with 26 GHz next

|  | ACMA planning decision | Minister decision where applicable | Auction | Notes |
| --- | --- | --- | --- | --- |
| **3.6 GHz** | Q2 2017–18 | Q3 2017–18 | Q2 2018–19 | Expected allocation under 1992 Act |
| **26 GHz** | Q2 2018–19 | Q3 2018–19  | Q4 2019–20 | May be allocated under new Act |
| **850/900 MHz** | Q2 2018–19\* | Q3 2019–20 | Q1 2020–21 | May be allocated under new Act |
| **1.5 GHz** | Q1 2019–20 | Q2 2019–20 | Q4 2020–21 | May be allocated under new Act |

\* Note a planning decision has already been communicated for this band (2017), however further options are currently being considered—the time frames described pertain to completing of that further consideration.

#### Scenario 2—Pause after 5G allocations and reconsider whether one band does not proceed to auction

The scenario explores two sets of alternative possibilities; namely, a timing pause after allocation of the 5G bands to reassess likely market demand, and where a narrower set of bands proceeds to allocation via auction (see Table 17).

Noting the expected industry focus on 5G network deployments over the next few years, it may be appropriate to reassess the relevant market circumstances once 5G networks are deployed to understand how these market changes will inform demand for other spectrum, following the conclusion of auctions for the 5G bands.

In relation to the scope of bands for inclusion in an allocation program, we have assumed that:

* the 900 MHz band does not proceed to auction (for example, because it is administratively reconfigured and allocated), noting that the reallocation of 900 MHz is still under consideration by the ACMA
* the 850 MHz expansion band allocation is then able to be delayed until closer to the completion of ongoing clearance processes in the band, which will conclude in 2024

the 1.5 GHz band is prioritised over the 850 MHz expansion band.

As with Scenario 1, the allocation timing for the 1.5 GHz band reflects the expected conclusion of planning activities, as outlined in the mobile broadband work program. As the sequencing shows, the ACMA would be able to allocate the 1.5 GHz band before the 850 MHz band, if this sequence best addresses industry demand at the time.

1. Scenario 2—Pause after 5G allocations and reconsider whether one band does not proceed to allocation

|  | ACMA planning decision | Minister decision where applicable | Auction | Notes |
| --- | --- | --- | --- | --- |
| **3.6 GHz** | Q2 2017–18 | Q3 2017–18 | Q2 2018–19 | Expected allocation under 1992 Act |
| **26 GHz** | Q2 2018–19 | Q3 2018–19  | Q4 2019–20 | May be allocated under new Act |
| **1.5 GHz** | Q2 2020–21 | Q3 2020–21  | Q4 2021–22 | May be allocated under new Act  |
| **850 MHz**  | Q3 2018–19 | Q3 2021–22 | Q2 2022–23 | May be allocated under new Act  |

### Consultation question

1. Do you have any comments about the ACMA approach to the forward allocations, or the specific allocation scenarios?

# Spectrum review implementation

## The reform context

The release of the [Exposure Draft of the Radiocommunications Bill 2017](https://www.communications.gov.au/have-your-say/consultation-new-spectrum-legislation) (the Bill) for public comment in May 2017 marked an important milestone in the ACMA’s preparations for implementing new spectrum management arrangements on commencement of the new Act.

In commenting on the Exposure Draft of the Bill, stakeholders wanted additional information from the ACMA about how it intends using the discretion provided under the Bill to implement the government’s reform directions for spectrum management.

While elements of the legislative scheme are still under development, the ACMA identified broad reform directions and implementation paths. In last year’s FYSO, we sought feedback on

* our intended approach to spectrum reform objectives and priorities
* our work plan to implement the Spectrum Review reforms

opportunities for user involvement in designing the revised spectrum management arrangements.

Here we reflect on the feedback provided and give an update on spectrum review implementation activity and planned activity for the next year.

## Feedback on ACMA approach to implementing the spectrum review

While stakeholders generally welcomed the objectives identified by the ACMA to guide its implementation of the Spectrum Review, they requested additional flexibility within the licensing system to provide for a broader suite of licensing models and requests for allocations. Administratively, the ACMA was encouraged to ensure that all relevant regulatory instruments and related guidelines are published in the same location, and that ACMA business units coordinate their consultation to avoid overlap and missed opportunities.

Some stakeholders expressed concerns about the new regulatory regime, particularly the maintenance of existing rights of licensees and specific issues such as licence term and renewal. Understandably, a number of stakeholders were interested in the transitional arrangements under the foreshadowed Transitional and Consequential Amendments Bill, expressing a desire for further engagement with the ACMA on the drafting of replacement licences, and on industry participants’ responsibilities as a result of the new legislative requirements.

The ACMA is committed to consultation with stakeholders on the development of the new regulatory arrangements, including instruments. We will continue to communicate relevant time frame information and promote opportunities to engage with us in the development of the new regulatory arrangements.

## What’s changed from the planned activity?

The ACMA’s implementation of regulatory arrangements is being undertaken in concert with the introduction to Parliament of the new Radiocommunications Bill (and related legislation) and the ACMA’s broader spectrum management reform, such as the design and implementation of the single licensing system.

The minister is expected to release a second Exposure Draft of the Radiocommunication Bill, along with a Transitional and Consequential Amendments Bill and a radiocommunications Taxation Bill during 2018 (collectively referred to as ED2). The release of ED2 will be a key juncture in relation to consultation on new regulatory arrangements.

### Thematic review of sunsetting instruments

The ACMA and DoCA applied to the Attorney-General to align the sunsetting dates of 21 instruments relevant to spectrum management processes, resulting in a new sunsetting date for them of 1 April 2023.

This new sunsetting date allows the Department and the ACMA to undertake a review and implement its findings in preparation for the proposed new Radiocommunications Act, Radiocommunications Taxation Act and the proposed new spectrum management framework.

These arrangements are given effect in the Legislation (Radiocommunications Instruments) Sunset-altering Declaration 2018 made under section 51A of the *Legislation Act 2003*.

The ACMA expects that these instruments will be replaced by the new regulatory arrangements under the Bill before this date. More information, along with the affected instruments, is provided at Appendix A.

## Progress achieved

At the RadComms 2017conference, the ACMA provided an opportunity for stakeholder engagement on licensing reform issues, where it outlined initial design parameters for licences under the single licensing scheme.

The government released its final Spectrum Pricing Review Report in February 2018, which makes 11 recommendations to improve spectrum-pricing arrangements, ranging from a review of the administrative pricing formula, to how reserve prices might be set for spectrum auctions. The ACMA has commenced implementation of some of the recommendations, such as exploring opportunities to transition bands from administrative to market allocation (recommendation 4 of the Pricing Review).

The ACMA intends finalising its interference management principles by Q4 2017–18. The principles will inform the development of an interference management framework, which will provide updated procedural guidance for licensees making interference complaints to the ACMA.

Consultation on concepts and design principles for the Equipment Rules under the Bill was delayed to ensure that there was an opportunity for stakeholder engagement after the Christmas/New Year period. Consultation has now occurred.

The ACMA has continued to support DoCA’s activities on drafting the new legislation and engaged with industry stakeholders at workshops conducted by DoCA.

## New/ongoing activities planned for 2018–19

The main areas of Spectrum Review implementation activity that are expected to be undertaken in the year are outlined below. The ACMA continues to work closely with the Department on the draft legislation and expects to release additional material for consultation after the release of the ED2 package.

### Annual work program

The ACMA is planning to finalise the 2018–22 FYSO near the commencement of the 2018–19 financial year, in readiness to transition smoothly to the annual work program obligations expected to apply under the Bill.

### Licensing

The ACMA intends to issue for consultation information about the design of the new licensing system and replacement licences, following release of ED2. The package will also consult on approaches to the transition of existing licences.

### Pricing

To implement recommendations of the government’s Spectrum Pricing Review, the ACMA intends to initiate three substantive programs of work:

* development of Spectrum Pricing Guidelines (recommendation 1) to provide better transparency and help licensees better understand how the ACMA approaches spectrum pricing.
* a review of how the ACMA administratively prices spectrum and the formula used to set many of the current apparatus licence taxes (recommendation 7). There is potential to improve the ACMA’s administrative pricing of spectrum so that it more closely reflects market value through approaches such as opportunity-cost based pricing.

simplification of industry cost recovery arrangements by combining separate taxes into a single radiocommunications licence tax. This is intended to occur in conjunction with the administrative pricing arrangements.

The ACMA will consult on these pricing programs following the release of ED2.

### Planning

The ACMA intends to consult on design options for the spectrum planning technical framework under the Bill, following release of ED2.

### Equipment rules

Outcomes of the Q3 2017–18 consultation on concepts and design principles for equipment rules will be incorporated into a more detailed options paper for consultation, following the release of ED2.

### Accreditation arrangements

The design and development of new accreditation rules is intended for consultation after the release of ED2.

### Consultation question

1. Do you have any feedback on the ACMA’s approach to Spectrum Review Implementation?

# Licensing and licensing systems

## Progress achieved

### Body scanners in airports

In 2017–18, the ACMA commenced consultation on changes to licensing for body scanners at airports, following representations from the Office of Transport Security in the Department of Home Affairs. The ACMA expects to consider changes to the current applicable licensing during 2018–19.

### Licensing processing system

Work has been suspended on developing an online portal due to re-prioritisation of ACMA ICT resources.

## New/ongoing activities planned for 2018–19 year

### Renew arrangements for amateur certificates of proficiency

The ACMA currently arranges for the delivery of amateur certificates of proficiency through a delegation of powers and a deed with the Wireless Institute of Australia (WIA). The current deed is due to expire in February 2019. Before that time, the ACMA will consider options for continued availability of amateur qualifications, including continuation of existing certificate of proficiency arrangements or other potential training and qualification frameworks. Any modification of the existing arrangements would include public consultation about any required changes to related legislative instruments.

### Consideration of changes to amateur licence conditions

The ACMA has received submissions from the WIA and the Radio Amateur Society of Australia requesting changes to the conditions under which amateur licensees operate. In addition to requests for access to frequency bands detailed above, these submissions seek:

* a review of permitted transmitter output power levels
* the relaxation of permitted bandwidths and emission modes in certain circumstances
* authorisation for foundation licensees to use digital modes and non-commercially manufactured equipment

clearer definitions of certain terminology.

The ACMA will consider these requests. Any amendment to the licence conditions would follow public consultation.

### Enabling trials of mobile phone jammers in prisons

The ACMA currently facilitates jamming of mobile phones in Lithgow Correctional Centre through the Radiocommunications (Field Trial by Corrective Services NSW of PMTS Jamming Devices at Lithgow Correctional Centre) Exemption Determination 2015. The instrument is due to expire on 1 November 2018. The ACMA will consider whether to extend the arrangements and the terms of such an extension before that time.

### Consider changes to VHF marine radio channels and their use

Following changes at World Radio Conference 2015, and representations from maritime radio users, in 2018–19, the ACMA will consider changes to the channels specified for maritime radio and the specification of the uses for the channels.

### 400 MHz band

The ACMA is preparing for the final milestone period of the 400 MHz implementation project during 2019–20. This will complete the necessary transition of licences to appropriate segments of the 400 MHz band. The ACMA continues to work closely with state and territory governments, as well as industry participants and representative organisations that are yet to complete their transition requirements in the 400 MHz band.

### Drone regulation

Remotely Piloted Aircraft Systems (also known as Unmanned Aerial Vehicles), commonly known as drones, have become increasingly popular with hobbyists and commercial users. Drones rely on use of radiocommunications for remote piloting and other uses such as video and sensing. The ACMA is currently considering the radiocommunications regulatory framework for the management of drones and drone jamming equipment.

The ACMA has engaged with an inter-departmental contact network, which is considering management of drones from a range of perspectives. During 2018–19, the ACMA expects to review its existing regulatory measures for licensing drones and its legislative prohibitions and exemptions related to drone jamming, to ensure that regulation remains fit for purpose. The ACMA will work with drone users and relevant agencies, including aviation regulators, and law enforcement and security agencies. The ACMA will also continue to monitor international treatment of spectrum management and regulation for drones and drone jammers.

# Pricing

## Progress achieved

### Scientific-assigned licences

Following a November 2017 consultation on taxes associated with scientific-assigned licences, in November 2017, the ACMA made a decision to reduce taxes associated with scientific assigned licences by 90 per cent.

### Spectrum licence taxes

The ACMA is currently consulting on changes to spectrum licence taxes to account for changes in the indirect cost of spectrum management and census data. The ACMA expects to make the relevant changes before the end of Q4 2017–18. Subsequent changes to spectrum licence taxes will also be required to account for new bands to be spectrum licensed, such as the 3.6 GHz band.

### Apparatus licence taxes

Adjustments were made to apparatus licence taxes to account for changes in census data and inflation, and to clarify the application of taxes for PMTS Class B services in external territories. The adjustments came into effect in April 2018.

The ACMA will continue to make changes to the apparatus licence tax regime to account for matters including adjusting taxes for inflation.

### 400 MHz monitoring framework and opportunity-cost pricing

After releasing a consultation paper in November 2016 on opportunity-cost pricing in the 400 MHz band, the ACMA has reviewed the monitoring framework for the 400 MHz band. The updated monitoring analysis indicates that demand growth has not been as strong as previously thought, in part reflecting a shift to the use of low-power devices by licensees. Given this, a planned third increase to licence tax rates is not currently justified and will not be implemented.

The demand monitoring framework has been updated and a response paper was published in Q3 2017–18. Monitoring will continue on a semi-regular basis and increases can be re-instated if demand accelerates. In releasing the response paper, the ACMA invited interested stakeholders to engage with ACMA staff on understanding more detail about the monitoring framework and how it could be applied.

Feedback to the 2017–21 FYSO related to a number of potential changes to apparatus licence taxes and the flagging of information about reviews in the FYSO. A number of submissions suggested that the ACMA should review spectrum pricing for particular services (such as satellite services in Ka- and Ku-bands, and HPON services). The ACMA anticipates that the general pricing review flowing from recommendation 7 of the Spectrum Pricing Review will address pricing adjustments required across a number of industries and spectrum bands.

## New/ongoing activities planned for 2018–19

The ACMA is implementing new tax arrangements for apparatus licences associated with the transmitters used by commercial radio and television broadcasters in the Broadcasting Services Bands. The changes result from the media reform package passed by Parliament in 2017. The first assessment of taxes is not expected until late in Q4 2017–18 or Q1 2018–19.

After 30 June 2019, the ACMA must conduct a review of the *Commercial Broadcasting (Tax) Act 2017.* In 2018–19, the ACMA may make announcements about any preparation it is undertaking for the review.

The ACMA is consulting on proposed amendments to spectrum licence taxes to account for changes in the indirect cost of spectrum management and to census data, and expects to make the relevant changes prior to the end of Q4 2017–18. Subsequent changes to spectrum licence taxes will also be required to enable new bands to be spectrum licensed, such as the 3.6 GHz band. The ACMA will continue to make changes to the apparatus licence tax regime, including adjusting taxes for inflation.

# Compliance and enforcement

## Priority Compliance Areas

The ACMA’s Priority Compliance Area (PCA) program commenced in 2012–13 and is now an integral part of our approach to compliance and enforcement. Centred on a risk-based methodology, this program aims to systematically identify and address high-risk compliance issues. The purpose of PCAs is to maximise the regulatory reach of the ACMA in a strategic and resource efficient manner. PCAs focus on the risks of harmful interference, risks to spectrum utility, and risks to public safety or compliance activities that are in the public interest.

PCAs are set annually. In 2017–18, the ACMA PCA programs focused on:

* Commonwealth Games preparation—compliance program

mobile handset compliance.

In April 2017, the ACMA consulted with industry through tune-ups held in Sydney and Melbourne on draft PCAs for 2018–19.

## Progress achieved

### Commonwealth Games preparation—compliance program

The ACMA completed the set up and testing of an extensive monitoring network inside the main stadiums, as well as a wide area network located on the Gold Coast.

The ACMA conducted work on the Gold Coast and in Brisbane, Townsville and Cairns between August 2017 and March 2018. The compliance program focused on the interference risks associated with the operation of unlicensed, non-standard hand held two-way radios in the 400 MHz/Harmonised Government Spectrum band and equipment operating in other band segments that were utilised during the games.

The ACMA’s compliance presence resulted in 1,262 site visits, 13 awareness visits, 231 compliance tasks, and 201 warning notices and one infringement notice issued.

The ACMA achieved all milestones as outlined in the contract between the ACMA and Gold Coast 2018 Commonwealth Games Corporation (GOLDOC):

* all Games contract requirements were met
* all area-wide and in-venue monitoring networks were installed and in operation during the Games

all frequency authorisations for use of spectrum in the Gold Coast during the Games were issued.

Pre-games planning was undertaken in the 12 months prior to March 2018.

A report on the ACMA’s Commonwealth Games PCA will be published in Q1 2018–19.

### Audit of mobile handset compliance—technical standards audit program

An audit of mobile handsets for compliance with technical standards was undertaken as part of the ACMA’s routine monitoring, rather than in response to non-compliance issues.

## New/ongoing activities planned for 2018–19

### Audit of mobile handset compliance—technical standards audit program

The ACMA’s audit of 13 mobile phone handset suppliers has concluded and found compliance was high. This completes the ACMA’s suite of EME compliance programs and an online report will be published in July 2018.

### Priority Compliance Areas

The ACMA’s PCAs for 2018–19 will be finalised in Q4 2017–18.

# International engagement

The ACMA, DoCA, Australian industry and government stakeholders participate in international radiocommunications forums to promote and protect Australian interests in spectrum management, including spectrum harmonisation and international frequency coordination.

The peak international forum is the International Telecommunication Union’s (ITU) World Radiocommunication Conference (WRC), which reviews and revises the Radio Regulations, the international treaty regarding use of the spectrum and satellite orbits. The next conference is scheduled for 28 October – 22 November 2019 (WRC-19). WRC-19 will be considering a large agenda concerning a range of new frequency allocation and procedural matters, including possible allocations for satellite services and identification of spectrum suitable for 5G services.

In line with the government’s agreement to Recommendation 4 of the 2017 *Review of the ACMA*, DoCA will lead the Australian delegation at WRC-19, as well as other key policy-related WRC-related ITU and Asia-Pacific Telecommunity (APT) meetings including the APT Conference Preparatory Group for WRC-19 (APG-19). The ACMA will continue to be closely involved in supporting Australian preparatory processes and providing technical expertise for these meetings.

In addition to the policy-related meetings, there are a number of other forums within the ITU and regionally within the APT that consider issues of significance to Australian spectrum management, such as ITU-R Study Groups and Working Parties, and the APT Wireless Group (AWG). The ACMA manages and, along with industry, provides technical expertise for the preparatory groups contributing to these forums.

In addition to the management and participation in these various formal international forums, the ACMA undertakes informal bilateral and multilateral engagement with peer regulators from around the world. This engagement is invaluable in both coordinating international activities and in sharing information and learnings from other spectrum managers on issues of common interest.

### Progress achieved

During 2017–18, the ACMA, working with DoCA, continued to manage, and provide technical expertise to Australian preparatory processes for international spectrum management forums through the established framework, including the Australian Radiocommunication Study Groups (ARSGs).

ACMA staff headed delegations to a number of ITU Radiocommunication Sector (ITU-R) meetings during 2017–18, including meetings of ITU-R Study Groups 4 and 5 and their associated Working Parties, and Task Group 5/1. The ACMA also supported industry led Australian delegations to ITU-R Study Groups 3, 6 and 7 and their associated Working Parties. ACMA staff also headed delegations to regional AWG meetings.

The ACMA and DoCA co-headed delegations to the second meeting of the APG19 (APG 19-2) held in July 2017 and the third meeting (APG19-3) in March 2018. The APG19-3 meeting, with over 400 delegates, was hosted in Perth by the Australian Government and was organised by the ACMA and DoCA.

### New/ongoing activities planned for 2018–19

The ACMA will continue to manage, and provide technical expertise for Australian engagement in international spectrum management forums through the established consultative frameworks.

The second meeting of the Conference Preparatory Meeting for WRC-19 (CPM 19-2) is scheduled for 18-28 February 2019 and will finalise a consolidated report to WRC-19 on ITU-R Preparatory Studies undertaken since 2015. The CPM report will include possible solutions to address WRC-19 agenda items to be used in support of the work of WRC-19. The fourth meeting of the APT Conference Preparatory Group for WRC-19 (APG19-4) will be held from 7–12 January 2019, just prior to the CPM meeting. DoCA will head the Australian delegation to these meetings.

Australia will also participate in various ITU-R and AWG forums over the coming year, with exact dates to be confirmed.

### Consultation question

1. Do you have any comments about the ACMA’s planned activities for licensing and licensing systems, pricing, compliance and enforcement, and international engagement?

# Appendix A—Sunsetting instruments

## Instruments previously due to sunset on 1 October 2018

1. Instruments previously due to sunset on 1 October 2018

| Instrument | Enabling provision | Status |
| --- | --- | --- |
| Radiocommunications (Devices Used in the Inshore Boating Radio Services Band) Standard 2008 | *Radiocommunications Act 1992* — s 162(1) | Authority remade a new standard on 17 August 2017 |
| Radiocommunications (HF CB and Handphone Equipment) Standard 2008 | *Radiocommunications Act 1992* — s 162(1) | Authority remade a new standard on 17 August 2017 |
| Radiocommunications Advisory Guidelines (Co-ordinating the operation of transmitters in the 500 MHz Bands) | *Radiocommunications Act 1992* — s 262(1) | Revoked by Authority resolution on 6 March 2014 |

## Thematic review of sunsetting instruments

The ACMA and DoCA applied to the Attorney-General to align the sunsetting dates of 21 instruments relevant to spectrum management processes, resulting in a new sunsetting date for them of 1 April 2023.

This new sunsetting date allows DoCA and the ACMA to undertake a review and implement its findings in preparation for the proposed new Radiocommunications Act, Radiocommunications Taxation Act and the proposed new spectrum management framework.

The Legislation (Radiocommunications Instruments) Sunset-altering Declaration 2018, made under section 51A of the *Legislation Act 2003*, gives effect to this change.

The instruments administrated by DoCA are at Table 19, with the related instruments administrated by the ACMA at Table 20.

1. Sunsetting instruments administered by DoCA—new sunsetting date 1 April 2023

|  |
| --- |
| Legislation title *:* |
| Enabling Act: *Radiocommunications Taxes Collection Act 1983* |
| Radiocommunications Taxes Collection Regulations 1985 |
| Enabling Act: *Radiocommunications Act 1992* |
| Radiocommunications Regulations 1993 |
| Radiocommunications (Coordination) Regulations |

1. Sunsetting instruments made by the ACMA—new sunsetting date 1 April 2023

|  |
| --- |
| Legislation title |
| Enabling Act: *Radiocommunications Act 1992* |
| Radiocommunications Advisory Guidelines (Use of Electronic Counter Measures for Bomb Disposal Activities) 2010 |
| Radiocommunications Spectrum Marketing Plan (2.3 GHz Band) 2009 |
| Radiocommunications (Prohibited Devices) (Use of Electronic Counter Measures for Bomb Disposal Activities) Exemption Determination 2010 |
| Radiocommunications (Prohibition of PMTS Jamming Devices) Declaration 2011 |
| Radiocommunications (Mid-West Radio Quiet Zone) Frequency Band Plan 2011 |
| Radiocommunications (UHF CB Radio Equipment) Standard 2011 (No. 1) |
| 1900-1920 MHz Frequency Band Plan 2012 |
| Radiocommunications (PMTS Jamming Devices - Visiting Forces and Suppliers) Exemption Determination 2011  |
| Radiocommunications (Public Mobile Telecommunications Services Surveillance Device) Exemption Determination 2011 |
| Radiocommunications Licence Conditions (Aircraft Licence) Determination 2011 (No. 1) |
| Television Outside Broadcast (1980-2110 MHz and 2170-2300 MHz) Frequency Band Plan 2012 |
| Radiocommunications (118 MHz to 137 MHz Amplitude Modulated Equipment — Aeronautical Radio Service) Standard 2012 |
| Radiocommunications Advisory Guidelines (Managing Interference from Spectrum Licensed Transmitters – 800 MHz Band) 2012 |
| Radiocommunications Advisory Guidelines (Managing Interference to Spectrum Licensed Receivers - 800 MHz Band) 2012 |
| Radiocommunications (Digital Radio Multiplex Transmitter Licences - Application Fee) Determination 2012 |
| Radiocommunications (subsection 145(3) Certificates) Determination 2012 |
| Radiocommunications (Trading Rules for Spectrum Licences) Determination 2012 |
| Radiocommunications (Unacceptable Levels of Interference – 800 MHz Band) Determination 2012 |

# Invitation to comment

The ACMA invites comments on the issues set out in this draft 2018–22 FYSO and any other comments you would like to make. The specific questions throughout the paper are collated below:

1. What further improvements could be made to the FYSO to make it easier for stakeholders to engage with the ACMA on its work program?
2. Are there other technology developments or sources of spectrum demand the ACMA should be aware of in considering spectrum management over the next five years?
3. Do you have any feedback on the ACMA’s plans for monitoring, initial investigation, preliminary replanning or re-farming of bands?
4. Do you have any feedback on optimising established planning frameworks?
5. Do you have any comments about the ACMA approach to the forward allocations, or the specific allocation scenarios?
6. Do you have any feedback on the ACMA’s approach to Spectrum Review Implementation?
7. Do you have any comments about the ACMA’s planned activities for licensing and licensing systems, pricing, compliance and enforcement, and international engagement?

The feedback you provide will inform and refine the priority activities included in the finalised 2018–22 spectrum work program. We aim to publish a final version of the work program in the first quarter of the 2018–19 financial year

## Making a submission

[**Online submissions**](http://www.acma.gov.au/theACMA/Consultations/Consultations)—submissions can be made via the comment function or by uploading a document. The online consultation page provides details.

**Submissions by post**—please address submissions to:
Spectrum Review Implementation Branch, five-year spectrum outlook.

Submissions can be sent to either one of the ACMA offices below:

* Sydney: PO Box Q500, Queen Victoria Building NSW 1230
* Canberra: PO Box 78, Belconnen ACT 2616

Melbourne: PO Box 13112 Law Courts, Melbourne Vic 8010

**The closing date for submissions is COB, Friday 15 June 2018.**

Electronic submissions in Microsoft Word or Rich Text Format are preferred.

Enquiries

* Consultation enquiries can be emailed to: spectrumworkprogram@acma.gov.au

Media enquiries can be directed to Emma Rossi on 02 9334 7719 or by email to media@acma.gov.au.

Effective consultation

The ACMA is working to enhance the effectiveness of its stakeholder consultation processes, which are an important source of evidence for its regulatory development activities. To assist stakeholders in formulating submissions to its formal, written consultation processes, it has developed [*Effective consultation—a guide to making a submission*](http://www.acma.gov.au/theACMA/About/Corporate/Responsibilities/acma-evidenceinformed-regulation-and-effective-consultation). This guide provides information about the ACMA’s formal written public consultation processes and practical guidance on how to make a submission.

Publication of submissions

In general, the ACMA publishes all submissions it receives. The ACMA prefers to receive submissions that are not claimed to be confidential. However, the ACMA accepts that a submitter may sometimes wish to provide information in confidence. In these circumstances, submitters are asked to identify the material over which confidentiality is claimed and provide a written explanation for the claim.

The ACMA will consider each confidentiality claim on a case-by-case basis. If the ACMA accepts a claim, it will not publish the confidential information unless authorised or required by law to do so.

Release of submissions where authorised or required by law

Any submissions provided to the ACMA may be released under the [*Freedom of Information Act 1982*](https://www.comlaw.gov.au/Series/C2004A02562) (unless an exemption applies) or shared with various other government agencies and certain other parties under Part 7A of the [*Australian Communications and Media Authority Act 2005*](https://www.comlaw.gov.au/Series/C2005A00044). The ACMA may also be required to release submissions for other reasons including for the purpose of parliamentary processes or where otherwise required by law (for example, under a court subpoena). While the ACMA seeks to consult submitters of confidential information before that information is provided to another party, the ACMA cannot guarantee that confidential information will not be released through these or other legal means.

Privacy

The [*Privacy Act 1988*](http://www.comlaw.gov.au/Series/C2004A03712) imposes obligations on the ACMA in relation to the collection, security, quality, access, use and disclosure of personal information. These obligations are detailed in the [*Australian Privacy Principles*](http://www.oaic.gov.au/privacy/privacy-resources/privacy-fact-sheets/other/privacy-fact-sheet-17-australian-privacy-principles).

The ACMA may only collect personal information if it is reasonably necessary for, or directly related to, one or more of its functions or activities.

The purposes for which personal information is being collected (such as the names and contact details of submitters) are to:

* contribute to the transparency of the consultation process by clarifying, where appropriate, whose views are represented by a submission
* enable the ACMA to contact submitters where follow-up is required or to notify them of related matters (except where submitters indicate they do not wish to be notified of such matters).

The ACMA will not use the personal information collected for any other purpose, unless the submitter has provided their consent or the ACMA is otherwise permitted to do so under the Privacy Act.

Submissions in response to this paper are voluntary. As mentioned above, the ACMA generally publishes all submissions it receives, including any personal information in the submissions. If a submitter has made a confidentiality claim over personal information that the ACMA has accepted, the submission will be published without that information. The ACMA will not release the personal information unless authorised or required by law to do so.

If a submitter wishes to make a submission anonymously or use a pseudonym, they are asked to contact the ACMA to see whether it is practicable to do so in light of the subject matter of the consultation. If it is practicable, the ACMA will notify the submitter of any procedures that need to be followed and whether there are any other consequences of making a submission in that way.

Further information on the Privacy Act and the ACMA’s privacy policy is available at [www.acma.gov.au/privacypolicy](http://www.acma.gov.au/privacypolicy). The privacy policy contains details about how an individual may access personal information about them that is held by the ACMA, and seek the correction of such information. It also explains how an individual may complain about a breach of the Privacy Act and how the ACMA will deal with such a complaint.

1. Report [ITU-R M.2410-0](https://www.itu.int/pub/R-REP-M.2410-2017) Minimum requirements related to technical performance for IMT-2020 radio interface(s), completed in November 2017. [↑](#footnote-ref-2)
2. See [5G-NR workplan for eMBB](http://www.3gpp.org/news-events/3gpp-news/1836-5g_nr_workplan). [↑](#footnote-ref-3)
3. Millimetre waves (or mmWaves) span 30 to 300 GHz (i.e. a wavelength of 1 cm to 1 mm), however, in the current 5G context, mmWave bands in consideration span from around 24 GHz up to 86 GHz. [↑](#footnote-ref-4)
4. See [*Impacts of 5G on productivity and economic growth*](https://www.communications.gov.au/departmental-news/impacts-5g-productivity-and-economic-growth), Bureau of Communications and Arts Research, 9 April 2018. [↑](#footnote-ref-5)
5. Sen. The Hon. Mitch Fifield, [Turnbull Government to convene 5G working group](http://www.minister.communications.gov.au/mitch_fifield/news/turnbull_government_to_convene_5g_working_group#.WeVEz2epXSo), media release, 12 October 2017. [↑](#footnote-ref-6)
6. Digital Video Broadcasting – Terrestrial it is the DVB European-based consortium standard for the broadcast transmission of digital terrestrial television that was first published in 1997. [↑](#footnote-ref-7)
7. A five-fold increase would be relative to a DVB-T multiplex carrying MPEG-2 encoded services and assumes: carriage of a similar quality and mix of SD and HD services, HEVC encoding being up to four times as efficient as MPEG-2, and DVB-T2 transmission parameters that provide a payload capacity of up to 34 Mbit/s. [↑](#footnote-ref-8)
8. FSS earth stations (as the name suggests) are intended to be at fixed locations on land. Spectrum planning, coordination and regulatory arrangements for FSS are designed on the principle that earth stations are at a fixed location and as such, moving earth stations are not typically supported by existing FSS arrangements. [↑](#footnote-ref-9)
9. In this context, a lower-tier user is a user that has lower priority compared to another user under a DSA arrangement. [↑](#footnote-ref-10)
10. This lower boundary (617 MHz) is based on the bottom edge of the 2 x 35 MHz plan identified for the US 600 MHz band. The size of any guard band between the bottom of possible 600 MHz arrangements and the upper edge of ongoing broadcasting would need to be considered as part of any review of the band. The upper boundary aligns with the top edge of the US 600 MHz band plan, noting that the top edge of the highest channel used for broadcasting in Australia ceases at 694 MHz. [↑](#footnote-ref-11)
11. Minister of Communications Malcolm Turnbull’s speech to RadComms 2014, available at [www.malcolmturnbull.com.au/media/radcomms-2014-spectrum-in-the-age-of-digital-innovation](http://www.malcolmturnbull.com.au/media/radcomms-2014-spectrum-in-the-age-of-digital-innovation). [↑](#footnote-ref-12)
12. Information available on the [FCC website](https://www.fcc.gov/about-fcc/fcc-initiatives/incentive-auctions#block-menu-block-4). [↑](#footnote-ref-13)
13. WiMAX networks in India, Medicine Industry News and Marketplace, June 19 2006, [www.wimax-industry.com/ar/7c.htm](http://www.wimax-industry.com/ar/7c.htm). [↑](#footnote-ref-14)
14. GSA – Global mobile Suppliers Association, [The case for new 5G spectrum](http://www.google.com.au/url?sa=t&rct=j&q=&esrc=s&source=web&cd=10&cad=rja&uact=8&ved=0ahUKEwi_yvCXi5zWAhWBQZQKHVGWCJ0QFghWMAk&url=http%3A%2F%2Fwww2.caict.ac.cn%2Fzscp%2Fqqzkgz%2Fljyd%2F201611%2FP020161125552600506791.pdf&usg=AFQjCNFC3W5_9fbfKj1nvBVkFqyGn2Qdpg), November 2016. [↑](#footnote-ref-15)
15. [ECC PT1 (17)055](https://cept.org/Documents/ecc-pt1/34326/ecc-pt1-17-055_5g-mandate)- Mandate to CEPT to develop harmonised technical conditions for spectrum use in support of the introduction of next-generation (5G) terrestrial wireless systems in the Union. [↑](#footnote-ref-16)
16. ECC Report 281, *Analysis of the suitability of the regulatory technical conditions for 5G MFCN operation in the 3400-3800 MHz band* and CEPT Report 67, *Review of the harmonised technical conditions applicable to the 3.4-3.8 GHz ('3.6 GHz') frequency band*. [↑](#footnote-ref-17)
17. GSA–Global mobile Suppliers Association, [The case for new 5G spectrum](http://www.google.com.au/url?sa=t&rct=j&q=&esrc=s&source=web&cd=10&cad=rja&uact=8&ved=0ahUKEwi_yvCXi5zWAhWBQZQKHVGWCJ0QFghWMAk&url=http%3A%2F%2Fwww2.caict.ac.cn%2Fzscp%2Fqqzkgz%2Fljyd%2F201611%2FP020161125552600506791.pdf&usg=AFQjCNFC3W5_9fbfKj1nvBVkFqyGn2Qdpg), November 2016. [↑](#footnote-ref-18)
18. Vodafone, [Vodafone and Nokia conduct Australia’s first live public 5G trial](https://www.vodafone.com.au/media/vodafone-nokia-conduct-australias-first-live-public-5g-trial), 12 October 2016. [↑](#footnote-ref-19)
19. Ericsson, [Ericsson and SoftBank trial 5G in 4.5 GHz band](https://www.ericsson.com/en/news/2017/8/ericsson-and-softbank-trial-5g-in-4.5ghz-band), 31 August 2017. [↑](#footnote-ref-20)
20. [Spectrum for 4G and 5G, Qualcomm, December 2017](https://www.google.com.au/url?sa=t&rct=j&q=&esrc=s&source=web&cd=3&cad=rja&uact=8&ved=0ahUKEwi6jp_qlJDaAhUGVrwKHYWmAUoQFggzMAI&url=https%3A%2F%2Fwww.qualcomm.com%2Fmedia%2Fdocuments%2Ffiles%2Fspectrum-for-4g-and-5g.pdf&usg=AOvVaw0FCBPB1Lj_Vaq2RucFO8x3). [↑](#footnote-ref-21)
21. In accordance with ITU-R Resolution **646**. [↑](#footnote-ref-22)
22. [Spectrum for 4G and 5G, Qualcomm, December 2017](https://www.google.com.au/url?sa=t&rct=j&q=&esrc=s&source=web&cd=3&cad=rja&uact=8&ved=0ahUKEwi6jp_qlJDaAhUGVrwKHYWmAUoQFggzMAI&url=https%3A%2F%2Fwww.qualcomm.com%2Fmedia%2Fdocuments%2Ffiles%2Fspectrum-for-4g-and-5g.pdf&usg=AOvVaw0FCBPB1Lj_Vaq2RucFO8x3) [↑](#footnote-ref-23)
23. The Radio Spectrum Policy Group (RSPG) is a high-level advisory group that assists the European Commission in the development of radio spectrum policy. [↑](#footnote-ref-24)
24. Report and Order and Further Notice of Proposed Rulemaking, [FCC 16-89](https://apps.fcc.gov/edocs_public/Query.do?numberFld=&numberFld2=&docket=14-177&dateFld=&docTitleDesc=). [↑](#footnote-ref-25)
25. Report and Order and Further Notice of Proposed Rulemaking, [FCC 16-89](https://apps.fcc.gov/edocs_public/Query.do?numberFld=&numberFld2=&docket=14-177&dateFld=&docTitleDesc=). [↑](#footnote-ref-26)
26. Contribution to WRC-15, [Revision 1 to Document 102(Add.24)](https://www.itu.int/md/dologin_md.asp?lang=en&id=R15-WRC15-C-0102!A21-A1!MSW-E), Korea (Republic of). [↑](#footnote-ref-27)
27. Refer to [www.acma.gov.au/theACMA/25-ghz-band-review](http://www.acma.gov.au/theACMA/25-ghz-band-review). [↑](#footnote-ref-28)
28. Available from the [ACMA website](http://www.acma.gov.au/~/media/Spectrum%20Engineering/Regulation/pdf/Embargo%20No%2023.pdf) and last revised September 2013. [↑](#footnote-ref-29)
29. Available on the ITU-R website at [www.itu.int/rec/R-REC-M.1036/en](https://www.itu.int/rec/R-REC-M.1036/en). [↑](#footnote-ref-30)
30. Refer to the [Radiocommunications (Spectrum Re-allocation—3.6 GHz Band for Adelaide and Eastern Metropolitan Australia) Declaration 2018](https://www.legislation.gov.au/Details/F2018L00225), [Radiocommunications (Spectrum Re-allocation—3.6 GHz Band for Perth) Declaration 2018](https://www.legislation.gov.au/Details/F2018L00221) and [Radiocommunications (Spectrum Re-allocation—3.6 GHz Band for Regional Australia) Declaration 2018](https://www.legislation.gov.au/Details/F2018L00222). [↑](#footnote-ref-31)
31. Refer to the [Radiocommunications (Spectrum Re-allocation—3.6 GHz Band for Adelaide and Eastern Metropolitan Australia) Declaration 2018](https://www.legislation.gov.au/Details/F2018L00225), [Radiocommunications (Spectrum Re-allocation—3.6 GHz Band for Perth) Declaration 2018](https://www.legislation.gov.au/Details/F2018L00221) and [Radiocommunications (Spectrum Re-allocation—3.6 GHz Band for Regional Australia) Declaration 2018](https://www.legislation.gov.au/Details/F2018L00222). [↑](#footnote-ref-32)
32. For example, those of the Radiocommunications (Communication with Space Object) Class Licence 2015, [Radiocommunications (Foreign Space Objects) Determination 2014](https://www.legislation.gov.au/Series/F2014L01584), Radiocommunications (Australian Space Objects) Determination 2014. [↑](#footnote-ref-33)
33. [Business operating procedures](https://www.acma.gov.au/Industry/Spectrum/Spectrum-planning/Current-APs-info-and-resources/business-operating-procedures-spectrum-planning-acma), including those related to space licensing, are available on the ACMA website. [↑](#footnote-ref-34)
34. See <https://www.minister.defence.gov.au/minister/marise-payne/media-releases/minister-defence-industry-minister-defence-boon-australian>. [↑](#footnote-ref-35)
35. [One reallocation declaration](https://www.legislation.gov.au/Details/F2018L00225) relates to mainland capital cities other than Perth, a [second](https://www.legislation.gov.au/Details/F2018L00221) relates to Perth, and a [third](https://www.legislation.gov.au/Details/F2018L00222) relates to regional Australia. [↑](#footnote-ref-36)
36. The reallocation declaration specifies a reallocation deadline of 12 months before the end of the reallocation period (subsection 153B(5) of the *Radiocommunications Act 1992)*. Section 153K has the effect of revoking the reallocation declaration if no spectrum licence is allocated by the reallocation deadline. To avoid revocation of the reallocation declaration, the ACMA needs to have allocated one or more spectrum licences by 8 March 2019. [↑](#footnote-ref-37)
37. See [https://www.cept.org/files/9522/Draft%20ECC%20Decision%20(18)FF%20PF.docx](https://www.cept.org/files/9522/Draft%20ECC%20Decision%20%2818%29FF%20PF.docx). [↑](#footnote-ref-38)