Five-year spectrum outlook

2019–23

The ACMA’s spectrum management work program—consultation draft

APRIL 2019

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# Foreword

Spectrum use continues to evolve rapidly in Australia. The Australian Communications and Media Authority (ACMA) is Australia’s spectrum manager and is responsible for ensuring radiofrequency spectrum is managed in a way that maximises the overall public benefit derived from using the spectrum.

We are continually monitoring the environment to identify opportunities for improvements in spectrum management arrangements, and accommodating new and changed uses of spectrum while ensuring the continuation of existing uses of spectrum that are of value to the community.

The year 2019 is a World Radiocommunication Conference (WRC) year. WRCs are scheduled every three to four years and are the most important forum for international harmonisation of spectrum use and planning.

Working with the Department of Communications and the Arts (DoCA) to ensure Australia’s interests are best represented at the World Radiocommunication Conference 2019 (WRC-19) in October and November—and then commencing work on the identification and implementation of relevant outcomes in our domestic planning arrangements—will be key priorities for the ACMA in 2019–20.

Advances in new technologies are a key driver of changes in spectrum use, along with increasing recognition of the value of wireless, mobile and satellite services across the economy.

The ACMA continues to facilitate the use of 5G services by identifying appropriate spectrum bands and putting in place the consultation necessary to make sound decisions that will support the development of 5G and other evolving wireless technologies in Australia.

Managing spectrum efficiently and effectively for the benefit of all Australians is a key priority for the ACMA, as outlined in our corporate plan.[[1]](#footnote-2) The ACMA needs an accurate understanding of changes in technology and market demand—for new and existing spectrum use—to inform the way we plan and make spectrum available. We rely heavily on spectrum users to keep us informed. Our performance in spectrum management is measured in our annual report.[[2]](#footnote-3)

The ACMA has consulted annually with industry about its spectrum management priorities through its five-year spectrum outlook (FYSO) since 2009. Last year, we refreshed our approach to the FYSO by publishing a draft FYSO for consultation ahead of settling the final FYSO. This draft FYSO 2019–23 continues this approach by proposing a draft work program for consultation. Based on feedback and further analysis of key spectrum management priorities, the ACMA will publish a final FYSO 2019–23 early in the 2019–20 financial year.

The FYSO is set out in three main parts:

* At a glance—summarises the ACMA’s activities proposed for 2019–20.
* Part 1—provides an overview of the technology, market and policy drivers likely to shape the demand of spectrum over the next five years.
* Part 2—gives detailed information about the ACMA’s planned work priorities for the 2019–20 year relating to spectrum planning, forward allocation, spectrum management improvements, licensing, pricing and compliance, and enforcement—recognising that these work streams sometimes include multi-year activities.

# Issues for comment

The ACMA invites comments on the issues set out in this draft FYSO 2019–23. Specific questions are set out throughout the paper and are collated below:

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

# At a glance—2019–20 work program

The tables below provide a summary of the ACMA’s proposed key spectrum management activities for 2019–20.

The ‘proposed timelines’ column details:

* timing for activities (these may be affected by the progression of other projects)

opportunities for consultation and engagement.

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. International engagement

| Project priorities | Proposed timelines |
| --- | --- |
| ITU-R Study Group 4 block meetings | Q1 2019–20 (19 June–4 July 2019) |
| 25th meeting of the APT Wireless Group (AWG-25)(attendance under consideration) | Q1 2019–20 (1–5 July 2019) |
| Fifth meeting of the APT Conference Preparatory Group (Asia Pacific) for WRC-19 (APG 19-5) | Q1 2019–20 (31 July–6 August 2019) |
| ITU Radiocommunications Assembly 2019 | Q2 2019–20 (21–25 October 2019) |
| World Radiocommunication Conference 2019 | Q2 2019–20 (28 October–22 November 2019) |
| First Conference Preparatory Meeting for WRC-23 | Q2 2019–20 (25–26 November 2019) |

1. Planning—major band planning and replanning activities

| Planning stage | Project priorities | Proposed timelines |
| --- | --- | --- |
| Monitoring | 600 MHz (617–698 MHz)3.3 GHz (3300–3400 MHz)4.5 GHz (4400–4500 MHz)4.8 GHz (4800–4990 MHz) Bands being studied under WRC-19 agenda item 1.16Bands being studied under WRC-19 agenda item 1.13 | Continue to monitor domestic and international developments in these bands to identify usage trends |
| Initial investigation | Extended MSS L-band (1518–1525 MHz and 1668–1675 MHz) | Q3/4 2019–20: Options paper |
| 2 GHz (1980–2010 MHz and 2170–2200 MHz) | Q4 2018–19: Discussion paper on planning issues Q3/4 2019–20: Possible options paper, dependent on outcomes of discussion paper |
| 3.8 GHz (3700–4200 MHz) | Q4 2018–19: Discussion paper on planning issues  |
| Preliminary replanning | 1.5 GHz (1427–1518 MHz) | Q3/4 2019–20: Options paper |
| 1710–1785 MHz and1805–1880 MHz (1800 MHz) in remote areas | Q4 2018–19: Discussion paper on planning issues  |
| 3.4–3.575 GHz | Q4 2018–19: Reconfiguration options paper |
| 28 GHz (27.5–29.5 GHz) | Q4 2018–19: Options paper on planning arrangements in the band Q1 2019-20: Planning decision  |
| Replanning | 850 MHz expansion band (809–824 MHz and 854–869 MHz) | Band is being cleared progressively. ACMA continues to consider options for optimising its use. Allocation timeframes tied to those of the 900 MHz band  |
| 900 MHz (890–915 MHz and 935–960 MHz) | Further consultation on configuration options for the band will be conducted in Q4 2018–19 |
| 5.6 GHz (5600–5650 MHz) | In Q1/2 2019–20 the ACMA plans to finalise the release of the 5.6 GHz band, including transitional arrangements for 3.6 GHz band point-to-multipoint licensees including fixed wireless access  |
| 26 GHz (24.25–27.5 GHz) | Q4 2018–19: Planning decision |

1. Planning—optimising established planning frameworks

| Planning area | Project priorities | Proposed timelines |
| --- | --- | --- |
| Broadcasting analog and digital radio | Finalise outcome of the consultation on AM to FM conversion for Scottsdale, Tasmania  | Q1 2019–20 |
| Develop and consult on proposals for AM to FM conversion for Bega, Cooma and Goulburn, New South Wales  | Q3 2018–19 |
| Consult on AM to FM conversion proposals for Murray Bridge, Spencer North and Port Lincoln, South Australia | Consult Q4 2018–19Finalise Q1 2019–20  |
| Develop and consult on proposals for AM to FM conversions in Taree and Grafton, New South Wales | Consult Q4 2018–19 Finalise Q1 2019–20 |
| Develop and consult on the potential for replanning analog radio services in Perth following the clearance of Band II TV in Bunbury | Q3/4 2019–20 |
| Complete engineering and consult on digital radio channel plans for Bathurst, Cooma, Goulburn and Warragul | Q1 2019–20 |
| Determine whether specified community radio licence areas should be deemed the same as the Hobart RA1 commercial radio licence area for the purpose of digital radio | Q4 2018–19 |
| Determine whether specified community radio licence areas should be deemed to be the same as the Bathurst RA1, Cooma RA1, Goulburn RA1 and Warragul RA1 commercial radio licence areas for the purpose of digital radio | Q2 2019–20 |
| Satellite | Consider feasibility of inclusion of 10.7–11.7 GHz in Radiocommunications (Communication with Space Object) Class Licence 2015 | Q4 2018–19 |
| Review regulatory arrangements for earth stations in motion in Ku-band | Q3 2018–19 |
| General review of licensing procedures for space-based communications systems | Q4 2018–19 |
| Review spectrum arrangements for small satellites | Q4 2018–19 |
| Consider applications for test and demonstration purposes in the 2 GHz band | Ongoing |
| Manage filing and coordination of Australian satellite systems | Ongoing  |
| Low interference potential devices (LIPD) | Completion of consideration of proposed update of the LIPD class licence to respond to industry requests (IFC 45/2018) | Q1 2019–20 |
| Internet of Things  | Facilitation of early access to the 928–935 MHz band for low-power wide-area IoT applications | Ongoing  |
| Spectrum Licence Technical Framework reviews | Commence discussion with industry on a potential program of work for the review of spectrum licensing technical arrangements in relation to new technology developments | Q1 2019–20 |
| Amateur service in the frequency band 5351.5–5366.5 kHz | Discussion paper on implementation issues | Q32019–20 |

1. Forward allocation work plan

| Project priorities | Proposed timelines—next steps |
| --- | --- |
| 26 GHz | Q4 2018–19: Planning decisionQ4 2018–19: Consultation on draft recommendation to Minister |
| 850/900 MHz | Q4 2018–19: Further consultation on configuration options for 900 MHz band  |
| 1.5 GHz | Q3/4 2019–20: Options paper |
| 3.4–3.575 GHz | Q4 2018–19: Reconfiguration options paper |
| 28 GHz | Q4 2018–19: Options paper |

1. Spectrum management practice improvements

| Project priorities | Proposed timelines |
| --- | --- |
| Annual work program | Q4 2018–19: Consult on draft work programQ1 2019–20: Publish final programQ4 2019–20: Consult on draft work program for next year |
| 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 | Q1 2019–20: Consult on draft spectrum pricing guidelines and new cost recovery proposalsQ4 2019–20: Consult on draft new spectrum pricing formula |
| 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 |
| Shorter-term improvements in spectrum management | Commenced in 2018–19, continuing throughout 2019–20 |

1. Licensing and licensing systems

| Project priorities | Proposed timelines |
| --- | --- |
| Consideration of changes to amateur licence conditions | Q4 2018–19: Commence consultation |
| VHF marine radio use | Q4 2018–19: Based on the outcome of the consultation paper released in 2018, the ACMA will consider making changes to the current VHF maritime mobile regulatory arrangements and work with industry on what future changes should be considered |
| 400 MHz band  | Preparation for the final milestone period of the 400 MHz implementation project in 2019–20 |
| Monitor licensing arrangements for drones, and prohibitions and exemptions for drone jamming | The ACMA will continue to monitor licensing arrangements and prohibitions in 2019–20The ACMA will consult on any required changes to regulatory arrangements for counter-drone equipment in 2019–20 |
| Review non-assigned amateur and outpost licensing arrangements | Q2 2019–20: Further consultation on non-assigned amateur and outpost licensing arrangements  |

1. Pricing

| Project priorities | Proposed timelines |
| --- | --- |
| Commercial broadcasting tax arrangements  | Ongoing assessment of taxes throughout 2019–20 |
| Preparation for review of *Commercial Broadcasting (Tax) Act 2017* | Q4 2018–19: Information to be issued about planned arrangements for the review required to be conducted after 1 July 2019 |
| 400 MHz opportunity-cost pricing | Continued semi-regular monitoring of band use  |
| Consultation on the adjusting of apparatus licence taxes for inflation and removing the freeze on taxes for fixed services in remote-density areas below 960 MHz | Q1/2 2019–20 |
| Implementation of spectrum pricing review | Consultation on draft guidelines in Q1 2019–20 |

1. Compliance and enforcement

| Project priorities | Proposed timelines |
| --- | --- |
| Licensing integrity  | Q4 2018–19: Results from 400 MHz monitoring activity to be used in next stage of the priority compliance area to target field-based compliance activities. |
| Interference management | Q4 2018–19: Finalise feedback on interference management principles |

1. Future consultation plans

This table summarises future consultations flagged throughout the draft FYSO. The list of consultations here is subject to change.

| Issue  | Proposed timelines |
| --- | --- |
| 28 GHz (27.5–29.5 GHz)–options paper | Q4 2018–19 |
| Spectrum arrangements for small satellites–discussion paper | Q4 2018–19 |
| Future delivery of radio services in Australia–issues paper | Q4 2018–19 |
| Potential changes to amateur licensing conditions, following a review of arrangements | Q4 2018–19 |
| 2GHz (1980–2010 and 2170–2200 MHz) | Q4 2018–19 (discussion paper)Q3/4 2019–20 (possible options paper) |
| 3.8 GHz (3700–4200 MHz)–discussion paper | Q4 2018–19 |
| 26 GHz (24.25–27.5 GHz)–consultation on draft recommendation to minister | Q4 2018–19 |
| 1710–1785/1805–1880 MHz (1800 MHz) in remote areas–discussion paper | Q4 2018–19 |
| 3.4–3.575 GHz–reconfiguration options paper | Q4 2018–19: |
| 900 MHz (890–915 MHz and 935–960 MHz)–further consultation on configuration options | Q4 2018–19 |
| AM to FM conversion consultations for Murray Bridge, Spencer North and Port Lincoln | Q4 2018–19 |
| AM to FM conversion proposals in Taree and Grafton | Q4 2018–19 |
| Feasibility of inclusion of 10.7–11.7 GHz in Radiocommunications (Communication with Space Object) Class Licence 2015–discussion paper | Q4 2018–19 |
| General review of space licensing procedures–consultation paper | Q4 2018–19 |
| Exploration of a spectrum space apparatus licence type–commence consultation | Q4 2018–19 |
| Annual work program | Q4 2018–19: consultation on draftQ4 2019–20: consultation on draft  |
| Digital radio channel plans for Bathurst, Cooma, Goulburn and Warragul | Q1 2019–20 |
| Determine whether specified community radio licence areas should be deemed to be the same as the Hobart RA1 commercial radio licence area for the purpose of digital radio | Q4 2018–2019 |
| Consultation on spectrum pricing guidelines | Q1 2019–20 |
| Consultation on the adjusting of apparatus licence taxes for inflation and removing the freeze on taxes for fixed services in remote density areas below 960MHZ | Q1/2 2019–20 |
| Determine whether specified community radio licence areas should be deemed to be the same as the Bathurst RA1, Cooma RA1, Goulburn RA1 and Warragul RA1 commercial radio licence areas for the purpose of digital radio | Q2 2019–20 |
| Non-assigned amateur and outpost licensing arrangements | Q2 2019–20 |
| Amateur service in the frequency band 5351.5–5366.5 kHz–discussion paper on implementation issues | Q3 2019–20 |
| 1.5 GHz (1427–1518 MHz) options paper | Q3/4 2019–20 |
| Potential for replanning analog radio services in Perth, following the clearance of Band II TV in Bunbury–consultation paper | Q3/4 2019–20 |
| Any further required changes to regulatory arrangements for counter-drone equipment | 2019–20 |

|  |
| --- |
| **Consultation question**1. What further improvements to the FYSO would make it easier for stakeholders to engage with the ACMA on its spectrum management work program?
 |

# Part 1—Five-year spectrum outlook

## Introduction

Part 1 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, including equipment availability, in spectrum use markets and in the broader policy environment, to inform our allocation of resources.

## **Anticipated change drivers**

Demand for new spectrum and for changes to existing arrangements continues to evolve quickly. The ACMA regularly reassesses its work priorities, as new opportunities arise, to maximise the overall public benefit derived from allocating and using spectrum.

International trends driving demand for spectrum include the appetite for wireless broadband, particularly in the context of 5G services, ongoing commercialisation of Internet of Things (IoT) applications, advances in broadcasting technology, rapid innovations in satellite technologies, and new approaches to spectrum sharing.

The four-yearly WRC meeting is in October this year where several important international harmonisation issues will be discussed. The ACMA will consider the outcomes of WRC-19 in developing the FYSO 2020–21.

As technology develops, it is able to use available spectrum more efficiently. Examples include more efficient radiocommunications transmission and encoding technologies and improved antenna technology that provides greater options in the use of high frequency bands.

The ACMA’s spectrum planning work program is also focused on supporting the evolution of technical frameworks that support more efficient technologies within an existing use.

The ACMA’s response to these demand pressures for the 2019–20 year is outlined in more detail in the planning and allocation work stream activities (see Part 2).

Part 1 (the five-year outlook) does not give timing commitments as experience shows the relative priority of work in future years is liable to change. The intention here is to alert stakeholders to the longer-term pressures that are shaping our immediate work program and informing future work programs.

### Wireless broadband, including 5G

Demand for spectrum to support wireless broadband, including both mobile and fixed applications, continues to be a major driver for changes in highest-value spectrum use across bands.

Mobile broadband applications continue to be a significant source of demand. We anticipate further spectrum will be needed to support the growth in broadband applications and mobile data. In addition, regulatory arrangements for broadband need to remain current and support the latest technology developments.

The current FYSO, including the forward allocation work plan 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 ACMA recognises three broad categories of use and notes that deployments in practice may reflect combinations of these categories.

The first is that of wide-area subscriber networks, served by ubiquitous base stations operated by one or more mobile service providers—this category could be considered ‘conventional’ telecommunication carrier mobile broadband operations.

The second category reflects more limited market subscriber networks over smaller, localised areas, including, but not limited to, fixed wireless broadband and fleet-oriented services.

The ACMA continues to provide support for local area fixed wireless access (FWA). Services provided by Wireless ISPs (WISPs) are a good example of this type of use. Many of the bands that are suitable for FWA are subject to spectrum licensing in the relevant geographical areas. Spectrum licensing arrangements may not be ideal for small and medium enterprises (SME), and apparatus-licensed arrangements are often preferred. Part 2 discusses a number of possible bands and access arrangements at various stages of maturity that may provide options for SME FWA interests (recognising that not all bands, if implemented, will be suitable for all FWA deployment models):

* 5.6 GHz band arrangements shared with weather radar
* 26 and 28 GHz
* 3.7–4.2 GHz

a number of sub 6 GHz bands that may be candidates for new spectrum-sharing approaches.

The final category of wireless broadband covers business enterprise services operated by private entities within the confines of their own premises or land estate—for example, a hospital, education precinct or an industrial facility.

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 due to:

* the potential for re-farming additional spectrum bands to support its deployment
* the characteristics of 5G

some of the bands into which 5G will be introduced challenge us to consider new ways to plan and license that spectrum.

Reviewing the arrangements in bands that are already licensed for wireless broadband is important to ensure existing allocations are efficient and can cater for new technology developments such as 5G.

The ACMA intends to commence a discussion with industry early in the 2019–20 year (see under Optimising established planning frameworks in Part 2).

The definition of 5G along with related spectrum harmonisation and technology specifications and standards has continued to firm over the past 12 months. Work has progressed in the International Telecommunication Union Radiocommunication Sector (ITU-R) to define IMT-2020[[3]](#footnote-4), and spectrum harmonisation considerations relating to the WRC 2019. In September 2018, 3GPP completed its ‘main drop’ of 5G-related specifications in Release 15.[[4]](#footnote-5)

Key characteristics 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 machine-to-machine communications and a wider deployment of the IoT
* use of frequency ranges in the previously little-used millimetre wave (mmWave) bands[[5]](#footnote-6)

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 will 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, some of which is already used for wireless broadband

’high bands’, above 6 GHz, specifically the mmWave bands.

In addition to considering the use of ‘new’ frequency bands (bands previously unused for wireless broadband), 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.

This re-farming will require the ACMA, in conjunction with licensees and other potentially affected parties, to revise existing technical frameworks to ensure they are compatible with 5G by permitting implementation of the related technology advances.

Globally, 5G is seen as having potentially revolutionary economy-wide benefits, including in areas not traditionally associated with fixed and mobile wireless broadband. The ACMA contributes to the work of the government’s working group to drive the deployment of 5G mobile technology in Australia.[[6]](#footnote-7)

In April 2018, DoCA released the [*Impacts of 5G on productivity and economic growth*](https://www.communications.gov.au/publications/impacts-5g-productivity-and-economic-growth) research paper which conservatively estimated that 5G is likely to improve productivity across the economy. This could add an additional $1,300 to $2,000 in gross domestic product per person after the first decade of the rollout.

The ACMA acknowledges the importance and urgency of addressing the 5G spectrum needs and is committed to ensuring that Australia is well placed to take advantage of the opportunities offered by 5G. The ACMA continues to implement arrangements to support the rollout of 5G services in Australia, across a number of bands.

Each of the broad bands identified for wireless broadband requires a specific approach by the ACMA. This is because different considerations apply, such as intrinsic features of the band (for example, propagation characteristics), international harmonisation and standardisation, domestic policy, legacy planning and allocation arrangements, and other incumbency factors.

Bands below 1 GHz

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

* working with industry to optimise the efficient configuration of the existing 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

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

Mid-band spectrum

The mid-band between 1 and 6 GHz are currently the focus of near-term 5G deployments, particularly around 3.4 to 3.7 GHz in Australia. In December 2018, the ACMA successfully allocated 125 MHz of spectrum in the 3.6 GHz band (3575–3700 MHz), in metropolitan and regional areas.

The ACMA also sees a major opportunity for efficiency gains through the defragmentation of the current 3.4–3.575 GHz frequency range. This will require both industry commitment and ACMA assistance to achieve. Beyond the 1.5 GHz band, which is included in this year’s annual work program for the commencement of a detailed planning review, there are several other potential areas of investigation in the mid-bands. Some stakeholders have indicated interest in planning for private LTE networks in mid-band spectrum such as 1.5 GHz.

Spectrum in the 3.8 GHz band from 3.7 to 4.2 GHz has been the subject of considerable interest internationally as well as domestically from large mobile network operators (MNOs) and FWA operators (such as WISPs), with several processes underway considering arrangements in the band. The ACMA is paying close attention to the global environment in this band and will soon be releasing a discussion paper to commence a broad review of arrangements in the 3700–4200 MHz band, which is discussed in Part 2.

There are also potential opportunities for wireless broadband via new spectrum sharing approaches in several mid-band ranges. These possibilities include the 3.3, 4.5 and 4.8 GHz bands that are discussed in the New approaches to spectrum sharing section.

High-band spectrum

The ACMA’s consideration of high-band spectrum for wireless broadband is focused on the millimetre waves in the bands above 24 GHz. Part 2 describes the ACMA’s proposed next steps in relation to the 26 and 28 GHz bands.

Higher in the spectrum, the ACMA has recently consulted[[7]](#footnote-8) on changes to class-licensing arrangements to support additional spectrum in the 60 GHz range for 5G services, which is also being looked at for 5G use around the world.

Along with the ACMA’s efforts to make further spectrum available for wireless broadband, 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.

### Machine-to-machine communications and the Internet of Things (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, dedicated terrestrial IoT technologies have been developed and deployed that usually utilise class-licensed bands, and multiple satellite systems are also in use or in development to enable IoT in a range of dedicated satellite bands.

Devices providing industrial metering, switching and/or control (including smart infrastructure) are a subset of IoT communications technologies that have been of interest in recent years. They require very low data rates and/or very low duty cycles and operate in low-power wide-area (LPWA) networks.[[8]](#footnote-9) 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 and Category M1, commonly known as Cat-M1. In both cases services are, or are expected to be, largely deployed using existing spectrum management frameworks and established bands.

Given the unique capabilities of satellite systems, for example in terms of coverage, multiple companies are delivering or pursuing new space-based IoT services—in some cases enabled through new small satellite technology. Some of these services are being pursued or delivered within established satellite bands within the existing regulatory framework. However, in some cases, enabling satellite IoT may require specific changes to the regulatory regime. A recent example is the inclusion of spectrum around 400 MHz in the [Radiocommunications (Communication with Space Object) Class Licence 2015](https://www.legislation.gov.au/Details/F2015L01486) in 2018.[[9]](#footnote-10)

### Future delivery of broadcasting services

The ACMA’s management of spectrum to support broadcasting services will need to consider the evolution of broadcasting services and their audiences.

Broadcasting services are delivered using radiocommunications spectrum, including AM and FM frequencies (for radio), UHF and satellite frequencies (for television) and other parts of the spectrum deliver broadcasting services using mobile broadband and other wireless delivery systems. Evolving digital transmission technology and changes in viewer and listener behaviour are altering the modes of delivery and consequently changing the broadcasting demand for spectrum.

In recognition of the technological evolution occurring in broadcasting, the ACMA has actively supported new technology trials, such as the DVB-T2 trials for television that commenced in Q4 2018–19. The ACMA continues its work in facilitating the progressive migration of legacy AM services in solus markets to FM services. Similarly, the ACMA continues to progress the roll-out of digital radio into regional Australia through a collaborative and consultative process with industry participants.

The ACMA is investigating the future delivery of radio broadcasting services in Australia to facilitate a discussion with industry on the issues and opportunities with current and new delivery systems, and the impact on metropolitan, and regional and remote markets.

This will facilitate a holistic assessment of radio broadcasting delivery issues and develop a common understanding of those issues that will have benefits for the public and industry in the long term.

### Satellite communications

There is continuing growth and innovation in the provision of satellite-delivered telecommunication and in space science services. These changes are increasing pressure both internationally and domestically to ensure that regulatory arrangements support this change. This can result in both the establishment of new spectrum access arrangements and the refinement of existing ones.

The development of lower-cost, miniaturised space hardware (often referred to as nanosats, cubesats or smallsats) and reduced launch costs are supporting growth in the diversity and capability of services delivered by satellite. In some cases, smallsats are allowing commercial broadband business models and services requiring constellations of satellites in non-geostationary orbit that were once cost prohibitive to now be viable. Some proposed non-geostationary orbit broadband systems require the deployment of very large numbers (e.g. hundreds or thousands) of satellites. This changed environment has also increased the opportunity for academic and scientific space missions, often of short duration.

Collectively these environmental changes are driving several spectrum management challenges. Many of these are being addressed, to some extent, on an international basis given the nature of satellite systems. For example, for reasons of economy and equipment availability, short duration smallsat missions often utilise systems operating in bands not allocated for space services in the *Australian Radiofrequency Spectrum Plan 2017* (ARSP) and/or are not filed and coordinated internationally for interference management purposes. This creates practical challenges for national spectrum managers such as the ACMA which are generally eager to support these missions but need to ensure practical interference management considerations are addressed.

There has also recently been growth in satellite broadband high throughput systems (HTS) that increase the demand for spectrum arrangements to support ubiquitous earth stations for user terminals and for supporting gateway earth stations.

The current Australian spectrum management framework already provides for ubiquitous, uncoordinated earth stations suitable for broadband HTS (using 1.55 GHz total uplink/downlink spectrum in Ku-band and 2.6 GHz in Ka-band). Parts of the satellite industry have suggested that additional spectrum in both bands is required to support planned satellite systems and expected future growth in satellite broadband HTS requirements.

The ACMA is investigating possible changes in both the Ku-band for additional downlink spectrum shared with terrestrial fixed links in 10.7–11.7 GHz (see under Optimising established planning frameworks in Part 2) and the Ka-band in the context of the 28 GHz band review that considers spectrum in the uplink range of 27.5–29.5 GHz (see under the Initial investigation section below). The ACMA acknowledges that downlink spectrum arrangements in the Ka-band would need to be reviewed if changes are made in the uplink (28 GHz) band.

One of the traditional strengths of satellite services is mobility. Recently, there has been increased interest in delivering broadband to moving earth stations from satellites. This recent innovation has resulted from technology developments that enable moving earth stations (also referred to as ‘earth stations in motion’ (ESIMs) communicating with space stations in the fixed satellite service bands (FSS)[[10]](#footnote-11). The ACMA has, on two occasions[[11]](#footnote-12), established interim arrangements supporting ESIMs in parts of the Ka-band prior to international regulatory arrangements being established, and during the 2019–20 year will be considering further action to support ESIMs.

### Government spectrum requirements

Government spectrum users primarily incorporate commonwealth and state agencies responsible for the provision of defence, national security, law enforcement, and emergency services, as well as scientific, meteorological and transport services.

Generally, government spectrum users operate within the same spectrum management framework as all other users. However, in recognising their unique needs and responsibilities, on some occasions government spectrum needs require specific consideration. The ACMA’s interaction with the government spectrum community is extensive, typically on a business as usual, rather than major project basis. Here we outline some of the medium-term drivers of change from this sector.

The ACMA works closely with the Department of Defence’s Chief Information Officer Group to ensure its ongoing access to spectrum to support a range of key capabilities. Recently, as part of the ACMA’s broader discussion on improving shared access to spectrum (see also the New approaches to spectrum sharing section below), we proposed two Defence-held frequency bands, namely 3300–3400 and 4800–4940 MHz, as candidates for case studies for secondary access by non-Defence use on a shared basis. The intent here is to improve the overall utility of spectrum—there is no intention to compromise Defence’s access to these bands in any way (see Part 2 for more details).

The ACMA supports DoCA’s leadership of the Government Spectrum Steering Committee (GSCC) in a technical advisory capacity. The GSCC comprises commonwealth agencies that rely on spectrum access to meet their business objectives. The GSCC was set up to improve transparency around the nature and management of commonwealth-held spectrum.

We continue to work with law enforcement agencies to assist with operation under the [Electronic Counter Measures for Bomb Disposal Activities Exemption Determination](https://www.legislation.gov.au/Details/F2010L00821) and are working with DoCA and the Department of Home Affairs towards putting in place similar measures to support countermeasures against remote piloted aircraft systems (RPAS, or drones).

The ACMA has been monitoring developments of RPAS regulatory arrangements, both internationally and within the Civil Aviation Safety Authority (CASA), as a precursor to reviewing planning and licensing arrangements for RPAS command and control radiocommunications systems.

Currently, these systems are generally authorised under the Radiocommunications ([Low Interference Potential Devices) Class Licence](https://www.legislation.gov.au/Series/F2015L01438) 2015 (the LIPD class licence), however in the medium term the ACMA may look at creating a new type of RPAS-specific planning and apparatus licence in bands allocated to the Aeronautical Mobile Services in the 5 GHz band (specifically in the range 5030–5091 MHz).

The necessity of, and planning arrangements for, these licensing arrangements will be informed by CASA’s consideration of availability and protection requirements for these communications. It is likely that apparatus licensing would only be required for command and control of certain classes of RPAS operating in certain classes of airspace—other consumer RPAS would continue to operate under the LIPD class licence.

### New approaches to spectrum sharing

Spectrum sharing is fundamental to effective spectrum management and a key tool in maximising the benefits achieved through use of the spectrum resource.

The ACMA, like many national spectrum managers, implements a range of spectrum sharing approaches to maximise the overall public benefit derived from using spectrum. As with all forms of resource sharing, spectrum sharing requires some degree of compromise between multiple spectrum uses (that is, services or applications) and users (individual licensees) accessing the shared spectrum.

Traditionally, spectrum sharing has largely focused on static approaches that establish coexistence arrangements defined through fixed geographic and spectral boundaries. More recently, new technologies and techniques have been developed that make new approaches to spectrum sharing more viable. These include dynamic 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[[12]](#footnote-13) 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 time. If this condition cannot be met, then enough spectrum is needed to ensure there is a high probability of enough 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.

DSA implementations to date have been limited, in part due to technological constraints, spectrum availability factors and user expectations. As such, regulatory frameworks have not been widely developed to facilitate spectrum sharing through DSA. However, several DSA frameworks have been proposed or introduced by overseas spectrum regulators (for example, the Federal Communications Commission (FCC) and Ofcom) with corresponding domestic interest in such approaches now growing.

The ACMA will continue to monitor international regulatory and technical developments and investigate and implement new sharing opportunities such as DSA arrangements when and where appropriate. The ACMA is also aware of related regulatory approaches to sharing such as licensed shared access and is monitoring technological developments that could facilitate more intensive spectrum sharing.

To facilitate a discussion with industry to share ideas and develop a common understanding on the issues and opportunities with new sharing approaches, the ACMA is considering hosting a ‘spectrum tune-up’ on the issue and, if it were to proceed, would release a paper to assist the discussion.

### Class licensing and the spectrum commons

Significant changes in demand for spectrum in class-licensed bands, including Wi-Fi, is monitored through the ACMA’s active environmental awareness and stakeholder feedback.

Class licensing is the approach used in Australia to implement less closely managed spectrum arrangements, including ‘spectrum commons’. The fundamental idea of a spectrum commons is that anyone can use commons spectrum, so long as they follow the set rules[[13]](#footnote-14)—in Australia those rules are set out in class licences.

Class licences make available spectrum used by services which operate on a limited set of common frequencies under a common set of conditions and often comply with industry or legislative standards. Class licences authorise users of designated segments of spectrum to operate on a shared basis. Class licences do not involve licence fees, and there is minimal regulatory overhead for spectrum users.

In Australia, the LIPD class licence authorises most class-licensed devices, including Wi-Fi and Bluetooth services along with a range of other uses including certain spread spectrum and ultra-wideband transmitters.

In many class-licensed bands, particularly those included in the LIPD class licence, use of the spectrum is on an uncoordinated basis and sharing mechanisms are implemented via technical and operational conditions on device usage, and, in some cases, network or system design considerations. In such bands, protection of individual devices from interference cannot be guaranteed. This relatively low level of interference protection means that these bands are not useful for all applications. This is balanced by the high degree of flexibility that is possible in the use of these class-licensed bands.

This flexibility, and the absence of licensing fees, has enabled massive innovation both in technology use and deployment approaches in some class-licensed bands. There is no greater example of this than the 2.4 and 5 GHz bands that are class licensed and used for radio local area networks (RLANs)—especially Wi-Fi.

Wi-Fi devices now carry approximately half of all global Internet Protocol (IP) traffic[[14]](#footnote-15) with Wi-Fi networks almost ubiquitous in homes and businesses along with many public spaces. There are regular questions about whether the class-licensed bands used for Wi-Fi are victims of their own success and are experiencing spectrum congestion due to their utilisation. These questions are hard to answer definitively. While there are anecdotal reports of congestion events (for example, poor or no Wi-Fi coverage), it is difficult to determine the cause, which could be spectrum interference, congestion or a range of other factors.

The ACMA will continue to review class licensing arrangements to assess whether regulatory settings can be changed to support the ongoing benefits derived from RLANs and Wi-Fi. Considerations will include whether more spectrum is required and if changes to existing arrangements are necessary. For example, the ACMA can consider whether existing class licence conditions such as power levels and other operating conditions (for example, indoor usage limitations in some frequency ranges) should be reviewed.

As described in this (see Part 2) and previous FYSOs, the ACMA regularly updates class licences to improve their operation and reflect changes in demand for access to class-licensed spectrum.

As part of ongoing environmental awareness, the ACMA monitors and, if appropriate, responds to, developments in Wi-Fi and RLAN technology. The ACMA recently consulted on making spectrum available via class licensing in the 66–71 GHz frequency range expected to support wireless gigabit RLANs (for example, utilising IEEE 802.11ad).

There are global developments in making more spectrum available for Wi-Fi above the 5 GHz band already included in the LIPD class licence. For example, in the US the FCC has commenced a notice of proposed rulemaking proposing rules in the 5925–7125 MHz band that would support Wi-Fi use.[[15]](#footnote-16) This would create over another 1 GHz of spectrum available for Wi-Fi in this band. The ACMA will monitor the progress of this issue—particularly the matter of coexistence between possible Wi-Fi and similar uses of the band with other uses such as satellite uplinks and fixed links.

The ACMA will monitor both domestic and international factors that inform consideration of changes to class licensing arrangements in Australia.

### Amateur radio

The amateur service is a longstanding user of radiofrequency spectrum, with a range of bands made available for qualified amateurs. The amateur service is designed primarily to facilitate hobby radiocommunications and technical experimentation. Amateur radio operators communicate using transmission modes including, but not limited to, Morse code, voice and data.

The ACMA’s amateur-related work program is multidimensional. The ACMA supports the amateur service through planning arrangements which recognise the desires of amateur radio operators to access frequency bands, while balancing other demands for spectrum. For example, this year’s work plan (see Part 2) includes reviewing non-assigned amateur licensing arrangements, and considering outcomes of WRC-15 in the 5351.5–5366.5 kHz band.

The ACMA’s amateur-related work program for 2019–20 also includes management of licensing and the arrangements for the qualification of amateur operators. The ACMA has commenced work on reviewing potential changes to amateur licence conditions in response to submissions and intends to consider options for a range of licensing mechanisms and conditions for non-assigned amateur licences as part of a wider review of non-assigned licences.

In relation to amateur qualifications, consistent with the consultation process initiated in June 2018, the ACMA will pursue the inclusion of amateur qualifications as units of competency into the Australian Qualifications Framework (AQF). The ACMA will also work to establish a Syllabus Review Panel for amateur radio, consistent with its new arrangements with the Australian Maritime College, to consider potential enhancements to the existing syllabus.

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| **Consultation question**1. Are there other technology developments of sources of spectrum demand that the ACMA should be aware of in considering spectrum management over the next five years?
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# Part 2—Proposed 2019–20 annual spectrum management work program

In Part 2, we provide information about the work streams and activities that the ACMA is proposing to focus on over the 2019–20 financial year. The planning information also reflects expected developments over a five-year timeframe.

Where elements of planning, allocation and spectrum reform activities span multiple years, we have identified the relevant timing information. Activities are grouped according to the ACMA’s main spectrum management functions:

* international engagement
* planning
* allocations
* regulatory review and reform
* licensing
* pricing

compliance and enforcement.

The planned milestones, including those relating to 2019–20, are subject to change. The ACMA is continually monitoring factors that may impact spectrum management including any short-term changes in spectrum demand, technological developments, government priorities and available resourcing.

The ACMA also has responsibilities in implementing the new spectrum management legislation (see Spectrum management practice improvements) as part of the recommendations of the Spectrum Review. As the legislation is settled, the timing and nature of the ACMA’s responsibilities will become clearer and may affect other milestones.

## Priorities and resources

There remains a continued demand for more activity from the ACMA than can be accommodated within our finite resources.

In responding to suggestions to our spectrum management priorities, the ACMA considers a range of relevant considerations, including:

* maximising the efficient allocation and use of radiofrequency spectrum
* changes in the development, availability and take-up of radiofrequency technologies, both in Australia and internationally
* spectrum management trends, including through the four-yearly ITU-R WRC process
* the least cost and least restrictive approach to achieve policy objectives.

## FYSO 2018–22 progress report

The [FYSO 2018–22 six-monthly progress report](https://www.acma.gov.au/Industry/Spectrum/Spectrum-projects/5-Year-Spectrum-Outlook/five-year-spectrum-outlook) provides an update on planned activities outlined in the most recent FYSO.

The ACMA is committed to giving regular updates on processes and explanations of changes to plans, and the publishing of this information meets the [Spectrum Review’s](https://www.communications.gov.au/publications/spectrum-review-report) call for greater government transparency and accountability.

The report has nine tables that show the ACMA’s 2018–19 work program for 1 July to 31 December 2018. Where applicable, it provides reasons for any timeframe slippage or change in direction.

# 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) WRC, which reviews and revises the Radio Regulations (RRs), the international treaty level document regarding use of the spectrum and satellite orbits.

The next WRC will be held from 28 October–22 November 2019 (WRC-19) in Sharm El-Sheikh, Egypt. WRC-19 will consider 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. DoCA will lead the Australian preparatory processes and Australian delegation to this meeting, including Asia-Pacific region and international preparation meetings, with the ACMA providing technical expertise.

Other forums within the ITU and regionally within the Asia-Pacific Telecommunity (APT) consider issues with a technical focus that are of significance to Australian spectrum management, including ITU-R study groups and working parties, and the APT Wireless Group (AWG). The ACMA manages Australian input and participation in these meetings in consultation with DoCA and industry.

The ACMA also undertakes informal bilateral and multilateral engagement with peer regulators from around the world. This engagement is invaluable in coordinating international activities and sharing information from other spectrum managers on issues of common interest.

## International meetings 2018–19

ACMA staff headed delegations to several ITU‑R meetings during 2018–19, including meetings of Task Group 5/1 and Study Groups 4 and 5 and their associated working parties, and regional AWG meetings. The ACMA also supported industry-led Australian delegations to ITU-R Study Groups 3, 6 and 7 and their associated working parties.

The ACMA supported DoCA by providing the Deputy Head of Delegation to the fourth meeting of the APG19 (APG19-4) held from 7–12 January 2019 in Busan, Republic of Korea. This meeting determined preliminary APT views in preparation for the second meeting of the Conference Preparatory Meeting for WRC-19 (CPM 19-2).

The ACMA also provided the Deputy Head of Delegation at CPM 19-2, which met from 18–28 February 2019 in Geneva, Switzerland, and finalised a consolidated report to WRC-19 on ITU-R preparatory studies undertaken since 2015. The CPM report included possible solutions to address WRC-19 agenda items to be used in support of the work of WRC-19.

Developments in international band planning are being actively considered in the lead up to WRC-19, and these may have an impact on the ACMA’s spectrum management activities for the 2019–20 year. The final FYSO 2019–23 will reflect any such changes.

## New and ongoing activities planned for 2019–20

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

In addition to WRC-19, the ACMA will provide input into development of Australian positions for key ITU and APT radiocommunication meetings during 2019–20, such as the:

* ITU’s Radiocommunication Assembly 2019 (21–25 October 2019)
* first Conference Preparatory Meeting for WRC 2023 (25–26 November 2019)

APT Conference Preparatory Group for WRC-19, the fifth and final meeting (31 July to 6 August 2019) (APG-19-5).

DoCA will lead the delegation to these meetings with the ACMA closely involved in supporting Australian preparatory processes and providing technical expertise.

Supporting these meetings will require significant support from the ACMA engineering area and will be a priority for the ACMA in 2019–20.

Australia will also participate in other ITU-R and APT forums over the coming year, with the ACMA considering attendance at the 25th meeting of the of the APT Wireless Group (1–5 July 2019) and the meetings of ITU-R Working Parties 4A, 4B and 4C (19 June to 4 July 2019).

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| **Consultation question**1. Do you have any comments about the ACMA’s planned international engagement activities?
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# Planning

Planning is informed by domestic and international trends in spectrum uses, developments in international spectrum harmonisation and technology standardisation, and evolution of communications technology.

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

However, where there is evidence of differing optimal use, the ACMA may identify a net public benefit in the band moving to a new or changed use or being reconfigured 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. In considering replanning options, the ACMA will seek to identify alternative bands or alternative arrangements within the same band for incumbents as part of our responsibilities to ensure spectrum is used and managed to maximise overall public benefit. However, there can be no guarantee that all incumbent users will have an alternative arrangement following a necessary band clearance activity.

Planning activities are directed into two main streams:

* major band planning and replanning activities to support the establishment of new spectrum uses

optimising established planning frameworks for existing spectrum use through updating technical coordination arrangements.

## Implementing outcomes of WRC-19

The outcomes of WRC-19 will affect the ACMA’s future work program. Australia’s spectrum arrangements will be reviewed and updated to align with revision of the ITU RRs and their impact on global and regional spectrum allocations and regulatory requirements.

A key task in this work is making a new ARSP to ensure that Australian spectrum arrangements take account of changes arising from the ITU WRC-19.

While timing of such work is dependent on when WRC changes come into effect (typically one year after the WRC), it is expected that the ACMA will commence scoping this work after WRC-19 in Q3/4 2019–20.

Amendments to the RRs agreed at WRC are subject to parliamentary review through the Joint Standing Committee on Treaties. DoCA administers this process of review.

## Major replanning progress achieved since FYSO 2018–22

* 850/900 MHz bands—the ACMA has continued to engage with stakeholders to firm up implementation timeframes for the reconfiguration of the 900 MHz band to optimise the band’s planning arrangements for LTE services.
* 3.6 GHz band—in December 2018 the ACMA successfully allocated 125 MHz of spectrum in the 3.6 GHz band (3575–3700 MHz), in metropolitan and regional areas.
* 5.6 GHz band—in December 2018, the ACMA published RALI FX23 describing frequency coordination for fixed point-to-multipoint services including FWA in the 5.6 GHz band.

mmWave spectrum for 5G—the ACMA released two consultation papers in September 2018 which considered planning options for 5G in the 26 GHz band and discussed the suitability of the 28 GHz band for a broad range of users and service types (including 5G). In December 2018 the ACMA commenced consultation on proposed updates to class licensing arrangements which included additional spectrum in the 60 GHz range for data communication systems, including 5G.

## **Major band planning and replanning activities**

This section provides an overview of the ACMA’s work in establishing new planning frameworks, including other major band re-farming and reallocation activities.

For price-based allocation of spectrum resulting from major band replanning activities see The forward allocation work plan below.

Bands listed are categorised into four stages as shown in Figure 1.

1. Four stages in spectrum management band planning



| Monitoring |
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| In the monitoring 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. |
| 600 MHz (617–698[[16]](#footnote-17) 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.[[17]](#footnote-18) 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 restack (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 (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.[[18]](#footnote-19) 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 RRs. Next stepsThe ACMA will continue to monitor international developments. 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 continue to engage with industry and government as required 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. |
| 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, this band is designated to be used principally for the purposes of defence and national security via footnote AUS101A of the ARSP. 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 several countries. 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 mid-2019. 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. Due to the current availability of equipment, WISPs and other FWA operators have also expressed interest in accessing the band.Next stepsThe ACMA will continue to monitor international developments in this 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.  |
| 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 ARSP. 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. Since then, there has been increasing interest in this band, particularly from Region 3 countries. In June 2016, Japan’s Ministry of Internal Affairs and Communications (MIC) named the 4.4–4.9 GHz band as a nationally suitable candidate band for 5G.[[19]](#footnote-20) There is some interest from domestic fixed and mobile wireless broadband interests in pursuing this band for mobile broadband in Australia. Next stepsThe ACMA will continue to monitor international developments in this band.  |
| 4.8 GHz (4800–4990 MHz) |
| At WRC-15, the 4800–4990 MHz band was identified for IMT by several countries, including Uruguay, Cambodia, Laos 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 ARSP. 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 ARSP.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.[[20]](#footnote-21) There is some interest domestically from large MNOs as well as WISPs and other FWA operators in pursuing this band for wireless 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. Several 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 band 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 services in the band, with work currently underway to develop sharing characteristics for IMT-2020 in this band as part of this work item. Next stepsThe ACMA will continue to monitor international developments in this 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.  |
| Bands being studied under WRC-19 agenda item 1.16 |
| 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 several 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; and sharing and compatibility studies of WAS/RLAN in the 5 GHz frequency range.In December 2018, the ACMA made the [Radiocommunications (Intelligent Transport Systems) Standard 2018](https://www.legislation.gov.au/Details/F2018L01658) 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. The ACMA also aims to have representatives attend ITU-R Working Party 5A meetings. |
| Bands being studied under WRC-19 agenda item 1.13 |
| 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 in these bands domestically and internationally, particularly in Region 3 countries such as South Korea, Japan and China. In its opinion on spectrum related aspects for next-generation wireless systems (5G), released 9 November 2016, the Radio Spectrum Policy Group[[21]](#footnote-22) (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 coexistence 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) held its final meeting in August 2018 and concluded 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, several 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 APG19-4, a common view developed, expressing interest in the 24.5–27.5 GHz and 37–43.5 GHz bands. 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. Representatives have attended all ITU-R Task Group 5/1 meetings so far and it is intended that representation continue at future ITU-R meetings. 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 *replanning* 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 the low interference potential devices class licence in the Optimising established planning frameworks section. |

| Initial Investigation |
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| 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.  |
| ‘Extended MSS L-band’ (1518–1525 MHz 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. As the coexistence with potential broadband use below 1518 MHz is likely to be a substantial consideration, the simultaneous review of the extended MSS L-band and the 1.5 GHz bands is likely to be appropriate. Further consideration of 1.5 GHz band will be conducted through an options paper in Q3/4 2019–20. |
| 2 GHz (1980–2010 MHz and 2170–2200 MHz) |
| As an outcome of the review of the 2.5 GHz band[[22]](#footnote-23), 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[[23]](#footnote-24) 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 soon. Specifically, Omnispace has expressed an interest in providing services in Australia. Satellite industry representatives have also suggested that services like 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 ARSP. 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 (see ITU-R Recommendation M.1036[[24]](#footnote-25)). 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.Though the work of the ITU on this issue is focusing on coexistence of terrestrial and satellite use of the band across international borders, this 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 stepsTo assist future consideration of the frequency bands 1980–2010 MHz and 2170–2200 MHz, the ACMA is intending to develop a discussion paper seeking industry views on what technologies should be supported and replanning considerations for release at the end of Q4 2018–19. Contingent on outcomes of this discussion paper, the ACMA would release an options paper in Q3/4 2019–20.This band will be retained at the *initial investigation* stage.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 (the 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. |
| 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 several 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.[[25]](#footnote-26) This has resulted in increasing interest from domestic parties in pursuing this band for mobile broadband. Recent developmentsIn July 2018, the US FCC released a Notice of Proposed Rulemaking that identifies the opportunity for satellite services to share 3.7–4.2 GHz for fixed and mobile wireless broadband services, including 5G.[[26]](#footnote-27)In April 2018, the UK’s Ofcom released a consultation paper seeking comments on opportunities for incumbent fixed links and FSS to share the 3.8–4.2 GHz band with fixed and mobile wireless broadband services.[[27]](#footnote-28)Next stepsGiven the global developments on wireless broadband mentioned above, and domestic considerations arising from the known interests of incumbent and aspirant users of the band, it is timely to begin a discussion with industry on any implications for long-term arrangements for the entire 3700–4200 MHz band. The ACMA will issue a discussion paper in Q4 2018–19.Reviewing arrangements across the entire band, rather than incrementally reviewing parts of it, should allow for a more holistic consideration of the needs of all users and potential uses of the band, both existing and future. The ACMA is alert to the needs of existing fixed satellite and point-to-point uses of the band, as well as the potential for both wide area and site based (for example, FWA) wireless broadband. Considering the whole band simultaneously will maximise the opportunity for balanced approaches that take appropriate account of all interests. |

| Preliminary replanning |
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| 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, considering IMT and BSS (sound) operational requirements.Domestically, the impact on aeronautical telemetry services and fixed services, including the Digital Radio Concentrator System, 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 early 2019. 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-25 in March/April 2019 but this may be reviewed depending on progress.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. Stakeholders have also indicated interest in the band for private LTE networks, subject to equipment availability.The ACMA plans to progress consideration of the 1.5 GHz band through the release of an options paper for the in Q3/4 2019–20. |
| 1710–1785 MHz and 1805–1880 MHz (1800 MHz) in remote areas |
| In 2016, the ACMA released arrangements for use of the 1800 MHz band in remote areas for fixed and mobile wireless broadband services by operators. To manage a potential surge in licence applications, a priority assignment model was adopted. An application window process was also adopted for the initial release of spectrum in the upper 2 x 30 MHz of the band to avoid conflicting assignments being made. Recent developmentsThe application window process has been finalised and prospective operators can now apply for licences on a first-in-time basis. Next stepsNow that demand for spectrum in the 1800 MHz band in remote areas is better understood, the ACMA will review the existing arrangements. This includes reassessing the need for a priority assignment model and could include allowing existing or prospective licensees to obtain larger contiguous channels. The ACMA will release a discussion paper in Q4 2018–19. |
| 3.4–3.575 GHz band |
| Optimising spectrum and apparatus licence arrangements in the 3.4–3.575 GHz bands, adjacent to the 3.6 GHz band auctioned in 2018, has been raised with the ACMA by stakeholders as an important priority. This is expected to result in more efficient use of spectrum and a reduction in deployment costs. Next stepsAn options paper for reconfiguration of the 3.4–3.575 GHz band is expected to be released in Q4 2018–19. |
| 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 several mitigation measures identified for affected incumbent point-to-multipoint licensees. This included a commitment from the ACMA to investigate the possibility of developing arrangements for the licensees as part the 27.5–29.5 GHz (28 GHz) band planning activities.Recent developmentsThe ACMA released a [discussion paper](https://www.acma.gov.au/theACMA/spectrum-planning-for-the-28-ghz-band) in September 2018 to commence discussion on the suitability of the 28 GHz band for a broad range of users and service types. 24 [submissions](https://www.acma.gov.au/layouts/web/standardasset/consultation%20asset/viewmore.aspx?i=9b4557df-d817-466d-9be2-1e0139adc296&type=submission&sectionID=) were received.Based on submissions received the ACMA has identified the following services/applications that are interested in accessing the 28 GHz band:* wide-area wireless broadband services which typically relates to services deployed by large MNOs or some fixed telecommunication carriers
* FWA services which relate to smaller, local area subscriber services such as those provided by WISPs or other dedicated wireless broadband networks (e.g. miners and local government)
* FSS which refers to gateway earth stations and ubiquitous earth stations (fixed earth stations at unknown locations and ESIMs, typically authorised to operate under a class licence)
* fixed point-to-point services which are used by many different services and operators to backhaul data
* high altitude platform stations.

Next steps Following on from the September 2018 discussion paper, the ACMA has released an options paper on planning arrangements in the 28 GHz band in Q4 2018–19. A decision on which planning arrangements will be implemented in the 28 GHz band is planned for Q1 2019–20. Depending on this decision, the ACMA will commence work to implement the new arrangements. |

| Replanning |
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| The replanning stage **i**ncludes 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 or reallocation activities. Conclusions from the ACMA planning process are communicated in an outcomes (decision) 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). |
| 850 MHz expansion band (809–824 MHz and 854–869 MHz) |
| See forward allocation work plan scenarios for allocation timing options.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* stage, which is largely geared towards the clearance/relocation of incumbent services operating in the 850 MHz expansion frequencies earmarked for mobile broadband. 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 stage progresses.As per the COAG communique of December 2018, all jurisdictions agreed a Strategic Roadmap that sets out a plan to design, implement and operate a public safety mobile broadband (PSMB) service and to continue to work together to resolve the supporting spectrum arrangements in parallel with proof of concept trials. The ACMA is working with DoCA to provide advice on allocation options and manage the impact of this work on the allocation of other parts of that band for commercial wireless broadband services.Next stepsThe implementation plan contains 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 in combination with the 900 MHz band, pending further consideration of 900 MHz reconfiguration options (see below). |
| 900 MHz (890–915 MHz and 935–960 MHz) |
| See forward allocation work plan scenarios for allocation timing options.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 ACMA 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. The ACMA is proposing to publish a consultation paper in Q4 2018-19 concerning these options. |
| 5.6 GHz (5600–5650 MHz) |
| Recent developments One of the outcomes from the [Future use of the 3.6 GHz band](https://www.acma.gov.au/theACMA/future-approach-to-the-3_6-ghz-band)process was that the ACMA committed to implementing point-to-multipoint apparatus licence arrangements in the 5.6 GHz band. The ACMA also implemented a policy that existing 3.6 GHz point-to-multipoint licensees including FWA services affected by planning decisions made in the band would, as far as possible, be given preference when assessing applications for apparatus licences in the 5.6 GHz band.In December 2019 the ACMA published the *Radiocommunications Assignment and Licensing Instruction (RALI)* FX23. This RALI defines frequency coordination requirements for new point-to-multipoint apparatus licences in the 5.6 GHz band. Before a new PMP licence is issued, prospective licensees must show they meet the defined protection criteria contained in RALI FX 23. The 5.6 GHz band is currently available for licensing in areas that will not affect the possible transition of 3.6 GHz band point-to-multipoint licences into the band. The ACMA is still considering the most appropriate process and timing for release of the band in other areas. Next steps Further information about the mechanism to release spectrum in these areas will be made available when options and arrangements have been developed. The ACMA is aiming to finalise this issue in the first half of 2019–20.26 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 a number of the bands under consideration as part of WRC-19 agenda item 1.13.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* stage to the *preliminary replanning* stage. Recent developmentsFollowing the tune-up hosted in September 2017 and consideration of feedback, the ACMA decided to include the 26 GHz band under *preliminary replanning*.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. Aligning domestic technical arrangements with larger overseas markets is an important consideration to achieve economies of scale and coexistence with global services such as passive earth observation.In July 2018, the Electronic Communication Committee of CEPT (ECC) released a decision titled *Harmonised technical conditions for Mobile/Fixed Communications Networks (MFCN) in the band 24.25–27.5 GHz*. This decision addressed sharing and compatibility conditions to ensure coexistence with other spectrum users and included technical conditions to achieve this coexistence. In September 2018, the ACMA released an [options paper](https://www.acma.gov.au/theACMA/options-for-wireless-broadband-in-the-26-ghz-band) consisting of a range of potential options, both for *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. 19 [submissions](https://www.acma.gov.au/layouts/web/standardasset/consultation%20asset/viewmore.aspx?i=08b4a6e1-ba84-459c-a930-50ca565a3d54&type=submission&sectionID=) were received. Next stepsUsing the information obtained from submissions to the options paper, the ACMA has released a paper detailing decisions and preliminary views for the introduction of wireless broadband in the 26 GHz band.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 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. |

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| **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

The optimisation of existing spectrum-planning arrangements is also a significant planning priority for the ACMA. This is typically achieved through updates to elements of 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.

In coming months, the ACMA intends to work within ITU-R Working Party 5A (responsible for recommendations and reports pertaining to public protection and disaster relief(PPDR) communications, among other things) to include channelling arrangements for 5G NR in documents relevant to 4.9 GHz PPDR arrangements. The benefit of this is that it may help pave the way for public safety-grade 5G equipment that could operate under the 4.9 GHz emergency services class licence and could augment a future PSMB capability. DoCA is considering future PSMB arrangements, which are centred around a 4G capability using 4G frequencies, in consultation with states and territories. Looking forward, the pre-existence of the 4.9 GHz class licence might potentially represent a path from progression from 4G to 5G-based PSMB systems in the longer term, if suitable equipment and protocols are established. The work within WP 5A is a first step in step in this process.

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

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

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 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 late 2018 the ACMA licensed a trial of DVB-T2 technology for Free TV Australia in Brisbane and the Gold Coast. This trial focused on the performance of DVB-T2 in a UHF single frequency network environment. It follows on from the successful VHF trial in Sydney earlier in 2018.
* The ACMA completed Australia-wide frequency allotment planning for DAB+ digital radio. Completion of this planning enabled the ACMA to vary the Canberra Digital Radio Channel plan to increase power from 5 to 20 kW.
* In September 2018, the ACMA issued 15-year digital radio multiplex transmitter licences for the commercial and community broadcasters in Canberra, Darwin and Hobart. The services under the licences are likely to commence in the fourth quarter of 2018–19. The services in Canberra and Darwin will succeed the current trial services.
* The ACMA consulted on a new digital radio channel plan for Mandurah, Western Australia.
* In 2018–2019 the ACMA approved AM–FM conversions for Bathurst, Burnie, Devonport, Queenstown and Mandurah. It has consulted on proposals for conversions in Scottsdale, Mandurah, Bega, Cooma and Goulburn.

Activities planned for 2019–20

Digital radio and AM to FM conversion

Over the next few years, the main priorities in radio broadcasting will continue to include planning for regional digital radio and consideration of the expansion of AM to FM conversions to competitive regional licence areas.

While the ACMA can plan spectrum for digital radio services in regional Australia, the establishment 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.

In Q4 2018–19 we will:

* consult on and determine whether specified community radio licence areas should be deemed to be the same as the Hobart RA1 commercial radio licence area for the purpose of digital radio

consult on proposals for the AM–FM conversion of Murray Bridge, Spencer North and Port Lincoln in South Australia.

In 2019–20, we will:

* complete engineering for, and consult on and finalise the digital radio channel plans for the licence areas where a commercial licensee has committed to starting up around 2020. This is likely to include Bathurst, Goulburn, Cooma and Warragul
* further consult on whether variations to the Brisbane digital radio channel plan are appropriate to improve digital coverage
* re-consult on the Gold Coast digital radio channel plan taking into account the completion of frequency allotment planning and the result of a proposed propagation trial
* consult on and determine whether specified community radio licence areas should be deemed to be the same as the Bathurst RA1, Cooma RA1, Goulburn RA1 and Warragul RA1 commercial radio licence areas for the purpose of digital radio
* finalise in Q1 2019–20 the outcome of the consultation on AM–FM conversions for Scottsdale, Tasmania, and Regional South Australia

consult on further AM–FM conversions in solus markets when engineering reports have been received from the licensees and approved by the ACMA. These areas include Nowra, Armidale, Gunnedah, Moree, Tamworth, Taree, Grafton, Parkes, Inverell, Lismore, Wangaratta, Albany, Horsham, Hamilton, Colac, Sawn Hill and Lithgow.

Potential for Perth analog radio broadcast planning initiative

Internal engineering work has been completed on a study into the potential for replanning Perth radio. The clearance of Band II television in Bunbury, following digital switch-over, has provided new planning options.

In 2019–20, we will consult on the potential to replan the Perth FM broadcast band in the second half of 2019–20.

Consultation on the future delivery of radio services in Australia

Radio broadcasting faces new opportunities and challenges due to technological evolution and changing listener preferences. As demand grows for IP-based services and platforms, the ACMA will need to manage available spectrum resources in an effective and efficient manner. This includes understanding the future roles of AM radio, FM radio, digital radio and radio delivered via IP in metropolitan areas, and regional and remote areas. It is timely then to ask radio industry participants about emerging technology, its impact on their businesses and the choices these create for the radio industry.

In Q4 2018–19 we will publish for consultation an issues paper on the future delivery of radio services in Australia.

In 2019–20, we will:

* consult with industry on the issues paper through multilateral and bilateral stakeholder discussions including a workshop
* undertake further research and analysis of international trends

report findings to the minister in Q2 2019–20.

### 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. Australia’s international engagement activities leading up to, and including, WRC-19, are a priority for the ACMA. However, 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)
* progressing work commenced in 2018–19 on:

reviewing licensing procedures for space-based communications systems to consider whether existing procedures are commensurate with the risk of interference, including consideration of the status of a satellite network in the ITU satellite coordination process

review of arrangements for ubiquitous ESIMs in the FSS in those parts of the Ku-band included in the Radiocommunications (Communication with Space Object) Class Licence 2015

work supporting the use of small satellites focusing on short-duration satellite missions for experimental purposes.

Progress achieved

In 2018–19, the ACMA finalised consultation on several issues to support developments in satellite communications and in September 2018 made updates to the:

* Radiocommunications (Communication with Space Object) Class Licence 2015
* Radiocommunications (Foreign Space Objects) Determination 2014

Radiocommunications (Australian Space Objects) Determination 2014.

In late 2018 the ACMA consulted on 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 geostationary orbit satellites.

In December 2018, the ACMA commenced consultation on an update to frequency coordination procedures for the earth station protection zones around Moree, Quirindi and Roma. This work is expected to be completed by Q4 2018–19.

Activities planned for 2019–20

While the ACMA intends to prioritise its support for Australia’s international engagement activities leading up to, and including, WRC-19, the following satellite planning activities are envisaged for 2019–20.

Spectrum arrangements for ‘small satellites’

The ACMA is continuing the work identified in the FYSO 2018–22 in support of ‘small satellites’.

The ACMA will target its work on supporting short-duration satellite missions for experimental purposes as well as seeking industry’s views on what changes can be made to the existing spectrum management framework to support the broader needs of smallsat users, while ensuring a continuing, stable regulatory environment for ‘traditional’ satellite users.

The ACMA expects to release a discussion paper by the end of Q4 2018–19. This work should continue into 2019–20 with the ACMA reviewing submissions received and developing a way forward.

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.

At this stage, except for consideration of inclusion 10.7–11.7 GHz in the Radiocommunications (Communication with Space Object) Class Licence 2015 (see below), the ACMA is not aware of any proposals that could necessitate the need for updates to current regulatory arrangements.[[28]](#footnote-29)

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 if so, their timing. Any future work will depend on stakeholder feedback, priority relative to other projects in the ACMA’s annual work program and technical viability (for example, consideration of the potential impact on terrestrial services).

Consideration of future Ka-band satellite usage, including expanding the frequency range supporting growing ubiquitous usage, is being undertaken as part of the ACMA review of the 28 GHz band.

General review of space licensing procedures

The ACMA is continuing the work identified in the FYSO 2018–22 reviewing its administrative assessment procedures for apparatus licensing of space-based communications systems.

One of the key purposes of the review is to consider whether, in light of trends in space-based communications systems, licensing procedures are appropriate and commensurate with the risk of interference, and to consider possible updates to business operating procedures for licensing of space-based communications systems.[[29]](#footnote-30) Given issues raised in previous consultations, 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 is not completed

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

This work has been delayed, with a consultation paper now expected to be released in Q4 2018–19 (previously Q2). This work is expected to continue into 2019–20 with the ACMA reviewing submissions received and developing a way forward. The ACMA is aware several stakeholders interested in this work are involved in the WRC-19 process and will be mindful of this in timing any follow-up work after the release of the discussion paper.

Review of regulatory arrangements for ESIMs parts of Ku-band

The ACMA is continuing the work identified in the FYSO 2018–22 reviewing existing arrangements to identify what (if any) changes are required to existing regulatory and licensing arrangements to support ESIMs in the Ku-band for both geostationary orbit and non-geostationary orbit satellite networks.

This work has progressed and the ACMA expects to release a discussion paper by the end of Q3 2018–19.

Feasibility of inclusion of 10.7–11.7 GHz in the Radiocommunications (Communication with Space Object) Class Licence

The ACMA is continuing the work identified in the FYSO 2018–22 investigating the feasibility of including the 10.7–11.7 GHz band for earth station receivers in the Radiocommunications (Communication with Space Object) Class Licence 2015.

That frequency range (known as the ‘11 GHz band’) is used for fixed point-to-point links and is one of the most heavily used microwave fixed point-to-point link bands in Australia, with over 15,300 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 station receiver use would not pose an interference risk to point-to-point links, a relevant consideration is under what conditions earth station receivers could operate on an 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.

This work has progressed and the ACMA intends to release a discussion paper considering the technical feasibility in 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. Outcomes of WRC-19 might result in the need for possible updates. 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.

Any future 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.

In the FYSO 2018–22 the ACMA considered, depending on progress of other projects, there was a possibility an update could commence in Q4 2018–19. Work on other satellite activities has not sufficiently progressed and now the ACMA will not consider this matter until after WRC-19. A caveat is that it is possible that work on spectrum for small satellites could result in the need for an earlier target updated.

### Low interference potential devices

In December 2018, the ACMA commenced consultation (see IFC 45/2018) on a proposed update to the LIPD class licence. The proposed updates considered:

* updating and expanding existing 60 GHz arrangements (57–66 GHz) for data communication systems, including 5G. Specifically:
* adding 66–71 GHz
* updating existing arrangements in 57–66 GHz regarding indoor and outdoor data communications systems

adding new arrangements for ‘All transmitters’ in 57–64 GHz

* revising arrangements for underground transmitters in certain bands supporting fixed and mobile services between 70–520 MHz
* adding support for higher power radiodetermination transmitters i.e. radars (76–77 GHz)
* adding support for ground and wall penetration radar as an adjunct to current apparatus licence arrangements (30–12400 MHz)

aligning existing arrangements for ultra-wideband devices with US and European arrangements for generic (indoor and handheld) devices (3100–3400 MHz and 8500–9000 MHz) and aircraft applications (6000–8500 MHz).

Progress achieved

Submissions closed on 22 February 2019 and the ACMA is currently considering submissions received.

Activities planned for 2019–20

The ACMA expects to complete its consideration of updating the LIPD class licence before the end of Q1 2019–2020. Organisations interested in further updates to the LIPD class licence should contact the ACMA to discuss the requirements and timing of such updates.

### Amateur radio

WRC-15 introduced a secondary allocation for the amateur service in the frequency band 5351.5–5366.5 kHz with a maximum radiated power of 15 W (EIRP)**[[30]](#footnote-31)**. While the spectrum allocation is included in the ARSP, the ACMA is yet to consider the technical feasibility and associated technical conditions that could support operation in Australia.

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 from Defence, due to the potential for interference to its systems.

Activities planned for 2019–20

With a range of existing uses currently supported in the band, the ACMA intends to publish a discussion paper in Q3 2019–20 seeking industry views on implementation issues, including appropriate technical conditions and in which part of the band the amateur service could be supported.

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

The ACMA has an ongoing program of review of the [spectrum planning](http://www.acma.gov.au/Industry/Spectrum/Spectrum-planning/About-spectrum-planning/radiofrequency-planning-framework-spectrum-planning-acma) technical framework to ensure its currency and consistency with current technologies and operational practices.

This work is primarily focused on frequency coordination requirements for apparatus-licensed services. This material is predominately recorded in Radiocommunications Assignment and Licensing Instructions (RALIs). Consideration of spectrum-licensing technical frameworks and ensuring the continuing appropriateness of spectrum embargoes are additional elements of this work program.

In September 2018 following industry consultation the ACMA released its [Frequency coordination requirements review work program](https://www.acma.gov.au/theACMA/-/media/Spectrum-Engineering/Issue-for-comment/IFC-26-2018/Review-work-program-2018-19_final-docx.docx) for 2018–19.

This work program outlined updates to frequency coordination rules (as recorded in RALIs) and future work the ACMA also intends to consider subject to completion of other priorities.

The ACMA has been progressing this work program and has released several proposed updates for industry consultation covering:

* [land mobile services: new small service area models](https://www.acma.gov.au/theACMA/land-mobile-services-new-small-service-area-models) (September 2018)
* [proposed updates to earth station protection zones coordination requirements](https://www.acma.gov.au/theACMA/proposed-updates-to-rali-ms-44) (December 2018)
* [minor updates to several RALIs](https://www.acma.gov.au/theACMA/proposed-updates-to-several-ralis) (December 2018) to:

support PTS operation in underground environments in the 1800 MHz and 2 GHz (1920–1980 MHz and 2110–2170 MHz) bands outside of spectrum licensing areas

update coordination zones and protection requirements for space research services at New Norcia and Tidbinbilla RALI MS 38 with earth station transmitters in the fixed-satellite service in the 27.5–30 GHz band

include additional radar sites for coordination between 2.5 GHz band spectrum-licensed transmitters with radiodetermination stations operated by the Department of Defence in the 2700–2900 MHz band.

The ACMA is also considering a broader review of the spectrum planning framework. The framework is complex, made up of a large array of interlinking technical and policy documents. The content and interrelationships can be difficult to understand and interpret, even for experienced practitioners, with information on any one service or part of the spectrum contained over multiple documents. A number of broad areas for review have become apparent, including improving the transparency and clarity of the framework overall**.**

Activities planned for 2019–20

The ACMA intends to complete the identified updates in the frequency coordination review work program and then subject to other priorities progress the future work identified in the review work program. Work on the broader review of the spectrum planning framework, which is flagged in the spectrum management improvements section below, is subject to further consideration of timelines and priorities.

### Marine VHF channel arrangements

Progress achieved

The ACMA, with the assistance of key maritime stakeholders, undertook a review of the current regulatory arrangements governing the operation of the VHF marine radio in Australia. The review was triggered by updates to the ITU RRs at WRC’s 12 and 15. Representations were made by maritime stakeholders that Australia’s regulatory arrangements could be usefully updated to reflect emerging safety-of-life technologies and systems.

The review aimed to:

* identify and include in Australia’s regulatory arrangements any mandatory ITU provisions, and ascertain how those might be best supported considering the ACMA’s functions and responsibilities
* identify improvements to the integrity of the VHF maritime mobile band as it applies to all maritime stakeholders
* where appropriate, update safety-of-life provisions to maintain pace with international developments
* consider the requirements of maritime stakeholders for use of the VHF maritime mobile band
* identify regulatory improvements that would not unduly increase regulatory burden or excessively increase costs on maritime stakeholders
* promote the overall efficiency of the regulatory framework that supports the operation of maritime radio by stakeholders

consider the current regulatory environment, including the relevant legislative instruments of which the ACMA has oversight, which allow for the channelisation, use and technical requirements of the VHF maritime mobile band in Australia.

At the end of 2018, the ACMA released a consultation paper with options on how the current regulatory framework, in the short-to-medium term, can improve safety-of-life arrangements, while also providing benefits to the Australian maritime community. The approach is designed to satisfy our regulatory requirements, as well as provide an opportunity for maritime stakeholders to guide the ACMA on how arrangements can be further improved. The paper provided two proposals for consideration:

* Proposal 1—outlined a set of changes to the Australian regulatory framework and provided a draft instrument identifying those key changes

Proposal 2—raised a series of questions form maritime stakeholders, answers to which will inform the ACMA’s consideration of any additional changes to the regulatory framework.

Activities planned for 2019–20

The consultation ended on 1 February 2019 and the ACMA will consider submissions with a view to implementing changes to the VHF maritime mobile band in 2019. A further review and consultation will be required to consider what future changes should be made, this includes considering the outcomes of WRC-19.

### Review of spectrum licence technical frameworks

Reviewing the arrangements in bands that are already licensed for wireless broadband is important to ensure existing allocations are efficient and can cater for new technology developments such as 5G. The update of the technical framework for the 2.3 GHz band has already been raised in this context.

Activities planned for 2019–20

The ACMA intends to commence a discussion with industry in Q1 2019–20 on the scope of a program of work to determine the bands that may need to be examined.

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| **Consultation question**1. Do you have any feedback on optimising established planning frameworks?
 |

# The forward allocation work plan

## Purpose of the forward allocation work plan

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

* strategic network planning by spectrum users
* technology deployment planning

capital-raising.

Under current law, specific allocation processes depend on ACMA and, in some cases, 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 changed allocation arrangements until a formal decision has been made. 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 a changed allocation arrangement, the specific design of each arrangement is dependent on a range of planning decisions yet to be made. These considerations include, for example, allocation timing, methodology (such as whether it involves an auction or other price-based allocation or conversion of existing apparatus licences to spectrum licences, and whether it involves the issue of apparatus or spectrum licences, or a combination) and lot configuration. The ACMA will take account of feedback from industry about likely demand and their priorities for access to particular spectrum bands.

The ACMA has completed a number of allocation and re-issue processes in recent years, providing significant predictability regarding spectrum availability in a number of key bands including 700 MHz, 1800 MHz, 2 GHz (1920–1980 and 2110–2170 MHz), 2.3 GHz, 3.4 GHz and 3.6 GHz. This has set the stage not only for improved services and greater choice for consumers, it also increases the opportunities for licensees to undertake trading and contribute to defragmentation in some bands, allowing more efficient use of spectrum.

Following the proposed series of timing and sequencing options for allocations planned over the next few years that was published in the FYSO 2018–22, we have updated the forward allocation plan and again seek stakeholder feedback on the identification of bands for allocation, and the timing and sequencing of those allocations.

## What we’re proposing

In December 2018, the ACMA oversaw the successful allocation of 125 MHz of spectrum in the 3.6 GHz band (3 575–3 700 MHz), in metropolitan and regional areas.

The remaining set of spectrum bands under consideration for potential future allocation is outlined in Table 10.

1. Spectrum bands under consideration for potential future allocations

| Band name | Spectrum parameters | Current use | Comments |
| --- | --- | --- | --- |
| 850 MHz expansion band | 809–824 MHz and 855–870 MHz | Fixed links point-to-point, point-to-multipoint, land mobile | Decision to re-farm optimised for wireless broadband was made in November 2015. Clearance process extends to 2024. |
| 900 MHz band | 890–915 MHz and 935–960 MHz | 3G, 4G | ACMA decision on way forward in October 2017 prompted comments regarding continued operations in this band. The ACMA is reconsidering configuration options in light of stakeholder feedback, with a focus on optimising the band for longer term uses for 5G, providing flexibility for licensees to negotiate a downshift in the 850 MHz band, and conversion to longer term licence tenure. |
| 1.5 GHz band | 1427–1518 MHz | Fixed links, some point-to-multipoint, Defence | Technology standardisation progressing. Lower level of near-term domestic interest, but available for allocation consideration, should demand change.  |
| 3.4–3.575 GHz band | 3400–3575 MHz | Fixed Wireless, point-to-multipoint, 5G  | Identify options for defragmentation which could include conversion and other allocation processes. |
| 26 GHz band | 24.25–27.5 GHz | Space research (ESA, CSIRO, NASA), FSS (NBN Co) | Identified as a potential band for 5G services Strong market interest expressed in accelerating planning and allocation.ACMA focus is on 26 GHz band planning and licensing options for an allocation. |
| 28 GHz band | 27.5–29.5 GHz | FSS, Fixed links point-to-point, body scanners | Considering options for the band including the needs of the FSS applications, fixed links point-to-point and fixed/mobile wireless broadband services. |

### 850 MHz expansion band

In late 2015, the ACMA finalised a review of the 803–960 MHz band, deciding to reallocate 2 x 15 MHz in 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 850 MHz expansion band has value as a substitute for wireless broadband licences in the 900 MHz band. The ACMA supports combining the 850 MHz reallocation with any reallocation of 900 MHz if possible.

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 as it develops optimisation options for the 900 MHz and 850 MHz expansion bands.

The Australian Government has agreed to set aside 2 x 5 MHz of spectrum in the 850 MHz expansion band for a public safety mobile broadband (PSMB) capability. At the 12 December 2018 meeting of COAG, all jurisdictions agreed a Strategic Roadmap that sets out a plan to design, implement and operate PSMB and to continue to work together to resolve the supporting spectrum arrangements in parallel with proof of concept trials. In December 2018, the NSW Telco Authority on behalf of all jurisdictions issued a request for proposal from the telecommunications industry, to support a proof of concept for a trial of a national PSMB capability. The ACMA is working with DoCA to provide advice on allocation options and manage the impact of this work on allocation of other parts of the 850 MHz expansion band for commercial wireless broadband services.

### 900 MHz

In October 2017, the ACMA published its planning decision on the 900 MHz band, and consulted on specific configuration arrangements for the band 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 indicated that immediate interest in reallocation of this spectrum is substantially lower than for the 26 GHz 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.

Continued engagement from mobile network operators operating in this band indicates a range of differing approaches to resolving configuration issues in the band. This requires resolution before there is any certainty on method of licensing, and the amount of spectrum that can be allocated.

For the purposes of the forward allocation work plan, the ACMA remains keen to consider ways to optimise holdings in the band, noting that the aggregation of mobile spectrum into fewer, broader-band holdings where possible, will minimise any need for future intervention as demand for sub-1 GHz 5G optimised spectrum gains momentum.

Further consultation on configuration options for the 900 MHz band will be conducted in Q4 2018–19. Subject to the outcomes of this consultation process, this may be followed by consultation on a draft reallocation recommendation in Q1/2 2019–20.

As part of these optimisation considerations, the ACMA also proposes the reallocation of the 850 MHz ‘expansion band’ for wireless broadband (see above).

### 1.5 GHz

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 the 1.5 GHz band to the *preliminary replanning* stage of the ACMA’s process for consideration of additional spectrum for mobile broadband (MBB) services.

Ongoing work in international spectrum harmonisation, technology standardisation and coexistence with other services will clarify the amount of spectrum that could be made available for allocation. The ACMA is yet to decide 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.

Feedback to the FYSO 2018–22 indicated a lower level of near-term domestic interest, compared to other potential wireless broadband bands although stakeholders have subsequently indicated broader interest in the band for private LTE networks Following consideration of submissions, the ACMA will issue an options paper for the 1.5 GHz band in Q3/4 2019–20.

### 3.4–3.575 GHz

Stakeholder engagement in the lead-up to the 3.6 GHz auction in 2018 identified optimising spectrum and apparatus licence arrangements in the adjacent 3.4‑3.575 GHz band as an important priority for the ACMA. This is expected to result in more efficient use of spectrum and a reduction in deployment costs.

The ACMA will progress consideration of this issue in an options paper slated for release in Q4 2018–19. This paper will also investigate options for the most appropriate use of currently unused spectrum in the 3.4–3.575 GHz band. There is also likely to be further consideration of pricing arrangements to reflect changes in the characteristics of the spectrum holdings, however, this will be done as part of the general review on pricing.

### 26 GHz

The 24.25–27.5 GHz band (the 26 GHz band) remains the next candidate band for allocation, following the allocation of the 3.6 GHz band in late 2018.

In September 2018 the ACMA released an [options paper](https://www.acma.gov.au/theACMA/options-for-wireless-broadband-in-the-26-ghz-band) outlining the various planning and configuration options for the 26 GHz band, and seeking views on proposals that the band proceeds to reallocation.

The ACMA has been considering submissions to the options paper and has now released a paper detailing decisions and preliminary views for the introduction of wireless broadband in the 26 GHz band. That paper sets out a timeframe for applicable draft reallocation recommendation consultations and development of relevant spectrum licensing instruments and frameworks. It describes new arrangements for apparatus and class licensing in the parts of the the band and associated timeframes.

### 28 GHz

The ACMA has previously committed to investigating the possibility of establishing new apparatus-licensed point-to-multipoint arrangements for wireless broadband in part of the band.[[31]](#footnote-32) In September 2018 the ACMA released a discussion paper commencing a review of all potential uses of the entire band.

Currently, the 28 GHz band is used by the FSS for both apparatus-licensed, coordinated gateway earth stations and, in part of the band, for ubiquitously deployed, uncoordinated, class-licensed earth stations (in some cases for moving terminals). Both FSS uses of the band are expected to continue and require ongoing regulatory support. The ACMA has also been asked to develop arrangements supporting additional class-licensed spectrum suitable for ubiquitous earth station deployments. In addition to FSS uses, part of the 28 GHz band is also currently planned for fixed point-to-point links.

There is interest in the US and other major markets in using some or all of the band for wide area wireless broadband supporting both fixed and mobile applications. This international interest is part of broader momentum in support of millimetre wave (mmWave) bands for 5th generation (5G) wireless broadband services. This is expected to create a viable equipment ecosystem for both wide-area wireless broadband services as well as localised fixed and mobile wireless broadband services (typically deployed by WISPs, miners and other FWA operators). Consequently, the ACMA is considering planning options in the 28 GHz band for both uses.

The ACMA released an options paper on band planning arrangements in Q4 2018–19.

## Allocation priorities and sequencing

Following publication of the forward allocation plan in the FYSO 2018–22, the ACMA has further considered the interest in each of the identified bands. Progress on the 26 GHz and 850/900 MHz bands is on track. Consideration of the 1.5 GHz bands also continues.

There is optionality on timing—in particular, whether the 3.4–3.575 GHz optimisation and defragmentation work ideally should proceed ahead of the 26 GHz planning and allocation considerations, or whether it should be delayed until after 26 GHz processes have been completed. The ACMA has considered further views on the relative prioritisation of this optimisation work in response to its 26 GHz band options paper released in September 2018.Submissions indicated contrasting views as to whether 26 GHz reallocation or 3.4–3.575 GHz optimisation/defragmentation work should be the priority.

The *Radiocommunications Act 1992* establishes a set of mandatory processes for allocating spectrum. In the ACMA’s experience, under current law this process takes a minimum of approximately 12.5 months from confirmation of the planning decision to the commencement of an auction, if there is certainty about all aspects of the allocation process. This process will take longer where there is uncertainty, for example if there is optionality around how the spectrum can be configured because further consultation and engagement with potential bidders will be necessary and important. The process can also be expected to be longer if there is a need to acquire new auction tools.

### Timing considerations

The optionality that continues to exist about the forward allocation plan is mainly about the timing of potential allocations, but there also remains some optionality around running an allocation, for example, of 850/900 MHz and 26 GHz concurrently.

The ACMA recognises that while there may be timing, administrative and potentially efficiency benefits of running an allocation of multiple bands concurrently, there may also be an additional burden on auction participants associated with capital funding, as well as potential auction complexity considerations. The ACMA will continue to consider the feasibility of a concurrent auction of the combined 850/900 MHz band with the 26 GHz band, depending on the timing of both processes.

This year’s forward allocation plan reflects the addition of two new allocation processes: the optimisation of the 3.4–3.575 GHz band (which may lead to allocation activities such as licence conversion and/or an auction of some spectrum), and consideration of the 28 GHz band (which may lead to changed allocations arrangements in that band).

We have opted to present ranges of time to better reflect the contingent nature of decisions on planning frameworks and relevant frequency assignments that are informed by progress in international harmonisation activity. This also accommodates future changes in domestic market demand for particular bands of spectrum in response to future auction outcomes.

Table 11 below outlines the ACMA’s current timing expectations in relation to future allocations, under current law.

As with the draft FYSO 2018–22, the ACMA seeks feedback from stakeholders on our proposed timing of these potential allocations.

1. Potential timing of allocations

| Band | ACMA next steps | ACMA recommendation to minister where applicable | Proposed allocation timing | Notes |
| --- | --- | --- | --- | --- |
| 26 GHz | Q4 2018–19 (planning decision)Q4 2018–19 (consultation on draft recommendation to minister | Q1 2019–20  | Auction: Q1/2 2020–21 | Consider whether concurrent with 850/900 MHz allocation |
| 850/900 MHz | Q2 2017–18 (planning decision on 900 MHz—complete)Q42018–19 (configuration options 900 MHz) | Q1/22019–20 | Allocation: Q1/2 2020–21 | Consider whether concurrent with 26 GHz auction |
| 1.5 GHz | Q3/4 2019–20 (options paper)Q1/2 2020–21 (planning decision) | Q3/4 2020–21 | Allocation Q3/4 2021–22 |  |
| 3.4–3.575 GHz band | Q4 2018–19 (options paper) |  | Allocation processes: Timing to be determined following outcome of consultation |  |
| 28 GHz band | Q4 2018–19 (options paper)Q1 2019–20 (planning decision) | TBC | Changed allocation arrangements implemented: Q3/4 2020–21 |  |

|  |
| --- |
| **Consultation question**1. Do you have any comments about the ACMA’s approach to the forward allocations, or the prioritisation and timing of allocations?
 |

# Spectrum management practice improvements

## Spectrum Review and Spectrum Pricing Review

The ACMA is committed to implementing spectrum reforms and improvements in line with the recommendations of the government’s Spectrum Review (2015) and Spectrum Pricing Review (2018) reports.

As part of implementing these reforms, DoCA is developing new radiocommunications legislation. The ACMA will be responsible for implementing the legislation and new spectrum management arrangements should it be enacted.

To fulfil these responsibilities, the ACMA will be developing the new regulatory arrangements with the twin aims of enhancing opportunities for market-based activities and providing better regulatory design and delivery.

As a next step, the ACMA intends to consult on the following after the release of the second exposure draft of legislation:

* licensing—information about the design of the new licensing system, replacement licences and the transition path
* planning—design options for the spectrum planning technical framework
* 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

accreditation arrangements—design and development of new accreditation rules.

The ACMA is also progressing the Spectrum Review recommendations by:

* continuing to consult on and publish the FYSO to prepare for the transition to the annual work program obligations expected to apply under the Bill
* implementing the recommendations of the government’s Spectrum PricingReview (see the Pricing section below)
* continuing to consider industry feedback on its interference management principles and expecting to finalise them during 2019. 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

continuing to work closely with DoCA on the draft legislation and in conjunction with the release of second exposure draft of legislation, issuing material to assist stakeholders in providing feedback on the draft legislation.

## New/ongoing activities planned for 2019–20

The ACMA is also actively pursuing improvements to spectrum management that can be achieved in the shorter term.

The main areas of spectrum management improvement activity that are expected to be undertaken in the 2019–20 year are outlined below.

1. ACMA Spectrum management practice improvement activities
2019–20

| Activity | Description | Timing |
| --- | --- | --- |
| Explore design of a spectrum space apparatus licence type | ‘Off the shelf’ licence product that could be adapted to authorise operation of multiple devices within a defined spectrum space.Assist in authorising new & emerging technologies e.g. in 26 GHz allocation. | Commence consultation Q4 2018–19 |
| Reforming arrangements for amateur qualifications | Use the Australian Qualifications Framework as an additional means for qualification | Commenced |
| Implement the Spectrum Pricing Review | Provide incentives for more efficient spectrum useReform cost recovery approach | Commenced and consultation expected Q1 2019–20. |
| Further review of non-assigned amateur licensing and review of non-assigned outpost licensing arrangements with a view to reform | Consider options for a range of licensing mechanisms and conditions for these non-assigned licences. | Following review of submissions on amateur licence conditions in 2018–19, the ACMA will continue to consider the fitness for purpose of existing arrangements. The ACMA expects to consult further on these arrangements in Q2 2019–20. |
| Improving transparency of the spectrum planning framework | Review the overall design and scope of the spectrum planning framework. | Progressively review and consider improvement through the 2019–20 year. |
| Review elements of the existing apparatus licensing framework with a view to streamlining, consistent with the Spectrum Review | Review of potential for reduced complexity. | Q1/2 2019–20 |

Further details on each of these ACMA spectrum management practice improvement activities can be found elsewhere in the FYSO. Activities relating to amateur qualifications and licensing, spectrum space apparatus licensing and the existing apparatus framework are expanded on in the Licensing and licensing systems section below. Further details on the implementation of the Spectrum Pricing Review can be found in the Pricing section below. Further details on improving the transparency of the spectrum planning framework can be found in the Optimising established frameworks section above.

|  |
| --- |
| **Consultation question**1. Do you have any feedback on the ACMA’s approach to improving how we manage spectrum?
 |

# Licensing and licensing systems

## Progress achieved

### Body scanners in airports

On 15 November 2018, the ACMA made the [Radiocommunications (Body Scanning – Aviation Security) Class Licence 2018](https://www.legislation.gov.au/Details/F2018L01583), authorising the operation of applicable body scanners used for aviation security screening in airports in the frequency ranges 24.25–30 and 67–80 GHz. Following public consultation, and prior to making the licence, the ACMA conferred closely with stakeholders regarding coexistence between relevant body scanners authorised by the class licence and 5G services.

### VHF marine radio channels and their use

In Q2 2018–19 the ACMA consulted on an [update to maritime VHF channel arrangements](https://www.acma.gov.au/theACMA/update-to-maritime-vhf-channel-arrangements). The ACMA will consider the issues associated with changing the VHF channel arrangements in Q4 2018–19. The ACMA will also work with industry on what additional changes should be considered in the future.

### Enabling trials of mobile phone jammers in prisons

In June 2018, following a successful trial by Corrective Services NSW at Lithgow Correctional Centre, the ACMA consulted on a proposal for the ongoing operation of the mobile phone jammer at Lithgow. The ACMA subsequently made the [Radiocommunications (Use by Corrective Services NSW of PMTS Jamming Devices at Lithgow Correctional Centre) Exemption Determination 2018](https://www.legislation.gov.au/Details/F2018L01185) in August 2018, which will allow Corrective Services NSW to continue operating the mobile phone jammer at Lithgow on an ongoing basis, subject to certain conditions and safeguards.

### Renewed arrangements for amateur certificates of proficiency

Following an approach to market, registered on Austender, the ACMA selected the University of Tasmania, through its institute the Australian Maritime College, as the preferred tenderer to provide services and functions related to amateur radio operator qualifications. The previous Deed of Agreement with the Wireless Institute of Australia operated for 10 years and expired on 1 February 2019.

Under the new arrangements, the AMC performs statutory functions and provides administrative services through delegation of powers and a new Deed of Agreement with the ACMA.

Before initiating the procurement process, the ACMA released a [consultation paper](https://www.acma.gov.au/theACMA/new-approaches-to-amateur-radio-qualification-arrangements) in June 2018 exploring future options for managing the services and functions currently provided under the Deed.

## New/ongoing activities planned for 2019–20

### Reforming arrangements for amateur certificates of proficiency

During 2019–20, the ACMA will pursue the inclusion of amateur qualifications as units of competency into the Australian Qualifications Framework (AQF). The AQF is the national policy for regulated qualifications in Australian education and training and is regulated by the Australian Skills Quality Authority. Addition of amateur qualifications to the AQF would enable more education and training bodies to provide a pathway for amateur operators to be qualified, expanding user choice.

Any modification of the existing arrangements would include public consultation about any required changes to related legislative instruments.

The ACMA will establish a Syllabus Review Panel for amateur radio, consistent with the arrangements under the new Deed of Agreement with the Australian Maritime College. The Panel will ensure that the amateur radio syllabus for examinations continues to reflect the knowledge and skills necessary to operate an amateur station.

### Consideration of changes to amateur licence conditions

The ACMA issues apparatus licences to applicants who have achieved the required amateur qualifications. Operators of licensed amateur stations are subject to a range of licence conditions that are set out in the [Radiocommunications Act 1992, the Radiocommunications Licence Conditions (Amateur Licence) Determination 2015](https://www.legislation.gov.au/Details/F2016C00286) (Amateur LCD) and in individual licences.

The ACMA expects to commence consultation on potential changes to amateur licensing conditions in Q4 2018–19 following its review of submissions from the Wireless Institute of Australia and the Radio Amateur Society of Australia, requesting changes to the conditions under which amateur licensees operate. The ACMA expects to take a staged approach to consultation on changes, and further consultation may be undertaken in Q1/2 2019–20.

### Enabling trials of mobile phone jammers in prisons

An exemption is in place for Corrective Services NSW to conduct a trial of a mobile phone jammer at Goulburn Correctional Complex, which will test the operation of a jammer in a medium density location. The trial is expected to commence by the end of 2019.

The ACMA continues to facilitate trials of mobile phone jammers and has approached other States and Territories to gauge their interest in conducting trials in low density locations. The ACMA will consider any request from other jurisdictions on a case by case basis.

### Changes to VHF marine radio channels and their use

Following the 2018–19 consultation and the WRC-19, the ACMA will consider what additional changes should be made to the VHF marine radio channels and their use. Based on submissions to the consultation paper, the ACMA is considering a number of changes to the Australian regulatory framework to bring it into line with international arrangements. Possible changes include bringing in new safety of life and search and rescue (SAR) technologies, provide greater protection to existing SAR channels and allocate more channels for use by commercial and recreational boaters in the VHF maritime mobile band.

### 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.

### Review of prohibition declarations and exemption determinations

The ACMA has prohibited two kinds of devices: mobile phone jammers (public mobile telecommunications service jamming devices) and radionavigation-satellite service (RNSS) jammers, which include GPS jamming devices. The ACMA may determine exemptions from the prohibition determinations, and from other parts of the *Radiocommunications Act 1992*, in favour of a narrow range of persons.

During 2019–20, the ACMA will consider whether the prohibition framework is operating as intended, and whether the range of devices to which prohibition declarations apply remains appropriate. In parallel, the ACMA will consider the scope and applicability of exemption determinations.

### Drone regulation

Unmanned Aircraft Systems, also known as Remotely Piloted Aircraft Systems, and commonly known as drones, have become increasingly popular with hobbyists and commercial users. Drones rely on radiocommunications for remote piloting and other uses such as video and sensing.

The ACMA has engaged with an inter-departmental contact network, which is considering management of drones from a range of policy perspectives. During 2019–20, the ACMA will continue to contribute to this network, and will continue to monitor the licensing requirements for drones with reference to international developments in spectrum management.

As drones are becoming increasingly widespread, so too are concerns about their use. The ACMA is currently working with aviation safety regulators, law enforcement and security agencies, and is monitoring international approaches to detecting and responding to incidents where drones could pose a risk to safety and security. In March 2019, the ACMA initiated consultation on proposed exemption arrangements that would allow the Australian Federal Police (AFP) to deploy drone jamming equipment over a two-year period. In 2019–20, the ACMA will consult on any required changes to regulatory arrangements for counter-drone equipment.

### Exploring the design of a spectrum space apparatus licence

The ACMA is exploring whether it might design a new spectrum space apparatus licence type.

Currently, apparatus licence types are generally linked to a specific purpose (e.g. a maritime licence is for maritime purposes). A spectrum space apparatus licence would not be linked to a specific use and could allow the licensee to operate multiple radiocommunications devices at a specified frequency or frequencies in a specified geographic area, subject to any conditions on the licence that the ACMA considers appropriate. Such a spectrum space apparatus licence would provide analogous technical and operational flexibility to a spectrum licence. The spectrum space licence would assist the ACMA in authorising new and emerging technologies in use-cases where spectrum licensing may be inappropriate.

The ACMA expects to consult with stakeholders as part of its exploration of the design of a spectrum space licence type in Q4 2018–19.

### Review of non-assigned amateur and outpost licensing arrangements with a view to reform

The ACMA is considering the best licensing mechanisms and conditions for non-assigned amateur and outpost licences. Non-assigned licences are apparatus licences that authorise the operations of a radiocommunications device, but do not include a specific frequency and instead operate within a general part of the spectrum identified for similar activities as specified in the relevant licence condition determination. Non-assigned licences are currently issued as part of the amateur, maritime, scientific and outpost licence types.

The Spectrum Review provides a basis for the ACMA to consider the form and content of these licences. In preparing for an evolution in radiocommunications licensing, the ACMA is keen to ensure that the transaction costs faced by licensees and the ACMA are minimised to the extent possible, and that opportunities for appropriate self-regulation are realised, while recognising the continuing need for callsigns and—in the case of amateur licensees—appropriate qualifications.

The ACMA expects to consult on options for associated licensing arrangements in Q2 2019–20.

### Review of elements of the existing apparatus licensing framework

The apparatus licensing framework is made up of the regulatory instruments, technical planning documents and operational practices that determine how apparatus licences are used and how the apparatus licensing system functions. A recurring issue with the framework has been its complexity and difficulty for users to navigate and understand. The ACMA is investigating potential reforms to improve the apparatus licensing framework by identifying and reducing complexity, providing users with greater operational flexibility and reducing operational costs.

Potential areas of reform include:

* determining whether the existing types of apparatus licence are still appropriate, and considering reducing the number of types and licensing option where suitable
* identifying the key spectrum management issues associated with these licence types, including any unnecessary regulatory barriers resulting from the licence types

identifying opportunities in the legislative and non-legislative instruments that make up the apparatus licensing framework to reduce complexity and increase transparency for users.

Changes to the licensing framework would be subject to public consultation.

# Pricing

## Progress achieved

### 3.6 GHz band

In May 2018, the ACMA consulted on the proposal for a spectrum licence tax and an early access price for the 3.6 GHz band. In June and July 2018, the ACMA made those respective changes to spectrum licence tax and apparatus licence tax.

### Apparatus licence taxes

In Q3 2018–19 adjustments were made to apparatus licence taxes to account for inflation, and to remove some redundant taxes relating to the early access pricing arrangements in the 700 MHz band and specific body scanner apparatus licence taxes. The early access pricing arrangements are no longer needed because spectrum licences in that band have commenced. The apparatus licence taxes associated with airport body scanners have been removed after the ACMA introduced class licensing arrangements in November 2018. The adjustments will come into effect in April 2019.

### Commercial broadcasting taxes

In 2018–19, the ACMA commenced the ongoing assessment of the taxes due for apparatus licences associated with the transmitters used by commercial radio and television broadcasters in the Broadcasting Services Bands. These assessments result from the media reform package passed by Parliament in 2017.

## New/ongoing activities planned for 2019–20

### Implementation of the government’s Spectrum Pricing Review

Some of the recommendations of the government’s Spectrum Pricing Review anticipated a new legislative framework and a single licensing framework. However, the ACMA considers that the policy intent of the recommendations can also be implemented under existing legislation, and later transitioned to new legislation, and the ACMA intends to proceed in this way.

To implement the recommendations of Spectrum Pricing Review, the ACMA has initiated four substantive programs of work:

* further identify bands to transition from administratively set charges to competitive market-based allocation in its annual work program (currently the FYSO) (recommendation 4)
* develop and publish Spectrum Pricing Guidelines to provide better transparency and help licensees better understand how the ACMA approaches spectrum pricing (recommendation 1). The ACMA expects to consult on these guidelines in Q1 2019–20.
* review how the ACMA administratively prices spectrum and the formula used to set many of the current apparatus licence taxes. There is potential to improve the ACMA’s administrative pricing of spectrum to more closely reflect market value through approaches such as opportunity-cost-based pricing (recommendations 7 and 8). The principles guiding this review will be part of the Spectrum Pricing Guidelines, to be consulted on in Q1 2019–20. The ACMA will then consult on reflecting these principles in a new formula in Q4 2019–20.

simplify industry’s spectrum management cost recovery arrangements to be consistent with the Australian Government Charging Framework and make them more transparent. This will be covered in the Spectrum Pricing Guidelines, and in addition, the ACMA proposes to consult on new cost recovery proposals in Q1 2019–20.

The implementation of the Spectrum Pricing Review will require analysis of current spectrum usage in bands, and forecasts of future use, taking into account trends in technology and international harmonisation.

The ACMA intends to consult on new approaches to pricing in Q1 2019–20 with a view to new arrangements being implemented over the course of 2020 and 2021.

### Commercial broadcast taxes

The ACMA will continue assessing commercial broadcast taxes on an ongoing basis as apparatus licences associated with a commercial broadcast services pass their anniversary dates.

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.

### Other pricing updates

As part of the ACMA’s opportunity-cost-based pricing work, the ACMA developed a monitoring framework for the 400 MHz band. This monitoring will continue on a semi-regular basis. It is expected that consultation on further price increases will only occur if there is evidence suggesting that demand is increasing and there is congestion in the band.

Feedback to the FYSO 2018–22 related to potential changes to apparatus licence taxes and the flagging of information about reviews. Several submissions suggested that the ACMA should review spectrum pricing for particular services (such as satellite services in Ka- and Ku-bands, open narrowcasting services and scientific licensing for 5G services).

In other consultation processes such as the 2018 ‘[Spectrum planning for the 28 GHz band](https://www.acma.gov.au/theACMA/spectrum-planning-for-the-28-ghz-band)’ paper, it was proposed by a stakeholder that the ACMA consider alternative pricing arrangements for fixed link services. The ACMA’s view is that implementation of the Spectrum Pricing Review across all spectrum pricing arrangements is the best way to address pricing concerns recently raised regarding specific industries and spectrum bands.

The ACMA will continue to consider changes to the apparatus licence tax regime to account for routine matters including adjusting taxes for inflation. The ACMA will also consult on a proposal to remove a ‘freeze’ on apparatus licence taxes relating to fixed services below 960 MHz in remote density areas. The ACMA considers it is now appropriate to consult on the proposal to remove the freeze as these taxes have remained unchanged since 2008. It is expected that the ACMA will consult on both proposals near the end of Q1 or early in Q2 2019–20.

# Compliance and enforcement

## Priority compliance areas

The ACMA’s priority compliance area (PCA) program commenced in 2012–13 and has effectively guided our approach to compliance and enforcement. Centred on a risk-based methodology, this program aimed to systematically identify and address high-risk compliance issues by maximising the regulatory reach of the ACMA in a strategic and resource-efficient manner.

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

PCAs are set annually. In 2018–19, the ACMA PCA programs focused on:

* Interference management—this PCA will continue from 2017–18 and will further consider the Interference Management Principles through the development of procedures for accepting and investigating complaints.
* Spectrum Review implementation—this PCA will position the ACMA to start a body of work relating to the practices and processes required to support the regulatory arrangements for transmitter licensing compliance; equipment rules, and interference offence provisions under the Bill.
* Licensing integrity—feedback received at the RadComms 2017 conference and work conducted on the Gold Coast to prepare for the Commonwealth Games in 2018 supports a compliance focus on licensing integrity. Licence integrity relates to the extent to which services are operating in compliance with their licence conditions.

## Progress achieved

### Licensing integrity

The ACMA is focusing on issues relating to non-renewal of lapsed apparatus licences and compliance with licence conditions. This complements the work that has already been done relating to the importation of cheap two-way radios that come pre-programmed with frequencies that are not covered by a class licence, and not apparatus-licensed, operating in land mobile spectrum.

Spectrum monitoring in the 400 MHz and 5.6 GHz bands has been completed in Western Victoria, South Australia and the Sunshine coast in Queensland.

The 400 MHz monitoring program will shortly be completed in Brisbane, Sydney and Melbourne. The results from this monitoring activity will be used in the next stage of the PCA to target field-based compliance activities in Q4 2018–19 including compliance investigations and enforcement action.

### Spectrum Review implementation

Practices and procedures are being developed to support the potential implementation of a civil penalties regime and the introduction of supply side controls including interim bans and product recalls under new legislation under development. The scope and timing of this work is related to the progress of the draft legislation.

### Interference management

The ACMA continues to consider industry feedback on its interference management principles and expects to finalise them in Q4 2018–19. 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.

### Compliance themes

Each year the ACMA investigates a broad range of issues and complaints relating to spectrum use, interference, licensing and device supply. During the 2018–19 year, the following themes have emerged:

* During the 6 months July to December 2018, ACMA compliance staff executed 3 search warrants relating to the operation of a mobile phone jammer, a GPS jammer and citizen band radio.
* Field staff conducted signal monitoring activities to identify unlicensed operation under the Licensing Integrity PCA. As a result, field staff are continuing to identify hand-held radios pre-programmed with unlicensed frequencies in the 400 MHz band.

Interference complaints from MNOs have increased. This increase can be attributed to reports of interference in the 700 MHz band attributable to emissions from computer monitors.

Full reporting on the number of compliance and enforcement activities can be found in the ACMA’s [2018–19 annual report](https://www.acma.gov.au/theACMA/annual-report).

## New/ongoing activities planned for 2019–20

For the 2019–20 period the ACMA is adopting a whole-of-agency approach to setting priorities to guide our compliance and enforcement activities. This new approach will replace the setting of annual priority compliance areas for radiocommunications that has guided our approach in recent years. There are three compliance priorities identified in relation to our spectrum functions.

With the expected increase in small cell deployments as 5G technology is implemented, the ACMA will conduct a program of compliance audits focused on small cell deployments by mobile network operators in the 2019–20 year. The purpose of this audit program will be to test compliance with the Electromagnetic Energy (EME) exposure obligations placed on mobile network operators and provide a baseline of compliance data. This data will complement the EME base station audit program conducted in 2013–14 and other previous EME priority compliance area programs relating to Smart Meters, Mobile Handsets and Wi-Fi devices.

The ACMA will extend its Licensing Integrity priority compliance area program into 2019–20 with a Compliance Priority aimed at maximising the utility of licensed spectrum use by addressing various sources of unlicensed activity. This Compliance Priority will focus on services operating unlawfully in the 5.6 GHz band and the operation of non-compliant devices in the 400 MHz bands, and interference caused by solar inverters.

As part of our ongoing priorities, the ACMA will also undertake activities that support communications network safety and reduce threats of disruption by operating well established regulatory and non-regulatory strategies targeting unauthorised cellular repeaters and prohibited devices (mobile phone and GPS jammers).

|  |
| --- |
| **Consultation question**1. Do you have any comments about the ACMA’s planned activities for licensing and licensing systems, pricing, and compliance and enforcement?
 |

# Invitation to comment

## Making a submission

The ACMA invites comments on the issues set out in this discussion paper.

* [Online submissions](http://www.acma.gov.au/theACMA/Consultations/Consultations) can be made via the comment function or by uploading a document. Submissions in Microsoft Word or Rich Text Format are preferred.
* Submissions by post can be sent to:

The Manager

Strategy and Transition Section

Spectrum Review Implementation Branch

Australian Communications and Media Authority

PO Box Q500

Queen Victoria Building NSW 1230

**The closing date for submissions is COB, Thursday 16 May 2019.**

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

Publication of submissions

The ACMA publishes submissions on our website, including personal information (such as names and contact details), except for information that you have claimed (and we have accepted) is confidential.

Confidential information will not be published or otherwise released unless required or authorised by law.

Privacy

[*Privacy and consultation*](https://www.acma.gov.au/theACMA/About/Corporate/Accountability/privacy-and-consultations) provides information about the ACMA’s collection of personal information during consultation and how we handle that information.

Information on the *Privacy Act 1988* and the ACMA’s privacy policy (including how to access or correct personal information, how to make a privacy complaint and how we will deal with the complaint) is available at [acma.gov.au/privacypolicy](http://www.acma.gov.au/privacypolicy).

# Appendix A—Sunsetting instruments

## Radiocommunications-related instruments due to sunset in 2019–20

1. Instruments due to sunset on 1 October 2019

| Instrument | Enabling provision | Status |
| --- | --- | --- |
| Broadcasting Services (Amalgamated Remote Television Licence Areas – Remote Central and Eastern Australia TV1 and Mt Isa TV1) Determination 2009 | Broadcasting Services Act 1992—s 38B(14) | Instrument will be allowed to sunset |
| Broadcasting Services (Amalgamated Remote Television Licence Areas – Remote Central and Eastern Australia TV1 and Remote Central and Eastern Australia TV2) Determination 2009 | Broadcasting Services Act 1992—s 38B(14) | Instrument will be allowed to sunset |

1. [ACMA corporate plan](https://www.acma.gov.au/theACMA/Library/Corporate-library/Corporate-publications/acma-corporate-plan). [↑](#footnote-ref-2)
2. [ACMA annual report](https://www.acma.gov.au/Home/theACMA/Library/Corporate-library/Corporate-publications/annual-report). [↑](#footnote-ref-3)
3. 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-4)
4. See [5G-NR workplan for eMBB](http://www.3gpp.org/news-events/3gpp-news/1836-5g_nr_workplan). [↑](#footnote-ref-5)
5. 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-6)
6. See <https://www.communications.gov.au/departmental-news/5g-working-group-convenes>. [↑](#footnote-ref-7)
7. See <https://www.acma.gov.au/theACMA/class-licensing-updates-supporting-5g-and-other-technology-innovations> [↑](#footnote-ref-8)
8. For information on IoT technologies see IoT Alliance Australia publication [IoTAA\_IoT Platform Selection Guideline](http://www.iot.org.au/wp/wp-content/uploads/2016/12/IoTAA_IoT-Platform-Selection-Guideline-V1.1-July-2018.pdf). [↑](#footnote-ref-9)
9. See <https://www.acma.gov.au/Home/theACMA/changes-to-legislation-supporting-space-based-communications>. [↑](#footnote-ref-10)
10. 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-11)
11. For example in advance of WRC-19 (see IFC 11/2017) and WRC-15. [↑](#footnote-ref-12)
12. In this context, a lower-tier user is a user that has lower priority compared to another user under a DSA arrangement. [↑](#footnote-ref-13)
13. See also M Cave and W Webb, *Spectrum Management*, Cambridge University Press, Cambridge, 2015, p. 5 and Chapter 8. [↑](#footnote-ref-14)
14. *Cisco Visual Networking Index: Global Mobile Data Traffic Forecast Update*, *2015-2020*, 3 Feb. 2016, pp. 24-25, available at <http://www.cisco.com/c/en/us/solutions/collateral/service-provider/visual-networking-index-vni/mobile-white-paper-c11-520862.pdf>. [↑](#footnote-ref-15)
15. See FCC preceding ET [18-295](https://www.fcc.gov/ecfs/search/filings?proceedings_name=18-295&sort=date_disseminated,DESC)  ‘Unlicensed Use of the 6 GHz Band’ and summary fact sheet at <https://docs.fcc.gov/public/attachments/DOC-354364A1.pdf> [↑](#footnote-ref-16)
16. 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-17)
17. See the former Minister for 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-18)
18. Information available on the [FCC website](https://www.fcc.gov/about-fcc/fcc-initiatives/incentive-auctions#block-menu-block-4). [↑](#footnote-ref-19)
19. 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-20)
20. In accordance with ITU-R Resolution **646**. [↑](#footnote-ref-21)
21. 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-22)
22. Refer to [www.acma.gov.au/theACMA/25-ghz-band-review](http://www.acma.gov.au/theACMA/25-ghz-band-review). [↑](#footnote-ref-23)
23. 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-24)
24. 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-25)
25. 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-26)
26. [Order and notice of proposed rulemaking – FCC 18-91](https://www.fcc.gov/document/fcc-expands-flexible-use-mid-band-spectrum) [↑](#footnote-ref-27)
27. [3.8 GHz to 4.2 GHz band: Opportunities for Innovation, Ofcom](https://www.ofcom.org.uk/consultations-and-statements/category-2/opportunities-for-spectrum-sharing-innovation) [↑](#footnote-ref-28)
28. 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-29)
29. [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-30)
30. Refer ITU Radio Regulation 5.133B. Note some Region 2 countries alternative limits of 20 or 25 watts apply. [↑](#footnote-ref-31)
31. ACMA, *Future approach to the 3.6 GHz band* (IFC:9/2017), 2017. [↑](#footnote-ref-32)