

# Five-year spectrum outlook 2018–22

## The ACMA's spectrum management work program—final

SEPTEMBER 2018

VERSION 1.1

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# Foreword

Spectrum is a critical input to Australian communications and media industries as more and more services and activities are relying on wireless connectivity. Managing spectrum efficiently and effectively for the benefit of all Australians is a key priority for the Australian Communications and Media Authority (ACMA).<sup>1</sup> The ACMA needs an accurate understanding of changes in technology and market demand, both for new and existing spectrum uses, to inform the way we plan and make spectrum available. We rely heavily on spectrum users themselves to keep us informed.

The ACMA has consulted annually with industry about its spectrum management priorities through its five-year spectrum outlook (FYSO) since 2009. Last year, we took steps to align the FYSO with the Spectrum Review's recommendation for a spectrum work program. Such a work program is expected to cover at least five financial years, be updated and published each financial year after consultation with the minister, and reflect consideration of submissions from stakeholders prior to finalising the work program.

The ACMA designs and adapts its spectrum management work program within its resources to meet these responsibilities, notably to ensure the overall public benefit derived from using the radiofrequency spectrum, in response to a range of demands and drivers.

This year's FYSO is the first to be informed by the publication of a draft prior to finalisation. We received 33 submissions to the draft 2018–22 FYSO (this includes two submissions that are confidential). These submissions were generally supportive of the changes the ACMA has made to clearly outline its work program priorities. As a result of the constructive and detailed feedback provided, the ACMA is proposing changes to this final work program for the 2018–19 year.

A response to issues raised in submissions is provided as an Addendum to the FYSO. Where priority changes have been made in response to feedback, these are identified with an update symbol: 

## Focus of changes made in response to submissions

As a result of issues raised in submissions, the ACMA is making the following changes to its work program.

### > **At a glance summary information**

A consultation timetable is now included, to alert stakeholders to forthcoming activities where they may wish to engage with the ACMA's regulatory review and development activity.

### > **Part 1—Environmental outlook**

Suggestions for a broader focus by the ACMA on the spectrum demand pressures arising from the Internet of Things, space and satellite industry, 5G and mobile

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<sup>1</sup> ACMA [Corporate plan 2018–19](#).

broadband developments will be taken up over the course of the year and reflected in future updates.

> **Part 2—2018–19 Spectrum work program**

Suggestions for better explaining the basis for changes to our spectrum management priorities.

> **Planning priority changes**

Fast-moving developments in the international environment and changing demand from industry, as expressed in submissions to the FYSO, has led the ACMA to reprioritise and bring forward planning work in a number of key bands:

- > **2 GHz**—A wide set of interested parties representing satellite, television outside broadcasting, direct air-to-ground and broadband wireless access users requested that the ACMA accelerate its planning work for this band. The ACMA is intending to develop a discussion paper seeking industry views on re-planning considerations for the band for release at the end of Q4 (2018–19). A consequence of this change is that consideration of the 1.5 GHz band matters will be deferred to until the 2019–20 financial year.
- > **3.3–3.4 GHz**—While retained at the ‘monitoring’ stage, in response to feedback from a number of submitters, the ACMA has specifically outlined additional work it will undertake in the next year on dynamic sharing models in the band.
- > **3.4–3.575 GHz**—Submissions encouraged the ACMA to, upon conclusion of the 3.6 GHz auction, consider optimising allocations across licensees’ existing and newly acquired spectrum holdings, which may include defragmentation and licence conversion processes. The ACMA intends to issue a discussion paper on reconfiguration options in 3.4–3.575 GHz band in Q3, following the conclusion of the 3.6 GHz auction.
- > **3.7–4.2 GHz**—Interest in accelerating planning work in these bands came from some stakeholders. Recent planning developments in other jurisdictions (UK and the US) have highlighted growing interest internationally in the band, but also increasing interest in more holistic approaches that seek to take account of existing (incumbent) requirements, as well as the pressure to accommodate new technologies. It is timely to discuss the significance of these developments for long-term arrangements in the 3700–4200 MHz band in Australia. The ACMA is considering releasing a discussion paper in Q4.
- > **26 GHz**—The ACMA is developing an options paper on band planning for release in Q1.
- > **28 GHz**—The ACMA had proposed to release a technical rules paper looking at point-to-multipoint (PMP) uses, but feedback identified a wider set of interests, including from satellite, and potentially 5G broadband as well as PMP uses in the band. The ACMA expects to develop a discussion paper in Q1–2.

> **Forward allocation work program**

The updated planning priorities have consequences for the timing and sequencing of spectrum that may become available for allocation by auction. In response to feedback, the ACMA has prioritised action on the 26 GHz band. The potential timing of allocations has been amended to reflect these changes.



## Potential timing of allocations

	ACMA planning decision	Minister decision where applicable	Auction	Notes
<b>3.6 GHz band</b>	Q2 2017–18	Q3 2017–18	Q2 2018–19	Applications for this auction opened on 6 August 2018. The auction is expected to commence in late November 2018
<b>26 GHz</b>	Q3–4 2018–19	Q1 2019–20	Q1–Q2 2020–21	May be allocated under new Act
<b>850/900 MHz</b>	Q2 2018–19*	Q1–2 2019–20"	Q1–Q2 2020–21	May be allocated under new Act
<b>1.5 GHz</b>	Q3–4 2019–20	Q3–4 2019–20	Q3–4 2020–21	May be allocated under new Act

## Activities progressed since the draft FYSO release

Since the draft 2018–22 FYSO was released, the ACMA has progressed the following activities:

- > made the Radiocommunications (Low Interference Potential Devices) Class Licence variation 2018 (no.1)
- > consulted on the Coffs Harbour Licence Area Plan (LAP) variation in August 2018
- > developed the Radiocommunications (VHF Radiotelephone Equipment – Maritime Mobile Service) Standard 2018 for consultation in Q1 2018–19
- > published a consultation paper on new approaches to amateur radio qualification arrangements
- > published the application package for the 3.6 GHz auction to commence in late November 2018
- > extended the determination of the low power open narrowcasting (LPON) sub-band to 31 December 2025 in September 2018
- > approved the AM to FM conversion for 2BS Bathurst, NSW.

## Correction

On 14 September 2018, the ACMA corrected a typographical error regarding the minister’s decision date on the potential timing of allocations for the 850/900 MHz band to Q1–2 2019–20 in the following tables:

- > Potential timing of allocations table
- > Table 3: Major price-based allocations
- > Table 16: Potential timing of allocations.

# At a glance—2018–19 work program

Here are the key activities proposed for 2018–19. Note timing may be affected by progression on other projects. Opportunities for consultation and engagement with the ACMA are highlighted in the timelines to provide stakeholders with information for their planning purposes. Planned ACMA spectrum consultations for 2018–19 are also listed below.

Please note that the following abbreviations are used throughout:

- > Quarter 1 (Q1): 1 July – 30 September
- > Quarter 2 (Q2): 1 October – 31 December
- > Quarter 3 (Q3): 1 January – 31 March
- > Quarter 4 (Q4): 1 April – 30 June.

**Table 1: Planning—establishing new planning frameworks**

Planning stage	Project priorities	Proposed timelines
Monitoring	600 MHz (617–698) 3.3 GHz (3300–3400) 4.5 GHz (4400–4500) 4.8 GHz (4800–4990) Bands under study at WRC-19 agenda items 1.16 and 1.13 5G bands considered internationally other than under WRC-19 1.13 40–50 GHz	Continue to monitor domestic and international developments in these bands to identify usage trends
Initial investigation	2 GHz (1980–2010 and 2170–2200 MHz) <b>NEW</b> 3.8 GHz (3700–4200) 28 GHz (27.5–29.5 GHz) Extended MSS L-band (1518–1525 and 1668–1675 MHz)	Q4: Discussion paper on planning issues to consider in the band. Q4: Discussion paper on planning issues to consider in the band. Q1: Discussion paper on planning issues to consider in the band. Further consideration deferred until Q3/4 2019–20
Preliminary replanning	26 GHz (24.25–27.5 GHz) <b>NEW</b> 1.5 GHz (1427–1518 MHz)	Q1: Consult on frequency, area and licensing configuration options Further consideration (including a possible options paper) deferred until Q3/4 2019–20

Planning stage	Project priorities	Proposed timelines
Re-planning	5.6 GHz (parts of 5600–5650 MHz)	Q2: Progress technical coordination rules and allocation arrangements for site-based point-to-multipoint uses outside of metropolitan areas including for the transition of services from the 3.6 GHz to the 5.6 GHz band, where possible
	850 MHz expansion band (809–824 MHz and 854–869 MHz)	Decision paper outlined transition milestones for incumbent services making way for new mobile broadband. Allocation timeframes tied to those of the 900 MHz band (assuming 900 MHz is ultimately reallocated)
	900 MHz (890–915 MHz and 935–960 MHz)	Considering options for timing of band reorganisation, including potential clearance and reallocation processes

**Table 2: Planning—optimising established planning frameworks.**

Planning area	Project priorities	Proposed timelines
Broadcasting analog and digital radio	Make final decisions on LAP variations for AM to FM conversion in Burnie, Devonport, Queenstown and Scottsdale	Q1, Q2
	Develop and consult on proposals for AM to FM conversion for Lithgow, Bega, Cooma, Goulburn and Nowra	Q2
	Further consider whether variations to the Brisbane digital radio channel plan are appropriate to improve digital coverage	Q2
	Following completion of digital radio allotment planning, consult on a variation to the Canberra digital radio channel plan that would allow a power increase	Q1
	Complete engineering and consult on over 15 new digital radio channel plans for the next-mover DAB+ markets	Q2
	<b>NEW</b> Develop and consult on the potential for re-planning analog radio services in Perth, following the clearance of Band II TV in Bunbury.	Q2
Satellite	Earth stations—codify frequency co-ordination of earth stations with point-to-point links (in the 6 and 6.7 GHz bands)	Q2

Planning area	Project priorities	Proposed timelines
Satellite	Space objects: Finalise changes to Radiocommunications (Communication with Space Object) Class Licence 2015 and Radiocommunications (Foreign Space Objects) Determination 2014	Q1
	Consider feasibility of inclusion of 10.7–11.7 GHz in Communications Space Objects Class Licence	Q4
Satellite	ESIMs—review regulatory arrangements for earth stations in motion (ESIM) in Ku-band	Q3
Satellite	Regulatory arrangements: General review of licensing procedures for space-based communications systems	Q2
	Commence update of regulatory arrangements for small satellites	Q2
Satellite	Consider applications for test and demonstration purposes in the 2 GHz band	Ongoing
Satellite	Manage filing and coordination of Australian satellite systems	Ongoing
Low interference potential devices (LIPD)	<b>NEW</b> Consultation on proposed update of the LIPD to respond to industry requests	Q2
Internet of Things (IoT)	Facilitation of early access to the 928–935 MHz band for low power wide area IoT applications	Ongoing

**Table 3:** **NEW** Major price-based allocations

Project priorities	Proposed timelines
3.6 GHz	Q4 2017–18: Final applicant information package released Q2 2018–19 (November): Auction commences
26 GHz	Q2 2018–19: ACMA planning decision* Q4 2018–19: Reallocation decision
850/900 MHz	Q1-2 2019-20: Finalisation of reconfiguration method for 900 MHz band and associated timeframes
1.5 GHz	Q3 2020–2021: ACMA planning decision

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

**Table 4: Regulatory review and reform (Spectrum Review implementation)**

<b>Project priorities</b>	<b>Proposed timelines</b>
Annual work program	Q1: Publish final program Q4: Consult on draft work program
Planning and technical frameworks	Consult on revised arrangements following the release of 2 <sup>nd</sup> Exposure Draft Radiocommunications Bill package
Licensing and licensing transition	Consult on revised arrangements following the release of 2 <sup>nd</sup> Exposure Draft Radiocommunications Bill package
Pricing review implementation	Consult on revised arrangements following the release of 2 <sup>nd</sup> Exposure Draft Radiocommunications Bill package
Equipment rules	Consult on revised arrangements following the release of 2 <sup>nd</sup> Exposure Draft Radiocommunications Bill package
Accreditation arrangements	Consult on revised arrangements following the release of 2 <sup>nd</sup> Exposure Draft Radiocommunications Bill package

**Table 5: Licensing**

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

**Table 6: Pricing**

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

**Table 7: Compliance and enforcement**

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

**Table 8: International engagement**

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

**Table 9:  Consultation plans**

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

Issue	Proposed timelines
28 GHz—discussion paper	Q1 2018–19
26 GHz—options paper	Q1 2018–19
3.7–4.2 GHz—discussion paper	Q4 2018–19
Four DRCPs for 12–14 licence areas	Q2 2018–19

Issue	Proposed timelines
Consider AM–FM conversion proposals in five NSW areas	Q2 2018–19
Spectrum arrangements for small satellites	Q3 2018–19
Space-based comms—update (CSO Class Licence and FSO Determination)	Q1 2018–19—Completion of consultation started 6 June 2018
General review of space licensing procedures consultation paper	Q2 2018–19
2 GHz (1980–2010 and 2170–2200 MHz—discussion paper	Q4 2018–19
3.4-3.575 GHz Reconfiguration Options discussion paper	Q3 2018–19
ESIM in the Ku-band	Q3 2018–19
Consider feasibility of inclusion of 10.7–11.7 GHz in Communications Space Objects Class Licence	Q4 2018–19
Frequency coordination requirements review work program	Q1 2018–19—Finalised work program following consideration of industry submissions. Future consultations in accordance with finalised work program
850/900 MHz planning decision	Q2 2018–19
Changes to amateur licence conditions	2018–19
VHF marine radio channels—consider changes	2018–19
Drone regulation	Q2 2018–19
400 MHz OC pricing information paper	Q3 2018–19
Short range devices/ITS standard	Q2 2018–19—Completion of consultation started 4 July
VHF radiotelephone equipment—maritime mobile services	Q1 2018–19
Brisbane analog LAP variation	Q3 2018–19
Regional Qld LAP variations	Q3 2018–19
RFT for spectrum licensing business systems	Q1 2018–19
Set digital radio start date for Canberra, Darwin and Hobart	Q2 2018–19

Issue	Proposed timelines
Finalising digital radio allotment plans for Tranche 2 (WA, SA and N. Qld)	Q1 2018–19
Canberra DRCP power increase	Q2 2018–19
Make over 15 new digital radio channel plans for the next-mover DAB+ markets	Q2 2018–19
<b>NEW</b> Options for re-planning radio services in Perth, following the clearance of Band II TV in Bunbury.	Q2 2018–19
<b>NEW</b> 1710–1785/1805–1880 MHz (1800 MHz) in remote areas discussion paper	Q4 2018–19

## Ongoing feedback on the FYSO is welcome

This final 2018–22 FYSO responds to feedback provided on the draft 2018–22 FYSO published in May. A draft 2019–23 FYSO will be published in the first half of 2019, ahead of the final FYSO for the 2019–20 calendar year.

The ACMA welcomes feedback by email to [spectrumworkprogram@acma.gov.au](mailto:spectrumworkprogram@acma.gov.au) on its spectrum planning priorities at any time.



# Part 1—Five-year spectrum outlook

## Introduction

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

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

## Anticipated change drivers

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

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

The ACMA's response to these demand pressures is outlined in more detail in the planning and allocation work stream activities. The information incorporates an annual work program component containing details of when we expect tasks to be completed during the 2018–19 year. The five-year component of the work program does not give timing commitments as experience shows the relative priority of work in future years is liable to change. The intention is to alert stakeholders to the pressures likely to shape future annual work programs. It lets the proponents of change know that ACMA is alert to issues, while giving notice to spectrum incumbents about the pressures emerging on planning arrangements in bands they rely on.

## Wireless broadband, including 5G

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

The current work program, including the forward allocation work plan (see below) and the [ACMA mobile broadband strategy](#), remain the basis for the ACMA's response to wireless broadband spectrum demand.

The rapid development of the next generation of wireless broadband technology, known as 5G, has emerged as a key driver of change to existing spectrum arrangements. This is the case not only because of the potential for reallocation of additional spectrum bands to support its deployment, but because its particular

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

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

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

- > support for very low latency and ultra-reliable communications
- > enhanced mobile broadband enabling data rates exceeding that of LTE/4G
- > an 'anytime, anywhere, anyone and anything' capability, which is anticipated to play a role in supporting multiple device M2M communications and a wider deployment of the IoT
- > its use of broader channel bandwidths than are currently used for wireless broadband services, particularly in the mid and high bands where channel bandwidths of hundreds of MHz are being contemplated.

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

- > 'low-band' spectrum below 1 GHz, much of which is already used for mobile broadband networks
- > 'mid-band' spectrum between 1 and 6 GHz
- > 'high bands', including in the previously unused millimetre wave (mmWave) bands<sup>4</sup>, which are the focus for much of our current wireless broadband-related planning work.

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

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

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

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<sup>2</sup> Report [ITU-R M.2410-0](#) Minimum requirements related to technical performance for IMT-2020 radio interface(s), completed in November 2017.

<sup>3</sup> See [5G-NR workplan for eMBB](#).

<sup>4</sup> 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.

<sup>5</sup> See [Impacts of 5G on productivity and economic growth](#), Bureau of Communications and Arts Research, 9 April 2018.

<sup>6</sup> Senator The Hon Mitch Fifield, [Turnbull Government to convene 5G working group](#), media release, 12 October 2017.

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

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

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

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

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

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

- > working with industry as necessary, optimize the efficient configuration of the 850 and 900 MHz band allocations, mostly already allocated for mobile broadband purposes, including by securing a 1 MHz downshift of the 850 MHz spectrum licences
- > implement the existing planning decision to make additional spectrum available for mobile broadband in the 850 MHz expansion band.

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

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

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

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

The ACMA is playing close attention to the global environment in this band and is commencing a broad review of arrangements in the 3700–4200 MHz band, which is discussed elsewhere in this paper.

The millimetre waves in the bands above 24 GHz are where the high-band efforts are centred. The near-term priority is investigating the potential for wireless broadband in some or all of the 26 GHz band where much global attention is focused and where there appears to be good opportunities in Australia. The ACMA has also previously committed to investigate the possibility of establishing apparatus-licensed arrangements for point-to-multipoint use in some of the 28 GHz band. Consultation on this issue is now expected include wider ranging considerations that do not restrict discussion to licence type or the type of use for the band. Consultation is expected to commence in Q1 of the 2018–19 year. This work is part of a suite of measures the ACMA has identified to assist incumbents displaced from the 3.6 GHz band due to its reallocation. Higher in the spectrum, the ACMA has flagged the possibility of changes to class-licensing arrangements to support additional spectrum in the 60 GHz range, which is also being looked at for 5G use around the world.

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

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

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

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

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

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

## Broadcasting

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

- > future requirements for broadcasting spectrum are likely to depend on government decisions about the development of the sector
- > the minister is responsible for decisions to vary the Broadcasting Services Bands (BSB).

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

The future spectrum planning requirements for television broadcasting remain unclear as technology advances. The main issue facing the television industry is the expected future obsolescence of the DVB-T<sup>7</sup> transmission standard and the MPEG-2 video compression standard. While upgrading the original MPEG-2 compression standard to MPEG-4 is proceeding using existing broadcaster multiplexes, use of more modern standards, such as DVB-T2 transmission along with HEVC video compression, or the rival ATSC standard, will require separate, dedicated multiplexes. The introduction of DVB-T2 services using HEVC video compression could provide a combination of higher quality services (for example, more high definition channels or ultra high definition channels) and/or greater numbers of services.<sup>8</sup>

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

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

The key compromises were an initial limit on the maximum power level for any transmitter considered in the development of allotment plans and an uneven split of the available spectrum capacity between national and commercial/community broadcaster multiplexes, with the national broadcasters having access to only two of

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<sup>7</sup> Digital Video Broadcasting – Terrestrial is the DVB European-based consortium standard for the broadcast transmission of digital terrestrial television that was first published in 1997.

<sup>8</sup> Depending on the DVB-T2 transmission parameters used the payload capacity could be 40–60 per cent greater than that of DVB-T. HEVC compression is up to four times more efficient than MPEG-2 and twice as efficient than MPEG-4 with current DVB-T multiplexes carrying a mix of MPEG-2 and MPEG-4 services.

the eight available frequency blocks. This is because national broadcasters are not constrained by licence areas and should be able to deploy single frequency networks over wider areas.

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

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

### **Satellite communications**

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

This is resulting in the need to both establish new spectrum access arrangements and refine existing ones. A range of changes and innovations are:

- > the development of low-cost, miniaturised space hardware (often referred to as nanosats, cubesats or smallsats)
- > the growth in high throughput systems (HTS) that both increase the demand for spectrum arrangements to support ubiquitous earth stations for user terminals and supporting gateway earth stations
- > the growth in the use of moving earth stations (also referred to as 'earth stations in motion') in the fixed satellite service (FSS)<sup>9</sup>
- > the development of large non-geostationary satellite orbit (NGSO) systems. The ACMA has a detailed program of activity outlined for 2018–19 to address a range of different satellite planning requirements. See the information in the *At a glance—2018–19 work program* summary and detailed planning information in Part 2.

### **Government spectrum requirements**

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

Discussions are currently underway between the Commonwealth, led by DoCA and the Department of Home Affairs, and state and territory governments on a public safety mobile broadband (PSMB) capability. The ACMA is continuing to assist

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<sup>9</sup> 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.

government in these considerations, which may have spectrum management implications.

### **Dynamic spectrum access**

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

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

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

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

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

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

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<sup>10</sup> In this context, a lower-tier user is a user that has lower priority compared to another user under a DSA arrangement.

# Part 2—Proposed 2018–19 spectrum work program

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

- > planning
- > allocations
- > regulatory review and reform, with a focus on implementation of the Spectrum Review
- > licensing
- > pricing
- > compliance and enforcement
- > international engagement.

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

The 2018–22 FYSO outlines the ACMA’s priorities for spectrum management activities in the 2018–19 year in particular. As the response to submissions demonstrates<sup>11</sup>, there is demand for more activity from the ACMA than can be accommodated within our finite resources.

In responding to suggestions for changes to our spectrum management priorities, the ACMA takes into account 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 Australian and internationally
- > spectrum management trends, including through the four-yearly ITU-R World Radiocommunication Conference (WRC) process
- > use the least cost and least restrictive approach to achieve policy objectives.

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<sup>11</sup> *Addendum to FYSO 2018–22—Response to submissions.*



# Planning

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

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

Planning activities are directed into two main streams:

- > major band (re)planning activities to support the establishment of new spectrum uses. This may require the re-farming and reallocation of spectrum from an existing use and users to different a use and users
- > optimising established planning frameworks for existing spectrum use through updating technical coordination arrangements. This can include addressing sharing demands, defragmentation and optimising planning configurations.

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

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

## Major band (re)planning activities

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

Bands listed are categorised as follows:

- > **Monitoring**—Business-as-usual monitoring of international and domestic spectrum usage trends. At this stage, the ACMA maintains an awareness of developments and interest in potential changes to the use of the band that may require substantial planning activities. There is no direct action required by stakeholders at this stage, however, there is an opportunity for stakeholders to keep the ACMA apprised of relevant developments and issues.  
  
In general, the ACMA sees bands and issues included at the monitoring stage as representing potential work items beyond its immediate 12-month work program.
- > **Initial investigation**—Initial investigation and scoping of potential options for domestic replanning of a band. This stage normally includes initial consideration of

whether the new spectrum use contributes to maximising the overall public benefit derived from use of the spectrum, along with preliminary assessments on coexistence and other technical considerations. Formal public consultation may occur through mechanisms such as public industry meetings (such as spectrum tune-ups) and/or discussion papers where general feedback on issues is sought.

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

## **NEW** What has changed since the draft FYSO?

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

Key planning changes that the ACMA is intending to make include:

- > **1.5 GHz**—following consideration of submissions and request to prioritise other work, the ACMA is deferring further consideration of 1.5 GHz matters until Q3/Q4 2019–20.
- > **2 GHz**—a wide set of interested parties representing satellite, point-to-multipoint, television outside broadcasting and mobile broadband spectrum users requested that the ACMA accelerate its planning work for this band over work on the 1.5 GHz band. The ACMA is intending to develop a paper seeking industry views on what technologies should be supported and re-planning considerations for release at the end of Q4.
- > **3.3–3.4 GHz**—the ACMA may examine potential sharing scenarios (geographic and temporal sharing) in response to feedback from a number of submitters suggesting further detailed planning work on Dynamic Spectrum Access sharing models.
- > **3.4–3.575 GHz**—submissions encouraged the ACMA to, at the conclusion of the 3.6 GHz auction, consider optimising allocations across licensees' existing and newly acquired spectrum holdings, which may include defragmentation and licence conversion processes. The ACMA intends to issue a discussion paper on reconfiguration options in 3.4–3.575 GHz band in Q3, following the conclusion of the 3.6 GHz auction.
- > **3.7–4.2 GHz**—interest in accelerating planning work in these bands came from stakeholders. The ACMA notes that recent planning developments in other jurisdictions (UK and US) highlight growing interest internationally in the band, but

may also signal a reduced focus on approaches that focus mainly on potential re-farming of entire segments, towards approaches where existing sharing arrangements are reviewed progressively in light of new use-cases. It is timely to discuss the significance of these developments for long-term arrangements in the 3700–4200 MHz band in Australia, taking account of the ongoing needs of existing users including fixed satellite and point-to-point. This should maximise the opportunity for a balanced outcome across all sectors. The ACMA is considering releasing a discussion paper in Q4.

- > **26 GHz**—The ACMA is developing an options paper on band planning for release in Q1.
- > **28 GHz**—The ACMA had proposed to release a technical rules paper looking at PMP uses, but feedback identified a wider set of interests from satellite, 5G mobile broadband as well as PMP uses in the band. The ACMA expects to develop a discussion paper in parallel with the 26 GHz work in Q1.

### Major replanning progress achieved since October 2017

- > **900 MHz band**—In October 2017, the ACMA released a paper setting out the preferred reconfiguration option for the 900 MHz (890–915/935–960 MHz) frequency band in order to transition from the current 2 x 8.2 or 8.4 MHz frequency arrangements to multiples of 2 x 5 MHz. The ACMA expects to firm up implementation time frames for the reconfiguration of the 900 MHz band during the year to optimise the band’s planning arrangements for LTE services.
- > **Cooperative intelligent transport systems (C-ITS) in the 5.9 GHz band**—The ACMA finalised the Radiocommunications (Intelligent Transport Systems) Class Licence 2017 in December 2017 and it was registered in January 2018. The ACMA, therefore, has no current plans to revisit these arrangements in the near term, but will continue to monitor the suitability of the regulatory regime, particularly in light of possible developments regarding V2X technologies.
- > **3.6 GHz band**—In October 2017, the ACMA announced the outcomes of the review of the 3.6 GHz frequency band. The decision confirmed that the frequency band be moved to the re-farming stage of the ACMA’s process for the consideration of additional spectrum for mobile broadband uses. In March 2018, the Minister for Communications made a reallocation declaration for the 3.6 GHz frequency band, following a recommendation from the ACMA. The ACMA is now conducting relevant processes to allow the band to be available for the issue of spectrum licences in metropolitan and regional Australia. This includes the formation of a technical liaison group (TLG) from March to April 2018 to provide advice on the 3.6 GHz band spectrum licence technical framework.

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

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

**Table 10: Monitoring**

Key projects	Activity	Milestones
600 MHz (617–698 <sup>12</sup> MHz)	<p>The 600 MHz band is currently used by digital television services in Australia and is available for some services under the <a href="#">Radiocommunications (Low Interference Potential Devices) Class Licence 2015</a>.</p> <p>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.<sup>13</sup></p> <p>It could also support scenarios in which national broadcasting services were consolidated onto a single multiplex in each area, potentially freeing up an additional channel for broadcasting or other uses. Current TV channel arrangements include spectrum both inside and outside of the 600 MHz band and would require a further re-stack (sometimes referred to as a ‘second digital dividend’) to yield a contiguous block of spectrum in the 600 MHz range. The sixth channel is currently available for trials of more advanced digital television technology. There are no current government or industry plans for technical standards migration of television or the reconfiguration of TV channels.</p> <p><b>Recent developments</b></p> <p>The FCC incentive auction (which closed on 30 March 2017) resulted in a repurposing of 84 MHz of spectrum—70 MHz for licensed use and another 14 MHz for wireless microphones and unlicensed use.<sup>14</sup></p> <p>In addition, the Radio Spectrum Policy Group (RSPG) of the European Commission (EC) has also provided a <a href="#">long-term strategy for the future of the UHF band</a>, 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 <a href="#">EC’s inception assessment</a>, but a final decision is still pending.</p> <p>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</p>	Ongoing monitoring

<sup>12</sup> 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.

<sup>13</sup> 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).

<sup>14</sup> Information available on the [FCC website](#).

Key projects	Activity	Milestones
	<p>IMT in the Radio Regulations (RR). The draft revision includes arrangements for the frequency band 470–698 MHz. Working Party 5D is aiming to complete the development of frequency arrangement(s) in the frequency band 470–698 MHz at its January 2018 meeting and finalise the revision of the Recommendation for the November 2018 meeting of ITU-R Study Group 5.</p> <p>The AWG finalised a report on frequency arrangements for IMT in the band 470–698 MHz at its September 2017 meeting. The arrangements mirror those put in place by the FCC and are included in Release 15 of the LTE specification as Band 71 by 3GPP.</p> <p><b>Next steps</b> The ACMA will continue to monitor international developments in the 600 MHz band. In particular, the implementation of the results of the incentive auction process in the United States (US) will be of key interest.</p> <p>The ACMA will also engage with industry and government on technological evolution of terrestrial digital television, including DVB-T2 and HEVC. Adoption of these technologies is likely to be a prerequisite for any future reallocation of broadcasting spectrum for non-broadcasting uses, though it is also key to the more efficient use of spectrum by the television industry itself. Both the government and the ACMA have emphasised the availability of ‘sixth channel’ spectrum for trialling the new standards.</p>	
<p><b>NEW</b> 3.3 GHz (3300–3400 MHz)</p>	<p>The 3300–3400 MHz band is currently allocated on a primary basis to the radiolocation service worldwide. In Australia, the radiolocation service in this band is designated to be used principally for the purposes of defence and national security via footnote AUS101A of the Spectrum Plan. The Department of Defence (Defence) is normally consulted in considering non-defence use of this service. At WRC-15, the 3300–3400 MHz band was identified for IMT by a number of countries.</p> <p><b>Recent developments</b> 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 IMT in the bands identified for IMT in the Radio Regulations (RRs). The draft revision includes arrangements for the frequency band 3300–3400 MHz. Working Party 5D also commenced studies as called for in Resolution <b>223 (Rev. WRC-15)</b>. Working Party 5D is aiming to complete these work items by late 2018. The AWG has a work plan</p>	<p>Ongoing monitoring</p>

Key projects	Activity	Milestones
	<p>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.</p> <p><b>Next steps</b> Given the outcomes of WRC-15, and the potential for economies of scale to develop for equipment, the ACMA will continue to monitor international developments in the 3.3 GHz band. Possible engagement (including through contributions) in international studies as outlined in Resolution <b>223 (Rev. WRC-15)</b> will be considered.</p> <p>Noting incumbent use of the band, the ACMA is of the view that this band may be a candidate for consideration of dynamic spectrum-access (DSA) type arrangements, to promote sharing and increase the utility of the band.</p> <p>A submission to the draft FYSO from the Wireless Internet Service Provider association of Australia suggested that this band could be explored for broadband wireless access (BWA) services using DSA.</p> <p><b>NEW</b> The ACMA plans to engage further over the next year with relevant stakeholders, including incumbent operators, to gain a better understanding of existing use patterns in the band. A better understanding of current use will help inform the possibility of enabling BWA services under a DSA-type arrangement.</p>	
4.5 GHz (4400–4500 MHz)	<p>The 4400–4500 MHz band is currently allocated on a co-primary basis to fixed and mobile service worldwide. In Australia, the band is designated to be used principally for the purposes of defence and national security via footnote AUS101 of the Spectrum Plan. Defence is normally consulted in considering non-defence use of this service. Typical use is for aeronautical mobile telemetry for flight testing by aircraft stations.</p> <p>The 4400–4500 MHz band was considered for use for mobile broadband services in the lead up to WRC-15. However, the band was not identified for IMT at WRC-15 despite strong interest from China, Japan and Korea, in particular.</p> <p>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</p>	Ongoing monitoring

Key projects	Activity	Milestones
	<p>5G.<sup>15</sup> There is some support from domestic mobile broadband interests in pursuing this band for mobile broadband in Australia.</p> <p><b>Recent developments</b></p> <p>In October 2016, Vodafone and Nokia conducted the first live public 5G demonstration in Australia using the 4.5 GHz band.<sup>16</sup> There have also been a number of 5G trials using the 4.5 GHz band in other Region 3 countries, including in China, Korea and Japan.<sup>17</sup> The 4400–4900 MHz band has been defined as one of Japan’s official 5G bands. Allocation and technical rules for Japan’s official 5G bands are expected in 2018.<sup>18</sup></p> <p><b>Next steps</b></p> <p>The ACMA will continue to monitor international developments in this band. Noting incumbent use of the band, the ACMA is of the view that this band may be a candidate for consideration of dynamic spectrum-access type arrangements to promote sharing and increase the utility of the band. If the ACMA pursues this idea, it will engage further with relevant stakeholders.</p>	
4.8 GHz (4800–4990 MHz)	<p>At WRC-15, the 4800–4990 MHz band was identified for IMT by a number of countries, including Uruguay, Cambodia, Lao PDR and Vietnam. Notably, there was also strong interest from China and Japan in identifying the band for IMT. This suggests that a viable ecosystem could develop for mobile broadband systems in this band.</p> <p>The 4800–4990 MHz band is currently allocated on a primary basis for the fixed and mobile services in Australia. The fixed and mobile services in this band are designated to be used principally for the purposes of defence and national security, as defined in footnote AUS101A of the Spectrum Plan. Defence is normally consulted in considering non-defence use of these services. The 4950–4990 MHz band is also allocated to the radio astronomy service on a primary basis under footnote 443 of the Spectrum Plan.</p> <p>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</p>	Ongoing monitoring

<sup>15</sup> GSA–Global mobile Suppliers Association, [The case for new 5G spectrum](#), November 2016.

<sup>16</sup> Vodafone, [Vodafone and Nokia conduct Australia’s first live public 5G trial](#), 12 October 2016.

<sup>17</sup> Ericsson, [Ericsson and SoftBank trial 5G in 4.5 GHz band](#), 31 August 2017.

<sup>18</sup> [Spectrum for 4G and 5G, Qualcomm, December 2017](#).

Key projects	Activity	Milestones
	<p>provision of defence, national security, law enforcement and emergency services.<sup>19</sup></p> <p>There is some support from domestic mobile broadband interests in pursuing this band for mobile broadband in Australia. However, the ACMA is not aware of any significant interest in this band by regional bodies such as CEPT, CITELE or APT.</p> <p>A number of countries, including Australia, have implemented arrangements in the 4940–4990 MHz band for defence and national security purposes. This is principally to support high-speed localised coverage around an incident or event. The <a href="#">Radiocommunications (Public Safety and Emergency Response) Class Licence 2013</a> outlines arrangements for the use of this band, which allows public safety agencies to enhance their ability to perform public safety activities and provide significant flexibility in deployment during emergency response and disaster recovery activities. The 4940–4990 MHz is also included in IEEE standard 802.11y Public Safety WLAN.</p> <p><b>Recent developments</b></p> <p>ITU-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 <b>223 (Rev. WRC-15)</b> on the coexistence conditions between IMT and aeronautical mobile service in the band, with work currently underway to develop sharing characteristics for IMT-2020 in this band as part of this work item. Working Party 5D is aiming to complete these work items by late 2018.</p> <p>The AWG has a work plan to develop a recommendation on frequency arrangements for the 4800–4990 MHz band. The current proposal is to finalise the work in late 2018. The 4400–4900 MHz band has been defined as one of Japan’s official 5G bands. Allocation and technical rules for Japan’s official 5G bands are expected in 2018.<sup>20</sup></p> <p><b>Next steps</b></p> <p>Given the outcomes of WRC-15, and the potential for economies of scale to develop for equipment, the ACMA will continue to monitor international developments in the 4.8 GHz band.</p>	

<sup>19</sup> In accordance with ITU-R Resolution **646**.

<sup>20</sup> [Spectrum for 4G and 5G, Qualcomm, December 2017](#)



Key projects	Activity	Milestones
	<p>Possible engagement (including through contributions) in international studies as outlined in Resolution <b>223 (Rev. WRC-15)</b> will be considered as part of the ACMA's international engagement processes. Given the nature of incumbent use of the band, the ACMA is of the view that this band may be a candidate for consideration of dynamic spectrum-access type arrangements as a way of sharing and, hence, increasing the utility of the band. If the ACMA pursues this idea, it will engage further with relevant stakeholders.</p>	
<p>Bands being studied under WRC-19 agenda item 1.16: 5150–5350 MHz, 5350–5470 MHz, 5725–5850 MHz and 5850–5925 MHz</p>	<p>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.</p> <p>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.</p> <p>Numerous countries around the world have or are considering identifying the 5850–5925 MHz band for Intelligent Transport Systems (ITS).</p> <p><b>Recent developments</b></p> <p>ITU-R Working Party 5A is continuing work towards WRC-19 agenda item 1.16. Australia has submitted a number of contributions providing the regulatory background to the operation of WAS/RLANs and other input regarding the 5150–5250 MHz segment. Working documents towards preliminary draft new reports are being developed on:</p> <ul style="list-style-type: none"> <li>&gt; proposed additional mitigation techniques to facilitate sharing between RLAN systems and incumbent services</li> <li>&gt; technical characteristics and operational requirements of WAS/RLAN in the 5 GHz frequency range.</li> </ul>	<p>Bands being studied under WRC-19 agenda item 1.16: 5150–5350 MHz, 5350–5470 MHz, 5725–5850 MHz and 5850–5925 MHz</p>

Key projects	Activity	Milestones
	<p>&gt; use of aggregate RLAN measurements from airborne and terrestrial platforms to support studies under WRC-19 agenda item 1.16</p> <p>&gt; sharing and compatibility studies of WAS/RLAN in the 5 GHz frequency range.</p> <p>Working Party 5A is aiming to finalise these reports by the end of 2018.</p> <p>In December 2017, the ACMA finalised the Radiocommunications (Intelligent Transport Systems) Class Licence 2017 to support the use of complying wireless ITS technologies and devices in the frequency range 5855–5925 MHz.</p> <p><b>Next steps</b></p> <p>The ACMA will continue to monitor and, where appropriate, engage with stakeholders via the usual international preparatory process to develop Australian positions on WRC-19 agenda item 1.16. When appropriate, it will develop individual positions on each of the bands being studied and potentially contribute to international sharing and compatibility studies on issues/bands of most interest to Australia, as determined through the WRC-19 agenda item 1.16 coordination group. The ACMA also aims to have representatives attend ITU-R Working Party 5A meetings, as appropriate.</p>	
<p>Bands being studied under WRC-19 agenda item 1.13:</p> <p>31.8–33.4 GHz, 37–40.5 GHz, 40.5–42.5 GHz, 42.5–43.5 GHz, 45.5–47 GHz, 47–47.2 GHz, 47.2–50.2 GHz, 50.4–52.6 GHz, 66–76 GHz and 81–86 GHz</p>	<p>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.</p> <p>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.</p> <p>There is strong interest domestically and internationally, particularly in Region 3 countries such as South Korea, Japan and China. In its <a href="#">draft opinion on spectrum related aspects for next-generation wireless systems (5G)</a>, released 14 June 2016, the Radio Spectrum Policy Group<sup>21</sup> (RSPG) stated that considerations of bands above 6 GHz for</p>	

<sup>21</sup> The Radio Spectrum Policy Group (RSPG) is a high-level advisory group that assists the European Commission in the development of radio spectrum policy.

Key projects	Activity	Milestones
	<p>5G should be limited to the bands listed in WRC-19 agenda item 1.13 in order to strengthen the global harmonisation opportunities, in particular, the bands 24.5–27.5 GHz, 31.8–33.4 GHz and 40.5–43.5 GHz. There are wide and varied ranges of incumbency and co-existence issues associated with each of these bands, which will need to be considered if the bands were to be investigated domestically for mobile broadband in the future.</p> <p><b>Recent developments</b></p> <p>ITU-R Task Group 5/1 (TG 5/1) has continued its work to address WRC-19 agenda item 1.13 under its Terms of Reference (<a href="#">CA/226 (Annex 9)</a>). 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 <a href="#">5-1/76</a>, <a href="#">5-1/117</a>, <a href="#">5-1/193</a> and <a href="#">5-1/290</a>).</p> <p>However, a number of other organisations internationally are considering frequency bands outside those listed for consideration in WRC-19 agenda item 1.13 for the next generation of IMT.</p> <p>At APG19-3, a common view developed, expressing interest in the band 24.5–27.5 GHz. A number of APT member nations also expressed interest in the bands 31.8–33.4 GHz and 37–43.5 GHz.</p> <p><b>Next steps</b></p> <p>The ACMA will continue to engage with stakeholders via the usual international preparatory process to develop Australian positions on WRC-19 agenda item 1.13. When appropriate, it will develop individual positions on each of the bands being studied and potentially contribute to international sharing and compatibility studies on issues/bands of most interest to Australia as determined through the WRC-19 agenda item 1.13 coordination group. Representatives have attended all ITU-R Task Group 5/1 meetings so far and it is intended that representation continue as appropriate. Developments in Europe and other regions/countries (such as the US) will be monitored for possible early implementation bands for 5G. Early implementation in Australia will depend on factors such as the location, type and number of incumbent services in the band, whether adequate interference management (or sharing) frameworks can be developed, and whether the development of economies of scale are likely.</p> <p>The 24.25–27.5 GHz band has been advanced to the <i>initial investigation</i> stage of the process for consideration of additional spectrum for mobile broadband services.</p>	

Key projects	Activity	Milestones
	<p>For 66–76 GHz, see related work on 64–71 GHz outlined on the low interference potential devices class licence in the <i>Optimising established planning frameworks</i> section.</p>	
<p>Non-agenda item 1.13 bands being considered for 5G</p>	<p>In July 2016, the FCC in the US announced that the 27.5–28.35 GHz, 37–38.6 GHz, 38.6–40 GHz and 64–71 GHz bands would be made available for licensed, unlicensed and shared use for future IMT services.<sup>22</sup> The FCC also released a Further Notice of Proposed Rule Making considering the bands 24.25–24.45 GHz, 24.75–25.25 GHz, 31.8–33.4 GHz, 42–42.5 GHz, 47.2–50.2 GHz, 50.4–52.6 GHz, 71–76 GHz, 81–86 GHz, as well as bands above 95 GHz for future IMT services.<sup>23</sup></p> <p>Korea is also continuing its support of investigations of the frequency ranges 24.25–29.5 GHz, 31.8–33.4 GHz and 37–40.5 GHz.<sup>24</sup></p> <p>Japan is investigating use of the 26.5–29.5 GHz; bands of interest for the European Union include 24.25–27.5 GHz and 40.5–43.5 GHz; and in China, 24.25–27.5 GHz and 37–43.5 GHz is the focus of consideration.</p> <p>Given the status of these countries as technology-developing nations, and their advanced consideration of these frequency bands outside the scope of WRC-19 agenda item 1.13, it is appropriate to include these frequency bands to the <i>monitoring</i> stage.</p> <p>Where applicable bands that would otherwise be included in this general list are included as specific entries elsewhere in this paper (for example, 28 GHz and 60 GHz).</p> <p><b>Recent developments</b> None applicable.</p> <p><b>Next steps</b> The ACMA will monitor international developments on all bands being considered or already identified internationally for 5G/IMT. However, it is noted that one of the elements of the ACMA’s spectrum management strategy to address the growth in broadband capacity is engagement in international deliberations to influence the development of domestically-suitable internationally-harmonised spectrum options. The feasibility of early implementation in Australia will depend on factors</p>	

<sup>22</sup> Report and Order and Further Notice of Proposed Rulemaking, [FCC 16-89](#).

<sup>23</sup> Report and Order and Further Notice of Proposed Rulemaking, [FCC 16-89](#).

<sup>24</sup> Contribution to WRC-15, [Revision 1 to Document 102\(Add.24\)](#), Korea (Republic of).

Key projects	Activity	Milestones
	<p>such as the location, type and number of incumbent services in a band, whether adequate interference management (or sharing) frameworks can be developed, and whether the development of economies of scale are likely.</p> <p>For 64–71 GHz, see related work on 64–71 GHz outlined on low interference potential devices in the <i>Optimising established planning frameworks</i> section.</p>	
40/50 GHz	<p>In addition to interest in spectrum in this range for terrestrial broadband use as part of mmWave 5G, spectrum in the 40/50 GHz range is also of increasing interest for satellite communications. Feedback has indicated that these bands could be used for both gateway and ubiquitous earth station use. The US has established a mix of arrangements supporting wireless broadband and satellite use on shared and exclusive use throughout these bands. However, Europe is focusing on slightly different bands in this range for terrestrial broadband to those established in the US, which overlap arrangements developed for satellite use. Therefore, there may be limited potential for global harmonisation in this range.</p> <p><b>Next steps</b> The ACMA will monitor developments in these bands. It is likely that it would be beneficial for any detailed consideration of the band for satellite communications to occur simultaneously with consideration of the bands for terrestrial wireless broadband.</p>	

Table 11: Initial investigation

Key projects	Activity	Milestones
<p><b>NEW</b></p> <p>'Extended MSS L-band' (1518–1525 and 1668–1675 MHz)</p>	<p>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.</p> <p>Inmarsat has identified an interest in utilising the extended L-band for MSS purposes from around 2020.</p> <p><b>Next steps</b></p> <p>The 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. Following consideration of submissions and requests to prioritise other work, the ACMA is deferring further consideration of 1.5 GHz matters for now.</p>	<p>Further consideration deferred until Q3/4 2019–20</p>
<p><b>NEW</b> 2 GHz (1980–2010 MHz and 2170–2200 MHz)</p>	<p>As an outcome of the review of the 2.5 GHz band<sup>25</sup>, 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 <a href="#">Television Outside Broadcast (1980–2110 MHz and 2170–2300 MHz) Frequency Band Plan 2012</a> (TOB Band Plan) was made. The frequency ranges remain subject to Embargo 23<sup>26</sup> to support TOB and future replanning activities.</p> <p>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.</p> <p>Inmarsat and Omnispace have indicated that they have (or plan to deploy) new 2 GHz band MSS services in the near future. Specifically, Omnispace has expressed an interest in providing services in Australia. Satellite industry representatives have also</p>	<p>Q4 2018–19 (discussion paper)</p>

<sup>25</sup> Refer to [www.acma.gov.au/theACMA/25-ghz-band-review](http://www.acma.gov.au/theACMA/25-ghz-band-review).

<sup>26</sup> Available from the [ACMA website](#) and last revised September 2013.

Key projects	Activity	Milestones
	<p>suggested that services similar to those to be provided by Inmarsat’s proposed satellite (Europasat) can be expected to be deployed in Australia as part of an international footprint in the future.</p> <p>The frequency bands 1980–2010 MHz and 2170–2200 MHz are already allocated to the mobile service and subject to a global IMT identification via footnote 388 of the Spectrum Plan. In Resolution <b>212 (Rev. WRC-15)</b>, it is noted that these frequency bands are available for use for both the terrestrial component of IMT and the satellite component of IMT.</p> <p>The ITU has defined IMT channel arrangements for the frequency bands 1980–2010 MHz and 2170–2200 MHz. These can be found in ITU-R Recommendation M.1036.<sup>27</sup> In order to include the new arrangements in ITU-R Recommendation M.1036, it was agreed in Resolution <b>212 (Rev. WRC-15)</b> 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.</p> <p>Though the work of the ITU on this issue is focusing on co-existence 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.</p> <p><b>Recent developments</b> ITU-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).</p> <p><b>Next steps</b> The frequency bands 1980–2010 MHz and 2170–2200 MHz will be retained at the <i>initial investigation</i> stage. To assist future work, the ACMA is intending to</p>	

<sup>27</sup> Available on the ITU-R website at [www.itu.int/rec/R-REC-M.1036/en](http://www.itu.int/rec/R-REC-M.1036/en).

Key projects	Activity	Milestones
	<p>develop a discussion paper seeking industry views on what technologies should be supported and re-planning considerations for release at the end of Q4.</p> <p>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.</p> <p>The ACMA remains open to case-by-case consideration of applications for test and demonstration purposes in the parts of the frequency ranges 1980–1985/2170–2175 MHz (guard band between TOB and frequency adjacent spectrum licensing and apparatus licensed public mobile telecommunications services) on a short-term, non-renewal basis, subject to appropriate interference management and resolution conditions.</p>	
<p><b>NEW</b> 3.8 GHz (3700–4200 MHz)</p>	<p>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.</p> <p>The use of the 3700–4200 MHz band has been debated internationally for a number of years. Recently, there has been increasing interest in the lower and lower-adjacent parts of this band for 5G services, particularly given the large bandwidths potentially available in this range. In June 2016, Japan’s Ministry of Internal Affairs and Communications (MIC) named the 3.6–4.2 GHz band as a nationally suitable candidate band for 5G.<sup>28</sup> This has resulted in increasing interest from domestic parties in pursuing this band for mobile broadband.</p>	<p>Q3–4 2018–19 (discussion paper)</p>

<sup>28</sup> GSA—Global mobile Suppliers Association, [The case for new 5G spectrum](#), November 2016.



Key projects	Activity	Milestones
	<p><b>Recent developments</b></p> <p>In 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.<sup>29</sup></p> <p>In April 2018, the UK's Ofcom released a consultation paper seeking comments on opportunities for incumbent fixed links and fixed satellite services to share the 3.8–4.2 GHz band with fixed and mobile wireless broadband services.<sup>30</sup></p> <p><b>Next steps</b></p> <p>Given 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. 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, point-to-multipoint) wireless broadband. Considering the whole band simultaneously will maximise the opportunity for balanced approaches that take appropriate account of all interests.</p>	
28 GHz (27.5–29.5 GHz)	<p>In October 2017, the ACMA announced the preliminary views and outcomes of its <a href="#">3.6 GHz band review</a>. As part of the outcomes announced, there were a number of mitigation measures identified for affected incumbent point-to-multipoint licensees. This included a commitment from the ACMA to investigate the possibility of developing arrangements as part the 27.5–29.5 GHz (28 GHz) band.</p> <p><b>Recent developments</b></p> <p>In March 2018, the Minister for Communications re-allocated the 3.6 GHz band for the issue of spectrum licences in regional and remote areas of Australia</p>	Q1 2018–19 (discussion paper)

<sup>29</sup> [Order and notice of proposed rulemaking – FCC 18-91](#)

<sup>30</sup> [3.8 GHz to 4.2 GHz band: Opportunities for Innovation, Ofcom](#)

Key projects	Activity	Milestones
	<p>following a recommendation that he do so from the ACMA.<sup>31</sup></p> <p><b>Next steps</b> Following the minister's reallocation declaration, the ACMA intends to commence a discussion on the suitability of the 28 GHz band for a broad range of users and service types. Consultation on this issue is expected to commence in the second half of 2018.</p>	

Table 12: Preliminary replanning

Key projects	Activity	Milestones
<p><b>NEW</b> 1.5 GHz (1427–1518 MHz)</p>	<p>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).</p> <p>The ACMA notes that an additional outcome of WRC-15 was Resolution <b>761 (WRC-15)</b>. This resolution invites the ITU-R to conduct, in time for WRC-19, the appropriate regulatory and technical studies, with a view to ensuring the compatibility of IMT and the broadcasting-satellite service (BSS) (sound) in the frequency band 1452–1492 MHz in regions 1 and 3, taking into account IMT and BSS (sound) operational requirements.</p> <p>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.</p> <p>As referred to in Resolution <b>223 (Rev. WRC-15)</b>, some satellite industry representatives have also pointed out that compatibility with mobile satellite services (MSS) operating above 1518 MHz will need to be considered.</p> <p>There is strong support domestically from mobile broadband representatives for progressing the re-farming of this band. The ACMA released the discussion paper, <a href="#">Future use of the 1.5 GHz and</a></p>	<p>Further consideration deferred until Q3–Q4 2019–20</p>

<sup>31</sup> Refer to the [Radiocommunications \(Spectrum Re-allocation—3.6 GHz Band for Adelaide and Eastern Metropolitan Australia\) Declaration 2018](#), [Radiocommunications \(Spectrum Re-allocation—3.6 GHz Band for Perth\) Declaration 2018](#) and [Radiocommunications \(Spectrum Re-allocation—3.6 GHz Band for Regional Australia\) Declaration 2018](#).

Key projects	Activity	Milestones
	<p><a href="#">3.6 GHz bands</a> in October 2016, with 72 submissions received from industry.</p> <p>In June 2017, the ACMA released a <a href="#">consultation package</a> including <i>Future use of the 1.5 GHz and 3.6 GHz bands—Summary of and response to 3.6 GHz submissions</i>. This detailed the ACMA’s decision to progress both the 1.5 GHz and 3.6 GHz bands to the <i>preliminary replanning</i> stage of the ACMA’s process for consideration of additional spectrum for MBB services.</p> <p><b>Recent developments</b></p> <p>ITU-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.</p> <p>Working Party 5D is also undertaking studies called for in Resolution <b>223 (Rev. WRC-15)</b>. Working Party 5D is aiming to complete these work items by late 2018.</p> <p>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.</p> <p><b>Next steps</b></p> <p>The ACMA will continue to monitor and engage with stakeholders via the usual international preparatory process to develop Australian positions on studies under Resolution <b>223 (Rev. WRC-15)</b> and Resolution <b>761 (WRC-15)</b>, and other international issues related to the 1.5 GHz band, such as possible new band plans.</p> <p>Following consideration of submissions and requests to prioritise other work, the ACMA is deferring further consideration of 1.5 GHz matters with the timing of further work to be reassessed in 2020.</p>	
<p><b>NEW</b> 1710–1785/1805–1880 MHz (1800 MHz) in remote areas</p>	<p>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 initial rush 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.</p>	<p>Q4 2018–19 (discussion paper)</p>

Key projects	Activity	Milestones
	<p><b>Recent developments</b> The application window process has been finalised and prospective operators can now apply for licences on a first-in-time basis.</p> <p><b>Next steps</b> Now 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 in particular areas.</p>	
26 GHz (24.25–27.5 GHz)	<p>WRC-19 agenda item 1.13 is to consider identification of frequency bands for the future development of IMT, including possible additional allocations to the mobile service on a primary basis. This agenda item is widely acknowledged to be focusing on spectrum harmonisation requirements for 5G mobile broadband technologies. The 26 GHz band is one of the bands under consideration as part of WRC-19 agenda item 1.13.</p> <p>Following consideration of feedback to the ACMA's <i>Five-year spectrum outlook 2016–20</i>, released in October 2016, the ACMA hosted a spectrum tune-up in September 2017 to solicit further industry views on the use of 26 GHz and other mmWave bands by broadband services. The ACMA also invited formal submissions on the issues raised for discussion at the event.</p> <p>The tune-up also floated some early ACMA thinking on potential technical planning scenarios and posed a number of <a href="#">questions</a> for industry input—27 <a href="#">responses</a> were received. A key question posed in the tune-up was the appropriateness of accelerating the band through the <i>initial investigation</i> phase to the <i>preliminary replanning</i> stage.</p> <p><b>Recent developments</b> Following the tune-up hosted in September 2017 and consideration of feedback, the ACMA has decided to include the 26 GHz band under <i>preliminary replanning</i>.</p> <p>Given the importance of aligning domestic technical arrangements with larger overseas markets so that economies of scale can be achieved and ensuring coexistence with global services such as passive earth observation, the ACMA is looking closely to international</p>	<p>Q1 2018–19 (options paper)</p> <p>Q2 2018–19 (target for decision)</p>

Key projects	Activity	Milestones
	<p>developments, particularly in Europe, to assist in determining what conditions are appropriate to consider in any Australian release of the band.</p> <p>In March and April 2018, the Electronic Communication Committee of CEPT (ECC) consulted on a draft decision titled <i>Harmonised technical conditions for Mobile/Fixed Communications Networks (MFCN) in the band 24.25-27.5 GHz</i>. This draft decision addressed sharing and compatibility conditions to ensure coexistence with other spectrum users and included technical conditions to achieve this coexistence.</p> <p>It was previously thought that clarity on some key technical coexistence considerations, particularly regarding compatibility with the earth exploration satellite service (EESS) would be resolved in Europe during the first half of 2018, which would have informed domestic considerations in roughly the same period. However, outcomes of the European process have not yet concluded.</p> <p>This lack of clarity and uncertainty has contributed to the decision by the ACMA not to progress consideration of the band as fast as contemplated in last year's FYSO. (See also discussion in the <i>Forward allocation work plan</i> for further details).</p> <p><b>Next steps</b></p> <p>The ACMA is considering what an accelerated process for the 26 GHz band would look like. This includes thinking through a range of potential options, both for <i>what</i> should be allocated, in terms of specific frequencies and areas, and <i>how</i> 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.</p>	

Key projects	Activity	Milestones
	<p>Specifically, potential approaches are likely to represent combinations of:</p> <ul style="list-style-type: none"> <li>&gt; allocating all or some fraction of the 26 GHz band (how much and in what part of the band would be informed by technical coexistence considerations)</li> <li>&gt; different licensing approaches to facilitate access for a number of different potential deployment models. This could include area-based spectrum licensing in either major metropolitan areas only, <i>or</i> metro areas <i>and</i> regional centres along with (potentially) apparatus and/or class licensing in various parts of the band and areas.</li> </ul> <p>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.</p> <p>The current Australian Preliminary View considers the 26 GHz band favourably for a possible IMT identification: Based on current studies, the Australian position is that some or all of the 24.25–27.5 GHz frequency band is likely to be a suitable candidate for an IMT identification. Australia will monitor ongoing studies on this band and will revise its opinion on this band as necessary.</p>	

Table 13: Re-planning

Key projects	Activity	Milestones
850 MHz expansion band (809–824 MHz and 854–869 MHz)	<p>In November 2015, the ACMA released its <a href="#">Long-term strategy for the 803–960 MHz band</a> 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.</p> <p><b>Recent developments</b></p> <p>The project is now in an <i>implementation</i> phase, which is largely geared towards the clearance/relocation of incumbent services operating in the 850 MHz expansion frequencies earmarked for mobile broadband. The implementation plan is contained in the decision paper and the ACMA has established an implementation team to ensure that the milestones of the plan are reached with minimal disruption.</p> <p>As part of this process, in July 2016, a new RALI (FX 22) was put in place to facilitate the transition of single frequency fixed links (SFFLs) and studio-to-transmitter links (STLs) to the new arrangements. Further incremental updates will be made to this and other instructions as the implementation phase progresses.</p> <p><b>Next steps</b></p> <p>The implementation plan set out in the decision paper contains various milestones for the transition to long-term arrangements by incumbent services. The ACMA is considering a range of options for how and when the 850 MHz expansion band might be allocated. The intent remains to allocate it concurrently with the 900 MHz band, pending further consideration of 900 MHz reconfiguration options (see below).</p>	See forward allocation work plan scenarios for allocation timing options
900 MHz (890–915 MHz and 935–960 MHz)	<p>In October 2017, the ACMA released a paper setting out its preferred reconfiguration option for the 900 MHz (890–915/935–960 MHz) band in order to transition from the current 2 x 8.2 or 8.4 MHz frequency arrangements to multiples of 2 x 5 MHz. The Authority also invited submissions about two related issues, namely the appropriate treatment of the 2 x 1 MHz of spectrum immediately adjacent to and below the existing 850 MHz spectrum licences, and the duration of any spectrum licences issued in 900 MHz or the 850 MHz expansion band.</p> <p>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</p>	See forward allocation work plan scenarios for allocation timing options

Key projects	Activity	Milestones
	<p>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.</p> <p><b>Recent developments</b> The ACMA is currently considering responses to its October 2017 paper.</p> <p><b>Next steps</b> Reconfiguration options for the band remain under consideration, including the above-mentioned clearance and reallocation proposal, in consultation with industry. This includes definition of time frames and any associated transitional arrangements.</p>	
<p>3.6 GHz (3575-3700 MHz)</p> <p>5.6 GHz (5600–5650 MHz)</p>	<p>In October 2017, the ACMA announced the preliminary views and outcomes of its <a href="#">3.6 GHz band review</a>.</p> <p>As part of the outcomes announced, there were a number of mitigation measures identified for affected incumbent point-to-multipoint licensees. This included:</p> <ul style="list-style-type: none"> <li>&gt; making part of the 5600–5650 MHz (5.6 GHz) band available under a coordinated apparatus-licensed regime for site-based point-to-multipoint uses outside of metropolitan areas</li> <li>&gt; a long-term alternative for site-based point-to-multipoint users who provide services that are not conducive to a spectrum-licensed regime and for the use of coordinated apparatus licences to facilitate protection of incumbent Bureau of Meteorology radars in the band.</li> </ul> <p><b>Recent developments</b> In December 2017, the ACMA made a recommendation to the Minister for Communications that he re-allocate the 3.6 GHz band in regional and metropolitan areas for the issue of spectrum licences.</p> <p>In March 2018, the minister re-allocated the 3.6 GHz band for the issue of spectrum licences in regional and remote areas of Australia.<sup>32</sup></p> <p><b>Next steps</b> Following on from the minister’s reallocation declaration, the ACMA has progressed planning work to put in place a coordinated apparatus-licensed</p>	<p>Conclusion of TLG process Q4 2017–18</p>

<sup>32</sup> Refer to the [Radiocommunications \(Spectrum Re-allocation—3.6 GHz Band for Adelaide and Eastern Metropolitan Australia\) Declaration 2018](#), [Radiocommunications \(Spectrum Re-allocation—3.6 GHz Band for Perth\) Declaration 2018](#) and [Radiocommunications \(Spectrum Re-allocation—3.6 GHz Band for Regional Australia\) Declaration 2018](#).



Key projects	Activity	Milestones
	<p>regime for site-based point-to-multipoint uses outside of metropolitan areas in the 5.6 GHz band.</p> <p>Consultation on proposed arrangements is progressing, with final arrangements put in place in the 2018–19 year. This will also include the development of transitional arrangements for affected 3.6 GHz band point-to-multipoint licensees into the 5.6 GHz band.</p>	

## Optimising established planning frameworks

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

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

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

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

### Broadcasting

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

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

The narrowcasting industry expressed concerns about certainty of access to spectrum for LPON services. The ACMA acknowledges these concerns. Following the publication of the draft FYSO, the ACMA consulted on a proposal to extend the determination of the LPON sub-band for a further five years—from 2020 to 2025. No objections were received to this proposal; in early September 2018, the ACMA extended the determination until 31 December 2025.

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

### ***Progress achieved***

- > In 2017, the ACMA issued long-term digital radio transmitter licences for the national broadcasters in Canberra and Darwin. The national services commenced digital radio broadcasting, in Canberra and Darwin, independently of the trial service, in December 2017.
- > In December 2017, the ACMA invited applications from eligible joint venture companies for digital radio multiplex transmitter licences in Canberra and Darwin. It is likely the ACMA will issue licences by the end of 2018. This will facilitate the 'permanent' licensing of commercial and community digital radio services in those areas.
- > The ACMA licensed the national broadcasters' digital radio transmitters in Canberra, Darwin and Hobart, with services commencing in early 2018. The ACMA expects to issue the commercial broadcaster's licence for Hobart in Q1 2018–19, which will allow service commencement in the first half of the calendar 2019 year.
- > East coast allotment planning for the expansion of digital radio in regional Australia was completed in Q3 2017–18. This will allow regional licensees to make an informed decision about the costs of digital radio infrastructure, and ultimately choose whether they will participate in the provision of digital radio services.
- > In March 2018, the ACMA approved LAP variations permitting AM to FM conversion in Mandurah and Warrnambool.
- > Following the release of the draft FYSO, the Authority approved the AM to FM conversion for 2BS Bathurst in late August 2018.
- > In May 2018, the ACMA consulted on proposals to permit AM to FM conversions in Burnie, Devonport, Queenstown and Scottsdale.

### ***Activities planned for 2018–19***

#### ***Digital radio and AM to FM conversion***

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

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

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

- > consult on and finalise the digital radio channel plans for the licence areas where a commercial licensee has committed to the next phase of rollout. If the ACMA finalises a plan but no application for a multiplex licence is forthcoming, it will be open to the ACMA to make available such a licence to other parties through a price-based allocation process
- > chair meetings of the Digital Radio Planning Committee for Regional Australia
- > finalise in Q1 and Q2 2018–19 the outcome of proposals permitting AM to FM conversion in Tasmanian licence areas—Burnie, Devonport, Queenstown as well as Scottsdale in NSW
- > consider proposals for AM–FM conversions for Lithgow, Bega, Cooma, Goulburn and Nowra in Q2 2018–19

- > following the completion of east coast digital radio channel allotment planning, consult on a proposal to increase the effective radiated transmission power of Canberra digital radio from the previous cap of 5 kW to 20 kW
- > further consider whether variations to the Brisbane digital radio channel plan are appropriate to improve digital coverage.

**NEW** *Perth analog radio broadcast planning initiative*

Since the publication of the draft FYSO, work has advanced on a study into the potential for re-planning Perth radio. The clearance of Band II television in Bunbury, following digital switch-over, has provided new planning options. The ACMA expects to consult on the potential to re-plan the Perth FM broadcast band in Q2 2018–19.

**Satellite planning**

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

- > provide ongoing operational support for Australian-filed satellite networks
- > support the deployment of novel satellite systems (particularly small satellites)
- > undertake a general review of licensing procedures for space-based communications systems to consider whether existing procedures are commensurate with the risk of interference, including consideration of status of the satellite network in ITU satellite coordination process
- > consider and action, if appropriate, identification of possible additional bands for ubiquitous satellite use
- > review of arrangements for ubiquitous earth stations in motion in the FSS in those parts of the Ku-band included in the Communication with Space Object Class Licence.

**Progress achieved**

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

- > update to Foreign Space Objects Determination (completed October 2017)
- > interim regulatory arrangements (in Business Operating Procedures (BOP) for Ka-band geostationary (GSO) and non-geostationary (NGSO) ESIM (completed October 2017)
- > a minor update to business operating procedures for licensing space-based communications systems (completed December 2017).

In June 2018, the ACMA commenced consultation on Radiocommunications (Communication with Space Object) Class Licence and amendments to the Radiocommunications (Foreign Space Objects) Determination 2014 and the Radiocommunications (Australian Space Objects) Determination 2014.

The ACMA is reviewing frequency coordination requirements between apparatus-licensed fixed point-to-point links (in the 6 and 6.7 GHz bands) and FSS earth stations communicating with GSO satellites. It was forecast that consultation would begin Q1 2018–19, however, this work has been delayed to Q2.

## **Activities planned for 2018–19**

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

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

Consultations on draft coordination requirements expected to commence Q2 2018–19.

### **Spectrum arrangements for ‘small satellites’**

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

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

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

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

Depending on stakeholder feedback and project prioritisation, the ACMA expects to commence this work towards the end of Q2 2018–19, with the release of a discussion paper by end Q3 2018–19.

### **Updating regulatory arrangements for space-based communications systems**

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

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<sup>33</sup> For example, those of the Radiocommunications (Communication with Space Object) Class Licence 2015, [Radiocommunications \(Foreign Space Objects\) Determination 2014](#), Radiocommunications (Australian Space Objects) Determination 2014.

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

Going forward, the ACMA work on 28 GHz will also include considerations of future Ka-band satellite usage.

### ***General review of space licensing procedures***

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

- > when the ITU satellite coordination process are not completed
- > cases where the satellite network has been recorded in the Master International Frequency Register (MIFR) in accordance with ITU Radio Regulation No. 11.41.

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

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

There is interest in using ubiquitous ESIM in the Ku-band. Progressively, from June 2016, the ACMA has been developing more flexible regulatory and licensing arrangements for NGSO and GSO satellite services operating in the Ka-band, most recently in October 2017.

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

This work is anticipated to commence after completion of current satellite communication projects and no earlier than the end of Q2 2018–19, with public consultation in Q3.

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

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

That frequency range (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 11,700 links in operation. Earth stations currently operate in this frequency range on an individual coordinated basis.

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

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<sup>34</sup> [Business operating procedures](#), including those related to space licensing, are available on the ACMA website.

While uncoordinated earth receive station use would not pose an interference risk to point-to-point links, a relevant consideration is under what conditions could earth station receivers operate on 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.

Depending on completion of existing projects, the ACMA intends to investigate the feasibility and discuss the results with industry. The earliest it is anticipated that this could occur is Q4 2018–19, though the related nature of the Ku ESIMs work may necessitate bringing this work forward to Q3.

#### ***Filing and coordination of Australian satellite systems.***

In accordance with the [Australian procedures for the coordination and notification of satellite systems](#), the ACMA has an ongoing role in the filing and coordination of Australian satellite systems with the ITU. This includes:

- > assisting Australian satellite operators with ongoing satellite coordination negotiations with other administrations
- > assessment of new notices related to progress of existing Australian satellite networks
- > filing of new Australian satellite networks
- > supporting international administration-level satellite coordination meetings with other administrations.

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

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

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

Depending on progress of other projects, there is a possibility this work could commence in Q4 2018–19. It is possible that work on spectrum for small satellites could result in an earlier target updated.

#### **Low interference potential devices (LIPD)**

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

#### ***Progress achieved***

Following consideration of issues raised in submissions, on 21 June 2018, the ACMA updated the LIPD to include new arrangements in the frequency ranges 122–122.25 GHz to align with European arrangements, 430–440 MHz for medical endoscopy capsules to align with overseas arrangements, 2483.5–2500 MHz for medical body area networks and low-power active medical implants, and revision of existing arrangements for digital modulation transmitters in the 57–66 GHz band to better align with changes to similar arrangements of the US FCC. The ACMA is now

consulting on related standards matters (refer to [IFC 25/2018](#)) and expects to finalise those consultations by Q2 2018–19.

### **Activities planned for 2018–19**

Organisations interested in further updates to the LIPD class licence should contact the ACMA to discuss the requirements and timing of such updates.

As noted in the [Response to submissions](#) paper to the June 2018 LIPD update, there is significant Australian industry interest in the ACMA progressing consideration of arrangements similar to those of the FCC in the frequency range 64–71 GHz. The ACMA will continue this work with a view to developing a proposed update to the LIPD for consultation in Q2 2018–19. This work will also consider whether changes are required to arrangements for mmWave point-to-point (self-coordinated) stations<sup>35</sup> operating in the frequency range 57–59 GHz and possible changes to LIPD class licence item 64 (Data communications transmitters used outdoors, 59–63 GHz) and item 65 (Data communications transmitters, 57–66 GHz). The ACMA also intends to develop proposed updates for consultation on:

- > all transmitters with maximum EIRP of 100 mW in the 57–64 GHz band, similar to arrangements contained in Annex 1 of ERC<sup>36</sup> Recommendation 70–03, May 2018
- > revising existing arrangements for underground transmitters in the frequency ranges covering the VHF mid- and high-frequency bands and the 400 MHz band to include segments supporting fixed services, in addition to mobile services (as under current arrangements) and spectrum covered by ARSP footnote AUS 91 (420–430 MHz)
- > changes to arrangements for LIPD class licence item 64 Radiodetermination transmitters operating in the 76–77 GHz band to increased maximum EIRP from 25 W to 25 dBW (316 W) similar to arrangements contained in Annex 4 of ERC Recommendation 70–03 and the FCC under the FCC Title 47 Part 95 Subpart M.

The ACMA has identified a further group of items for consideration for inclusion in a future LIPD. To the extent other priorities permit, proposals will be developed in time for the Q2 2018–19 consultation, otherwise they will be deferred until a later LIPD update, along with any additional suggestions from industry. These items are:

- > introducing provisions supporting ground penetrating radars similar to FCC Rules Part 15.509 'Technical requirements for ground penetrating radars and wall imaging systems'
- > general provision for very low-powered devices similar to FCC Rules Part 15.209 'Radiated emission limits; general requirements', in consideration of the FCC requirements on restricted bands of operation
- > further alignment of Australian arrangements for ultra-wideband systems with US and European arrangements.

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<sup>35</sup> Refer RAIL FX 20 [Millimetre Wave Point to point \(Self-coordinated\) Stations operating in the 58 GHz, 75 GHz and 85 GHz bands](#).

<sup>36</sup> European Radiocommunications Committee, now replaced by the Electronic Communications Committee. See [www.cept.org/cept/background](http://www.cept.org/cept/background).



## Amateur radio

### *Progress achieved*

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

- > **70.0–70.5 MHz**—The ACMA considers that operating amateur services in this frequency range is not feasible as it would be inconsistent with ITU Radio Regulations and existing services already operating in the frequency range. This frequency range is used by a variety of fixed and land mobile services as supported under the VHF mid band (70–87.5 MHz). Class-licensed devices authorised under the LIPD Class Licence operate in the frequency range 70–70.24375 MHz.
- > **extension of the 3776–3800 kHz DX window to above 3800 kHz**—The ACMA does not support this change, as it poses considerable disruption to existing users.
- > **50–52 MHz upgrade of amateur allocation to primary in Australian Radiofrequency Spectrum Plan**—With other priorities (for example, digital radio planning, AM to FM conversions), the ACMA does not intend to consider this matter in the short- to medium-term.
- > **Expansion of amateur usage in 1800–1875 kHz up to 2000 kHz**—At the ITU level, there is an allocation for the amateur services in 1800–2000 kHz. However, in Australia, 1875–2000 kHz is used by other services. The introduction of amateur services would be a disruption to those services and the views of existing users would need to be sought. At this stage, based on our knowledge of current usage, the ACMA does not consider such expansion possible without impacting existing services.
- > **Secondary allocation at 5.3 MHz (implementation of WRC 15 agenda item 1.4)**—In Australia, the band is currently used by some emergency service and law enforcement organisations for mobile operations. Defence also uses these frequencies in support of key capabilities. The ACMA consulted with local stakeholders on this potential allocation in the lead-up to WRC-15. Stakeholder views were varied, with opposition to the allocation in particular from Defence, due to the potential for interference to its systems.

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

The ACMA considers that the concerns of Defence, as an existing user of band, remain. Relevantly, the Australian Government has recently committed \$1.2 billion in support of defence systems that operate in the high frequency part of the spectrum.

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

The ACMA will continue its ongoing review of the technical [spectrum planning](#) framework. This activity is primarily focused on frequency assignment and coordination frameworks (as specified in apparatus-licensing coordination requirements, with occasional consideration of spectrum-licensing technical frameworks).

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



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

***Activities planned for 2018–19***

The ACMA intends to finalise the draft program of review (refer [IFC 26/2018](#)) by end Q1 2018–19.

***Terrestrial IoT planning***

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

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

# 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 communications sector. For incumbent and prospective spectrum users, this forward allocation work program provides information for stakeholders about the planning status and possible allocation timing and sequencing of particular spectrum bands, to better support:

- > strategic network planning by spectrum users
- > technology deployment planning
- > information relevant to capital-raising activities.

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

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

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

This allocation program builds on a considerable body of work the ACMA has undertaken over the last fourteen or so months in finalising the allocation of residual lots in a range of bands. In April 2017 the ACMA undertook an auction of 15 MHz of spectrum in the 700 MHz band, which had remained unsold at the conclusion of the 2013 digital dividend auction. This was followed, in December 2017, by the auction of 39 lots that remained unallocated after previous allocation and re-issue processes in the 1800 MHz, 2 GHz, 2.3 GHz and 3.4 GHz bands.

The completion of these auctions not only offers the prospect of improved services and greater choice for consumers in areas where the spectrum was allocated, it also increases the opportunities for licensees to undertake trading and contribute to defragmentation in some bands, allowing more efficient use of spectrum. The ACMA considers that facilitating defragmentation is an important part of spectrum management, and this is reflected in this update of the forward allocation work program.

We have developed a revised series of timing and sequencing options for allocations planned over the next few years, which respond to the feedback we received in submissions.

## **Feedback**

A range of differing views were expressed about the timing and sequencing of particular bands for allocation. A summary of the issues raised on band prioritisation is outlined in Table 14.

As a consequence of allocation activities, a number of submitters also encouraged the ACMA to consider defragmentation processes to optimise allocations across licensees' existing and newly acquired spectrum holdings. The ACMA expects to do further work this year on defragmentation options for existing holdings in the 900 MHz band and the 3.4–3.575 GHz bands.

**Table 14: Summary of submissions**

<b>Submitter</b>	<b>26 GHz</b>	<b>900 MHz</b>	<b>850 MHz expansion band</b>	<b>1.5 GHz</b>	<b>Other suggestions</b>
<b>ACCC</b>	The ACCC considers that from both technical and competition perspectives, it would be appropriate that the planning process for 26 GHz band ensures that the maximum amount of spectrum in the band could be allocated together.	The ACCC supports band clearance and price-based allocation via auction for the 900 MHz band.			
<b>AMTA</b>	AMTA observes that progress on planning options for 26 GHz have slowed. AMTA supports the ACMA making provisions for potential licensees to evaluate high bandwidth mmWave bands in dense urban areas where they are likely to be deployed.	AMTA members have differing views on the proposed ACMA approach to the reconfiguration of the 890–915/935–960 MHz band made their own individual submissions.		AMTA supports the progression of the 1.5 GHz band to the preliminary planning stage.	
<b>ARCIA</b>				ARCIA suggests that the 1.5 GHz band could be ideal for a different allocation style and be shared between private LTE networks and the fixed wireless broadband community.	

Submitter	26 GHz	900 MHz	850 MHz expansion band	1.5 GHz	Other suggestions
<b>Communications Alliance</b>	The Satellite Services Working Group (SSWG) believes the 26 GHz band reallocation and development of the associated technical frameworks should not occur until the new Act is made, noting that Telstra does not support delaying the allocation.			With 1.5 GHz, we are still awaiting outcomes of studies of the out-of-band (OOB) interference at the 1518 MHz band edge, before this work should proceed.	
<b>Facebook</b>	As the ACMA proceeds to investigate making the 26 GHz band available for 5G, Facebook encourages the ACMA to allow for the possible development of fixed services in this band, specifically, high altitude platform stations ('HAPS').				
<b>NBN Co</b>	In respect of the 26 GHz band, NBN Co's submission is that consideration of spectrum for mobile broadband use in the Ka-Band be limited to bands below 27.0 GHz.				

Submitter	26 GHz	900 MHz	850 MHz expansion band	1.5 GHz	Other suggestions
<b>Nokia</b>	Prioritise early allocation of mmWave Bands (26 GHz and 28 GHz ) and start working on Allocation.				
<b>Optus</b>	Optus does not support the premature allocation of this band prior to any finalisation and standardisation of spectrum in this frequency range. Consequently, the domestic allocation should similarly be paused beyond the proposed timeframe for the ACMA planning decision in Q2 2018–19 (Sep–Dec 2018).	Optus’s view that any re-allocation of the 900 MHz band should not occur while it is being used to support 3G services to regional and metropolitan customers, unless the re-allocation mechanism also provides a guaranteed way for incumbent mobile 3G services to be protected until commercially phased-out.	Optus also reiterates the following scenarios be considered: (a) The 1.5 GHz process commencing in 2020, with an allocation in 2022; (b) The 26 GHz process commencing in 2021, with an allocation in 2023; and (c) The extension 850 MHz process commencing in 2022, with an allocation in 2024.		Optus considers there is merit in prioritising the de-fragmentation of the global 3.5 GHz band and assessing global 5G candidate band developments following the completion of the current 3.6 GHz allocation process and before any further 5G allocations commence.
<b>Telstra</b>	The price based allocation of the 26 GHz band should remain the ACMA’s next highest priority.  Its clear first preference is for an auction of the entire 26 GHz band as early as possible in 2019. If there is a delay in reaching international consensus, they believe the ACMA should move quickly to make the	Telstra believes the 850 MHz expansion band and the 900 MHz GSM bands should be allocated in a single price-based allocation process.  It would only support the administrative allocation if all parties also agree to implement the 1 MHz downshift of the 850 MHz band.		Telstra agrees with the ACMA’s view that this band is regarded as a lower priority for allocation and consider the proposed timing for consultation on an options paper ( <i>‘no earlier than Q3 2018–19’</i> ) is appropriate.	

Submitter	26 GHz	900 MHz	850 MHz expansion band	1.5 GHz	Other suggestions
	upper part of the band (which does not pose a risk of interference on the EESS) available to mobile network operators.				

## What we're proposing

The ACMA completed an auction in December 2017 for a multi-band allocation of unsold spectrum in four bands: 1800 MHz, 2 GHz, 2.3 GHz and 3.4 GHz. It plans to offer the single lot that remained unsold at the conclusion of the auction shortly, in Q3 2018–19.

The 3.6 GHz band allocation is on track for an auction commencing in late November 2018.

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

**Table 15: Spectrum bands under consideration**

Band name	Spectrum parameters	Current use	Comments
<b>850 MHz band</b>	809–824 MHz and 855–870 MHz	Fixed links, point-to-multipoint, land mobile	Decision to re-farm has been made already, but lengthy clearance process up to 2024.
<b>900 MHz band</b>	890–915 MHz and 935–960 MHz	2G mobile (GSM), 3G, 4G	2G shutdown imminent. ACMA decision on way forward challenged by two mobile network operators, indicating current use as a 3G band. The ACMA is reconsidering 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.
<b>26 GHz band</b>	24.25–27.5 GHz	Space research, FSS satellite (ESA, CSIRO, NASA), NBN Co	Second of the 5G bands. Strong market interest expressed in accelerating planning and allocation. ACMA focus is on 26 GHz band planning and licensing options for an allocation, noting delays in international standardisation processes impacting on timing.
<b>1.5 GHz band</b>	1427–1518 MHz	Point-to-point, some multipoint, Defence	Technology standardisation progressing. Lower level of near-term domestic interest, but available for allocation consideration, should demand change.



### 3.6 GHz

The minister made relevant reallocation declarations on 8 March 2018<sup>37</sup> and the band is now proceeding to an auction that is expected to commence in late November 2018. The ACMA previously advised an auction was likely to be held in October, but a longer two-step application process has been introduced to respond to concerns from interested parties about the challenges created by a single-step application period.

### mmWave spectrum

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.

The ACMA is currently preparing a consultation paper outlining the various planning and configuration options for the 26 GHz band for release in Q1 of the 2018–19 financial year to seek views on proposals that the band proceeds to re-allocation. The paper will deal with licence design as well as outstanding planning issues and options. Subject to the resolution of international harmonisation issues at the WRC in March 2019, the ACMA would then expect to have greater certainty about the technical framework to develop licence products for allocation (in the latter part of 2020). Responses to the consultation will further inform the ACMA's consideration of the timing of a possible allocation for the band.

### 900 MHz

In October 2017, the ACMA consulted on its reallocation proposal in [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 mmWave band. Submitters to the 900 MHz reconfiguration consultations also raised concerns about the spectrum available for reallocation, including the role of 900 MHz in 3G regional coverage, and mitigations for consumers migrating from 2G to 3G and 4G technologies. The ACMA sought additional information from the mobile network operators to inform its consideration of the reconfiguration issues in the band.

For the purposes of the allocation work plan, 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.

As it develops further options, the ACMA is interested in canvassing approaches that provide for fully tradable, long-duration licences, with aligned licence tenure to support licence transfers and spectrum trading. As part of these optimisation considerations, the ACMA also proposes the reallocation of the so-called 850 MHz 'expansion band' for wireless broadband. As a consequence of accelerating the allocation of the 5G bands, the timing for a combined 850/900 MHz band allocation has been extended. The timing reflects that reallocation of the 900 MHz band is still under consideration, and also reflects the lower level of interest expressed by stakeholders for the remaining bands, compared with access to bands suitable for 5G.

### 850 MHz

In late 2015, the ACMA finalised a review of the 803–960 MHz band, deciding to reallocate the 850 MHz expansion band for spectrum licences configured for wireless broadband. The band is being cleared progressively, and is expected to be fully

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<sup>37</sup> [One reallocation declaration](#) relates to mainland capital cities other than Perth, a [second](#) relates to Perth, and a [third](#) relates to regional Australia.

cleared by 2024, although a significant portion of the band will be available for use from mid-2021.

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

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

### **1.5 GHz**

Potential use of the band has been identified for wireless broadband. 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 make a decision on the timing of the band allocation and the quantum of spectrum that should be made available for allocation—both elements are influenced by international developments.

## **Allocation priorities and sequencing**

The ACMA consulted on two allocation scenarios that were intended to reflect different views about spectrum demand, while providing continued flexibility to adjust timing and allocation sequencing in response to new information.

New information about expressed demand as provided by stakeholders in their feedback on the allocation scenarios, as well as progress on international harmonisation efforts has caused the ACMA to adjust both the timing and sequencing of allocations.

Key changes being considered that respond to feedback include:

- > After the conclusion of the 3.6 GHz auction, optimising spectrum holdings in the 3.4–3.575 GHz bands was identified by a number of submissions as the next most urgent issue to require the ACMA's attention. Considerations include optimising spectrum configuration to create more spectrally efficient holdings, freeing up spectrum for an additional allocation as a result of defragmentation, and potential approaches to move from apparatus to a fully tradeable spectrum licence. There is also likely to be further consideration of pricing arrangements to reflect changes in the characteristics of the spectrum holdings. These are all likely matters that would be further developed in an issues and options paper for consultation.
- > The pressures to optimise the configuration of the 900 MHz band raise a similar suite of considerations, so there may be merit in the ACMA developing a more coherent optimisation/defragmentation policy to guide considerations across both the 3.4–3.575 GHz and 900 MHz bands.
- > The ACMA proposes to include work on the optimisation and defragmentation issues in the 3.4-3.575 GHz band in the work program, providing an opportunity for consultation on an issues paper after the conclusion of the 3.6 GHz auction.

- > On the 900 MHz band, continued engagement from the mobile network operators 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 these reasons, the ACMA has pushed back any allocation until at least 2021.

There is optionality on timing—in particular, whether the 3.4–3.575 GHz optimisation/defragmentation work ideally should proceed ahead of the 26 GHz planning and allocation considerations, or should be delayed until after 26 GHz processes have been completed. The ACMA will welcome further views on the relative prioritisation of this optimisation work in response to its consultation paper (for release in Q1 2018–19) outlining the various planning and configuration options for the 26 GHz band. Also, depending on the relative timing of the implementation of the new spectrum legislation and the release of the 26 GHz band to market, the ACMA may be able to offer more flexible licensing options than under the current legislation.

The at times complex coexistence environment and the evolving international situation, combined with the diverse views expressed in stakeholder submissions, create challenges for the ACMA in identifying the most appropriate way forward for the 26 GHz band.

The ACMA expects to release a paper later in 2018 canvassing options for the introduction of wireless broadband services in the band. After reviewing responses to this paper in the context of evolving international considerations, this may ultimately result in, for example, allocation of only part of the frequency range, at least initially. However, this would need to be balanced against the risk of increased band fragmentation arising from multiple allocation processes.

The *Radiocommunications Act 1992* establishes a set of mandatory processes for allocating spectrum. In the ACMA's experience, this process takes a minimum of approximately 12.5 months from confirmation of the planning decision to the commencement of an auction, if there is no real uncertainty about the most appropriate way that the spectrum should be configured for auction. This process will take longer 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.

Some of these processes will be streamlined in the new Radiocommunications Bill, which is expected to simplify the decision-making process. The timing of one or more future allocations may straddle the commencement of the new Radiocommunications Bill.

### **Timing considerations**

Rather than present two different allocation scenarios, the feedback on the allocation work program has provided a clearer indication of the bands that should be included for consideration. The optionality that continues to exist 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 at the same time. The ACMA notes however, that there are merits and disadvantages to running such allocation processes. While there may be timing, administrative and potentially efficiency benefits of running an allocation of multiple bands at the same, there is also an additional burden on auction participants associated with capital funding, as well as potential auction complexity considerations.

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

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

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 16: Potential timing of allocations**

<b>Band</b>	<b>ACMA planning decision</b>	<b>Minister decision where applicable</b>	<b>Auction</b>	<b>Notes</b>
<b>3.6 GHz band</b>	Q2 2017–18	Q3 2017–18	Q2 2018–19	Applications for this auction opened on 6 August 2018. The auction is expected to commence in late November 2018
<b>26 GHz</b>	Q3–4 2018–19	Q1 2019–20	Q1–2 2020–21	May be allocated under new Act
<b>850/900 MHz</b>	Q2 2018–19*	Q1-2 2019-20	Q1–2 2020–21	May be allocated under new Act
<b>1.5 GHz</b>	Q2–3 2019–20	Q3–4 2019–20	Q3–4 2020–21	May be allocated under new Act

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

# Spectrum Review implementation

## The reform context

The release of the [Exposure Draft of the Radiocommunications Bill 2017](#) (the Bill) for public comment in May 2017 marked an important milestone in the ACMA's preparations for implementing new spectrum management arrangements on commencement of the new Act.

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

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

- > our intended approach to spectrum reform objectives and priorities
- > our work plan to implement the Spectrum Review reforms
- > opportunities for user involvement in designing the revised spectrum management arrangements.

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

## ACMA approach to implementing the Spectrum Review

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

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

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

## Progress achieved

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

The government released its final Spectrum Pricing Review Report in February 2018, which makes 11 recommendations to improve spectrum-pricing arrangements, ranging from a review of the administrative pricing formula, to how reserve prices might be set for spectrum auctions. The ACMA has commenced implementation of some of the

recommendations, such as exploring opportunities to transition bands from administrative to market allocation (recommendation 4 of the Pricing Review).

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

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

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

The main areas of Spectrum Review implementation activity that are expected to be undertaken in the year are outlined below. The ACMA continues to work closely with DoCA on the draft legislation and expects to release soon after ED2 material to assist stakeholders in providing feedback on the draft legislation to DoCA. The ACMA intends to seek stakeholder feedback on its intended approach to implementing key areas of the new regulatory regime.

### **Annual work program**

The changes to this FYSO prepare the ACMA to transition smoothly to the annual work program obligations expected to apply under the Bill.

### **Licensing**

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

### **Pricing**

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

- > development of Spectrum Pricing Guidelines (recommendation 1) to provide better transparency and help licensees better understand how the ACMA approaches spectrum pricing.
- > a review of how the ACMA administratively prices spectrum and the formula used to set many of the current apparatus licence taxes (recommendation 7). There is potential to improve the ACMA's administrative pricing of spectrum so that it more closely reflects market value through approaches such as opportunity-cost based pricing.
- > simplification of industry cost recovery arrangements by combining separate taxes into a single radiocommunications licence tax. This is intended to occur in conjunction with the administrative pricing arrangements.

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

### **Planning**

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

### **Interference management**

The ACMA continues to consider industry feedback on its interference management principles and expects to finalise them during 2018. 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.

**Equipment rules**

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

**Accreditation arrangements**

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

# Licensing and licensing systems

## Progress achieved

### Body scanners in airports

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

### Licensing processing system

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

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

### Renew arrangements for amateur certificates of proficiency

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

### Consideration of changes to amateur licence conditions

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

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

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

### Enabling trials of mobile phone jammers in prisons

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



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

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

### **400 MHz band**

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

### **Drone regulation**

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

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

# Pricing

## Progress achieved

### Scientific-assigned licences

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

### Spectrum licence taxes

In the second half of 2017–18, the ACMA conducted separate consultation processes on changes to spectrum licence taxes. In March 2018, the ACMA consulted on proposals to account for changes in the indirect cost of spectrum management and census data for existing spectrum licensed bands. In May 2018, the ACMA consulted on the proposal for spectrum licence taxes for the 3.6 GHz band. In June 2018 and July 2018, the ACMA made those respective changes to spectrum licence taxes.

### Apparatus licence taxes

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

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

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

The demand monitoring framework has been updated and a response paper was published in Q3 2017–18. Monitoring will continue on a semi-regular basis and increases can be re-instated if demand accelerates.

## New/ongoing activities planned for 2018–19

The ACMA is implementing new tax arrangements for apparatus licences associated with the transmitters used by commercial radio and television broadcasters in the Broadcasting Services Bands. The changes result from the media reform package passed by Parliament in 2017. The ACMA is in the process of assessing taxes and will continue this on an on-going basis as apparatus licences associated with a commercial broadcast service passes 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.

Monitoring of demand in the 400 MHz band will continue on a semi-regular basis and increases can be re-instated if demand accelerates.

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

review flowing from recommendation 7 of the Spectrum Pricing Review will address pricing adjustments required across a number of industries and spectrum bands.

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

# Compliance and enforcement

## Priority compliance areas

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

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

- > Gold Coast 2018 Commonwealth Games preparation—compliance program
- > mobile handset compliance.

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

## Progress achieved

### Gold Coast 2018 Commonwealth Games preparation—compliance program

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

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

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

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

- > all Games contract requirements were met
- > all area-wide and in-venue monitoring networks were installed and in operation during the Games
- > all frequency authorisations for use of spectrum in the Gold Coast during the Games were issued.

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

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

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

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

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

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

The ACMA's audit of 13 mobile phone handset suppliers concluded and found compliance was high. This completes the ACMA's suite of EME compliance programs and an online report will be published in Q2 2018-19.

### **PCAs**

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

# International engagement

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

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

DoCA leads the Australian delegation to WRCs, and other key policy-focussed ITU and Asia-Pacific Telecommunity (APT) radiocommunication meetings including the APT Conference Preparatory Group for WRC-19 (APG-19). The ACMA is closely involved in supporting Australian preparatory processes and providing technical expertise for these meetings.

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

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

## Progress achieved

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

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

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

## **New and ongoing activities planned for 2018–19**

The ACMA will continue to manage, and provide technical expertise for Australian engagement in international spectrum management forums through the established consultative frameworks. Where DoCA leads Australian delegations to policy-focused international meetings, the ACMA will continue to provide technical expertise in support.

The second meeting of the Conference Preparatory Meeting for WRC-19 (CPM19-2) is scheduled for 18–28 February 2019 and will finalise a consolidated report to WRC-19 on ITU-R Preparatory Studies undertaken since 2015. The CPM report will include possible solutions to address WRC-19 agenda items to be used in support of the work of WRC-19. The fourth meeting of the APT Conference Preparatory Group for WRC-19 (APG19-4) will be held from 7–12 January 2019, just prior to the CPM meeting. The Australian delegations to these meetings will include ACMA officers.

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

# Appendix A—Sunsetting instruments

## Instruments previously due to sunset on 1 October 2018

Table 17: Instruments previously due to sunset on 1 October 2018

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

## Thematic review of sunsetting instruments

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

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

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

The instruments administered by DoCA are at Table 18, with the related instruments administered by the ACMA at Table 19.

Table 18: Sunsetting instruments administered by DoCA—new sunsetting date 1 April 2023

Legislation title
Radiocommunications Taxes Collection Regulations 1985
Radiocommunications Regulations 1993
Radiocommunications (Coordination) Regulations



**Table 19: Sunsetting instruments made by the ACMA—new sunsetting date  
1 April 2023**

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