Australian Government

Australian Communications and Media Authority

Five-year spectrum outlook 2022–27 and 2022–23 work program

SEPTEMBER 2022

acma.gov.au

Canberra
Red Building
Benjamin Offices
Chan Street
Belconnen ACT

PO Box 78
Belconnen ACT 2616

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

Melbourne
Level 32
Melbourne Central Tower
360 Elizabeth Street
Melbourne VIC

PO Box 13112
Law Courts
Melbourne VIC 8010

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

Sydney
Level 5
The Bay Centre
65 Pirrama Road
Pyrmont NSW

PO Box Q500
Queen Victoria Building
NSW 1230

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

Contents

Contents (Continued)

Contents (Continued)

Foreword

The Australian Communications and Media Authority (ACMA) is Australia's spectrum regulator, responsible for managing the radiofrequency spectrum to promote the long-term public interest derived from its use. We consult annually about spectrum management priorities through the five-year spectrum outlook (FYSO) and annual work program, as required by section 28F of the *Radiocommunications Act 1992* (the Act). Our FYSO process includes releasing a draft outlook and work program for consultation before we settle the final FYSO.

In the FYSO 2022–27, we continue to undertake extensive planning activities focused on bringing 5G spectrum to market. We recently completed low- and high-band allocations to support a range of 4G and 5G use-cases and services. Our immediate focus continues to be the allocation of more spectrum for wireless broadband by implementing the planning outcomes for mid-band spectrum in the 3.4–4.0 GHz band.

Satellite communications are experiencing a significant period of technological innovation and disruption in the provision and delivery of communications and space-based science services. This year we raised for discussion whether it is timely to consider the adequacy of existing regulatory arrangements for non-geostationary satellite orbit constellations, noting the strong domestic and global interest in deployments.

In updating the annual work program, we gauged interest in the potential uses and supporting regulatory arrangements for terahertz spectrum bands, which is the next frontier of lightly used spectrum.

Spectrum in many bands is increasingly contested by interest from existing users alongside demand from prospective spectrum users. Addressing this demand informs our work to maintain and improve the efficiency of existing technical frameworks and to adapt them for new technologies. We are doing this through an ongoing program of updates to spectrum licensing technical frameworks, and radiocommunications assignment and licensing instructions for apparatus licences. We continue to explore new spectrum sharing techniques, through both licensing arrangements and seeking interest in models for real-time spectrum assignments as mechanisms to manage coordination and spectrum congestion.

We will monitor terrestrial television broadcasting technology options to support future planning work, while continuing radio industry transition to digital radio technologies.

In the lead up to the World Radiocommunication Conference 2023 (WRC-23), there is significant ongoing engagement with industry through a series of Study Group and Working Party meetings, to support the development of Australian positions for the conference.

We have implemented the bulk of reforms to the Act that were brought about by the *Radiocommunications Legislation Amendment (Reform and Modernisation) Act 2020*. In the coming year, we will consider the renewal processes for spectrum licences that are due to expire and review sunsetting instruments.

Using the FYSO

The FYSO covers the 5 financial years 2022–23 to 2026–27. It comprises:

- Part 1: an outlook of the drivers likely to shape the demand for spectrum over the next 5 years
- Part 2: a detailed annual work program for the 2022–23 financial year.

For ease of interpretation, references to quarters are calendar year quarters:

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

Where significant priority or other changes have been made to the FYSO 2022–27 since the draft FYSO, we have included a 'change' symbol: CHANGE. Where significant new material has been inserted, this is identified with a 'new' symbol: NEW.

Key to icons


Wireless broadband


Satellite

Class licensing

Internet of things


Radio and television broadcasting


Amateur radio


Point-to-multipoint


Point-to-point


Defence


Aviation


Maritime


International interests and engagement


Pricing

Commonly used acronyms

AWL	area-wide licence (type of apparatus licence)	**PTP**	point-to-point
FSS	fixed-satellite service	**PMP**	point-to-multipoint
IMT	international mobile telecommunications	**RR**	Radio Regulations
ITU	International Telecommunications Union	**WBB**	wireless broadband
MSS	mobile satellite service	**WRC**	World Radiocommunication Conference

Part 1: Five-year spectrum outlook 2022–27

Part 1 provides an outlook of the trends in markets, technology and spectrum uses that inform the ACMA's medium-term planning, allocation and re-allocation activities.

Overview

The connectivity facilitated by wireless, satellite and broadcasting access to the radiofrequency spectrum supports an ever-growing range of Australia's economic, social and public-interest activities.

In considering the outlook for spectrum demand and the pressures on spectrum management arrangements, our 5-year outlook is informed by domestic and international views about the timing of technology developments and progress in international harmonisation activity. We also consider Australian market information about demand for spectrum-dependent wireless and satellite communications, and existing spectrum utilisation, as well as relevant government policies.

In the international context, the ACMA; the Department of Infrastructure, Transport, Regional Development, Communications and the Arts (the Department); other government stakeholders and Australian industry participate in international radiocommunications forums to promote and protect Australian interests in spectrum management, including spectrum harmonisation and international frequency coordination.

The peak international technical regulatory forum is the International Telecommunication Union's (ITU) World Radiocommunication Conference (WRC), which reviews and revises the Radio Regulations (RRs) – the international treaty-level set of texts regarding use of the spectrum and satellite orbits. The next WRC will be held in late 2023 (WRC-23) and will consider possible new frequency allocations, service identifications, and regulatory and procedural matters across a range of services and applications.

In addition to our role in participating in international fora, we also aim to understand and help realise the benefits of the technological developments that enhance existing, or create new, use-cases and/or have the potential to improve spectrum utilisation and efficiency.

In the Australian market, technologies that are driving demand for spectrum highlight an ever-increasing appetite for wireless connectivity across many sectors, particularly using 5G and new satellite technologies. These include private networks, commercial applications of internet of things (IoT) and an evolution in satellite-delivered services.

Demand for spectrum is heavily influenced by the state of competition in downstream output markets via the services that spectrum facilitates for end users, whether they are consumers, businesses or governments. Spectrum holdings directly influence an operator's network capacity, service quality and its potential for entry into new geographic markets, making it a significant determinant in an operator's competitive ability. The management and allocation of scarce spectrum resources, including the timing of major spectrum allocations, can have a significant impact on the nature of competition in downstream markets that rely on spectrum.

Our approach to spectrum management

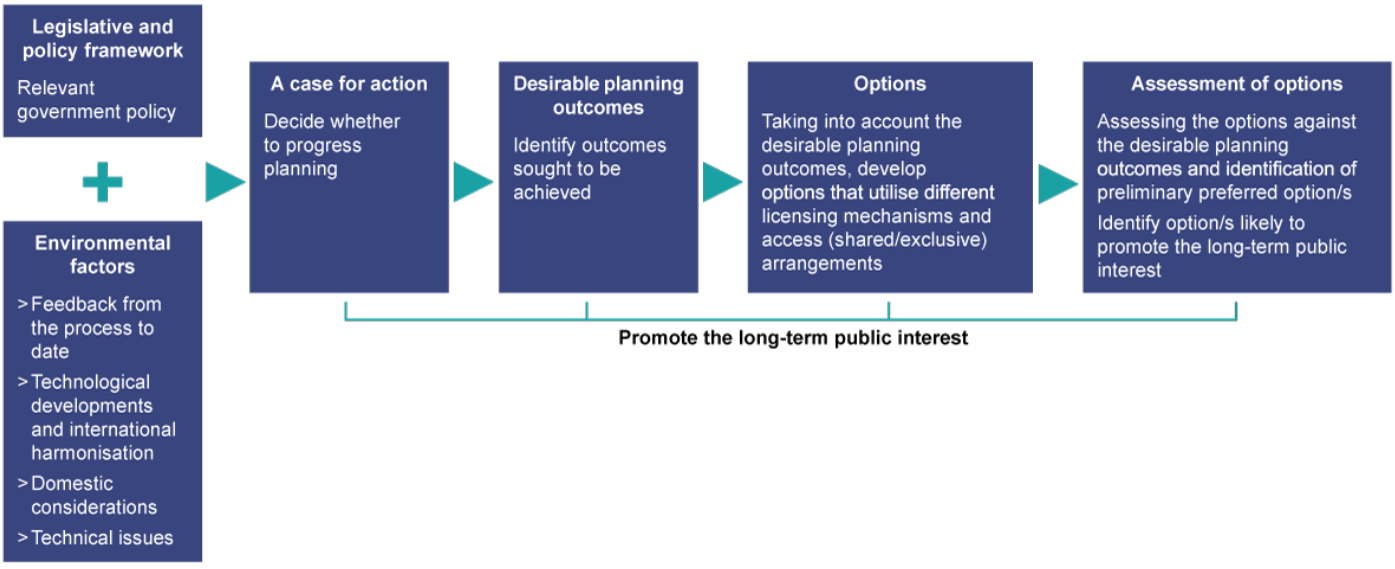
Our responsibilities to manage the radiofrequency spectrum are set out in the *Radiocommunications Act 1992* (the Act), as amended by the *Radiocommunications Legislation Amendment (Reform and Modernisation) Act 2020* (the Modernisation Act).

The Modernisation Act amendments provide that the object of the Act is to promote the long-term public interest derived from the use of the spectrum by providing for the management of the spectrum in a manner that:

- facilitates the efficient planning, allocation and use of the spectrum
- facilitates the use of the spectrum for:
  - commercial purposes
  - defence purposes, national security purposes and other non-commercial purposes (including public safety and community purposes)
- supports the communications policy objectives of the government.

Consistent with the new object of the Act, we aim to facilitate efficient spectrum planning, allocation and licensing arrangements in each band for the use or uses[1] that best promote the long-term public interest derived from the use of that spectrum.[2] We will often promote the object of the Act and relevant government policy through a balanced application of market and regulatory mechanisms. Figure 1 describes the approach the ACMA uses in developing and assessing planning, replanning and allocation options.

Figure 1: The spectrum planning options framework



[1] Uses refer both to the general types of use such as a service (for example, the mobile service) and more specific applications within a service (for example, wireless broadband within the mobile service).
[2] We have aligned our assessment framework with the new object of the Act.

Spectrum planning comprises the investigations and decisions that determine general service and application-level uses of the spectrum. This includes developing the technical framework that establishes co-existence arrangements between different uses and users, and heavily influences the 'licensing product' that will authorise access to the band. It also includes determining the most appropriate licensing mechanisms to apply in each situation.

To the extent possible, the planning arrangements are intended to allow the allocation (or movement) of spectrum with no, or minimal, further regulatory intervention. Planning arrangements may remain stable over long periods; however, where there is evidence of changing optimal use, it may be necessary to amend the arrangements to enable a new use or better support an existing use. Reviewing spectrum planning arrangements in the band in question is a key step to ensuring arrangements continue to support optimal use.

The band-planning process is made up of 4 stages: monitoring, initial investigation, preliminary replanning and implementation. A band may move forwards or backwards through the stages if circumstances warrant. This approach has proven to be a flexible and responsive way of addressing changes in spectrum demand and ensuring the timely delivery of spectrum to market.

We note that planning outcomes have implications for decisions on future allocations. For example, planning outcomes will determine the type of user likely to be interested in an allocation by determining what uses are permitted and which are not. In addition, to achieve efficient use of the spectrum, the interference management framework is often optimised for an expected use, even if such use is not mandatory. As an example, while spectrum licences may be 'technology flexible', in that they do not explicitly preclude any use, they are designed and optimised with a likely technology in mind to maximise the efficiency of these licences for their expected use, consistent with co-existence requirements of other spectrum uses/users.

The spectrum management framework we use does not identify specific quantitative metrics or targets for spectrum that is required for a specific use or group of users. The models used to estimate such spectrum targets are highly sensitive to inputs and variables, which are difficult to predict beyond the short- to medium-term. While long-term estimates are useful as a guide for trend analysis, they are less so for determining specific spectrum targets.

Our approach to spectrum management is informed by considering the impact that a regulatory proposal has on the public interest, measured as the sum of the effects on individuals, businesses, community organisations, as well as its broader economic, social and competition impacts. We ask:

- what is the issue we are trying to solve?
- why is government action needed and what government policies, if any, are relevant to the issue?
- what are the options we are considering?
- what is the likely net benefit of each option?
- who should we consult, and how?

- what is the best option from those we have considered?
- how will we implement and evaluate our chosen option?

In responding to these questions, we draw on a variety of evidence available to us, including technical studies, stakeholder views (whether through public consultation or targeted tune-up meetings) and quantitative data, where available.

The policy environment and regulatory reform CHANGE

The object of the Act includes managing spectrum in a manner that supports the communications policy objectives of the government. Our work program is informed by the policy environment in which we operate and is intended to support government initiatives that promote the development and take-up of critical technologies that support domestic industries and communities, and better connect Australians to each other and to the world.

Making spectrum available to enable Australia's transition to 5G and ensuring that spectrum is available for Australia's rural and regional areas are key elements of our planning and allocation work. This is consistent with the government's commitment to improving regional connectivity through targeted investment intended to expand and enhance mobile coverage in regional communities and along the transport corridors that connect those areas. We continue to support innovative 5G services by providing information on our website on bands where suitable spectrum might be available by an administrative process, that is, 'over the counter'.

We have undertaken extensive planning activities focused on bringing 5G spectrum to market. We recently completed an allocation by auction of spectrum in the 900 MHz and 850 MHz expansion band, supporting the deployment of more wireless broadband (WBB) services, and facilitating higher speeds and more reliable networks for consumers. The successful allocation of this valuable low-band spectrum is another important step towards Australia's transition to 5G, and the deployment of new technologies.

Our priority is to allocate more spectrum for WBB by continuing to implement the planning outcomes of our review of the 3.7–4.2 GHz band. In doing so, we are having regard to the communications policy objectives specified in the Ministerial Policy Statement made under subsection 28B(1) of the Act, which are:

- supporting the deployment of new and innovative technology, including 5G
- supporting a range of use-cases and users
- supporting digital connectivity and investment in regional Australia
- promoting competitive markets.

We may also identify objectives for specific planning and allocation processes. For example, for the forthcoming allocations within 3.4–4.0 GHz, we have articulated a set of desirable planning outcomes that would be achieved by allocating a combination of apparatus and spectrum licences in remote, regional, and metropolitan areas over the next 2 years.

The 2021 Regional Telecommunication Independent Review Committee (RTIRC) has delivered its final report and recommendations to the Australian Government as part of the 2021 Regional Telecommunications Review. The report of the 2021 Regional Telecommunications Review was tabled in Parliament on 14 February 2022. It

reinforces the essential role of telecommunications networks in regional Australia and their increasing importance. The Review noted that there has been a step change in the demand for telecommunications, emphasising the need for effective policies and programs that support the delivery of telecommunications services in regional Australia.

Our planning, allocation and licensing activities seek to support a range of regional communications use-cases and users. This is particularly relevant for WBB services, where there are multiple kinds of service offerings, users and deployment models, resulting in a diverse range of spectrum needs in regional Australia. In addition to the Australia-wide allocation of the 850/900 MHz band, we have also made spectrum in the millimetre wave (mmWave) bands (26 GHz and 28 GHz) available in regional areas under apparatus licensing, with spectrum currently available for allocation. Additionally, apparatus licensing in the 2 GHz band will support Australia-wide mobile satellite services – we are reviewing arrangements for the 1800 MHz band in remote areas for fixed and mobile WBB services and we are exploring a range of different use-cases in the 1.5 GHz band.

Supporting local news and community broadcasting, and supporting domestic manufacturing, are also government priorities.

The COVID-19 pandemic and recent trends have increased the need for certainty for all broadcasting services, including national services and radio and television community services. These services are also navigating changes to their environment, stemming from changes in technology and audience listening and viewer habits. The broadcasting elements of our spectrum planning and management activities continue to provide certainty for these services and support the exploration of new ways to deliver content.

Our recently implemented innovation and industry development framework is geared towards enabling domestic manufacturing, research and development (R&D), and export opportunities involving strategic technologies by Australia's defence industry and technology sectors, and our review of scientific licensing arrangements will ensure that we can continue to foster and encourage the development and testing of new technologies, services, and equipment.

We will take opportunities to work with the government on any legislative reform that enables us to improve our regulatory processes and optimise the outcomes that the radiocommunications regulatory framework can deliver for licensees and the public. Our work program continues to implement other regulatory reform introduced by the Modernisation Act*,* including consulting on licence renewal processes in the coming year for spectrum licences due to expire in 2028 and the review of 31 instruments due to sunset by 1 April 2023 – see Appendix A.

Market and technology drivers of change in spectrum demand

The demand for spectrum is growing across many sectors, driven by the take-up of spectrum-reliant technologies that promise to deliver efficiencies and enhanced connectivity for consumers, business and government. Before the COVID-19 pandemic, the digital economy was already experiencing growth, alongside an ongoing need for connectivity and sufficient data capacity to support it. More recently, the continuing impact of the pandemic, exacerbated by turmoil in Europe, has seen major disruptions to global sourcing and supply chains. Strategic competition among major economies, and increased pressure on the rules, norms and institutions that help maintain peace and security, and guide global cooperation, are also shaping the market environment.

Now in its third year, the changed digital work and business practices that evolved during the pandemic continue, and drive innovations in communications technology to support telehealth and telemedicine, remote working and learning, online entertainment and e-commerce. 2021 saw data traffic at an all-time high, with total downloads over 3 months rising by 20% in the year to June 2021, to 9.8 million terabytes.[3] ACMA research also highlights the increasing popularity of wireless services, with almost all Australians aged 18 or over now owning some form of mobile device. Internet-enabled 'smart' devices are prevalent in nearly all Australian households, and smartphone use has also greatly increased in regional areas, rising from 77% in 2019 to 93% in 2021.[4]

There are a range of competing forecasts from different industry groups on the forecast data demand growth[5], but a common thread is that forecast growth will drive demand for future communications networks, requiring ever-greater network speeds and reduced latency. This in turn increases demand for the spectrum needed to support WBB, satellite communications and the deployment of critical technologies.

While it is too early to predict how the metaverse (the digitalisation of the physical world) will impact directly on demand for spectrum, developing industry views point to a consensus that the metaverse will drive additional demand for connectivity, data and reduced latency. Over the next 5 years, we expect increasing clarity around the connectivity requirements for metaverse applications.

The industry landscape is seeing restructures occurring, in part through cost pressures, leading to a range of differing models for network deployment and ongoing management. These include network-sharing arrangements, the sale of passive infrastructure assets and increased interest in neutral host models. All these changes are likely to impact investment strategies and future demand for spectrum, although we note that access to spectrum is only one aspect of delivering a wireless service capability.

[3] Australian Competition and Consumer Commission, Internet Activity Report, June 2021, accessed February 2022.
[4] See our interactive report *Communications and media in Australia: How we communicate*.
[5] A Venture Insights survey revealed that 65% of large enterprises and 37% of small to medium enterprises in Australia expect to implement or increase spending on satellite broadband over the next 12 months. Meanwhile, the Ericsson Mobile data traffic outlook suggests that in 2027, 5G networks will carry 62% of the world's smartphone traffic.

We are also seeing increasing interest in the deployment of private networks, as a growing number of enterprises place greater value on having dedicated local area WBB networks for advanced, secure connectivity. In this enterprise market, automation, AI and advanced sensing requirements are driving demand for high-speed connectivity and low latency. The construction and mining sectors were early adopters of private networks, which are now increasingly found in the agribusiness, transport and logistics, utilities, and hospitality sectors. We are supporting these use-cases through licensing arrangements for local area WBB and IoT.

Private networks are delivered using 4G technology; however, industry trials to deploy private 5G options that can deliver higher speeds and sustained high throughput, will maintain the pressure for spectrum to support 5G connectivity. It is expected that private networks will continue to increase in number, and most new networks will use 5G technology.[6] Research suggests that the uptake of 5G is expected to be faster than 4G globally, and that by 2027, just under half of global mobile subscriptions will be 5G.[7] To support this, we continue to provide for this sector, with our immediate focus on forthcoming mid-band allocations to release spectrum for WBB use.

Additionally, 5G is expected to accelerate the growth of fixed wireless access (FWA) services, making it more achievable for operators to deliver FWA in regions where massive upfront infrastructure costs present a barrier to deploying in those areas. Network operators recognise the value of 5G FWA to monetise their investments in spectrum and 5G infrastructure.[8]

The ubiquity of satellite coverage means that satellite services both compete directly for coverage as well as readily plug the gaps in connectivity presented by terrestrial data networks, and new commercial satellite services will continue to emerge and evolve in response to rising demand for satellite connectivity. This has been driven by an increased appetite for data and applications from consumers and households in regional and remote areas, as well as businesses and enterprises transitioning into a digital economy.[9] Advances in satellite, machine-to-machine and AI technology are facilitating the development of smaller, more affordable space hardware, also accelerating the attraction of satellite connections for IoT.

The World Economic Forum predicts that in the next 10 years, the IoT will double to at least 20 billion active devices[10], and the satellite-based IoT network industry is gaining momentum alongside this growth. Satellite IoT systems are being developed to operate in frequency bands used for terrestrial IoT systems, challenging current regulatory frameworks.[11]

Maritime tracking, agricultural networks and environmental health monitoring are examples where limited terrestrial connectivity in remote or underserved locations make satellite connections for IoT a viable option. Businesses that typically rely on terrestrial networks also see the value in having a reliable back-up for critical business functions. Together, these factors continue to place pressure on spectrum management arrangements.

[6] Analysys Mason Research, 2022 telecoms, media and technology predictions, accessed January 2022.
[7] Ericsson, Ericsson Mobility Report November 2021, accessed December 2021.
[8] Deloitte, Deloitte TMT predictions 2022, accessed December 2021.
[9] Venture Insights, Satellite Communications: Market Trends and Outlook, accessed January 2022.
[10] World Economic Forum, Top 10 Emerging Technologies of 2021, accessed January 2022.
[11] See for example, LoRa®: Delivering Internet of Things Capabilities Worldwide, accessed February 2022.

Interest in using spectrum above 100 GHz (often referred to as the terahertz frequency range) is increasing internationally, owing to the amount of spectrum available and its potential for sharing due to its propagation characteristics. The emerging and potential applications for spectrum in this range include short-range radar sensing, security imaging, non-destructive testing and high-speed communications, potentially with 6G technology.

Existing services in the terahertz range are focused primarily on scientific applications for earth observation, including climate change modelling. These applications are sensitive to interference and, for now, are protected both through provisions in the Radio Regulations, and the comparatively limited use of spectrum in these bands for other applications.

Technology and commercial use-cases for terahertz spectrum are still in their infancy, though some national spectrum managers, including the Federal Communications Commission (FCC) in the US and Ofcom in the UK, have recently implemented new regulatory arrangements above 100 GHz to specifically support these emerging technologies, while Canada recently announced it is investigating shared access to these bands.

In Australia, the scientific licensing regime in place provides a flexible and low-cost mechanism to support trials and technology development in these bands. However, the scientific licence regime doesn't provide the long-term framework necessary to support commercial, wide-scale use of these bands. As part of our implementation of the second tranche of changes from the Spectrum Pricing Review, we have reduced apparatus licence taxes to the minimum annual tax for most licence types with services operating in spectrum above 100 GHz.

CHANGE In developing the work program, we sought industry views on whether it was necessary for us to explore, in the near term, the development of an ongoing regulatory framework for terahertz spectrum. We queried whether the global technology and spectrum market was mature enough for Australia to follow the UK and the US in establishing dedicated spectrum management arrangements and, if so, what the relative priority of such work should be, compared to other spectrum management activities.

NEW The feedback we received acknowledged the role that terahertz spectrum will have in the future, particularly for next generation satellite services and mobile applications. Noting this, we will continue to monitor developments in these frequencies, particularly given recent interest in Canada to licence terahertz spectrum for mobile applications, and Ofcom's expression of support for exploring solutions to share terahertz spectrum in a controlled sandbox environment. We will review international regulatory models and use-cases in an information paper, and our work program for pricing matters will also include updates for industry about our monitoring of developments relevant to terahertz spectrum.

In the remainder of Part 1, we focus on the priorities of particular spectrum uses and the demand for spectrum that is being shaped by the evolving technologies and market drivers.

Wireless (mobile and fixed) broadband, including 5G

Overview

We anticipate the pressure on spectrum required to support the ever-increasing growth in mobile and fixed WBB applications and mobile data will continue in the short- and medium-term. In planning for future spectrum demand, we recognise 3 broad categories of WBB use-cases and note that network deployments may reflect combinations of these categories.

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

The second category reflects more limited market subscriber networks over smaller, localised areas, including, but not limited to, fixed WBB and fleet-oriented services. Services provided by wireless ISPs are an example of this type of use.

The third category of WBB covers business enterprise services operated by private entities within the confines of their own premises or land estate – for example, a hospital, education precinct or an industrial or transport facility. These private networks are usually best aligned with local area licensing approaches and can utilise the access arrangements and bands identified above in the context of FWA. However, we are aware of interest in other bands, and are progressing work on the 1.9 GHz band with the release of a discussion paper in 2021 seeking feedback on some possible planning scenarios for the band, including potential co-existence issues. The review of the 1.5 GHz band will include consideration of private networks.

Reviewing the arrangements in bands that are already licensed for WBB is important to ensure existing allocations are efficient and can cater for new technology developments, such as 5G. Our work program includes projects that consider optimising existing planning frameworks.

Spectrum bands supporting wireless broadband use

From a spectrum management perspective, 5G uses spectrum across a wide range of frequency bands. This includes:

- 'low-band' spectrum below 1 GHz, specifically, bands traditionally used for WBB networks
- 'mid-band' spectrum between 1 GHz and 6 GHz, some of which is already used for WBB
- 'high-band' spectrum, above 6 GHz, specifically, the mmWave bands previously little-used for WBB.[12]

In addition to considering the use of 'new' frequency bands (bands previously unused for WBB), 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.

The existing technical frameworks provide flexibility for licensees to re-use spectrum and adopt new technologies. However, where appropriate, we will revise existing technical frameworks to ensure they are suitable for 5G. Of course, this has to be balanced with the need to manage interference with other licensed services.

[12] mmWaves span 30 GHz to 300 GHz (that is, 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.

Each of the spectrum bands identified for WBB (sub-1 GHz, 1–6 GHz, above 6 GHz) requires a specific approach. This is because different considerations apply, such as intrinsic features of the band (for example, propagation characteristics), as well as international regulations and standards, domestic policy, legacy planning and allocation arrangements, and other incumbency factors.

Low-band spectrum

Following the re-allocation of the additional spectrum available for WBB in the 850 MHz expansion band and spectrum already licensed for WBB in the 900 MHz band, our short-term objectives for sub-1 GHz spectrum allocations have been realised. We will continue with the established program of reviewing spectrum licence technical frameworks to ensure currency by looking at the 700 MHz framework in the short term.

In the medium term (that is, within this 5-year outlook period), we will focus on renewal processes for spectrum licences in the 800 MHz and 700 MHz bands that will expire in 2028 and 2030, respectively.

Mid-band spectrum

Our immediate objective for mid-band spectrum is to progress arrangements and begin allocation of spectrum in the 3.4–4.0 GHz band across various parts of Australia. We aim to achieve this consistent with the communications policy objectives identified in the ministerial policy statement for the band, and our desired planning outcomes for this band, which are to:

- introduce wide area (WA) WBB and local area (LA) WBB uses, with frameworks suitable for both
- support a range of continuing uses in the band
- ensure co-existence with adjacent band services.

We propose applying a combination of apparatus- and spectrum-licensing arrangements to facilitate a wide range of users and use-cases. We intend to allocate:

- apparatus licences first in remote areas, commencing not before Q4 2022
- spectrum licences in metropolitan and regional areas in Q3 2023
- apparatus licences in regional and metropolitan areas, later in 2023–24.

In the medium term, we will consider whether to progress replanning arrangements for the 1.5 GHz and 1.9 GHz bands. We are also considering the future use of the 1800 MHz band in remote areas.

Beyond the term of this 5-year outlook, we will turn our focus to mid-band spectrum licences expiring between 2028 and 2032. This includes 1800 MHz in 2028, 2.5 GHz in 2029, 2.3 GHz and 3.4 GHz in 2030, and 2 GHz in 2032. As part of this work, we will assess whether renewal is likely to be in the public interest and, if so, the likely taxes and charges payable. In addition to these planning and allocation activities, we will continue to monitor several other bands for possible replanning for 5G WBB services.[13]

[13] See ‘Bands being studied under WRC-23 agenda items 1.2 and 1.4’ in the section on Monitoring, Part 2.

High-band spectrum

Following the allocation of mmWave spectrum in the 26 and 28 GHz bands, we will also continue to monitor the 40 GHz, 46 GHz (mainly in Region 1 countries) and 47 GHz bands identified for international mobile telecommunications (IMT) use at WRC-19. Of these, the 40 GHz and 47 GHz bands are the most mature in terms of standardisation and equipment availability.

The 40 GHz and 47 GHz bands are of significant interest for both terrestrial 5G and satellite broadband services – the US, for example, has established arrangements supporting both services. We will consider global trends and local circumstances, including domestic and international take-up of mmWave 5G services, to determine whether replanning for possible 5G in the 40 GHz and 47 GHz bands is appropriate. We note that optimal spectrum management outcomes are likely to be achieved when both bands are considered simultaneously.

Satellite communications

Overview

Satellite communications are experiencing a significant period of technological innovation and disruption in the provision and delivery of communications and space-based services. Rapid innovation in satellite technologies, services and launch vehicles are driving new satellite business models. This includes the development of constellations of non-geostationary satellite orbit (NGSO) systems that are significantly larger than previous constellations, with a number of systems planned to contain thousands of satellites.

The Australian Space Agency's *Communications Technologies and Services Roadmap 2021-2030* identified emerging technologies that offer the greatest opportunities for the growth of the Australia space industry. Our 2021 market study on the Australian space sector revealed the sector generated an estimated $5.7 billion in 2020 and highlighted the implications of this growth for the Australian market, including on future spectrum demand.

The Satellite Industry Association has identified key spectrum issues to support the growth of satellite services in the US, including arrangements in the Ka and Q/V bands, NGSO sharing, and supporting E band[14] gateway earth stations in bands used for self-coordinated fixed links. Given the global nature of satellite systems, we expect that in future, some of these issues will need to be considered in the Australia context.

The current Australian spectrum management framework already provides for high-throughput systems and very-high-throughput systems in several frequency bands. Our program of work to review and update arrangements over the last 2 to 3 years has provided improved support for satellite services in Ku and Ka bands and has generally improved licensing procedures for all satellite services.

We have introduced pricing changes to support the ongoing growth in satellite broadband high- and very-high-throughput systems. These systems are increasing the demand for spectrum arrangements to support ubiquitous earth stations for user terminals and gateway earth stations

We recognise the growing interest in the use of spectrum to support innovation in satellite communications (including infrared communications) and welcome interest

[14] In the context of satellite services in the US, the Satellite Industry Association submission to the FCC considered the frequency band 27.5–28.35 GHz forms the Ka band; 37.5–40 GHz, 47.2–48.2 GHz and 50.4–52.4 GHz form the Q/V band. An FCC proceeding on 70/80/90 GHz considers the 70 GHz (71–76 GHz), 80 GHz (81–86 GHz) and 90 GHz (92–95 GHz) bands form the E band.

from the space sector on any further developments. In the meantime, we are open to supporting technology trials under scientific licensing.

The emergence of large NGSO systems

While large NGSO systems bring the benefits of lower latency and greater capacity, we are aware of concerns that the emergence of operational and planned large NGSO systems will result in an increasingly contested spectrum environment, placing pressure on established spectrum frameworks and raising questions of competition and equitable access. While there is no consensus in the satellite industry on the issues and possible treatment, commonly expressed concerns include that:

- supporting early innovators (providers of NGSO) will hinder the development of future systems because of interference concerns (potentially restricting future competition)
- to avoid in-line interference events, separation of hundreds of kilometres is required between NGSO gateways[15]
- congested orbits and large NGSO systems may constrain the capacity/throughput of GSO satellites and small NGSO satellites systems.[16]

We are alert to the various perspectives on 'congestion of space', orbital debris and the potential impact on optical astronomy raised by the current resurgence in interest in the use of large constellations. However, the ACMA does not have a role in these matters, as they are related to the physical objects in orbit and are primarily the responsibility of the nation launching these networks. Nonetheless, we are aware that these concerns are discussed at the United Nations Office for Outer Space Affairs' Committee on the Peaceful Uses of Outer Space, a forum that the Australian Space Agency participates in as part of the Department of Industry, Science and Resources.[17]

While a number of the large NGSO constellations have authorisations to provide services in other markets such as the US, not all are active in the Australian market yet.[18] Those that have been authorised, have been so under our current long-standing approach that relies heavily on the framework provided by the ITU for the global management of the spectrum and satellite orbit resource. This is consistent with the government approach to International Standards and Risk Assessments, which adopts the principle that if a system, service or product has been approved under a trusted international standard or risk assessment, then regulators should not impose any additional requirements for approval in Australia, unless it can be demonstrated that there is a good reason to do so.

[15] An in-line interference event is when satellites from 2 different NGSO satellite systems appear to be in the same part of the sky. The result is that interference levels can temporarily increase on the gateway links between the gateway earth station and the satellite. As NGSO satellites are moving, the period on an individual in-line event may be brief. The overall impact depends on a number of factors, such as how often it occurs and the robustness of the systems to such events. The same scenario is normally avoided in GSO systems due to fixed orbital separation.

[16] For a discussion on these issues and differing views from industry, see the Ofcom consultation on Non-geostationary satellite systems, licensing updates and submissions received.

[17] See the Department of Industry, Science and Resources website for more information about Australia's international collaboration on space.

[18] The FCC approved space station list is an unofficial list of space stations authorised by the FCC under Part 25 or granted access to the US market (pursuant to Section 25.137 of the FCC's rules). For more details use the FCC Authorizations List to generate a report of satellite space stations current authorizations by licensee.

Satellite service licensing arrangements

Australian licensing procedures for satellite services rely substantially on ITU processes, with checks of the compatibility of different satellite services limited to:

- ensuring that the international processes are being followed
- considering the impact on Australian filed satellite systems
- ensuring consistency with the Australian spectrum management regulatory environment.

We encourage cooperation and coordination between satellite networks to achieve mutual benefit, without the burden and delays of additional prescriptive regulation. In line with this approach, it is our view that coordination matters between foreign-filed satellite networks are the responsibility of the filing administration and satellite operators. Accordingly, Australia's, and the ACMA's role is limited to the domestic licensing of these systems.

We are aware that some regulators of larger markets have more prescriptive approaches to the regulation of satellite systems, which, comparatively, are more interventionist than our approach.[19] These regulatory systems have developed over time to reflect regulatory approaches and the market environment of the countries concerned. To date, there has been no need for such systems in Australia.

A range of interventions are possible, including licence application windows ('processing rounds' in some countries), public consultations on licence applications, auctioning of licences, and comparative assessment based on 'benefits' to be provided, measured against criteria (often called 'beauty contests'). Some of these interventions are being implemented or considered overseas (by Ofcom and the FCC, for example).

Given the global nature of NGSO systems, we are cautious about introducing additional regulatory overlays on global systems that are already subject to ITU processes and with solutions established in other major jurisdictions. It is also likely that such interventions would be burdensome and introduce delays in considering licence applications (especially if public consultation on licence applications was introduced). Any interventions are likely to be applied to a licence type, rather than a particular satellite product (that is, interventions would likely apply to all space/space receive licences and possibly earth/earth receive and area-wide apparatus licences to capture gateway earth stations, not just large NGSO constellations). Therefore, it is not yet clear if additional regulatory intervention by Australia will be proportionate to the potential benefits.

Industry views on issues relating to large NGSO constellations

In developing the work program, we sought industry views on spectrum issues related to large NGSO constellations. Feedback received suggested that industry is supportive of the ACMA's existing regulatory arrangements. Noting that the continuing evolution of NGSO satellite communications will present longer-term challenges for spectrum management arrangements, our key satellite priorities for 2022–23 will include continuing to monitor relevant domestic and global regulatory developments, as well as spectrum demand from the sector.

[19] In December 2021, Ofcom published an update to its licensing approach for NGSO systems, which include assessing potential impacts on competition and compatibility with other services; The FCC has issued a proposed rulemaking, refining current rules on sharing between NGSO systems to include protection based on time of authorisation.

Broadcasting services

Broadcasting services may be delivered using radiocommunications spectrum, including AM and FM frequencies (for radio), VHF, UHF and satellite frequencies. Evolving digital transmission technology and changes in viewer and listener behaviour are altering the modes of delivery and, consequently, changing the broadcasting demand for spectrum.

In recognition of the technological evolution occurring in broadcasting, we have actively supported new technology trials, such as the DVB-T2 trials for television and DRM30 and DRM+ trials for radio.

We are conducting technical research to explore television channel planning and licensing approaches that could be used when developing restack channel plans for future television transmission technologies. This research includes examining television receiver technical performance and viewer antenna deployments in complex reception environments, which is also informing our responses to complex television reception inquiries.

We continue with a significant program of radio planning and allocation activities, informed and prioritised by our radio broadcast planning priorities, outlined in the future delivery of radio report. These include converting from AM to FM and enhancing coverage of commercial, national and community services where spectrum is available, making digital radio channel plans (DRCP) for regional DAB+ where a commercial licensee or national broadcaster has committed to a rollout and supporting trials of new broadcasting technology.

Class licensing and the spectrum commons

Class licensing is the approach used in Australia to implement less-closely-managed spectrum arrangements, including 'spectrum commons'. The fundamental idea of a spectrum commons is that anyone can use spectrum in the spectrum commons, as long as they follow the set rules[20] – in Australia, those rules are set out in class licences.

Class licences make available spectrum for use by services that operate on a limited set of common frequencies under a common set of conditions and often must comply with industry or legislative standards. They authorise users of designated segments of spectrum to operate on a shared basis. Class licences do not involve licence taxes or charges, and there is minimal regulatory overhead for spectrum users. Most authorise ubiquitous access to commons spectrum, although there are exceptions that limit access to certain classes of use/user (for example, the public safety and emergency response class licence authorising public safety agencies access to the 4.9 GHz band).

Currently, there are 16 class licences in force, which authorise the use of a variety of radiocommunications devices and systems. In Australia, the most widely-used class licences by everyday consumers are the low interference potential devices (LIPD), cellular mobile and radio navigation satellite service (RNSS) class licences. The LIPD class licence authorises the widest range of class-licensed devices, including wi-fi and Bluetooth technologies and a range of IoT services, along with a range of other uses including certain spread spectrum and ultra-wideband transmitters. The LIPD class

[20] M Cave and W Webb, *Spectrum Management*, Cambridge University Press, Cambridge, 2015.

licence is reviewed regularly, with the most recent variation coming into force in March 2021.

In many class-licensed bands, particularly those included in the LIPD class licence, use of the spectrum is on an uncoordinated basis and co-existence with other mechanisms are implemented via technical and operational conditions on device use, and, in some cases, network or system design considerations. In such bands, protection of individual devices from interference cannot be guaranteed. This relatively low level of interference protection means that these bands are not useful for all applications – though in some cases, system engineering approaches can improve the utility of these bands for uses not immediately associated with a low interference protection environment. This is balanced by the high degree of flexibility that is possible in the use of these class-licensed bands.

This flexibility, and the absence of licensing taxes and charges, has enabled massive innovation both in technology use and deployment approaches in some class-licensed bands. Relevant examples are the 2.4 GHz (2400–2483.5 MHz) and 5 GHz (various parts of 5150–5875 MHz) bands that are class licensed and used for RLANs, especially wi-fi.

Wi-fi devices now carry approximately half of all global Internet Protocol (IP) traffic[21], with wi-fi networks almost ubiquitous in homes and businesses along with many public spaces. We are currently investigating possible changes to class-licensing arrangements in Australia in the existing 5 GHz and 6 GHz bands for RLAN use, having recently made the lower 500 MHz of the 6 GHz band available for this purpose. These changes would provide spectrum to accommodate next generation wi-fi devices and allow for the increasing traffic being carried over wi-fi networks.

We will continue to review class-licensing arrangements to assess whether regulatory settings can be changed to support new technologies, including RLANs such as wi-fi. Considerations will include whether more spectrum is required and if changes to existing arrangements are necessary. For example, we can consider whether existing class licence conditions, such as power levels and other operating conditions (for example, indoor use limitations in some frequency ranges), should be reviewed.

As noted, class licences do not involve licence taxes and charges; therefore, where appropriate, a transition to class licensing can be a deregulatory initiative. We recently reviewed non-assigned amateur and outpost licensing arrangements and concluded that a transition from apparatus to class licensing was suitable. The amateur service is a longstanding and valued user of the radiofrequency spectrum and is designed primarily to facilitate hobby radiocommunications and technical experimentation. Given that there are over 15,000 licensed amateurs in Australia, the transition to class licensing is expected to be a substantial reduction in regulatory burden.

Spectrum for government use and innovative applications

Many public service provisions require the use of spectrum, with key government spectrum users incorporating Commonwealth and state agencies responsible for defence, national security, law enforcement, safety and emergency services. Scientific, meteorological and transport services also have unique spectrum needs.

Government spectrum users typically operate within the same spectrum management framework as other users, although there are occasions where government spectrum needs require additional considerations and regulatory arrangements. For example, a

[21] Cisco, Cisco Annual Internet Report (2018–2023) White Paper, 2020, accessed April 2020.

significant portion of Defence spectrum access is authorised under Defence apparatus licences, which can be issued in bands with certain footnotes ascribed in the Table of Allocations in the Australian Radiofrequency Spectrum Plan 2021 (ARSP). These are commonly termed 'Defence bands'. Similarly, bands accessed by Airservices Australia used for internationally-harmonised aeronautical communications, navigation and surveillance services are set aside through ARSP footnotes.

NEW The ACMA works closely with the Department of Defence's Chief Information Officer Group to ensure its ongoing access to spectrum to support a range of key capabilities. Defence's spectrum requirements are closely tied to its response to Australia's changing strategic environment. The 2016 Defence White Paper set out 6 drivers shaping that environment, which were subsequently reinforced and updated as part of the 2020 Defence Strategic Update.[22]

The drivers include strategic competition in our region, the potential for actions that could undermine stability in the Indo-Pacific and our immediate region, the need for increased reliance on sovereign capability development due to supply chain disruptions arising from COVID-19, and an increasing role for Defence in providing humanitarian assistance and disaster relief both domestically and in our region. There is also growing emphasis on non-traditional capabilities such as cyber, autonomous systems and more advanced sensors, which are driving demand for Defence access to spectrum.

A range of future satellite- and land-based joint command, control, communications and electronic warfare capabilities do (or will) rely heavily on access to, and effective use of, spectrum. In particular, the success of a number of current and future acquisitions such as nuclear-powered submarines, Hunter Class frigates, Arafura Class Offshore patrol vessels, F-35A Lighting II Joint Strike Fighters and EA-18G Growler Electronic Attack aircraft will be highly dependent on securing adequate access to spectrum.

We also work with Commonwealth and state-based law enforcement and emergency services bodies to accommodate their critical, and often unique, spectrum needs. For example, our review of the banned equipment and exemptions framework allows us to ensure the effectiveness of the framework in an environment that is increasingly characterised by rapid technological change.

Our new innovation and industry development exemption framework facilitates research and development, domestic manufacturing and commercial opportunities involving equipment that is otherwise banned. The framework is designed to benefit the Australian defence industry and technology sectors that supply specialist capability to law enforcement, Defence, and other government agencies.

The continuing interest in deploying drones across private, commercial and government uses has rapidly expanded the growth potential of the urban air mobility sector using electric vertical take-off and landing aircraft (eVTOL, or air taxis). We continue to monitor developments in this sector and are exploring new ways of addressing current and future challenges associated with new and changing capabilities of radiocommunications devices and the operation of those devices by a wide range of users.

[22] The recently announced Defence Strategic Review will help Defence to better understand where it should prioritise investment.

Part 2: 2022–23 annual work program

Part 2 provides information about the spectrum management work program that will be the ACMA's focus over 2022–23.

Overview

In Part 1, we discussed the medium- and longer-term pressures shaping and informing the overall demand environment for spectrum. We also discussed technology advances that enable us to harness higher spectrum bands. In response to these influences, we have developed our detailed annual work program.

Our work program supports the evolution of technical frameworks that encourage more efficient technologies within an existing use. Over time, adjustments to technical frameworks have freed up additional spectrum for new uses or new spectrum users. This year's detailed annual work program also identifies bands and frequencies where we are updating and optimising technical frameworks to support more efficient technologies and spectrum use.

Work program activities are grouped under the following headings in accordance with the ACMA's spectrum management functions and powers:

- band planning and forward allocation
- optimising established planning frameworks
- licensing and licensing systems
- pricing
- compliance
- international engagement.

The planned timelines are subject to change. We are continually monitoring factors that may impact spectrum management, including any short-term changes in spectrum demand, technological developments, government priorities and available resourcing.

In setting our spectrum management priorities, we consider a range of relevant matters, including:

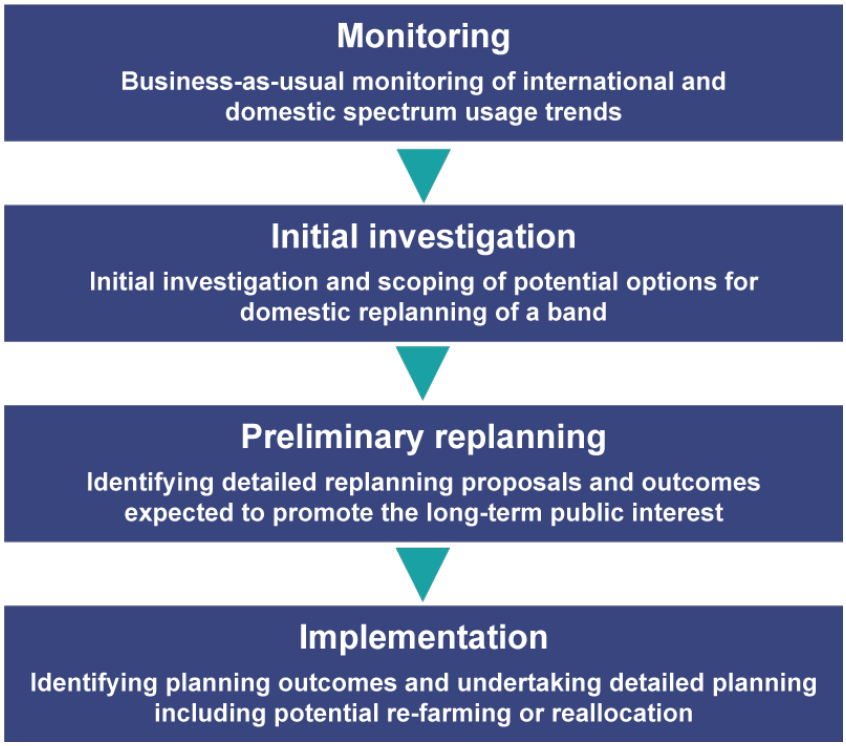
- domestic and international trends in spectrum uses
- developments in international spectrum harmonisation and technology standardisation
- evolution of communications technology
- the lowest cost and least restrictive approach to achieve policy objectives
- feedback received through consultation with stakeholders.

Band-planning and forward spectrum allocations

Band-planning activities support the establishment of new spectrum uses.

In establishing new planning frameworks, we consider bands at 4 distinct stages: *monitoring*, *initial investigation*, *preliminary replanning* and *implementation*. These are shown in Figure 2.

Figure 2: Four stages in spectrum management band planning



A band's possible progression through each stage will depend on a range of factors and, in some cases, may move 'backwards' if consultation processes, information gathering, or work-program prioritisation suggest this is appropriate. Similarly, bands may 'jump' stages if circumstances warrant doing so. There is also no set period a band must remain at a particular stage. Timing of any progression is based on the circumstances at hand and not on any predetermined cadence.

In addition, only a relatively small number of bands are subject to active consideration (that is, being considered beyond the monitoring stage) under this process at any one time – most spectrum is subject to a relatively stable environment that does not necessitate replanning considerations.

In order to mitigate a large source of costs of replanning, when considering replanning options, we seek where possible to identify alternative bands or alternative arrangements within the same band for incumbents.

The 4 stages of band planning provide thorough consultation opportunities for stakeholders to keep us apprised of developments and issues in various bands, and to inform us of their views and the effects of different options on incumbent and potential

new services. The consultation process at each stage allows us to be transparent about our approach to planning arrangements in each band, and to be sufficiently informed of the costs and benefits of a particular planning proposal.

Throughout Part 2, we indicate our project priorities and when we plan to consult. In the summary of upcoming consultations at the end of the FYSO, we detail a new consultation approach we plan to adopt for some forthcoming consultation processes.

Table 1 summarises the proposed band planning activities for 2022–23.

Table 1: Band-planning activities

Planning stage	Frequency band/s	Priorities and proposed timelines
Monitoring	600 MHz (617–698 MHz) 3.3 GHz (3300–3400 MHz) CHANGE 4.0 GHz (4400–4990 MHz) 13 GHz (12.75–13.25 GHz) 40 GHz (37–43.5 GHz) 46 GHz (45.5–47 GHz) 47 GHz (47.2–48.2 GHz) Bands being studied under WRC-23 agenda items 1.2 and 1.4	Continue to monitor domestic and international developments in these bands to identify usage trends
Initial investigation	1.5 GHz (1427–1518 MHz) and Extended mobile satellite service (MSS) L-band (1518–1525 MHz and 1668–1675 MHz)	We will review these 2 bands simultaneously. Q1 2023: decision on whether to move to preliminary replanning stage and options paper
	1.9 GHz (1880–1920 MHz)	CHANGE Q3/4 2022: decision on whether to move to preliminary replanning stage and options paper (which will include review of the frequency band plan)
	2300–2302 MHz	Not scheduled for 2022–23
	5030–5091 MHz	Continue to monitor development of draft ITU recommendation that specifies the characteristics of terrestrial air-ground links operating in the aeronautical mobile radiocommunication service in this band

Planning stage	Frequency band/s	Priorities and proposed timelines
	6 GHz (5925–7125 MHz)	Continue to monitor other relevant developments to inform further decisions on use of the upper 6 GHz band, and on the use of higher power RLAN class licensed devices and possible support for non-RLAN class licensed devices
Preliminary replanning	There are no projects currently in this stage.	
Implementation	850 MHz expansion band (814–825 MHz and 859–870 MHz)	Band is being cleared progressively ahead of spectrum licence commencement on 1 July 2024
	1800 MHz (1710–1785 MHz and 1805–1880 MHz) in remote areas	Q3/Q4 2022: discussion paper Q4 2022–Q1 2023: implement decisions through appropriate changes to RALIs
	2 GHz (1980–2010 MHz and 2170–2200 MHz)	CHANGE Q3/4 2022: develop technical and regulatory arrangements to support MSS (including complementary ground component) use in 1980–2005/2170–2195 MHz CHANGE Q1/2 2023: consult on proposed arrangements
	3400–3575 MHz	CHANGE Q3 2022: decision on whether to make a re-allocation declaration for the 3.4 GHz and 3.7 GHz bands Work to develop arrangements for the allocation of apparatus and spectrum licences in the 3400–3575 MHz band will be combined with similar work in the 3700–4200 MHz band Allocation timeframes are also tied to those of the 3700–4200 MHz band
	3700–4200 MHz	CHANGE Not before Q4 2022: allocation in remote areas Q4 2022–Q4 2023: development of proposed arrangements for areas other than remote

Monitoring stage

The *monitoring* stage consists of business-as-usual monitoring of international and domestic spectrum-related developments. At this stage, we maintain 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 us appraised of relevant developments and issues.

In general, bands and issues included at the monitoring stage represent potential work items beyond our immediate detailed annual work program. Importantly, not every band being monitored will subsequently be considered in detail.

600 MHz (617–698[23] MHz)

The 600 MHz band is currently used by digital television services in Australia and is available for some services under the LIPD class licence.

Current television channel arrangements include spectrum both inside and outside of the 600 MHz band and would require a further restack (sometimes referred to as a 'second digital dividend') to yield a contiguous block of spectrum in the 600 MHz range. The sixth channel is currently available in most areas for trials of more advanced digital television technology. We note previous trials of DVB-T2 technologies conducted in 2018 and 2019 and will continue to support industry-driven initiatives for trials of the new television transmission technologies in the future.

Recent developments

In December 2019, an operator in the US was the first to deploy a 5G service in the band.[24]

In 2019, Canada issued licences for use of the 600 MHz band. Mexico recently announced its plan to auction spectrum in the 600 MHz band this year for use by WBB, including 5G.[25]

In addition, the Radio Spectrum Policy Group (RSPG) of the European Commission (EC) has provided a long-term strategy for the future of the UHF band, 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

[23] This lower boundary (617 MHz) is based on the bottom edge of the 2 × 35 MHz plan identified for the US600 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.
[24] T-Mobile, T-Mobile 5G: It's On! America's First Nationwide 5G Network Is Here, December 2019, accessed April 2020.
[25] Mobile World Live, Mexico pencils in 5G spectrum auction for 2022, February 2022, accessed February 2022.

on a secondary basis. This outcome is reflected in the EC's inception assessment, but a final decision is still pending.

WRC-23 agenda item 1.5 will review spectrum use and needs of existing services in the frequency band 470–960 MHz in Region 1 and consider possible regulatory actions in the frequency band 470–694 MHz in Region 1 on the basis of the review, in accordance with Resolution 235 (WRC-15).

Recommendation ITU-R M.1036 was recently amended to include frequency arrangements for the implementation of the terrestrial component of IMT in the 600 MHz band.

There has also been some recent interest within the Asia–Pacific Region for variations to the 2 × 35 MHz US band plan. The Asia-Pacific Telecommunity (APT) Wireless Group (AWG) is currently studying candidate band plans that will ultimately form the basis of an APT recommendation on regional frequency arrangements in the band.

We are conducting technical research that will support possible future work on television channel replanning and licensing.

The television broadcasting spectrum in Australia is also used by various forms of white space devices[26], most notably wireless audio devices such as wireless microphones. White space devices would also need to be relocated from the 600 MHz band to achieve a dividend. This would require a transitional program similar to that used during the 700 MHz dividend.

Next steps

The ACMA's technical research work will provide inputs for both government and industry regarding a possible future digital dividend, by:

- exploring television channel planning and licensing approaches that could be used when developing television restack channel plans in the future
- providing evidence about television receiver performance and viewer antenna deployments in complex reception environments, relevant to potential technical and consumer impact issues.

We will continue to engage with industry and government and monitor international developments.

[26] White space devices operate in 'white spaces' where, in order to avoid interference between television services, some spectrum is not used in a geographic area for television services. These 'white spaces' can be used for some forms of low power services that can co-exist with adjacent television services.

3.3 GHz (3300–3400 MHz)

The 3.3 GHz band is currently allocated in the ITU Radio Regulations (RRs) on a primary basis to the radiolocation service worldwide. In Australia, this band is designated to be used principally for defence and national security, as described in footnote AUS101A of the ARSP. The Department of Defence is normally consulted in considering non-defence use of this service. At WRC-15, the 3.3 GHz band was identified for IMT by several countries. Recommendation ITU-R M.1036 includes frequency arrangements for the implementation of the terrestrial component of IMT in the 3.3 GHz band with some implementation aspects included.

Recent developments

The band is the subject of WRC-23 agenda item 1.2 within regions 1 and 2. This agenda item will consider identifying the band for IMT in more countries within those regions. Over the past few years, there has been increasing interest in this band, with numerous countries in Asia, South America and the Middle East planning to or having assigned spectrum in the band for WBB.[27]

Next steps

We will continue to monitor developments in this band.

4.0 GHz (4400–4990 MHz) CHANGE

The 4400–4500 MHz band is currently allocated in the RRs on a co-primary basis to fixed and mobile services worldwide, while the 4500–4800 MHz band also includes an allocation for the fixed-satellite service (FSS). In Australia, these bands are designated to be used principally for defence and national security as described in footnote AUS101 of the ARSP. The Department of Defence is normally consulted in considering non-defence use of spectrum in the 4400–4800 MHz band.

The 4800–4990 GHz band is currently allocated in the RRs on a primary basis for fixed and mobile services in Australia. In Australia, the fixed and mobile services in this band are designated to be used principally for defence and national security purposes, as defined in footnote AUS101A of the ARSP. The Department of Defence is normally consulted in considering non-defence use of these services. The 4950–4990 MHz part of the band is also allocated to the radio astronomy service on a primary basis under footnote 443 of the ARSP.

There is some interest domestically from mobile network operators as well as from wireless internet service providers and other FWA operators in pursuing this band for WBB in Australia. However, we are not aware of any significant interest in this band by regional bodies, such as the European Conference of Postal and Telecommunications Administrations (CEPT), the Inter-American Telecommunication Commission or the APT.

Several countries, including Australia, have implemented arrangements in the 4940–4990 MHz band for public safety, defence and national security purposes. This was

[27] Global mobile Suppliers Association, Mid-band Spectrum – October 2021 – Member Report, October 2021, accessed January 2022.

originally intended to principally support high-speed localised coverage for an incident or event, however, the inclusion of the band in 3GPP standards for 5G technologies means that it may be suitable for wider-area high-speed broadband public safety applications. The Radiocommunications (Public Safety and Emergency Response) Class Licence 2013 (the PSER class licence) sets arrangements for the use of this band.

Recent developments

Over the past few years, there has been increasing interest in this band. Japan has made the 4500–4600 MHz band available for WBB and is considering allocating spectrum in the 4600–4900 MHz band as well. Brazil, China, Russia, Singapore and Vietnam are also considering all or part of the 4400–5000 MHz band for WBB use.[28] There is some interest from domestic WBB users in pursuing this band for that use in Australia.

Recommendation ITU-R M.1036 on frequency arrangements for implementation of the terrestrial component of IMT in the bands identified for IMT in the RRs was recently updated. It now includes arrangements for the 4800–4990 MHz band.

China, Japan, Nigeria, Korea and Taiwan plan to or have assigned spectrum in the 4800–5000 MHz band for WBB use. Brazil, China, Myanmar, Russia, Singapore and Vietnam are also considering all or part of the broader 4400–5000 MHz band for WBB use.[29]

Separately, the 4940–4990 MHz band is included in IEEE standard 802.11y Public Safety Wireless Local Area Network (WLAN) and has also been included in 5G standards (3GPP band n79), which may enable public safety agencies in Australia to deploy their own 5G capabilities under the PSER class licence.[30]

Co-existence between IMT and aeronautical use of the 4800–4990 MHz band at national borders is being studied as part of WRC-23 agenda item 1.1.

Next steps

We will continue to monitor developments in this band.

13 GHz (12.75–13.25 GHz)

The 13 GHz band has primary allocations in the RRs for fixed, fixed-satellite (earth-to-space) and mobile services in Australia. In accordance with footnote 441 of the ARSP, the use of this band by geostationary-satellite systems in the FSS must be in accordance with the provisions of Appendix 30B.

In Australia, there are currently arrangements in place to support fixed point-to-point (PTP) services and television outside broadcast (TOB) services in this band. There are over 2200 PTP links licensed in the band and 4 Australia-wide licences for TOB, as well as a single licence covering Western Australia.

[28] Global mobile Suppliers Association, National Spectrum Positions: Spectrum from 4400 MHz to 5000 MHz, January 2022, accessed January 2022.
[29] Global mobile Suppliers Association, National Spectrum Positions: Spectrum from 4400 MHz to 5000 MHz, January 2022, accessed January 2022.
[30] The FCC recently halted the implementation of a new leasing framework that would grant states the option to facilitate spectrum access by a range of entities not limited to public safety. It is currently reviewing the use of the band.

Recent developments

The band is the subject of WRC-23 agenda item 1.15.

Next steps

We will continue to monitor developments in this band.

40 GHz (37–43.5 GHz)

The 40 GHz band has primary allocations in the RRs for a range of services across different portions of the band. These include space research, fixed, mobile, mobile satellite and FSS in Australia. Some of the footnotes in the ARSP that apply to the 40 GHz band include:

- footnote 516B, which identifies different portions of the band in regions 1, 2 and 3 for use by high-density FSS applications
- footnote 547, which identifies the 37–40 GHz and 40.5–43.5 GHz bands for use by high-density applications of the fixed service
- footnote AUS87, which identifies several radio astronomy facilities that use the 40 GHz band to conduct passive observations
- footnote AUS101, which states the 37–37.5 GHz band is designated to be used principally for defence and national security. The Department of Defence is normally consulted in considering non-defence use of this service.

In Australia, there are currently arrangements in place for PTP use of the 37.5–39.5 GHz band.

Recent developments

At WRC-19, the 40 GHz band was identified globally for IMT. In December 2019, the US auctioned licences in the 37.6–38.6 GHz, 38.6–40 GHz and 47.2–48.2 GHz frequency ranges to support 5G.

The European Communications Commission (ECC) has commenced activities to develop an ECC decision on fixed/mobile WBB harmonisation in the 40.5–43.5 GHz band.[31] The target date for completion of this work is November 2022.

As a result of these developments, it is likely a viable equipment ecosystem could develop for fixed and mobile broadband systems in this band. We are also aware of interest from the satellite industry for access to this band. This may include uncoordinated class licence and coordinated earth station use.

Next steps

We will continue to monitor developments in this band.

[31] European Conference of Postal and Telecommunications Administrations (CEPT), Mandate to CEPT to develop least restrictive harmonised technical conditions suitable for next-generation (5G) terrestrial wireless systems for priority frequency bands above 24 GHz, accessed March 2021.

46 GHz (45.5–47 GHz)

The 46 GHz band has primary allocations in the RRs for mobile, mobile satellite, radionavigation and radionavigation satellite services in Australia. Some of the footnotes in the ARSP that apply to the 46 GHz band include:

- footnote 62, which indicates that parts of the band might be used in the future for defence
- footnote AUS87, which identifies several radio astronomy facilities that use the 46 GHz band to conduct passive observations.

In Australia, there are currently no formal arrangements for any services in the band.

Recent developments

At WRC-19, more than 50 countries (mainly from Region 1) identified the 46 GHz band for IMT.

Next steps

We will continue to monitor developments in this band.

47 GHz (47.2–48.2 GHz)

The 47 GHz band has primary allocations in the RRs for fixed, mobile and FSS in Australia. Footnote AUS87 in the ARSP identifies several radio astronomy facilities that use the 47 GHz band to conduct passive observations.

In Australia, there are currently no formal arrangements for any services in the band.

Recent developments

At WRC-19, Region 2 and 68 other countries in regions 1 and 3, including Australia, identified the 47 GHz band for IMT.

In December 2019, the US commenced an auction for licences in the 37.6–38.6 GHz, 38.6–40 GHz and 47.2–48.2 GHz frequency ranges to support 5G.

We are also aware of interest from the satellite industry for access to this and the adjacent 48.2–50.2 GHz and 50.4–52.4 GHz bands. This may include uncoordinated class licence and coordinated earth station use. Consequently, we will consider including these bands in any future review of the 47 GHz band.

Next steps

We will continue to monitor developments in this band.

Bands being studied under WRC-23 agenda items 1.2 and 1.4

CHANGE WRC-23 agenda item 1.2 considers identification of the frequency bands 3300–3400 MHz (Regions 1 and 2 only), 3600–3800 MHz (Region 2 only), 6425–7025 MHz (Region 1 only), 7025–7125 MHz (globally) and 10.0–10.5 GHz (Region 2 only) for IMT, including possible additional allocations in the RRs to the mobile service on a primary basis. This agenda item is widely acknowledged to be focusing on spectrum harmonisation requirements for 5G WBB technologies.

WRC-23 agenda item 1.4 considers the use of high-altitude platform stations as IMT base stations (HIBS) in the mobile service in certain frequency bands below 2.7 GHz already identified for IMT, on a global or regional level.

Recent developments

Working Party 5D has been identified as the responsible party for conducting work under these agenda items. Work on these issues has commenced.

Next steps

We will continue to engage with stakeholders via the usual international preparatory process to develop Australian positions on WRC-23 agenda items 1.2 and 1.4. Developments in Europe and other regions and countries (such as the US) will be monitored.

Initial investigation stage

The *initial investigation* stage normally includes consideration and scoping of potential options for domestic replanning of a band. Triggers that influence when a band moves from monitoring to initial investigation include international spectrum harmonisation, technology standardisation, developments in other countries, the existing domestic spectrum environment and domestic demand drivers.

This stage normally includes initial consideration of whether the new spectrum use/s would contribute to promoting the long-term public interest derived from the use of the spectrum, along with preliminary assessments on co-existence and other technical considerations.

Formal public consultation may occur through mechanisms including public industry meetings (such as spectrum tune-ups) and/or discussion papers.

1.5 GHz (1427–1518 MHz)

At WRC-15, all of the 1.5 GHz band was harmonised for IMT within ITU regions 2 and 3, while ITU Region 1 identified 1427–1452 MHz and 1492–1518 MHz via regional footnotes. In ITU Region 1, identification of the 1452–1492 MHz range was limited to African and Arab administrations – CEPT did not identify this band due to disagreement over the protection of aeronautical mobile telemetry services.

Domestically, the impact on aeronautical telemetry services and fixed services, including the digital radio concentrator system, will need to be considered in any replanning process.

As referred to in Resolution 223 (Rev. WRC-15), some satellite industry representatives have also pointed out that compatibility with MSS operating above 1518 MHz will need to be considered.

There is support domestically from WBB representatives for progressing the re-farming of this band.

Recent developments

WRC-19 agenda item 9.1.2 considered the compatibility of IMT and broadcasting-satellite service (BSS) (sound) in the frequency band 1452–1492 MHz in regions 1 and 3 as detailed in Resolution 761 (WRC-15). This resolution invited the ITU-R to conduct the appropriate regulatory and technical studies in time for WRC-19, with a view to ensuring the compatibility of IMT and the BSS (sound) in the frequency band 1452–1492 MHz in ITU regions 1 and 3, considering IMT and BSS (sound) operational requirements.

At WRC-19, it was decided to retain and modify Resolution 761 (WRC-19) to define restrictions and coordination triggers on BSS (sound) to protect IMT. Limits on IMT emissions near country borders were also introduced.

Recommendation ITU-R M.1036 was updated to include frequency arrangements for implementation of the terrestrial component of IMT in the 1.5 GHz band. This includes a note to indicate studies are still being conducted in accordance with Resolution 223 (Rev.WRC-15) to provide possible technical measures to facilitate adjacent band compatibility. This work is underway in Working Party 5D and may result in a revision to the frequency arrangements in Recommendation ITU-R M.1036.

CHANGE The Asia–Pacific Telecommunity Wireless Group (AWG) finalised its report on frequency arrangements for the 1.5 GHz band at AWG-29, held in March 2022. The report provides relevant information for administrations considering the possible implementation of IMT in the band.

As co-existence with possible MSS use above 1518 MHz is likely to be a substantial consideration, the simultaneous review of the extended MSS L-band and the 1.5 GHz band is considered appropriate. We released an initial discussion paper in Q2 2022.

Next steps

We will continue to monitor and engage with stakeholders to develop Australian positions on studies under Resolution 223 (Rev. WRC-15) and Resolution 761 (WRC-15), and other international issues related to the 1.5 GHz band, such as possible new band plans. Stakeholders have also indicated interest in the band for private LTE networks, subject to equipment availability.

Pending a review of submissions to the consultation paper, we will decide whether to proceed to the preliminary replanning stage and, if so, release an options paper in Q1 2023.

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

In Australia, channel planning arrangements are in place to support use of the band by fixed service digital radio concentrator systems.

Recent developments

WRC-03 and WRC-07 allocated additional spectrum in the RRs to the MSS to complement existing L-band allocations used by numerous satellite operators.

The upper and lower frequency ranges also have mobile and fixed allocations in the RRs, while the upper band also has various meteorological, radio astronomy and space research service allocations.

The discussion above on WRC-19 developments in relation to the 1.5 GHz band is also relevant here. We will undertake a simultaneous review of the extended MSS L-band and the 1.5 GHz band, noting the co-existence with potential broadband use below 1518 MHz is likely to be a substantial consideration.

Next steps

We recognise the need to review planning arrangements in these bands to identify the spectrum use or uses that would promote the overall long-term public interest and, if appropriate, we may vary spectrum management arrangements in support. Timing on a decision about progressing to the next planning stage and the related options paper is the same for the 1.5GHz band.

1.9 GHz (1880–1920 MHz)

The 1.9 GHz band is allocated in the ARSP to fixed and mobile services on a primary basis. There are arrangements in place for Digitally Enhanced Cordless Telecommunications (DECT) technology under the Radiocommunications (Cordless Communications Devices) Class Licence 2014 in the 1880–1900 MHz range and PTP and point-to-multipoint (PMP) licensing in the 1900–1920 MHz range in regional and remote areas. We are also aware of wireless microphone use of the 1880–1900 MHz band (using DECT).

While the band is identified internationally for IMT by the ITU, to date, domestic use for WBB services has been low.

Recent developments

The establishment of MulteFire technology, the standardisation of DECT-2020 new radio (DECT-2020 NR) and the European review of the 1900–1910 MHz band for future railway mobile communication system[32] are all driving increased interest in the band.

The ITU-R has included the DECT-2020 NR standard in its IMT-2020 technology recommendation ITU-R M.2150. Developed in October 2021 by the European standards body ETSI, it is the first non-cellular 5G standard to be included in the IMT Recommendation by the ITU-R.

The ACMA is aware of interest in expanding DECT arrangements into the 1900–1920 MHz band and expanding PMP licensing arrangements into the 1880–1900 MHz band. Noting this interest and recognising that arrangements have been in place for the 1880–1900 MHz range for some time, we released a discussion paper in Q4 2021 exploring the future use of the band.

Next steps

Pending review of submissions to the discussion paper, we will decide whether to proceed to the preliminary replanning stage and, if so, consult on associated options in Q3/4 2022. This work will include review of the 1900–1920 MHz Frequency Band Plan 2012, which is due to sunset on 1 April 2023.

[32] UIC, Future railway mobile communication system, accessed February 2022.

2300–2302 MHz

The 2300–2302 MHz band is allocated in the ARSP to the fixed and mobile services on a primary basis and amateur services on a secondary basis. It is currently used by amateur services. The adjacent 2302–2400 MHz (2.3 GHz) frequency range has been subject to spectrum licensing since the year 2000.

Recent developments

The 2300–2400 MHz band was identified globally for IMT at WRC-07. The 2.3 GHz band is currently being used to provide WBB services across Australia. The most spectrally efficient profile bandwidths for internationally standardised WBB equipment are in multiples of 5 MHz.

In addition, carrier aggregation and emerging 5G technologies will allow operators to deploy services in bandwidths of up to 100 MHz. The current 98 MHz of spectrum available in the 2.3 GHz band is not optimised for this use. Consequently, there is interest from spectrum licensees in the 2.3 GHz band in making the 2300–2302 MHz band available for WBB use.

Next steps

Recognising competing interests for use of the 2300–2302 MHz band from incumbent and new services, we have moved it to the initial investigation stage and will reassess its timing priority in FYSO 2023–28. Any review will necessarily consider the interests of incumbent amateur services and the importance of the band for activities such as earth-moon-earth operations.

5030–5091 MHz

At WRC-12, the 5030–5091 MHz band was identified for use by line-of-sight (LoS) and beyond line-of-sight (BLoS) remotely piloted aircraft systems (RPAS) command and control radio links (known as control and non-payload communication, or CNPC) in the RRs. LoS and BLoS CNPC equates to terrestrially and satellite-based control of RPAS, respectively.

Excluding Defence use, RPAS operating in non-controlled airspace currently use technologies predominantly authorised under the LIPD class licence for both CNPC and payload communications. In controlled airspace, however, operation of remotely piloted aircraft is far more heavily regulated, and systems authorised under the LIPD class licence may not have the level of protection from interference required for safety-critical control links.

The band is being considered internationally as a potential candidate for CNPC in controlled airspace, although consideration of LoS arrangements is more advanced than for BLoS.

Recent developments

The International Civil Aviation Organisation expects to finalise the standards and recommended practices for RPAS CNPC in 5030–5091 MHz in 2022. The ITU-R is also currently reviewing a draft new recommendation that specifies the characteristics of terrestrial air-ground links operating in the aeronautical mobile radiocommunication service in the band.

The US is currently in the final stages of establishing regulatory arrangements for use of the band by LoS RPAS CNPC operating in controlled airspace, while some countries in Europe and the Asia–Pacific are also currently considering implementation of the WRC-12 outcomes.

Acknowledging domestic and international momentum in this space, we commenced a consultation process in 2021 on international trends in the 5030–5091 MHz band. We recently published a summary of submissions to that consultation, along with arrangements to allow temporary access to part of the band (5055–5065 MHz) for LoS RPAS CNPC links. These interim arrangements will be in place while we await finalisation of relevant work within the ITU-R on band planning.

Next steps

We will continue to monitor the progress of the ITU draft recommendation through our participation in ITU-R Working Party 5B meetings. A detailed paper setting out options for more permanent arrangements will be released when international arrangements are sufficiently mature. The timeframe for elevation of this frequency band to preliminary replanning status is dependent on the completion timeframe of relevant ITU-R studies.

It should be noted that our role in enabling CNPC operation in the band is confined to making licensing arrangements for access to this spectrum. Specific technologies and procedures for safe operation of RPAS are matters for other regulatory agencies, such as the Civil Aviation and Safety Authority and Airservices Australia, and any arrangements in the band will be developed in consultation with those agencies.

Consideration of BLoS CNPC arrangements using other bands is ongoing within the ITU-R (and is the subject of a WRC-23 agenda item). Noting the lack of progression on these arrangements relative to LoS CNPC internationally, BLoS CNPC was not within the scope of our Q1 2021 discussion paper. We will continue to monitor developments and may consider consulting on arrangements if or when international momentum warrants us doing so.

6 GHz (5925–7125 MHz)

There is significant interest in ongoing international developments in the 6 GHz band

The FCC and the CEPT recently implemented changes to the 6 GHz band aimed at enabling the use of next-generation wi-fi (Wi-Fi 6E). Since then, regulators in many other countries have also implemented – or are planning – changes to the band. Parts of the 6 GHz band are also being considered as part of the current WRC study cycle (WRC-23, agenda item 1.2) to identify possible additional spectrum for IMT.

During the WRC-19 study process, several segments of the neighbouring 5 GHz band (5150–5350 MHz and 5725–5925 MHz) were also considered, resulting in changes to the RRs in some parts of those bands, most notably in 5150–5250 MHz.

Arrangements already exist in Australia for RLANs in the 5150–5350 MHz band (for low power indoor use only) and the 5725–5850 MHz band. These 2 bands are also included in the IEEE 802.11 series of standards for RLAN.

There are no arrangements in place for RLANs in the 5350–5470 MHz and 5850–5925 MHz bands in Australia.

Recent developments

In Australia, 5925–6425 MHz (the lower 6 GHz band) was recently made available for use by RLANs. We released a discussion paper in Q2 2021 as part of the initial investigation stage, looking at the state of both the 5 GHz and 6 GHz bands and recent international developments in those bands. A follow-up paper was released in Q4 2021 proposing specific updates to the LIPD class licence that would allow use of the lower 6 GHz band for RLANs. These updates were implemented in Q1 2022.

Next steps

Responses to the 2021 consultations revealed a diverse range of views on preferred use of the upper 6 GHz band – primarily the question of RLAN or IMT use of the band – and the potential use of higher power RLAN devices across the entire 6 GHz band.

This upper portion of the band remains under initial investigation as we continue to monitor developments in the ITU and other international trends, including standardisation of IMT and RLAN technologies. In the meantime, to further inform these considerations, we will endeavour to explore the feasibility of potentially implementing complementary technologies in Australia, such as automatic frequency control (AFC) for managing access by higher power RLAN devices.

Preliminary replanning stage

The *preliminary replanning* stage includes identification of detailed replanning options based on feedback received at the initial investigation stage, along with a detailed consideration of the spectrum uses/s that would promote the long-term public interest. Considerations are informed by detailed technical co-existence studies and include identification of draft, high-level technical planning frameworks. Analysis is undertaken of ongoing incumbent spectrum needs and identification of available mitigations to address any adverse impacts that potential changes in the planning environment may have on incumbent users.

Formal public consultation may occur through mechanisms such as public industry meetings (such as spectrum tune-ups) and/or options papers.

There are no projects currently in the preliminary replanning stage.

Implementation stage

The *implementation* stage is the conclusion of an ACMA band-planning activity and identifies planning outcomes expected to promote the long-term public interest derived from use of the spectrum. This stage includes further development of detailed technical planning frameworks (including further consultation where necessary), and licensing and allocation frameworks, as required. Depending on the nature of the existing use of the band and the outcome of the planning process, this stage could potentially lead to refarming or re-allocation activities.

Conclusions from our planning process are communicated in outcomes (decision) papers that may include decisions on issues within our remit and/or identify preliminary views on future activities subject to further legislative process.

When reviewing or developing technical frameworks that describe technical arrangements for the use of a frequency band, we may establish a technical liaison group (TLG) to assist in the development of those frameworks. Further information on TLGs is available from the ACMA website.

850 MHz expansion band (809–824 MHz and 854–869 MHz)

In November 2015, we released our *Long-term strategy for the 803–960 MHz band* decision paper. A key decision was to make available 2 × 15 MHz of 4G-standardised spectrum for new WBB services from 2024. This spectrum is known as the 850 MHz 'expansion band', which is lower adjacent to the current 850 MHz 3G band used by Telstra and TPG Telecom.

Recent developments

The project is now geared towards the clearance and/or relocation of incumbent services operating in the 850 MHz expansion band frequencies allocated at auction in December 2021 (814–825/859–870 MHz).[33] Spectrum licences in those frequencies commence on 1 July 2024.

As per the Council of Australian Governments (COAG) communique of December 2018, all Australian jurisdictions agreed to a strategic roadmap that sets out a plan to design, implement and operate a public safety mobile broadband (PSMB) service, and to continue to work together to resolve the supporting spectrum arrangements in parallel with the proof-of-concept trial. The Australian Government has set aside 2 × 5 MHz of spectrum at the lower end of the 850 MHz expansion band for a national PSMB capability.

Next steps

We are continuing to clear and/or relocate incumbent services. The decision paper contains an implementation plan detailing milestones for the transition to long-term arrangements by incumbent services.

[33] The auction followed the making of the Radiocommunications (Spectrum Re-allocation—850/900 MHz Band) Declaration 2020 in October 2020.

1800 MHz (1710–1785 MHz and 1805–1880 MHz) in remote areas

In 2016, we released arrangements for use of the 1800 MHz band in remote areas for fixed and mobile WBB services.

Recent developments

We have been monitoring the band and are developing a discussion paper on possible options for the band. Work has been delayed so that we can assess in more detail the impact of changes to the process for setting allocation limits. Feedback from the development of arrangements in other bands will inform allocation limits in this band.

Next steps

We plan to release a discussion paper in Q3/4 2022 to gather feedback on the future of the band. Following this, we expect to implement decisions using appropriate changes to radiocommunication assignment and licensing instructions (RALIs) in Q4 2022 – Q1 2023.

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

The 1980–2010 MHz and 2170–2200 MHz bands are currently used for television outside broadcast (TOB) services on a shared and non-exclusive basis for short-term applications, such as covering special events. TOB was introduced in the 2 GHz band in 2012 on an interim basis.

In January 2021, we released the *Replanning the 2 GHz band (1980–2010 and 2170–2200 MHz)* outcomes paper after considering submissions to the discussion paper, *Planning of the 2 GHz band* in August 2019.

In the outcomes paper, we outlined our decision to replan the 2 GHz band for mobile-satellite services, with:

- 2 × 25 MHz (1980–2005 MHz paired with 2170–2195 MHz) replanned for mobile-satellite services Australia-wide under apparatus licensing arrangements, with:
  - price-based allocation mechanism via auction – this is our preliminary view of the most appropriate mechanism to resolve competing demand, given demand is likely to exceed supply (as expressed in responses to the options paper)
  - arrangements to provide support for terrestrial applications where a mobile-satellite licensee wishes to supplement/extend its mobile-satellite service. For example, extending coverage of a satellite network with terrestrial-based complementary ground component infrastructure or direct air-to-ground communications services (involving ground-based WBB links to aircraft) to provide inflight communication services.
- 2 × 5 MHz (2005–2010 MHz paired with 2195–2200 MHz) dedicated for satellite IoT and similar narrowband services to be used on a shared basis between operators. This arrangement will provide spectrum access with a low barrier to entry for innovative satellite applications and will assist in growing the Australian space industry.

To support introduction of mobile-satellite services, existing TOB services will be required to stop operation. The outcomes paper outlined our preliminary view that a transition period ending 1 March 2026 is appropriate for capital cities, and 1 March 2024 in regional areas where TOB use is minimal.

Recent developments

CHANGE In Q2 2022, we consulted on updates to the 7.2 GHz TOB band provisions in RALI FX3. The updates are intended to better accommodate current digital technology use in this band by existing users, including broadcasters and other TOB operators. The updates are expected to provide more efficient use of the 7.2 GHz band by TOB operators, including those that will need to transition out of the 2 GHz band.

In Q2 2022, we made the Radiocommunications (Television Outside Broadcasting) (2010–2110 MHz and 2200–2300 MHz) Frequency Band Plan 2022, which sets out the transition timelines for when TOB services must stop operating in the bands. In making the Radiocommunications (Mobile-Satellite Service) (1980–2010 MHz and 2170–2200 MHz) Frequency Band Plan 2022, we implemented arrangements for narrowband MSS use in 2005–2010/2195–2200 MHz.

Next steps

CHANGE In Q3/4 2022, we will begin research into the development of technical and regulatory arrangements to support MSS (including complementary ground component) use in 1980–2005/2170–2195 MHz. We will consult on proposed arrangements in Q1/2 2023.

3400–3575 MHz band

We recognise that optimising spectrum and apparatus licence arrangements in the 3400–3575 MHz band, adjacent to the 3.6 GHz band auctioned in 2018, is an important priority. This is expected to result in more efficient use of spectrum and a reduction in deployment costs, supporting the implementation of 5G services in Australia.

We consulted on options for optimising arrangements in the 3400–3575 MHz band in April 2019 and announced the outcomes in November 2019. These included:

- restacking incumbent services to consolidated arrangements
- converting NBN Co Limited's (NBN Co) apparatus licences to spectrum licences, if the minister decided to designate spectrum
- making more spectrum available for PMP apparatus licensing in regional and remote areas
- making more spectrum available for spectrum licensing in regional areas, if the minister decided to designate spectrum
- excising unused urban areas of NBN Co's licences in the band and making them available for use by other WBB operators.

Recent developments

The first step of the optimisation process, the restacking of incumbent services, was finalised on 30 November 2020.

In December 2020, the then minister made the Radiocommunications (Spectrum Designation—3.4 GHz Band) Notice 2020. NBN Co's apparatus licences were subsequently converted to spectrum licences in Q2 2021. Work to defragment NBN Co's and Optus's 3.4 GHz spectrum licence holdings, as far as possible, was finalised in Q3 2021.

In September 2021, NBN Co surrendered its urban excise licence, and we opened a consultation to explore options for the use of this spectrum for WBB services in urban excise areas. In December 2021, we published an outcomes paper. To ensure the best long-term outcomes are adopted, we decided that more time is required so this issue can be considered in the context of work underway across the broader 3.4–4.0 GHz band.

We consulted on options for use of the 3400–3475 MHz band in urban excise areas, combined with a consultation on making one or more re-allocation declarations for the issue of spectrum licences in defined areas and frequencies of the 3400–3575 MHz and 3700–3800 MHz bands in Q1 2022. A spectrum tune-up on 3.4–4.0 GHz-related issues was also held in Q1 2022.

Next steps

CHANGE We plan to finalise decisions surrounding the proposed re-allocation declaration in the 3.4 GHz and 3.7 GHz bands in Q3 2022. We will combine work on developing arrangements for apparatus-licensed WBB services and releasing new spectrum for spectrum licensing in the 3.4 GHz band with similar work in the 3700–4200 MHz band. This will include the release of spectrum in urban excise areas. We will also consider the best way to make any spectrum available and the timing of any release.

See the 'Forward allocation workplan' below for allocation of specific parts of the overall 3400–3575 MHz band in conjunction with similar decisions in the 3700–4200 MHz band.

3700–4200 MHz

The 3700–4200 MHz band is currently allocated on a co-primary basis in the ARSP to the fixed, fixed satellite (space-to-earth) and mobile services.

Optimal use of the 3700–4200 MHz band has been debated internationally for several years. Recently, there has been increasing interest in the lower and lower-adjacent parts of this band for 5G and other WBB services, particularly given the large bandwidths potentially available in this range.

We are aware of the needs of existing fixed satellite and PTP uses of the band, as well as the potential for both wide-area and site-based WBB (for example, FWA). Considering the whole band simultaneously will maximise the opportunity for balanced approaches that account for all interests.

The proposed decisions in the January 2021 outcomes paper provide certainty of access to FSS in the 3800–4200 MHz range Australia-wide. Access to all of the 3700–4200 MHz band is maintained at the Earth Station Protection Zones (ESPZs).

Recent developments

In the US in January 2021, the FCC auctioned the 3700–3980 MHz segment of the band for 5G (that is, WBB) use, preserving the 4000–4200 MHz segment for FSS.

The Canadian spectrum regulator, ISED, announced in May 2021 decisions on the technical and policy framework in the 3650–4200 MHz band. This included changes to introduce 5G services in the range 3700–3980 MHz and preserving FSS use in 4000–4200 MHz.

Saudi Arabia also announced their intended approach to the band in January 2021 as part of their *Spectrum Outlook for Commercial and Innovative Use 2021- 2023* paper. This included near-term (2021) allocation of 3800–4000 MHz for mobile or FWA uses.

In January 2021, we released an outcomes paper describing the future uses of the 3700–4200 MHz band. We propose to reallocate 3700–3800 MHz to exclusive wide-area WBB in metropolitan and regional areas, and introduce local-area WBB services on a shared basis in remote areas in 3700–3800 MHz and Australia-wide in 3800–4000 MHz. Arrangements in the 4000–4200 MHz segment are not proposed to change.

We are aware of the needs of existing fixed satellite and PTP uses of the band, as well as the potential for both wide-area and site-based WBB (for example, FWA). Considering the whole band simultaneously will maximise the opportunity for balanced approaches that account for all interests.

The proposed decisions in the January 2021 outcomes paper provide certainty of access to FSS in the 3800-4200 MHz range Australia-wide. Access to all of the 3700–4200 MHz band is maintained at the Earth Station Protection Zones (ESPZs).

It was also signalled in the outcomes paper that the apparatus-licensing framework for 3700–4000 MHz in remote areas could be aligned with the apparatus-licensing framework in 3400–3700 MHz, enabling an allocation of 3400–4000 MHz in remote areas.

We have begun the next steps as outlined in the outcomes paper. A TLG was formed in July 2021 to develop technical frameworks for both spectrum licensing and apparatus-licensing arrangements in the band and across relevant parts of 3400–3700 MHz. Work on draft frameworks for remote areas was completed in December 2021.

We consulted on the technical and licensing frameworks for local area WBB for the 3400–4000 MHz band in remote areas in Q1 2022.

Next steps

The initial allocation of apparatus licences in remote areas will not commence before Q4 2022. Following that, we will develop apparatus- and spectrum-licensing allocation frameworks for the other areas. See the ‘Forward allocation workplan’ below for allocation of specific parts of the overall 3700–4200 MHz band, including the overlapping 3400–4000 MHz band in remote areas.

Forward allocation workplan CHANGE

Timely access to spectrum is increasingly important to an innovative and dynamic economy.

Our approach to designing spectrum allocations reflects outcomes from the ACMA's planning processes, informed by relevant government policy considerations. Information from incumbent and prospective spectrum users about the demand for access to specific bands and the timing of any possible allocation also provides important feedback to guide licensing and allocation decisions.

As a result of recent reforms to the Act, we now have a more flexible set of regulatory tools for allocations. The Act enables us to allocate spectrum licences via auction, tender, or by a pre-determined or negotiated price. While we can directly allocate spectrum licences, typically the relevant spectrum is of high value and in high demand. To enhance allocative efficiency for the high-demand spectrum licence allocations identified in the forward allocation workplan, we will continue to facilitate access using price-based allocation mechanisms.

Access to apparatus-licensed spectrum has typically used an 'over-the-counter' process, also known as administrative allocation. This process can provide timely spectrum access to support specific and diverse kinds of radiocommunications services and use-cases. More recently, when opening a band to a new set of users, we employed an 'allocation window' approach, which provides for a staged consideration of applications for apparatus licences.[34] This approach can assist in instances where there may be competing demands for the spectrum. We can also set enduring allocation limits for administrative allocation of apparatus licences[35], as well as allocating apparatus licences using a price-based process like an auction.

The Act establishes a set of mandatory processes for allocating spectrum licences. In our experience, these processes can be expected to take at least 16 to 18 months from confirmation of the planning decision to the start of an auction for a price-based allocation of licences. This process will take longer where there is uncertainty – for example, if there is optionality around how the spectrum can be configured, the process will take longer because further consultation and engagement with potential bidders will be necessary and important.

Reforms to the Act simplified and streamlined critical allocation and re-allocation processes and simplified the respective spectrum management roles of the ACMA and the minister.

We recognise the regulatory, consultation and financial burden of running multiple allocations concurrently, and so we seek to plan appropriately to minimise encumbrance on applicants and interested bidders.

Table 2 summarises our timing expectations for future allocations. Timing expectations cannot be definitive.

[34] This approach was used, for example, for the allocation of area-wide apparatus licences in the 26/28 GHz bands

[35] Under section 102G of the Act.

Table 2: Forward allocation timing

Band	Stage	Proposed allocation timing	Notes	Allocation method
3400–4000 MHz (remote areas)	Implementing planning decision	CHANGE Not before Q4 2022	Administrative allocation of apparatus licences for remote areas. Incorporates spectrum from the recent 3700–4200 MHz planning decision and previous decisions on 3400–3700 MHz in remote areas.	Administrative (allocation window followed by over the counter).
3400–3575 MHz and 3700–3800 MHz	Implementing planning decision	CHANGE Q3 2023	Q4 2022: consult on draft allocation instruments for spectrum licences in various regional areas in 3400–3575 MHz, and regional and metropolitan areas of 3700–3800 MHz band.	Spectrum licence auction.
3400-3575 MHz (metro only) and 3800–4000 MHz (regional and metropolitan areas)	Implementing planning decision	2023–24	Allocation of apparatus licences in regional and metropolitan areas.	To be determined.
2 GHz (MSS)	Implementing planning decision	2023–24 (Following the 3400–3575 MHz and 3700–3800 MHz auction)	Allocation of apparatus licences. New services will not commence until TOB services have transitioned to new arrangements; anticipated to occur over 5 years.	Our preliminary view is the allocation will occur via auction, subject to further consideration.[36]
800 MHz and 1800 MHz	Expiring spectrum licences (expiring 11 June 2028)	Consideration of the renewal of expiring spectrum licences	Consideration of licence renewal 5 years from expiry, with a preferred outcome being identified no later than 2 years from expiry.	To be determined.

[36] As per the 2 GHz outcomes paper, our preliminary view, given that demand is likely to exceed supply (as expressed in responses to the 2 GHz options paper), is that the most appropriate mechanism to resolve competing demand is a price-based allocation mechanism via auction. With price-based allocations under section 106 of the Act limited to the allocation of transmitter licences (in this case, space licences in 2170–2195 MHz), the ACMA would generally only issue the associated space receive licences in the paired band 1980–2005 MHz to those successful in the priced-based allocation process.

3400–4000 MHz (remote areas)

The replanning phase for the 3700–4200 MHz band concluded with the release of the *Replanning the 3700–4200 MHz band* outcomes paper in January 2021. This paper stated that we would, as far as practical, extend or align frameworks and the timing of their development with similar ones in the 3400–3700 MHz band. One of the conclusions from this replanning process was to introduce arrangements to make available 600 MHz of spectrum between 3400–4000 MHz in remote areas for apparatus licensing.

The 3400–4000 MHz band is currently used by a mix of services and applications including PTP links, PMP links, coordinated FSS earth stations, radiodetermination, amateur and various low power class-licensed devices. The proposed allocation process and accompanying technical frameworks carefully balance the needs of both WBB and incumbent services.

The ACMA is proposing to issue area-wide apparatus licence types (AWLs) to authorise access to spectrum in the 3400–4000 MHz band in remote areas.

CHANGE Before the allocation, we will further consider the co-existence of the proposed AWLs with radio altimeters operating in the adjacent 4.2–4.4 GHz band.

This will include the development of evidence-informed measures that will support our proposed approach to manage the WBB and radio altimeter issue. We will engage further with stakeholders, so that they can provide feedback on the proposed measures.

Once co-existence matters are resolved, we are proposing an over-the-counter allocation of AWLs in remote areas. To enhance the efficiency of allocation, we intend to adopt an ‘allocation window/allocation principles’ approach. An allocation window provides for a staged approach to considering applications, depending on whether there are competing applications and sufficient spectrum to fulfil all applications. Timeframes associated with the resolution of co-existence issues is likely to see the allocation commence not before Q4 2022.

3400–3575 MHz and 3700–3800 MHz

Recent consideration of technical arrangements for the bands and alignment between the 3400–3700 MHz and 3700–4200 MHz processes has provided an opportunity for a holistic assessment of arrangements across the broader 3400–4200 MHz band.

As a result, we have identified spectrum to be made available for spectrum licensing within these bands. We recently consulted on the terms of a re-allocation declaration that encompasses spectrum in various areas of regional Australia in the 3400–3575 MHz band, as well as spectrum in the 3700–3800 MHz band (3700–3750 MHz in all metropolitan and regional areas, and 3750–3800 MHz in all metropolitan areas).

This spectrum within the 3400–3575 MHz band includes 75 MHz of unused spectrum that was recently surrendered by NBN Co in urban areas. This spectrum is referred to as the urban excise.

We intend to consult on draft allocation instruments for the 3400–3575 MHz and 3700–3800 MHz bands in Q4 2022.

3800–4000 MHz (regional and metropolitan areas)

Another outcome of the *Replanning the 3700–4200 MHz band* outcomes paper was that arrangements will be introduced to support local area WBB services on a shared, coordinated basis with incumbent FSS and PTP services. In that paper, our preliminary view was that area-wide apparatus licensing (that is, AWLs) would be the preferred mechanism for local area WBB services.

The technical liaison group convened in Q3 2021 is still considering the technical framework for areas outside of remote areas. Availability of spectrum for local-area WBB services will depend upon the apparatus-licensing framework and methods of allocation in each region. We will finalise the technical frameworks for both local area and wide-area broadband services outside of remote areas as we resolve related co-existence issues in the band.

2 GHz

Our focus in 2021 was the development of transition arrangements for existing TOB services. Work is underway to implement replanning decisions. Our preliminary view is that a timeframe of 5 years is appropriate for this in capital cities, and 3 years in regional areas where TOB usage is minimal.

Timing for an allocation of mobile-satellite service licences will be considered alongside other allocation processes, but at this stage does not appear likely before late-2023.

Optimising established planning frameworks

The optimisation of existing spectrum planning arrangements is also a significant priority for the ACMA. This is typically achieved through updates to elements of the spectrum planning technical framework, such as band plans (either administrative or legislative) and RALIs.

These changes are intended to address band- and service-specific issues identified within existing frameworks – for example, by addressing technology developments and enabling sharing opportunities and other changes to improve the efficient use of the spectrum. Our optimisation work across a range of different spectrum uses is outlined below.

Table 3 summarises the proposed optimisation activities for 2022–23.

Table 3: Optimising established planning frameworks

Planning area	Project priorities	Proposed timelines
Broadcasting	Variations in several licence areas in NSW and VIC[37] to enable AM to FM conversions	Ongoing: consult
	NEW Planning principles for AM to FM conversions in regional areas	Q3 2022: finalise
	Following extension of Part 3 of the *Broadcasting Services Act 1992* (BSA) to Norfolk Island, finalise licensing of various incumbent broadcasting services in accordance with the provisions of the BSA and the Act	Q3 2022: finalise
	Vary the Remote Western Australia Radio LAP	CHANGE Q4 2022: consult
	Following extension of Part 3 of the BSA to Norfolk Island, prepare or vary a LAP to include Norfolk Island	Q4 2022: consult
	Vary the Remote Central and Eastern Australia Radio LAP	Q4 2022: consult
	Consult on the digital radio channel plan (DRCP) for the licence areas where the incumbent broadcasters have committed to rollout digital radio in 2023	Timing is driven by demand from broadcasters
Satellite	Consider applications for test and demonstration purposes in the 2 GHz band	Ongoing

[37] This may include a subset of the following areas: Inverell, Moree, Gunnedah, Tamworth, Lismore, Mudgee, Young, Parkes and Wangaratta. We are consulting with the licensees to determine indicative timelines and relative priorities. Proceeding with these variations may depend on the relevant licensees making timely strategic business decisions on available implementation options.

Planning area	Project priorities	Proposed timelines
	Manage filing and coordination of Australian satellite systems	Ongoing
Low interference potential devices (LIPD)	Monitor developments	Ongoing
	Regular update to the LIPD class licence	Q3 2022: consult
Intelligent Transport Systems	Monitor the developments in cooperative intelligent transport systems (C-ITS)	Ongoing
	Investigate permanent arrangements for the assignment and coordination of fixed-satellite service Earth stations in the 5.9 GHz band	Q3 2022: consult
Spectrum planning, assignment and coordination requirements	Review of the spectrum planning technical framework to ensure its currency and consistency with current technologies and operational practices	Ongoing
	NEW Spectrum planning framework information paper	Q3 2022: publish
Spectrum licence technical frameworks: review of frameworks below 4 GHz	2 GHz band	Q3 2022: consult on proposed amendments
	700 MHz band	Q3 2022: commence review and form a technical liaison group
	NEW 800 MHz band	Q3 2022: variations to 800 MHz spectrum licences
	2.5 GHz band	Work will commence once work on the 2 GHz band is finalised and 700 MHz nears completion
Spectrum-sharing approaches	Consideration of new approaches to spectrum sharing when proposals are submitted	Ongoing
Out-of-policy spectrum arrangement requests	Provide advice on requests that involve departing from our published policies and considering applications for trial demonstrations of new technologies.	Ongoing

Broadcasting

We continue to undertake technical research to support possible future work on television channel replanning and licensing and inform ongoing television reception issues, by:

- Investigating television receiver performance capabilities, including operating under Single Frequency Networks (SFN) scenarios, and the ability of receivers to cope with shared multiplexing. This work will help inform consideration of potential consumer impacts under different planning scenarios, and coverage and interference modelling in possible subsequent channel planning.
- Investigating new processes and tools for channel planning to assist with the restack channel planning under multiplex sharing arrangements.
- Exploring possible parameters and solutions for channel planning relevant to possible new shared multiplex arrangements. This work will provide evidence to inform any future restack channel planning framework and planning principles
- Undertaking preliminary work on the licensing options under potential new arrangements with shared multiplexing and assessment of requirements for template amendments to television licence area plans (TLAPs). We will also consider the operational procedures for varying the TLAPs.

We continue to provide spectrum planning and licensing assistance for ad-hoc requests for optimisation of existing television transmission infrastructure, as well as facilitating trials of new television transmission technologies.

We also provide information about television reception and interference on our website and manage the mySwitch website, a public television coverage data portal with address-specific information about television coverage and access to Viewer Access Satellite Television (VAST). We also provide interference diagnostic services where external interference is the cause.

For radio spectrum planning, we are progressing with the priorities outlined in the future delivery of radio report.

Our current radio broadcasting planning priorities are:

- converting commercial, national and community services from AM to FM where FM spectrum is available
- enhancing coverage of national, commercial and community broadcasting services where spectrum is readily available
- making DRCPs for regional DAB+ where a commercial licensee or national broadcaster has committed to a rollout
- supporting trials of new broadcasting technology.

These broad categories of activity inform how individual requests for planning and allocation activity are prioritised.

Recent developments

We have:

- consulted on:
  - 5 options to replan analog radio services in Perth
  - planning principles for AM to FM conversions in regional licence areas, which will guide how we plan conversions in regional radio licence areas as we expand the current AM to FM conversion program
- released updated temporary community broadcasting licence guidelines for radio after consultation in February and March 2021
- made and subsequently varied the DRCP for the Gold Coast RA1 licence area
- finalised variations to the Deniliquin LAP
- issued an apparatus licence for foundation category 1 digital radio multiplex transmitter for the Gold Coast RA1 licence area
- varied the:
  - Remote Central and Eastern Australia Radio LAP
  - DRCP for Brisbane RA1
  - Melbourne television LAP to continue the planning for the continuing community television broadcasting service for another 3 years, consistent with government policy
- consolidated a number of broadcast planning documents into the ACMA's general approach to broadcast planning and varying licence area plans. These explain our general approach to planning for broadcasting services and how we make broadcast planning decisions for both television and radio.
- brought together the ACMA's 2 separate retransmission policies for radio and television into a single document to provide better information to industry about how we make retransmission decisions.

Activities planned for 2022–23

We will:

- consult on the variations to LAPs to enable AM to FM conversions in regional single-licensee markets where engineering reports have been received from the licensees and approved by the ACMA. This includes a subset of the following areas: Inverell, Moree, Gunnedah, Tamworth, Lismore, Mudgee, Wangaratta, Young and Parkes. We are consulting with the licensees to determine indicative timelines and relative priorities. Proceeding with these variations depends on the relevant licensees making timely strategic business decisions on available implementation options
- 

Consult on proposals for variations to the Remote Western Australian Radio LAP in Q4 2022
- consult on further variations to the Remote Central and Eastern Australia Radio LAP in Q4 2022
- licence various incumbent broadcasting services and prepare or vary a LAP to include Norfolk Island in Q3 2022, following the extension of Part 3 of the BSA to Norfolk Island.

- commence engineering assessments for AM to FM conversions in regional competitive markets where engineering reports have been received by the ACMA and the requests are made in accordance with the planning principles (when they have been finalised) for AM to FM conversions in regional licence areas
- engage in targeted consultation with commercial radio broadcasters and the ABC in Perth to gather feedback on the potential to replan the Perth FM radio band
- engage further with industry on our findings in our report to the minister on the future delivery of radio.

Satellite planning

We continue to engage internationally to coordinate, develop and implement measures to enhance spectrum use for satellite communications and space research services.

Recent developments

Since 1 July 2021, on behalf of Australian satellite operators, the ACMA has filed 5 new satellite systems with the ITU and submitted modifications to 2 in accordance with the Australian procedures for the coordination and notification of satellite systems.[38]

We have reviewed 658 ITU publications on new or modified satellite systems for compatibility with Australian services and requested further coordination with 355 foreign satellite networks. We have assessed 302 radiocommunications licence applications for space-based communications systems for consistency with ITU and Australian regulatory arrangements for space systems.[39]

In December 2021[40], we consulted on arrangements to implement planning outcomes from the reviews of the 2 GHz and 28 GHz bands, and in Q2 2022 we varied the Radiocommunications (Communication with Space Object) Class Licence 2015 to give effect to those arrangements.

In September 2021[41], we commenced consultation on updates to our licensing procedures to reflect regulatory requirements of ITU Resolution 169 (WRC-19) (Use of the frequency bands 17.7-19.7 GHz and 27.5-29.5 GHz by earth stations in motion communicating with geostationary space stations in the fixed-satellite service). We intend to finalise these updates after completing the consultation commenced in December 2021 on 2 GHz and 28 GHz bands.

As part of our work implementing the recommendations of the Spectrum Pricing Review, we have introduced a number of pricing reforms supporting satellite services. In the first tranche of reforms, we introduced a 'systems price' for earth stations with multiple antennas, with prices commensurate with the spectrum denial of those

[38] See the list of satellite notices received (but not yet published) by the ITU in accordance with Res 55 (rev. WR-19), at the ITU's Information "As Received" webpage.
[39] Note that the number of assessments refers to the number of stations (assignments) considered. The assessments are undertaken before a complete licence application is submitted to the ACMA. As such, the number of assessments may differ from licensing statistics for that period. Refer to the ACMA procedures for earth and earth receive licensing, and registering earth stations and procedures for space and space receive licensing.
[40] See our consultations on proposed licensing arrangements for 2 GHz narrowband mobile-satellite services and 28 GHz fixed-satellite services and Replanning the 2 GHz band: Review of the 2 GHz Television Outside Broadcast Frequency Band Plan.
[41] See our consultation on updating regulatory requirements for earth stations in motion.

systems and taxes reduced by 90 per cent in frequency bands above 8.5 GHz. This will benefit all services in addition to satellite).

In October 2021, we commenced consultation on a proposal to set the tax rate for services above 100 GHz at the minimum tax (currently $41.37). Our intention is to support innovative services emerging in these high frequencies (such as terahertz services and infrared[42] optical communications for satellite services) that operate with very large bandwidths, although with a limited spectrum-denial footprint.

Activities planned for 2022–23

Our key spectrum planning priorities over the next year are:

- progressing work in implementing 2 GHz planning outcomes
- continuing reviewing the Australian procedures for the coordination and notification of satellite systems in consideration of outcomes of WRC-19 and industry developments
- providing ongoing operational support for Australian-filed satellite networks, including:
  - assisting Australian satellite operators with ongoing satellite coordination negotiations with other administrations
  - assessing new notices related to the progress of existing Australian satellite networks
  - filing of new networks
  - supporting international administration-level satellite coordination meetings with other administrations
- continuing to monitor trends in the spectrum needs of space-based communications systems, and developments in emerging space-based technologies and applications with a view to:
  - updating regulatory arrangements for space-based communication systems as required, including considering updates to the LIPD class licences to support satellite IoT devices operating in frequency bands providing for terrestrial IoT systems, as well as general updates to the Radiocommunications (Australian Space Objects) Determination 2014 and the Radiocommunications (Foreign Space Objects) Determination 2014 if required.
  - considering whether changes are required to licensing procedures for space-based communications to support development
  - encouraging organisations planning new satellite communication systems or intending to change existing systems to contact us to discuss if updates are required and, if so, their timing, as any future work will depend on its priority in the detailed annual work program.
- supporting the development of the Australian space industry through participation in the Australian Space Agency forums as a member of the Space Coordination Committee

[42] The infrared portion of the electromagnetic spectrum is part of the spectrum between microwaves (300 GHz) to below visible red light (around 430 THz) (1 millimetre to 700 nanometres). Note that under the Act, radio emissions are considered to be any emission of electromagnetic energy of frequencies below 420 THz. Consequently, optical systems (including laser systems using visible light) operating at frequencies above 420 THz are outside the scope of the Act and hence are not subject to regulation administered by the ACMA.

- assessing new radiocommunication licence applications for space-based communications systems for consistency with Australian and ITU requirements
- providing support and information to assist the growing interest from organisations considering developing experimental satellite systems with short-duration missions
- developing frequency coordination between earth station and terrestrial services, as appropriate
- continuing monitoring the demand for spectrum and emerging regulatory arrangements for NGSO constellations.

Low interference potential devices (LIPD)

The LIPD class licence authorises a wide range of applications including wi-fi, Bluetooth technologies and IoT services along with other uses, including certain spread spectrum and ultra-wideband transmitters. The last update to the LIPD class licence occurred in March 2021.

Recent developments

We continually monitor international and domestic developments that may prompt variations to the LIPD class licence. Recent developments have focused on 6 GHz RLANs. Following a consultation in Q4 2021, we updated the LIPD class licence to add the 5925–6425 MHz band for RLAN access.

Activities planned for 2022–23

The LIPD class licence is updated regularly. We are currently monitoring developments and plan to consult on the next general update of the LIPD class licence in Q3 2022. Several issues arising from the recent 6 GHz consultations will be considered in the next general update, including frequency-hopping spread spectrum devices in the 6 GHz band and possible updates to the use of RLANs in parts of the 5 GHz band.

Additionally, we will consider updates to the LIPD class licence to provide for satellite IoT devices operating in frequency bands supporting terrestrial IoT systems, along with a number of other potential additions to the class licence. Suggestions for other updates from industry that were received when developing this FYSO will also be considered.

Intelligent transport systems

Intelligent transport systems (ITS) are a range of wireless technologies designed to enable vehicle-to-vehicle, vehicle-to-person or vehicle-to-infrastructure (collectively known as V2X) communications.

The Radiocommunications (Intelligent Transport Systems) Class Licence 2017 (ITS class licence) supports the use of wireless technologies and devices in the frequency range 5855–5925 MHz (the 5.9 GHz band). Compliance with the current European standard for cooperative ITS (C-ITS) is a condition of the ITS class licence, following advice from industry.

Recent developments

A submission to a previous FYSO indicated interest in changes to the ITS class licence to accommodate V2X technology and the potential implementation of channelisation arrangements.

As flagged in the 6-month progress report for the FYSO 2021–26, initial consultation with Austroads[43] has indicated that the current arrangements are fit for purpose. The Australian approach has been to follow European standards for C-ITS. In addition, the CEPT is required to initiate a review of ECC Decision (08)01 by the end of 2022.

Given this feedback and ongoing international activities, we believe it is prudent to pause further work on V2X and channelisation until it can be informed by these ongoing deliberations in Europe.

Activities planned for 2022–23

While we will continue to monitor the developments in C-ITS more generally, we intend to investigate permanent arrangements for the assignment and coordination of FSS earth stations in the 5.9 GHz band with a view to replacing the interim arrangements outlined in Spectrum Embargo 48. We will consult on this issue in Q3 2022.

Ongoing review of spectrum planning, assignment and coordination requirements

We have an ongoing program of review of the spectrum planning technical framework to ensure its currency and consistency with current technologies and operational practices.

This work is primarily focused on frequency coordination requirements for apparatus-licensed services, which are predominately recorded in RALIs. Consideration of spectrum-licensing technical frameworks and ensuring spectrum embargoes continue to be appropriate are additional elements of this work program.

Recent developments

Our frequency coordination requirements review work program was finalised in October 2021. We are now considering a broader review of the spectrum planning framework. The framework is complex, made up of a large array of interlinking technical and policy documents. The content and interrelationships can be difficult to understand and interpret, even for experienced practitioners, with information on any one service or part of the spectrum contained in multiple documents. Several broad areas for review have become apparent, including improving the transparency and clarity of the framework overall.

Activities planned for 2022–23

The review work program details our plans to the end of 2022. We also intend to build on the information paper with other measures designed to improve transparency and articulation of the planning framework.

[43] Austroads is the collective of the Australian and New Zealand transport agencies, representing all levels of government.

NEW In Q3 2022, we will release an information paper on the role of the spectrum planning framework and how the various framework elements interact with each other and other aspects of spectrum management. The paper is just one measure we will implement to improve transparency and explain the planning framework to assist all stakeholders.

Review of spectrum licence technical frameworks

In November 2019, we consulted with spectrum licensees about a review of current arrangements in bands that were already licensed for WBB. This was to ensure existing allocations are efficient and can cater for new technology developments such as 5G. The consultation identified interest in reviewing all technical frameworks below 4 GHz.

Recent developments

Based on feedback received from spectrum licensees, we have prioritised bands for review and developed an associated workplan.

The 3.4 GHz band was the first band to be considered, with the review of the core condition relating to unwanted emissions. This work was completed in Q2 2020. Reviews of the 2.3 GHz, 800 MHz and 1800 MHz bands were completed in Q2 2021, Q3 2021 and Q1 2022, respectively.

Activities planned for 2022–23

We began work on a review of the 2 GHz band in Q4 2021. We intend to publicly consult on any changes in Q3 2022.

The 700 MHz and 2.5 GHz bands have also been identified in the work program. We intend to commence work on the review of the 700 MHz band in Q3 2022, followed by consideration of the 2.5 GHz band.

NEW In Q3 2022, we will commence work to vary 800 MHz spectrum licences to align existing core conditions (emission characteristics) with the 850 MHz expansion band and 900 MHz band sample spectrum licences.

In Q4 2022, we will review spectrum licence technical framework instruments for the 700 MHz, 1800 MHz, 2.5 GHz and 2.5 GHz mid-band gap frequency bands, which will sunset on 1 April 2023.

Spectrum-sharing approaches

Spectrum sharing in its traditional form is a core component of managing access to spectrum – all users ‘share’ the spectrum through coordinated access (by working around other users on a time, frequency and/or spatial separation basis) or uncoordinated access, where interference potential is understood and accepted and/or mitigated by technology (for example, under the LIPD class licence).

Recent developments

Attention has turned to ‘non-traditional’ sharing arrangements, most notably dynamic spectrum access (DSA) regimes being looked at or implemented internationally. A consultation was held in 2019–20 seeking views on the appetite for making

arrangements for DSA and potential implementation methodologies; however, no specific arrangements or trials were proposed. As there was no strong domestic interest, it was decided that it was not yet the right time to actively pursue DSA arrangements in Australia.

When consulting on updates to the LIPD class licence to allow low power RLAN devices in the lower 6 GHz band, we also discussed the option of implementing an automatic frequency coordination (AFC) system to facilitate access to the band for higher power devices. We will continue to consider the value of introducing such a system in Australia and are monitoring the upcoming introduction of similar systems in the 6 GHz band in other countries, particularly in the US.

Activities planned for 2022–23

We welcome proposals for potential trials of DSA technologies and approaches and will explore the utility and feasibility of AFC ahead of further consideration of the upper 6 GHz band.

Spectrum management advice and out-of-policy requests

We have an ongoing role to provide advice on spectrum arrangements, including advice on requests that involve departing from our published policies and considering applications for trial demonstrations of new technologies.

Licensing

The ACMA issues 3 broad categories of licences. Spectrum licences can only be issued in specified areas and frequency ranges and have a high degree of exclusivity. Apparatus licensing generally authorises specific kinds of radiocommunications services and use-cases, such as land mobile, fixed, satellite and maritime. Class licences provide for shared use of the spectrum, with minimal or no licensing hurdles and no associated regulatory fees for users.

In addition, to promote efficient use of the spectrum, the interference management framework is often optimised for an expected use, even if such use is not mandatory. For example, while spectrum licences may be 'technology flexible' in that they do not explicitly preclude any use, they are designed and optimised with a likely technology in mind. This maximises the efficiency of these licences for their expected use alongside the co-existence requirements of other spectrum uses/users.

Table 4 summarises the proposed licensing activities for 2022–23.

Table 4: Licensing and licensing systems

Work area	Project priorities	Proposed timelines
Radiocommunications regulatory reform	Sunsetting instruments	Q3 2022 – Q1 2023
	Renewal processes and licence use	Q2 2023: discussion papers
Mobile phone jammers in prisons	Monitor use under exemption	Ongoing
Drone regulation	Monitor licensing requirements	Ongoing
RNSS repeater trials	Develop permanent licensing solution in conjunction with the facilitation and monitoring of trials	2022–23
Review of banned equipment and exemptions framework	Proposed framework with new and amended instruments	CHANGE Q3 2022: consult
Review of non-assigned amateur and outpost licensing arrangements	Updated draft amateur class licence	NEW Q3 2022: consult
	Implementation activities to transition to class licensing arrangements	CHANGE Q1–2 2023
Higher power amateur operation	Finalise options following consultation	2022–23
Review of scientific assigned and non-assigned apparatus licensing arrangements	Options for new arrangements	CHANGE Q3/Q4 2022: consult

Work area	Project priorities	Proposed timelines
NEW Terahertz spectrum	International regulatory models and use-cases	Q1 2023: information paper
Assigned amateur beacons and repeaters	Proposed licensing options	CHANGE Q1 2023: consult
	Develop guidance material for accredited persons	CHANGE Q2 2023
Maritime regulatory arrangements	Proposed updates to VHF channel plan and related instruments	CHANGE Q2 2023: consult

Radiocommunications regulatory reform

In June 2021, the *Radiocommunications Legislation Amendment (Reform and Modernisation) Act 2020* (the Modernisation Act), together with the *Radiocommunications (Transmitter Licence Tax) Amendment Act 2020* and the *Radiocommunications (Receiver Licence Tax) Amendment Act 2020* came into force.

Key amendments to licensing and allocation arrangements introduced by the Modernisation Act include:

- increasing the maximum licence term of spectrum and apparatus licences to 20 years
- requiring that some licences include renewal and public interest statements, and allowing other licences to include these statements
- streamlining the spectrum re-allocation process by enhancing the ACMA's ability to independently allocate spectrum licences, including making unencumbered spectrum available for spectrum licensing
- allowing the ACMA to set allocation limits for price-based allocations of spectrum and apparatus licences, after having received advice from the Australian Competition and Consumer Commission (ACCC).

In March 2021, we published an information paper which described, at a high level, our approach to short-term (up to one year), medium-term (one to 10 years) and long-term (20 years) licensing. Longer-term licensing is likely to be appropriate for services operating in bands with high levels of international harmonisation, and which are unlikely to be replanned for an alternative use within the next 20 years.

Activities planned for 2022–23

Changes under the Modernisation Act have implications for the renewal of expiring spectrum licences. In the information paper, we identified that, for spectrum licences in

force at the commencement of the Modernisation Act, we would begin consideration of licence renewal 5 years from expiry, with a preferred outcome identified no later than 2 years from expiry.[44]

The first spectrum licences to expire following commencement of the Modernisation Act will be the 800 MHz and 1800 MHz licences – these will expire on 11 June 2028. We also note that between 2028 and 2032, existing spectrum licences across 700 MHz, 850 MHz, 1800 MHz, 2 GHz, 2.3 GHz, 2.5 GHz, 3.4 GHz and 3.6 GHz will expire.

In Q2 2023, we intend to release a discussion paper on renewal processes for expiring 800 MHz and 1800 MHz licences spectrum licences, examining the matters we would consider in assessing generally whether renewal is in the public interest, the assessment process for a renewal and the taxes and charges payable.

One matter we may consider when assessing the public interest is whether the licence is in use. We have also indicated in other contexts, including the allocation of AWLs in 26/28 GHz, that we may decide not to renew licences that have not been used and there is unmet demand for these licences. In Q2 2023, we also intend to release a discussion paper on how we determine whether a licence is in use.

A large number of radiocommunications legislative instruments are due to sunset on 1 April 2023.[45] These include:

- technical framework instruments for spectrum-licensed frequency bands
- frequency band plans and spectrum marketing plans
- equipment rules prescribing standards (formerly radiocommunications standards)
- instruments in the banned equipment and exemptions framework

We have begun the significant body of work to consult on the remaking or revoking of sunsetting instruments and will continue this in 2022–23. We expect to consult on instruments grouped by a theme or purpose (for example, equipment rules prescribing standards, or technical framework instruments), rather than individually. Appendix A provides the full list of sunsetting instruments and our proposed action and timing.

Mobile phone jammers in prisons

Since September 2013, we have provided Corrective Services NSW (CSNSW) with successive exemption determinations to conduct field trials of a mobile phone jammer at the Goulburn Correctional Complex (Goulburn) and Lithgow Correctional Centre (Lithgow) on an ongoing basis.

The exemption arrangements for CSNSW at Goulburn and Lithgow have been consolidated under a single new instrument, the Radiocommunications (Exemption – Corrective Services NSW) Determination 2021, which was made by the ACMA in November 2021.

[44] Some spectrum licences, such as those issued before the commencement of the Modernisation Act, are exempt from containing renewal statements, and as such, a default application period beginning 2 years from expiry and ending when the licence is due to expire, and a decision-making period of 6 months from receipt of an application for the renewal of a licence, apply.

[45] Sunsetting involves setting a date for the automatic repeal of legislation. Legislative instruments are automatically repealed after a fixed period of time (subject to some exceptions). The sunsetting rules are set out in Chapter 3, Part 4 of the *Legislation Act 2003*.

CSNSW's operation of a mobile phone jammer at Goulburn and Lithgow has not resulted in interference to legitimate mobile phone users outside the perimeter of the correctional facilities.

Activities planned for 2022–23

We will continue to monitor the ongoing use of mobile phone jammers under the exemption arrangements. We will also consider like requests from other jurisdictions on a case-by-case basis.

Drone spectrum regulation

Unmanned aircraft systems, also known as remotely piloted aircraft systems (RPAS) or drones, have become increasingly popular with hobbyists and commercial users. Drones rely on radiocommunications for remote piloting and other uses, such as video and sensing.

In Q2 2020, we consulted on, and subsequently made, radiocommunications exemption arrangements to facilitate the national rollout of counter-drone capability by all Australian police agencies.

Activities planned for 2022–23

We are collaborating with the Department on the management of drones. During 2022–23, we will continue to contribute to relevant government initiatives and monitor the licensing requirements for drones alongside international developments in spectrum management. We are also working with aviation stakeholders to monitor spectrum and licensing requirements internationally and domestically.

As drones are becoming increasingly widespread, so too are concerns about their use. We have put into place exemption arrangements that facilitate law enforcement access to counter-drone equipment, and we will continue to monitor international approaches to detecting and responding to incidents where drones could pose a risk to safety and security.

We are also supporting local industry through the innovation and industry development exemption framework, which can facilitate R&D and manufacturing of counter-drone equipment.

On the spectrum front, the most commonly available drones use spectrum authorised under the LIPD class licence. While this is expected over time to transfer more and more to mobile (including 5G) networks, larger drones used for commercial or military purposes are increasingly requiring access to dedicated aeronautical spectrum. Spectrum planning to support interim access by RPAS to the 5030–5091 MHz band is discussed earlier in the section on 'Band planning and forward spectrum allocations'.

RNSS repeater trials

We have collaborated with a range of emergency services and road transport stakeholders on proposals to facilitate trials and small-scale deployments of certain radionavigation satellite service (RNSS, which encompasses a number of ubiquitous systems including GPS and GLONASS, a global navigation satellite system) repeaters in road tunnels. Loss of RNSS coverage in complex road tunnels can inconvenience motorists and compromise the ability of emergency service organisations to detect and deploy assets in response to emergencies.

In 2020, we removed regulatory barriers to using types of RNSS repeaters, creating a pathway to authorise trials using scientific licences.

Activities planned for 2022–23

We will continue to work with stakeholders in deploying trials of RNSS repeaters in road tunnels, using scientific-licensing arrangements.

We will use feedback and data from the trials to inform a longer-term licensing solution for the devices.

Many stakeholders requested that we consider whether RNSS repeaters and similar devices could be deployed in locations other than road tunnels. We will consider this as we progress long-term licensing arrangements, following a consultation on the banned equipment and exemptions framework (immediately below).

Review of banned equipment and exemptions framework

Under the Act, the ACMA has permanently banned 2 kinds of devices: mobile phone jammers (public mobile telecommunications service jamming devices) and RNSS jammers, which include GPS jamming devices. The ACMA may determine exemptions from the permanent bans, and from other parts of the Act.

In Q2 2020, we released an issues paper seeking comments from stakeholders about the operation of the prohibition declarations, and the appropriateness of our approach to exemption determinations.

Since the release of the issues paper, we have implemented regulatory arrangements to facilitate trials of previously prohibited RNSS repeaters, and deployments of counter-drone equipment by law enforcement. We have also consulted on, and implemented, new exemption powers that can facilitate industry and innovation outcomes, associated with, for example, manufacturing of equipment subject to permanent bans.

Activities planned for 2022–23

CHANGE In Q3 2022, we will consult on new and remade instruments. Following the review, we will undertake the relevant implementation activities, including advancing work on developing licensing arrangements for a wider range of RNSS retransmissions technologies (including RNSS repeaters, simulators and pseudolites). This will end our review of the banned equipment and exemptions framework.

Looking ahead, we will consider any new requests for exemptions, with a continued focus on implementing arrangements that balance the concerns of potentially adversely affected licensees, with the requirements of safety, security and law enforcement bodies.

Review of non-assigned amateur and outpost licensing arrangements, and higher power amateur operation

In Q1 2021, we released our review of non-assigned amateur and outpost licensing arrangements for public consultation. We published the summary of submissions and our response in December 2021.

As noted in our response to submissions, we will be implementing the proposed class licensing arrangements for non-assigned amateur and outpost stations. In Q2 2022, we made the Radiocommunications (Outpost Stations) Class Licence 2022 and began implementation activities required to support the transition to class-licensing arrangements for existing non-assigned outpost licensees.

We are aware that many amateurs continue to be interested in operating their stations at higher power limits. We are supportive of further investigating the licensing and technical framework and, potentially new accreditation arrangements, that could facilitate higher power limits.

Activities planned for 2022–23

We will continue to engage with the amateur and outpost community and provide regular updates on implementation activities required to support the transition. In Q3 2022, we will consult on an updated draft amateur class licence. The implementation of class-licensing arrangements will be a large and complex body of work, involving administrative and operational changes to how amateur qualifications and certificates are issued and recognised under the Act, how call signs are managed, and consequential changes to Deed arrangements for the delivery of amateur radio services.

We do not expect this body of work to cause interruptions to the amateur radio service for licensees. We will focus on communicating the changes and timeframes to the amateur community and making the transition as smooth as possible. We encourage amateur licensees to subscribe to our *Amateur update* newsletter to ensure that they are kept up-to-date.

In 2022–23, we will finalise our consideration of options for higher-power amateur licensing, informed by the Q3 2022 consultation process. We will also consider, and consult as appropriate, on any further changes to amateur syllabi.

Assigned amateur beacons and repeaters

Submissions to the review of non-assigned amateur and outpost licensing arrangements noted that the assigned amateur beacon and repeater licensing process could be streamlined. Currently, an applicant is required to obtain a letter of endorsement from the Wireless Institute of Australia before approaching an accredited person or apply for their licences directly through the ACMA. This requirement can introduce delays to the licensing process.

Activities planned for 2022–23

CHANGE We support improving the assignment of amateur beacons and repeaters. In Q1 2023, we will consult on options for frequency assignment coordination arrangements for assigned amateur beacons and repeaters. Following consultation and consideration of submissions, we will develop AP guidance material for frequency coordination in Q2 2023.

Review of scientific assigned and non-assigned apparatus licensing arrangements

The review aims to ensure that suitable, low-cost licensing arrangements are available for spectrum users to trial and assess new and innovative radiocommunications technologies. We will also update guidelines and other relevant material where appropriate.

Activities planned for 2022–23

CHANGE We intend to release a consultation paper in Q3 or Q4 2022.

Updates to maritime VHF channel arrangements

The maritime communications regulatory framework includes several legislative instruments, including the Radiocommunications (Maritime Ship Station — 27 MHz and VHF) Class Licence 2015, the Radiocommunications Licence Conditions (Maritime Ship Licence) Determination 2015 and the VHF maritime mobile band channel plan.

Revisions to Appendix 18 of the ITU RRs, *Table of transmitting frequencies in the VHF maritime mobile band*, were agreed at WRC-19. The outcomes were implemented in the new ARSP in May 2021.

Activities planned for 2022–23

CHANGE We will consult on updates to the VHF channel plan and relevant instruments in Q2 2023.

Terahertz spectrum NEW

Emerging and potential applications for spectrum in the terahertz frequency range (above 100 GHz) include short-range radar sensing, imaging, non-destructive testing and high-speed communications. While there is comparatively limited use of spectrum in these bands, and technology and commercial use-cases are still in their infancy, the interest in terahertz spectrum will grow, given the amount of spectrum available and its potential for sharing due to its propagation characteristics.

Activities planned for 2022–23

In Q1 2023, we will release an information paper that examines international regulatory models and use-cases for these frequency bands.

Pricing

In 2022–23, we will focus on:

> completing the implementation of the Spectrum Pricing Review reforms

> assessing the commercial broadcasting tax arrangements and implementing the Commercial Broadcasting (Tax) (Transmitter Licence Tax Rebate) Rules 2022 (the Rebate Rules)

> continuing to update pricing structures with new data and developments.

This work will complement the pricing implications for the band and licensing reviews.

Table 5 summarises the proposed pricing activities for 2022–23.

Table 5: Pricing

Project priorities	Proposed timelines
Pricing review implementation considering new technologies and trials	To be generally aligned with the review of scientific licensing arrangements
Commercial broadcasting tax arrangements	Ongoing assessment of taxes throughout 2022–23 including introducing the new Rebate Rules
Maintenance of the current licence tax regime, including update to tax determinations with references to the 2021 census population figures and other machinery changes	Q3 2022: consult
CHANGE Pricing arrangements considering opportunities for different levels of interference protection and other machinery changes to allow for the updates to taxes	CHANGE Q1 2023: consult
Examining pricing implications for ongoing licensing or band reviews	Ongoing throughout 2022–23

Implementation of the Spectrum Pricing Review

To implement the recommendations of the Spectrum Pricing Review, in 2021 we published pricing guidelines, and implemented the first tranche of pricing reforms, including:

> reducing taxes based on the tax formula for services above 5 GHz, from 50% to 90% depending on the frequency range and the service

> introducing a ‘systems price’ for earth stations with multiple antennas, with prices commensurate with the spectrum denial of those systems.

> introducing an additional price discount to encourage more use of the land-mobile ‘micro’ service model.

In October 2021, we published a consultation paper on a second tranche of pricing reform proposals that focused on:

- updating the assigned apparatus licence tax formula, including:
  - proposed changes to the structure of the location weightings table
  - a rebalance of some of the weightings
  - changes to the way we update taxes each year
  - changes to the Perth and Adelaide medium-density areas.
- reducing tax rates for transmitter licences used to provide high-power open narrowcasting (HPON) services.
- adjusting some first tranche reforms following industry feedback.

After considering submissions, we implemented the second tranche reforms in Q2 2022 to formally end the Spectrum Pricing Review process. As we embed relevant changes into our systems in Q3 2022, we expect that there will be ongoing assistance to industry.

In Q2 2022, we launched a new apparatus licence fee calculator to assist licensees with estimating their likely licence fees and help them better understand the underlying pricing arrangements. Based on the feedback we received, we anticipate further refining the calculator over time.

Activities planned for 2022–23

Commercial broadcasting tax assessment process CHANGE

We will continue assessing commercial broadcasting tax on an ongoing basis, as apparatus licences associated with commercial broadcasting services pass their anniversary dates.

Transitional support to eligible regional broadcasters was extended when the minister made the Commercial Broadcasting (Tax) (Transmitter Licence Tax Rebate) Rules 2022. This rebate will apply until June 2024. We will be working closely with the commercial broadcasting sector to implement these extended rebate arrangements. To assist with planning of payments of tax assessments, early in Q3 2022, we will provide all commercial broadcasters with estimates of their tax assessments for the financial year.

Other pricing work

The ACMA is conducting several licensing and band reviews, and as part of those reviews, we will undertake work for any spectrum pricing implications. For example, as part of the review of scientific licensing arrangements we will consider the associated pricing arrangements.

While have formally ended the Spectrum Pricing Review with the implementation of the second tranche of reforms, our work to maintain the licence tax regime is ongoing as developments emerge and reform opportunities arise. This will include:

- Updating census population figures in tax determinations. A number of radiocommunications licence taxes are determined using population figures from the Australian Bureau of Statistics (ABS). The ABS released 2021 Census population data in June 2022, which allows us to update population figures in the relevant apparatus licence and spectrum licence tax determinations. We will consult on the proposed updates to the relevant tax determinations in Q3 2022.
- CHANGE Considering pricing of different levels of interference protection. In recent years, the ACMA has allowed more customised licensing for certain types of transmitters via area-wide licences in specific parts of the spectrum. Similarly, we would like to explore whether more bespoke arrangements can also be introduced for receivers that require different levels of protection, to encourage more efficient use of spectrum. In addition, as part of the consultation on the second tranche of pricing proposals, we received several submissions supporting consideration of a range of other bespoke arrangements. In finalising the implementation of the Spectrum Pricing Review, we also noted that we would consult on our approach to our annual update of apparatus licence taxes. We anticipate consulting further on these arrangements in early Q1 2023.
- Another outcome of the implementation of the Spectrum Pricing Review is that we will undertake band reviews to update apparatus licence taxes in particular frequency ranges. The first of these reviews will relate to the 2,690 MHz to 5 GHz frequency ranges. We expect to consult on findings of the review subsequent to allocations of 3.4 to 4 GHz AWLs in remote and regional/metro areas. We anticipate reviewing the frequency ranges 520 MHz to 2,690 MHz in the subsequent financial year.

Compliance priorities

The utility of spectrum is also affected by the interference protection environment. The risk of causing harmful interference to the radiocommunications spectrum is managed through both our planning and allocations work, and our compliance programs.

Each year, as part of these compliance programs, we set whole-of-agency compliance priorities that aim to systematically identify and address high-risk compliance issues or issues of significant concern to the community or industry, by maximising our regulatory reach in a strategic and resource-efficient manner.

Compliance activities undertaken in 2021–22 CHANGE

Compliance with 5G electromagnetic energy (EME) was one of the ACMA's 2021–22 compliance priorities. Australia has strict safety and compliance standards that regulate EME from telecommunications and wireless networks. We check telecommunications providers are complying with the EME exposure limits set by the Australian Radiation Protection and Nuclear Safety Agency (ARPANSA).

5G EME compliance CHANGE

Our EME measurement program involved conducting audits of 5G-enabled mobile stations and collecting 5G EME measurement data at over 120 mobile station sites across New South Wales. This program built on a similar body of work undertaken in Victoria in 2020–21. We used the data to check compliance by mobile network operators with their regulatory obligations on EME levels.

The audits found that for all sites tested, the EME levels were well below the exposure limits set by ARPANSA to protect the public. The results of our program for NSW in 2021–22 were similar to the results of our program in Victoria in 2020–21.

The audits also showed that mobile service carriers were meeting their obligations under the Mobile Phone Base Station Deployment Code when deploying base stations and are complying with the EME requirements of the Radiocommunications Licence Conditions (Apparatus Licence) Determination 2015.

Compliance activities for 2022–23 NEW

In Q1 2022, we undertook consultation to help us set our compliance focus for 2022–23. Informed by submissions to the consultation, we identified 7 areas for the 2022–23 ACMA compliance priority program.

To support the ACMA's work to manage the risk of interference to radiocommunications spectrum, the 2022–23 program includes a focus on tackling the online supply of 'dodgy' devices.

We are seeing a rise in complaints about non-compliant radiocommunications devices advertised or bought online. We will be focusing on supplier compliance with equipment rules and educating Australians about the risks of buying these devices online.

We will also continue our program of EME measurements at 5G-enabled mobile base stations as part of our business-as-usual compliance program, and will be providing ongoing updates on the results of this work through the new online EME Checker.

Find out more about the 2022–23 compliance priorities.

International engagement

The ACMA, the Department, 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 ITU's WRC, which reviews and revises the RRs, the international treaty level document regarding use of the spectrum and satellite orbits.

The next WRC will be held in 2023 (WRC-23) and will consider a large agenda concerning new frequency allocation and procedural matters across a range of services. The Department will lead the Australian preparatory processes and the Australian delegation to this meeting, including Asia–Pacific region and international meetings in preparation for WRC-23, with the ACMA providing technical expertise.

Other forums within the ITU and regionally within the Asia–Pacific Telecommunity (APT) consider issues with a technical focus that are also of significance to Australian spectrum management. These forums include ITU-R study groups and working parties, and the APT Wireless Group (AWG). We manage Australian input and participation in these forums in consultation with the Department and industry. ITU-R study groups and working parties also undertake studies relevant to WRC agenda items. We work in consultation with the Department to manage engagement in these processes.

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

In 2021–22, we led delegations to the ITU and APT meetings shown in Table 6.

Table 6: International engagement in 2021–22

Meeting	Date
ITU-R Working Parties 4A-C	5–28 July 2021
APT Wireless Group Meeting 28 (AWG-28)	6–14 September 2021
ITU-R Working Party 5D	4–15 October 2021
ITU-R Study Group 4 and Working Parties 4A-C	20 October – 5 November 2021
Third meeting of APG (APG 23-3)	8–13 November 2021

Meeting	Date
ITU-R Study Group 5 and Working Parties 5A-C	15 November – 16 December 2021
ITU-R Working Party 5D	7–23 February 2022
APT Wireless Group Meeting 29 (AWG-29)	21–29 March 2022
ITU-R Working Party 5B	29 March – 8 April 2022
ITU-R Working Party 5D	19–22 April 2022
ITU-R Working Parties 4A-C	4–20 May 2022
ITU-R Working Parties 5A and 5C	23 May – 3 June 2022
ITU-R Working Party 5D	13–24 June 2022

We also supported the Department by providing the Deputy Head of Delegation (and other delegates) with subject matter expertise for the virtual meetings of the APT Conference Preparatory Group (Asia–Pacific) (APG) APG23-3, held from 8–13 November 2021.

Activities planned for 2022–23

NEW Table 7 summarises the anticipated international engagement activities for the coming year. Some of these meeting dates are still subject to confirmation and may change

Table 7: International engagement in 2022–23

Meeting	Date
ITU-R Working Party 5B	11–22 July 2022
Fourth meeting of the APG (APG 23-4)	15–20 August 2022
ITU-R Study Group 4 and Working Parties 4A-C	7–23 September 2022
APT Wireless Group Meeting 30 (AWG-30)	5–9 September 2022
ITU-R Working Party 5D	10–21 October 2022
ITU-R Study Group 5 and Working Parties 5A-C	14–29 November 2022
ITU-R Working Party 5D	30 January–10 February 2023
Second Session of the Conference Preparatory Meeting for WRC-23 (CPM23-2)	27 March–6 April 2023
ITU-R Working Parties 5A and 5C	8–19 May 2023
ITU-R Working Party 5D	12–23 June 2023
ITU-R Study Group 4 and Working Parties 4A-C	21 June–7 July 2023

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

Upcoming consultations

Approaches to consultation

The ACMA consults extensively with industry through both formal public and targeted informal industry consultation processes. This not only meets various legislative obligations but also assists us to obtain industry views as well as key technical and industry information.

The information and views obtained through the consultation process are essential inputs to informing our decision-making and the development of appropriate regulation. Consultation processes also provide transparency to industry, both about our thinking and decision-making, but also to the views and evidence put forward by other parts of industry.

While our approach to consultation is well established, we consider there is value in testing existing approaches to ensure they remain fit-for-purpose and best meet the goals of information gathering and transparency, while remaining alert to the consultation load on industry.

In the context of major band reviews, the typical[46] steps and associated papers are described in the work program and usually include an information-gathering discussion paper followed by an options paper that includes proposed regulatory approaches. ACMA decisions and preliminary views are then announced in an outcomes paper, followed by further consultation on specific aspects of implementation.

In some jurisdictions such as the US, the regulator provides for a 'reply comment' period that allows industry to comment on other party's submissions. That is, a 60-day comment or submission period is followed by a 30-day reply comment period in which industry submissions can be rapidly responded to. The key benefit of this approach is that it allows industry to test notionally factual assertions and opinions, rather than this solely being the role of the regulator.

We see value in adopting such an approach in some circumstances and propose to adopt this general approach (with details such as the appropriate timing period to be determined) the next time we consult on detailed planning options via an options paper. At this stage, this is likely to be the options paper associated with exploring the future use of the 1.9 GHz band – we released the discussion paper in November 2021. If the process proves to be beneficial, we will consider using this approach at other times in the future.

Table 8 summarises consultations flagged throughout the FYSO. Consultation plans are subject to change.

[46] If the circumstances require it, we may compress or expand this process.

Table 8: Consultation plans

Consultation	Proposed timelines
Permanent arrangements for FSS earth stations in 5.9 GHz band	Q3 2022
2 GHz band amendments to technical framework	Q3 2022
Regular update to the LIPD class licence	Q3 2022
Review of banned equipment and exemptions framework	Q3 2022
Updated draft amateur class licence and higher power options	Q3 2022
Proposed updates to tax determinations	Q3 2022
Sunsetting instrument: Radiocommunications (Mid-West Radio Quiet Zone) Frequency Band Plan 2011	Q3 2022
1.9 GHz (1880–1920 MHz) band options paper	CHANGE Q3/Q4 2022
Scientific assigned and non-assigned apparatus licensing arrangements	CHANGE Q3/Q4 2022
Sunsetting instruments: equipment rules prescribing standards and the Protected Symbols Determination 2013	Q3/Q4 2022
1800 MHz in remote areas discussion paper	Q3/Q4 2022
Sunsetting instrument: Radiocommunications (Trading Rules for Spectrum Licences) Determination 2012	Q4 2022
Sunsetting instruments: spectrum licence technical framework instruments for the 700 MHz, 1800 MHz, 2.5 GHz and 2.5 GHz mid-band gap frequency bands	Q4 2022
Draft allocation instruments for 3400–3575 MHz and 3700–3800 MHz spectrum licences	Q4 2022
Preparation or variation to a LAP to include Norfolk Island	Q4 2022
Variations to Remote Central and Eastern Australia Radio LAP	Q4 2022
Variations to the Remote Western Australia Radio LAP	CHANGE Q4 2022
Pricing arrangements of different levels of interference protection and other related matters	CHANGE Q1 2023
Options for assigned amateur beacons and repeaters	CHANGE Q1 2023
1.5 GHz band and extended MSS L-band options paper	Q1 2023
Draft *Five-year spectrum outlook 2023–28*	Q1 2023
2 GHz band proposed technical and regulatory arrangements	CHANGE Q1/Q2 2023
Licensing renewal processes and use discussion papers	Q2 2023
Proposed updates to maritime regulatory instruments	CHANGE Q2 2023

Appendix A – Sunsetting instruments 2022–23

There are no radiocommunications instruments due to sunset on 1 October 2022.

Table 9 indicates our proposed action (or action already commenced) for the radiocommunications instruments due to sunset on 1 April 2023. Where consultation[47] is proposed, this would be on instruments to replace or revoke the sunsetting instrument.

Table 9: Radiocommunications instruments due to sunset on 1 April 2023

No.	Sunsetting instrument	Action
1	Television Outside Broadcast (1980–2110 MHz and 2170–2300 MHz) Frequency Band Plan 2012	Repealed and replaced by the Radiocommunications (Mobile-Satellite Service) (1980–2010 MHz and 2170–2200 MHz) Frequency Band Plan 2022 and the Radiocommunications (Television Outside Broadcasting) (2010–2110 MHz and 2200–2300 MHz) Frequency Band Plan 2022
2	Radiocommunications (Digital Radio Multiplex Transmitter Licences – Application Fee) Determination 2012	CHANGE Q2 2022: included in our consultation on proposed ACMA fees for service 2022–23
3	Radiocommunications (Prohibited Devices) (Use of Electronic Counter Measures for Bomb Disposal Activities) Exemption Determination 2010	Q3 2022: consultation as part of the review of banned equipment and exemptions framework
4	Radiocommunications Advisory Guidelines (Use of Electronic Counter Measures for Bomb Disposal Activities) 2010	
5	Radiocommunications (PMTS Jamming Devices – Visiting Forces and Suppliers) Exemption Determination 2011	
6	Radiocommunications (Public Mobile Telecommunications Services Surveillance Devices) Exemption Determination 2011	
7	Radiocommunications (Prohibition of PMTS Jamming Devices) Declaration 2011	
8	Radiocommunications (Mid-West Radio Quiet Zone) Frequency Band Plan 2011	Q3 2022: consult

[47] If a sunsetting instrument applies to a narrow range of stakeholders, the ACMA will consider engaging directly with those stakeholders.

No.	Sunsetting instrument	Action
9	1900–1920 MHz Frequency Band Plan 2012	CHANGE Q3/Q4 2022: consultation expected as part of the 1.9 GHz band options paper
10	Protected Symbols Determination 2013	Q3/Q4 2022: consult
11	Radiocommunications (UHF CB Radio Equipment) Standard 2011 (No. 1)	
12	Radiocommunications (118 MHz to 137 MHz Amplitude Modulated Equipment – Aeronautical Radio Service) Standard 2012	
13	Radiocommunications Advisory Guidelines (Additional Device Boundary Criteria – 1800 MHz Lower Band) 2012	Allow to sunset/repeal, with the advisory guidelines to be incorporated into a determination made under section 145 of the Act
14	Radiocommunications Advisory Guidelines (Managing Interference from Spectrum Licensed Transmitters – 1800 MHz Band) 2012	Q4 2022: consult
15	Radiocommunications Advisory Guidelines (Managing Interference to Spectrum Licensed Receivers – 1800 MHz Band) 2012	
16	Radiocommunications (Unacceptable Levels of Interference – 1800 MHz Band) Determination 2012	
17	Radiocommunications Advisory Guidelines (Managing Interference from Transmitters – 2.5 GHz Band) 2012	
18	Radiocommunications Advisory Guidelines (Managing Interference to Receivers – 2.5 GHz Band) 2012	
19	Radiocommunications (Unacceptable Levels of Interference – 2.5 GHz Band) Determination 2012	
20	Radiocommunications Advisory Guidelines (Managing Interference from Transmitters – 2.5 GHz Mid-band Gap) 2012	
21	Radiocommunications Advisory Guidelines (Managing Interference to Receivers – 2.5 GHz Mid-band Gap) 2012	
22	Radiocommunications (Unacceptable Levels of Interference – 2.5 GHz Mid-band Gap) Determination 2012	
23	Radiocommunications Advisory Guidelines (Managing Interference from Transmitters – 700 MHz Band) 2012	
24	Radiocommunications Advisory Guidelines (Managing Interference to Receivers – 700 MHz Band) 2012	
25	Radiocommunications (Unacceptable Levels of Interference – 700 MHz Band) Determination 2012	
26	Radiocommunications (Trading Rules for Spectrum Licences) Determination 2012	Q4 2022: consult

No.	Sunsetting instrument	Action
27	Radiocommunications Spectrum Marketing Plan (700 MHz Band) 2012	Allow to sunset
28	Radiocommunications Spectrum Marketing Plan (2.3 GHz Band) 2009	
29	Radiocommunications Spectrum Marketing Plan (2.5 GHz Band) 2012	
30	Radiocommunications (Spectrum Licence Allocation – Combinatorial Clock Auction) Determination 2012	
31	Radiocommunications Licence Conditions (Aircraft Licence) Determination 2011 (No. 1)	