



Australian
Communications
and Media Authority

Spectrum options optimised for local area wireless broadband services

Information paper

AUGUST 2024

Canberra

Level 3
40 Cameron Avenue
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
Pymont NSW

PO Box Q500
Queen Victoria Building
NSW 1230

T +61 2 9334 7700
F +61 2 9334 7799

Copyright notice

<https://creativecommons.org/licenses/by/4.0/>

Except for the Commonwealth Coat of Arms, logos, emblems, images, other third-party material or devices protected by a trademark, this content is made available under the terms of the Creative Commons Attribution 4.0 International (CC BY 4.0) licence.

All other rights are reserved.

The Australian Communications and Media Authority has undertaken reasonable enquiries to identify material owned by third parties and secure permission for its reproduction. Permission may need to be obtained from third parties to re-use their material.

We request attribution as © Commonwealth of Australia (Australian Communications and Media Authority) 2024.

Contents

Version history	1
Summary	2
Background	3
Licensing frameworks	3
Apparatus licensing	3
Spectrum licensing	4
Class licensing	5
Licensing approaches that support local area services	5
Overview	7
Summary of apparatus licensing arrangements	7
Summary of class-licensed arrangements	8
Possible future arrangements	8
Band-by-band apparatus-licensing arrangements	9
1710–1785 MHz/1805–1880 MHz (1800 MHz) band	9
1900–1920 MHz (1900 MHz) band	9
1920–1980 MHz/2110–2170 MHz (2100 MHz) band	9
3400–3475 MHz urban excise	9
3400–4000 MHz remote	9
3750–3950 MHz metro, regional and rural	10
3950–4000 MHz metro and regional	10
5600–5620 MHz and 5630–5650 MHz (5.6 GHz) band	10
24.25–27.5 GHz (26 GHz) band	10
27.5–29.5 GHz (28 GHz) band	10
Backhaul	11
Apparatus-licensed point-to-point links	11
Class-licensed point-to-point links	11
Further information	12

Version history

Date	Summary of changes
May 2020	Initial version.
August 2021	<ul style="list-style-type: none">• Updated licensing frameworks with Modernisation Act changes.• Added 24.25–25.1 GHz to class licensing arrangements.• Added 3700–4000 MHz to apparatus licensing arrangements.• Updated details to band-by-band apparatus licensing arrangements for 1800 MHz, 1900 MHz, 3.4 GHz, 3.6 GHz, 26 GHz and 28 GHz.
August 2023	<ul style="list-style-type: none">• 3.4 GHz, 3.6 GHz and 3700–4000 MHz bands consolidated into one 3400–4000 MHz section for remote AWL licensing.• Added 3750–3950 MHz metro and regional section to apparatus licensing arrangements.• Added 3400–3475 MHz urban excise and 3950–4000 MHz highly localised use arrangements.• Added 5925–6425 MHz for summary of class-licensed arrangements.
July 2024	<ul style="list-style-type: none">• Updated details for band-by-band apparatus licensing arrangements for 3400–3475 MHz urban excise, 3750–3950 MHz metro and regional and 3950–4000 MHz metro and regional.

Summary

The ACMA recognises that different types of spectrum use require different types of authorisation regimes to best enable spectrum users to deliver a range of services. This is particularly the case with wireless broadband services where there is a large variety of service offerings available and diverse needs for spectrum access which are supported by different licensing approaches.

This paper provides information to assist existing and prospective providers of local wireless broadband networks in identifying spectrum bands – including regulatory arrangements – that are suitable for deploying their services.

These providers typically provide fixed wireless access (FWA) or private mobile networks – sometimes referred to as private Long Term Evolution (LTE) networks – to small or medium-sized geographical areas such as schools, mines, campuses, small towns and businesses.

Given the local nature of these use types and user preferences, apparatus and class licensing arrangements are often the most suitable – and are the focus of this paper. We acknowledge that spectrum licensing arrangements are not usually well suited for these use types and users (and are not discussed in this paper). However, the use of spectrum-licensed bands may be an option in some circumstances, especially under third-party authorisation. The ACMA is aware of circumstances where this has occurred.

This paper focuses on spectrum access options to support customer access networks or ‘last mile’ service delivery, with some information also provided about spectrum suitable for network backhaul options.

Background

The ACMA recognises multiple categories of wireless broadband use and notes that deployments in practice may reflect combinations of these categories.

One category of wireless broadband service is the wide-area subscriber network, with an extensive base station infrastructure serving large geographic areas. This category is characterised by telecommunication carrier mobile broadband operations and is often authorised by wide-area spectrum licences.

Another category, and the focus of this paper, reflects more limited networks over smaller, localised areas, including, but not limited to, FWA and private mobile networks. Services provided by wireless internet service providers (WISPs) are a good example of this type of small and medium enterprise (SME) that often provide these services. SMEs and associated use types are often best supported by apparatus- or class-licensed arrangements.

Licensing frameworks

There are currently 3 licence types available to authorise access to spectrum – spectrum, apparatus and class. Each of these vary in their allocation method commonly used, approach to pricing, associated level of exclusivity and interference environment.

On 17 June 2021, amendments to the *Radiocommunications Act 1992* from the *Radiocommunications Legislation Amendment (Reform and Modernisation) Act 2020* (the Modernisation Act) came into force. The amendments allow for greater flexibility for the ACMA to manage spectrum and provide greater clarity to licensees. More information on the amendments can be found on the [ACMA website](#) and in the information paper, [Our approach to radiocommunications licensing and allocation](#).

Apparatus licensing

An apparatus licence authorises the use of a radiocommunications device (or group of devices) operating under a specific radiocommunications service type, in a specific frequency range, and generally at a specific geographic location¹ for up to 20 years. It is typically issued ‘over-the-counter’ in accordance with coordination rules developed by the ACMA.

Information and application processes for different apparatus licences can be found on the [ACMA website](#). Typically, public telecommunications service ([PTS](#)) or point-to-multipoint ([PMP](#)) licences under the [fixed licence](#) category are suitable for providers as they can be used for ‘point-to-area’ services.

The ACMA [charges fees](#) for apparatus licences, which cover our costs and give people a reason to use spectrum efficiently.

When applying for an apparatus licence, new potential services are typically [coordinated with existing services](#) using Radiocommunications Assignment and Licensing Instructions ([RALIs](#)) to manage interference. Consequently, there will be areas where a new apparatus licence in

¹ Area-wide apparatus licences (AWLs), discussed later, can also be issued.

a frequency band will not be able to be issued. A band that is apparatus licensed shares spectrum through geographic separation of services.

At any point in time, a frequency range or geographic area may be subject to a [spectrum embargo](#), which can prevent licences being issued under specified circumstances.

Prospective licensees are advised to engage the services of an [accredited person](#) to assist in the licence application process and determine spectrum availability in the location and bands of interest.

The ACMA has also introduced an apparatus licence type called the [area-wide apparatus licence](#) (AWL), which is intended to permit the operation of one or more radiocommunications devices in an area. For a frequency band under consideration for an AWL, the licence may have conditions that specify:

- the frequencies in which radiocommunications devices are authorised to operate
- the geographical area in which radiocommunications devices may be operated
- the maximum equivalent isotropically radiated power (EIRP) or total radiated power (TRP) levels for radiocommunications devices operated under the licence
- the maximum signal level at the boundary/edge of the licence area.

The licence type is intended to support scalable applications, enabling its use for authorising access to different-sized geographic areas and bandwidths. Unlike existing apparatus licence types – which typically align with specific uses and purposes – the AWL type is intended to authorise a variety of services, uses, applications and technologies. For a frequency band, the conditions would be developed to suit the intended services.

Spectrum licensing

A spectrum licence authorises the use of a specific frequency band within a defined geographic area for up to 20 years. The geographic area can vary in size and may be as large as the entire country. Spectrum licences have historically been utilised for most bands used to deploy commercial mobile broadband networks.

[Spectrum licences](#) are typically issued via a competitive allocation process as demand often exceeds supply. Further information on spectrum licensing processes can be found on the [ACMA website](#).

Each spectrum-licensed band will have a [technical framework](#), which describes the main licence conditions and how interference is managed. The framework is typically designed to provide for exclusive use by a licensee within the defined geographical area and frequency ranges that were allocated to them.

An inherent feature of spectrum licensing is technological flexibility – that is, the licensing rules. While usually optimised for an expected technology, spectrum licences generally specify only generic technical details and limitations, such as maximum power, frequency range, out-of-band emissions limits and geographical licence area, while not expressly mandating a specific technology or service. This allows a licensee to deploy any technology that complies with the terms and conditions of the licence, without intervention from the regulator. It is up to the licensee to manage interference between the devices it deploys, although the adoption of international standards mitigates the potential for interference between devices.

Spectrum licences are more conducive to spectrum trading than apparatus licences, due to design features such as their longer tenure, built-in certainty/rights and their ability to be subdivided.

Class licensing

[Class licences](#) are a standing authorisation to use spectrum without the need to apply to the ACMA for access, so long as the conditions of that licence are met. These conditions can be technical or geographic and pertain to the type of use, class of user or interference environment.

There are 15 class licences, including citizen band (CB) radios, emergency locating devices, intelligent transport systems and others. The [low interference potential devices](#) (LIPD) class licence is the class licence appropriate for wireless broadband use as it includes arrangements for radio local area network (RLAN) transmitters such as wi-fi.

Class licences provide a standing authorisation, with no current requirement to register device location with the ACMA. However, class-licensed devices are not afforded protection from interference, either from other class-licensed devices or other apparatus- or spectrum-licensed devices that may also be in the band.

Licensing approaches that support local area services

Apparatus and class licensing offer a degree of tailored use with flexibility that is well suited to addressing the spectrum needs of local area service providers. While apparatus licensing provides more certainty for access and a coordinated interference environment consistent with the ability to offer quality of service guarantees, class-licensed device use can, and has been, used in successful FWA services. For example, this is potentially possible in locations with smaller population densities where the associated use of class-licensed devices (and hence interference) is lower. The inherent robustness of some type of class-licensed devices (for example, using spread spectrum or beam-forming technologies in millimetre wave bands) can also assist.

Additional flexibility can be achieved by using combinations of apparatus- and class-licensed bands, for example, spectrum use across a multiband network. Alternative approaches that use multiple class-licensed bands might in some cases also provide greater resilience (for example, using the 60 GHz class licence band for high data rates where possible, then falling back to a lower band such as 5.8 GHz when necessary).

While spectrum licensing or a single Australia-wide apparatus licensing arrangement is generally not suitable for the use-cases of localised providers, there is the possibility of [third-party access](#) to spectrum-licensed bands through agreement with the spectrum licensees. Third-party access arrangements are developed between the spectrum licensee and the

access seeker. In our experience, such arrangements do not appear to occur often, however, we are aware of some occurrences. These arrangements can be developed for a defined area or an amount of spectrum that is agreed between the parties. While the ACMA is not usually involved or required to be involved in these processes, we may consider playing a brokering role in reaching these types of agreements in exceptional circumstances.

Note that this information is intended as a guide only and should not be relied on as legal advice or to replace detailed analysis by prospective licensees. Prospective licensees may wish to seek their own legal and engineering advice to determine how the regulatory framework applies to their situation and what the current regulatory framework is.

Overview

Summary of apparatus licensing arrangements

The following summarises bands with apparatus licensing arrangements in place (or being developed) to support local area FWA and private mobile network services. Each band is discussed in more detail in the [Band-by-band apparatus licence arrangements](#) section of this document.

Table 1: Summary of bands with apparatus licensing arrangements

Band	Apparatus licence type ¹	Applicable areas ²
1710–1785/ 1805–1880 MHz	PTS	Remote (part band only)
1900–1920 MHz	PMP	Regional and remote
1920–1980 MHz/ 2110–2170 MHz	PTS	Regional (part band only) and remote (entire band)
3400–3475 MHz	Arrangements under development	Urban excise areas ³
3400–4000 MHz	AWL	Remote
3750–3950 MHz	AWL	Metro, regional and rural
3950–4000 MHz	Arrangements under development	Metro and regional
5600–5620 MHz and 5630–5650 MHz	PMP	Regional
24.7–25.1 GHz and 27.5–29.5 GHz	AWL	Australia-wide
25.1–27.5 GHz	AWL	Regional and remote

Note 1: PTS = public telecommunications service; PMP = point-to-multipoint; AWL = area-wide licence.

Note 2: Refer to relevant RALIs – as detailed in the next part of this paper – for a detailed definition of an area’s arrangements.

Note 3: Urban excise areas include inner metropolitan areas in Melbourne, Sydney, Brisbane, Adelaide and Perth.

Summary of class-licensed arrangements

Operation under the [Radiocommunications \(Low Interference Potential Devices\) Class Licence 2015](#) (LIPD) is possible in number of bands that may suit certain provider use-cases. Some of the bands that may be suitable include:

- 915–928 MHz
- 2400–2483.5 MHz
- 5150–5350 MHz
- 5470–5600 MHz
- 5650–5725 MHz
- 5725–5850 MHz
- 5925–6425 MHz
- 24.25–25.1 GHz
- 57–71 GHz. Certain restrictions or requirements may apply to use of a band, such as EIRP limits, indoor or outdoor only use, implementing transmit power control and dynamic frequency selection. Refer to the LIPD for full details.

Further information on class licensing is available on the [ACMA website](#).

Possible future arrangements

The ACMA uses the [five-year spectrum outlook](#) (FYSO), issued annually, to outline future work plans and priorities. A draft outlook document is released for comment, providing an opportunity for interested stakeholders to propose new or different priorities for the work plan.

The ACMA also uses public consultation processes when reviewing changes to the use of a specific frequency band. Current and recent consultations can be found on the [ACMA website](#).

Band-by-band apparatus-licensing arrangements

1710–1785 MHz/1805–1880 MHz (1800 MHz) band

Parts of the 1800 MHz band are available for PTS apparatus licensing in remote areas. Detailed information, frequency coordination and licensing procedures can be found in [Radiocommunications Assignment and Licensing Instruction \(RALI\) MS 34](#). Under the current arrangements, priority assignment arrangements mean that only part of the band (the upper 30 MHz of each duplex segment) is available for licensing to organisations who are not mobile network operators (MNOs).

1900–1920 MHz (1900 MHz) band

The 1900–1920 MHz frequency range is available for PMP apparatus licensing in specific regional and remote areas only. Detailed information, frequency coordination and licensing procedures can be found in [RALI FX 19](#).

This frequency range, along with 1880–1900 MHz, is under initial investigation regarding new technologies and new use cases. More information on this process can be found in the [FYSO](#).

1920–1980 MHz/2110–2170 MHz (2100 MHz) band

The 2100 MHz band is available for PTS apparatus licensing in regional and remote areas that are outside areas where spectrum licensing applies. This limits access to the lower 40 MHz of each duplex segment in regional areas. [RALI MS 33](#) provides detailed information, frequency coordination requirements and licensing procedures.

3400–3475 MHz urban excise

We are developing technical arrangements for highly localised services in parts of the 3400–3575 MHz band in urban excise areas with public consultation planned for Q3 2024. These areas are inner metropolitan areas of Melbourne, Sydney, Brisbane, Adelaide and Perth. More detailed maps of these areas can be found in the [Planning for wireless broadband use of urban areas in 3400–3475 MHz: Outcomes paper](#).

Development of the technical and licensing arrangements for this band will be done concurrently with arrangements in 3950–4000 MHz metro and regional areas. Information on the progress of this process can be found on our website: [Allocating the 3.4–4.0 GHz band](#).

3400–4000 MHz remote

Area-wide licences are available in remote areas in the 3400–4000 MHz frequency range. Further details can be found in [RALI MS47](#) and on our website at [Area-wide apparatus licensing in the 3.4–4.0 GHz band](#). Existing PMP licences remain supported in this band in remote areas.

3750–3950 MHz metro, regional and rural

Area-wide licences are available in metro, regional and rural areas in the 3750–3950 MHz frequency range. Further details can be found in [RALI MS47](#) and on our website: [Area-wide licence allocation in the 3.8 GHz band](#).

3950–4000 MHz metro and regional

We are in the process of developing technical arrangements for highly localised services in 3950–4000 MHz metro and regional areas, with public consultation planned for Q3 2024.

Development of the technical and licensing arrangements for this band will be done concurrently with arrangements in 3400–3575 MHz in urban excise areas.

Information on the progress of this process can be found on our website: [Allocating the 3.4–4.0 GHz band](#).

5600–5620 MHz and 5630–5650 MHz (5.6 GHz) band

The 5.6 GHz band is available for PMP apparatus licences in regional areas.

[RALI FX 23](#) provides detailed information, frequency coordination requirements and licensing procedures.

24.25–27.5 GHz (26 GHz) band

The 26 GHz band is available for AWL apparatus licensing as follows:

- > 24.7–25.1 GHz: Australia-wide
- > 25.1–27.5 GHz: in areas not subject to the [Radiocommunications \(Spectrum Re-allocation—26 GHz band\) Declaration 2019](#).

[RALI MS 46](#) provides detailed information, frequency coordination requirements and licensing procedures.

27.5–29.5 GHz (28 GHz) band

The 28 GHz band is available for AWL apparatus licensing Australia-wide. [RALI MS 46 and RALI MS 38](#) provide detailed information, frequency coordination requirements and licensing procedures.

Backhaul

Backhaul to serve the access network may be provided by point-to-point (PTP) links, using spectrum covered by apparatus licensing and class licensing arrangements.

Apparatus-licensed point-to-point links

Information about most PTP link spectrum bands, including frequency coordination and general guidance, can be found in [RALI FX3](#).

Appendix 1 of RALI FX3 provides a useful summary of PTP bands, including channel designated use, typical use, channel bandwidth, typical capacity and minimum path length.

There are also some self-coordinated bands above 50 GHz that are detailed in [RALI FX 20](#):

- > 58 GHz (57–59 GHz) 75 GHz (71–76 GHz) 85 GHz (81–86 GHz). There are also classes under the LIPD class licence that cover the 57–59 GHz band. These have different conditions of operations than apparatus licensed under RALI FX 20.

The [5725–5825 MHz \(5.8 GHz\) band](#), while normally available via the LIPD class licence, can also be used with higher transmitter power for PTP with [certain restrictions](#) via apparatus licensing. The restrictions include the definitions of the low population density areas where they may be licensed.

Class-licensed point-to-point links

Some of the frequency bands in the [Radiocommunications \(Low Interference Potential Devices\) Class Licence 2015](#) may be suitable for backhaul uses, however, the limitations on the use of class-licensed devices should be noted. The LIPD classes concerning frequency hopping, wi-fi and RLAN transmitters are those that may be of most interest.

Further information

- To apply for licences for local area wireless broadband services, contact an [accredited person](#).
- General enquiries:
 - email the ACMA Customer Service Centre at info@acma.gov.au
 - [enquire online](#).