Apparatus licences in the 26 GHz and 28 GHz bands

Licensing, technical framework and pricing arrangements consultation paper

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Introduction 1

Background 2

Planning decisions 2

Technical Liaison Group 3

Area-wide apparatus licences 3

Related allocation processes 4

Consultation package 5

Issues for comment 6

Invitation to comment 7

Making a submission 7

Appendix A—Taxation and charges 8

Apparatus licence tax arrangements 8

Charging arrangements 10

Appendix B—Technical Framework 11

Overview of proposed arrangements 11

Draft technical framework for consultation 16

Appendix C—International allocations 26

# Introduction

The Australian Communications and Media Authority (ACMA) is consulting on draft arrangements for allocating apparatus licences in the 26 GHz and 28 GHz bands   
(the bands).

We propose introducing new apparatus licensing arrangements in the bands which will support:

* the introduction of millimetre wave (mmWave) band fifth-generation (5G) wireless broadband (WBB) services in the range 24.7–29.5 GHz[[1]](#footnote-2)

ongoing access to the band by apparatus licensed fixed-satellite service (FSS) earth stations in the range 27–29.5 GHz.

We are proposing to authorise access for the above services under area-wide apparatus licences (AWLs) of up to five years duration. A key premise of AWLs is that they are scalable in bandwidth and geographic area by aggregating geographic cells and/or spectrum blocks authorised by the licence.

We are proposing that AWLs will be allocated using a two-stage administrative allocation which is described in the accompanying draft applicant information pack (AIP). The allocation will see the first AWLs issued initially in two rounds:

* **Round 1:** 24.7–25.1 GHz and the 27.5–29.5 GHz ranges Australia-wide. Apparatus licences via administrative allocation before the spectrum auction in the first quarter of 2021 (which is for specified areas in the 25.1–27.5 GHz range). We are expecting to open this round in late October 2020, with licences issued from December 2020.

**Round 2:** 25.1–27.5 GHz in all areas other than those designated for spectrum licensing. Apparatus licences via administrative allocation after the spectrum auction. We are expecting to open this round in May 2021, and complete licence issue by end of June 2021.

We will announce the opening and closing dates for the round 1 and round 2 allocations on our website.

We propose that the annual apparatus licence tax for an AWL be based on the established $/MHz/pop construct.

# Background

A broad range of large and small (largely 5G) wireless broadband (WBB) use cases are emerging in Australia and internationally. 5G technologies, along with the unique propagation characteristics of mmWave frequency bands, will accommodate many different existing, emerging and new use cases. This includes the potential for non-traditional spectrum users to deploy private, enterprise or small-scale commercial 5G networks supporting such applications as healthcare, manufacturing/industrial, transportation and education.

We believe that the proposed allocation process and accompanying technical frameworks balance the needs of both WBB and satellite interests in accessing mmWave frequency bands. Under the proposed arrangements for the 28 GHz band, satellite users will benefit from additional access to spectrum, and there will be significant new opportunities for terrestrial fixed wireless broadband uses in the band. In both cases, these opportunities will deliver flow-on benefits to consumers in terms of quality and range of services available at little or no detriment to existing users of the spectrum.

## Planning decisions

The 26 GHz band, which comprises 24.25–27.5 GHz, and the upper-adjacent 28 GHz band (27.5–29.5 GHz), are the first of the mmWave bands to be allocated internationally on a widespread basis for wireless broadband services. A summary of the allocations of mmWave spectrum by overseas regulators is at [Appendix C](#_Appendix_C_–).

This consultation package is a key part of the process of implementing previous planning decisions for the deployment of 5G services in Australia. These decisions were the culmination of detailed reviews and are encapsulated in the 26 GHz band [planning decisions and preliminary views paper](https://www.acma.gov.au/consultations/2019-08/options-wireless-broadband-26-ghz-band-consultation-322018) (26 GHz band decisions paper) and the 28 GHz band [planning decisions and preliminary views paper](https://www.acma.gov.au/consultations/2019-08/planning-options-28-ghz-band-consultation-092019) (28 GHz decisions paper), which were released in April and September 2019 respectively.

Licensing options for both bands had regard to a range of factors, including the necessary conditions for coexistence between disparate services, and the likely technologies, use cases and deployment scenarios in those bands.

The 26 GHz band decisions paper flagged a suite of class, apparatus and spectrum licensing measures to facilitate a broad range of WBB use cases, along with proposed coexistence conditions necessary to ensure the ongoing, protected use of the band by various incumbent fixed-satellite, space-research and passive earth exploration satellite services (EESS).

The 28 GHz band decisions paper outlined a combination of measures aimed at maximising the overall public benefit derived from use of the band. This included:

* The introduction of arrangements for fixed wireless access (FWA) services across the entire 28 GHz band on a co-primary basis with apparatus licensed fixed satellite service (FSS) earth stations in large population centres in the 27.5–28.1 GHz frequency range, and on a secondary (no protection) basis to the FSS in other areas and frequencies.

Providing for increased access to spectrum suitable for current and evolving satellite services, such as very high throughput broadband both to the home and to moving platforms.

## Technical Liaison Group

Our practice is to review or develop a new spectrum licence technical framework through the formation of a Technical Liaison Group (TLG). A TLG is a short-term advisory body convened by the ACMA and comprising ACMA spectrum planning engineers and industry and other spectrum users to discuss the technical aspects of spectrum licences.

In November 2019, we convened a TLG to provide advice on the development of the 26 GHz spectrum licence technical framework, which included consideration of the technical frameworks for 26 GHz and 28 GHz AWLs. The TLG completed its consideration of the draft technical framework in April 2020. The outcomes of the 26 and 28 GHz TLG are available on the [ACMA website](https://www.acma.gov.au/spectrum-licence-technical-liaison-groups). The draft technical frameworks that are proposed for AWLs in these bands (contained in [Appendix B](#_Draft_technical_framework)) have been informed by TLG deliberations.

As WBB use cases were the initial focus of interest for the AWL, the draft technical framework was originally optimised for that service. At the end of the TLG process, staff engaged in an FSS-specific consultation using the TLG distribution list.

These subsequent discussions identified scenarios where AWLs could also be used to authorise FSS earth stations in the range 27–30 GHz. Initial feedback on these preliminary proposals identified a set of concerns about using AWLs for earth station licensing. This feedback has been considered in the development of the draft technical framework. In order to create a homogeneous licensing system, this draft framework has been modified so it is now optimised for both WBB and FSS earth stations.[[2]](#footnote-3)

Earth stations in the range 29.5–30 GHz are still authorised under a fixed-earth apparatus licence. This paper is also consulting on a proposal that FSS earth stations in this range could be authorised under AWLs.

Area-wide apparatus licences **(AWLs)**

The AWL has been proposed for use in the 26 GHz and 28 GHz bands. Unlike existing apparatus licence types, which typically align with specific uses and purposes, the AWL type will be capable of authorising a variety of fixed and mobile services, uses, applications and technologies. This flexibility is intended to allow licensees to tailor the spectrum capacity and geographic reach of the licence to highly specific use-cases.

AWLs have been designed to be technology and service-flexible, however the technical arrangements for AWLs in the 26 GHz and 28 GHz bands have been optimised for wireless broadband services and FSS earth stations. This means that other service types can be deployed as long as they comply with all licence conditions and regulatory arrangements.

The ACMA considers that the AWL will be beneficial in scenarios where there are multiple radiocommunications devices operated within smaller defined geographical areas and specified frequencies than those typically authorised by spectrum licences (the typical scale, cost and limited availability of spectrum licences means that they may not be suitable for authorising smaller-scale deployments).

Our preference for AWLs in the mmWave bands reflects developments internationally, where a number of overseas jurisdictions have developed a licensing option for small-area, multi-device deployments, including for proposed 5G applications. These overseas arrangements, while not exclusively restricted to industrial or commercial applications of spectrum, have often been utilised by a variety of industry sectors who use spectrum to facilitate their operations (for example, mining and infrastructure).[[3]](#footnote-4)

Our earlier planning consultations identified the following categories of use case:

* Smaller, local-area market-subscriber services, such as those provided by wireless internet service providers (WISPs) or dedicated (e.g. government-only) wireless broadband networks, which are expected to best align with apparatus licences.

Uncoordinated ad hoc deployments within the confines of private premises or property (including domestic, industrial, business, commercial and government), which are expected to best align with class licences.

## Related allocation processes

Following the release of the 26 GHz decisions paper, the ACMA made a draft recommendation to the Minister for Communications, Cyber Safety and the Arts (the Minister). On 18 October 2019, the minister made the [Radiocommunications (Spectrum Re-allocation—26GHz Band) Declaration 2019](https://www.legislation.gov.au/Details/F2019L01374)(the re-allocation declaration). This declares that spectrum in the frequency range 25.1–27.5 GHz in metropolitan and certain regional areas is to be reallocated by issuing spectrum licences. This was a necessary step in giving effect to the proposal to spectrum licence those parts of the 26 GHz band. The recommendation was made on the basis that spectrum licensing was considered to be the licensing framework most likely to ensure the efficient allocation and use of the spectrum in the areas in question, and to provide licensees with the flexibility and security of tenure needed to encourage investment in infrastructure.

The ACMA will auction spectrum licences in the 26 GHz band in the first quarter of 2021. AWLs will be available in the 25.1–27.5 frequency range in all areas outside those designated for spectrum licensing after the auction.

# Consultation package

We are seeking comments from interested stakeholders on the following aspects of our framework for implementing AWLs in the 26 GHz and 28 GHz bands:

* applicant information pack
* pricing

technical framework.

### Applicant information pack

The draft applicant information pack (AIP) contains important information about the allocation and issuing of apparatus licences in the 26 GHz (24.7–27.5 GHz) and 28 GHz (27.5–29.5) bands.

The draft AIP is a guide for applicants when applying for an AWL. It includes information about how the spectrum will be licensed, duration, variation of conditions, renewal of licences, and what taxes and charges will apply to the licences. Our proposed renewal policy for AWLs in the bands is that we will have regard to whether the spectrum has been used over the duration of the relevant licence and if there is unmet demand in the bands. We may decide not to renew a licence, or the licence may be offered for renewal with different conditions.

We welcome feedback on any part of the AIP. The AIP is available as a separate attachment in the key documents section of the [consultation page](https://acma.gov.au/consultations/2020-08/proposed-licensing-arrangements-26-ghz-and-28-ghz-bands-consultation-252020).

### Pricing

The implementation of AWLs into the bands means that new pricing arrangements suitable to the licence type are required. Information about pricing for AWLs is available at [Appendix A](#_Appendix_A_–).

### Technical framework

The purpose of the technical framework is to provide for an equitable, interference-managed set of conditions and instructions for access that will be optimised for both WBB and FSS ground-segment use cases, as applicable.

Information about the proposed technical framework for AWLs is available at [Appendix B](#_Appendix_B_–).

The technical framework comprises:

* a draft amended Radiocommunications Licence Conditions (Area-Wide Licence) Determination 2020 (AWL LCD)
* draft Radiocommunications Assignment and Licensing Instruction (RALI) for AWLs in the 26 GHz and 28 GHz bands (referred to as RALI [new])

draft updated RALIs for coordination between earth station transmitters in the fixed-satellite service and other services in the 25.5–30 GHz band (updated RALI MS 38)

These documents are available as separate documents on the [consultation page](https://acma.gov.au/consultations/2020-08/proposed-licensing-arrangements-26-ghz-and-28-ghz-bands-consultation-252020).

# Issues for comment

We welcome comment from interested stakeholders on any aspect of the consultation package.

In addition, we invite comments on these specific questions:

The ACMA is proposing to use a two-stage administrative allocation for apparatus licences in certain segments of the 26 GHz band and in all of the 28 GHz band. Do stakeholders agree with this approach? If not, please explain why.

Do stakeholders have any concerns with the licence duration and renewal policy for AWLs in the 26 GHz and 28 GHz bands?

The ACMA is proposing that AWLs be available for issue for the operation of FSS earth stations in the 27–29.5 GHz range. Do stakeholders support this proposal? If not, please explain why.

The draft technical framework is optimised for both wireless broadband and FSS earth stations. Fixed earth stations in the range 29.5–30 GHz are still authorised under a fixed-earth apparatus licence. We are seeking views on a proposal to authorise FSS in the 29.5–30 GHz range with AWLs. Do stakeholders have any comments about this proposal?

Do stakeholders have any specific comments about the draft AWL LCD or RALI [new] or updated RALI MS 38?

Do stakeholders agree with the proposed apparatus licence tax? As explained in [Appendix A](#_Appendix_A_–), at this time in Australia there is limited information about the value of the spectrum on offer for administrative allocation. The ACMA is open to reviewing the apparatus licence tax for AWLs in light of developments in domestic markets that have occurred or will occur over time. What considerations should the ACMA take into account?

# Invitation to comment

## Making a submission

The ACMA invites comments on the issues set out in this discussion paper. [Online submissions](https://www.acma.gov.au/have-your-say) can be made by uploading a document. Submissions in PDF, Microsoft Word or Rich Text Format are preferred. Submissions by post can be sent to:

The Manager

Spectrum Outlook and Strategy Section

Australian Communications and Media Authority

PO Box Q500

Sydney NSW 1230

The closing date for submissions is **COB, Wednesday 16 September 2020**.

Consultation enquiries can be emailed to [licensingdesign@acma.gov.au](mailto:licensingdesign@acma.gov.au).

#### Publication of submissions

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

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

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Information on the *Privacy Act 1988,* how to access or correct personal information, how to make a privacy complaint and how we will deal with the complaint, is available in our [privacy policy](https://www.acma.gov.au/privacy-policy).

# Appendix A—Taxation and charges

## Apparatus licence tax arrangements

### Proposed tax arrangements

The ACMA is proposing an apparatus licence tax of $0.0003/MHz/pop in segments of the 26 GHz band (the 24.7–25.1 GHz range and in areas other than those designated for spectrum licensing in the 25.1–27.5 GHz range) and in the 27.5–29.5 GHz frequency range of the 28 GHz band where:

* MHz is the amount of spectrum in an area.
* Pop is the population of the area. The area will be defined in terms of the Hierarchical Cell Identification Scheme (HCIS).[[4]](#footnote-5)

The 26 GHz and 28 GHz bands means the apparatus licensed spectrum from 25.7 GHz up to and including 29.5 GHz.

Where the calculated tax, using the method outlined above, is less than the minimum annual tax, the tax will be the minimum annual tax. Currently the minimum annual tax is $41.49.

It is proposed that these tax arrangements will be inserted into the Radiocommunications (Transmitter Licence Tax) Determination 2015. As it is not expected that AWL receiver licences will be required, we are not proposing to determine a tax in the Radiocommunications (Receiver Licence Tax) Determination 2015.

### Context to the pricing arrangements

The AWL taxation arrangements differ from most apparatus licence tax arrangements.

Many apparatus licence taxes are based on the number of stations or spectrum accesses included in the licence. AWL licensing permits any number of stations or spectrum accesses to be used within any given area, as long as these meet the specified technical criteria. Accordingly, the AWL tax is based on the amount of spectrum and the area authorised and not on the number of stations or spectrum accesses. The proposed tax arrangements are similar to those for PMTS Class B licences that also use a $/MHz/pop construct to determine the tax.[[5]](#footnote-6)

In determining a $/MHz/pop rate for the tax, we note that 5G services and satellite services are still evolving, so there is limited information about the value of the spectrum at this time in Australia.

Given these limitations, we have been guided by overseas auction results for similar spectrum. Table 1 outlines some of the recent international auctions for similar spectrum.

Making comparisons with overseas auctions is difficult. In Australia, differences between pricing arrangements for apparatus and spectrum licences occur due to licence duration and technical conditions. Similarly, the outcome of auctions in other countries can also be influenced by factors like licence duration, technical conditions and competitive tension in auctions, which may not be present in Australia. Nevertheless, the outcomes across countries highlight the potential value of the spectrum.

1. Overseas auction prices

| **Date** | **Country** | **Frequency** | **Bandwidth** | **Licence term** | **$/MHz/pop**  **(one-year apparatus licence)[[6]](#footnote-7)** |
| --- | --- | --- | --- | --- | --- |
| Jun 2018 | South Korea | 28 GHz | 2400 MHz | 5 | $0.0013 |
| Sep 2018 | Italy | 26 GHz | 1000 MHz | 19 | $0.0003 |
| Jan 2019 | US | 28 GHz | 850 MHz | 10 | $0.0017 |
| Apr 2019 | US | 24 GHz[[7]](#footnote-8) | 500MHz  200 MHz | 10  10 | $0.0018  $0.0004 |
| Jan 2020 | Taiwan | 28 GHz | 2500 MHz | 20 | $0.0001 |
| Feb 2020 | Thailand | 26 GHz | 2700 MHz | 15 | $0.0002 |
| Jun 2020 | Finland | 26 GHz | 2400 MHz | 12.5 | $0.0002 |

Given the diversity of outcomes from $0.0001 to 0.0018/MHz/pop from these auctions, the ACMA has been relatively conservative in proposing an annual tax rate of $0.0003/MHz/Pop.

At this tax rate, we expect that the tax imposed on site-specific deployments should be relatively low where the area licensed will be relatively small. This is expected to encourage deployment of new and emerging 5G use cases. At the same time, the tax rate reflects a value for the spectrum that larger deployments, such as some fixed wireless models, could face in other jurisdictions. Some examples of the potential taxes can be found in the applicant information pack.

With the limited information currently available, the ACMA is open to reviewing the apparatus licence tax for AWLs in light of developments in domestic markets that have occurred or will occur over time.

### Implementation of the Spectrum Pricing Review

In 2019–20, we commenced implementation of the [Spectrum Pricing Review](https://www.acma.gov.au/consultations/2020-02/implementation-spectrum-pricing-review-consultation-072020). The ACMA consulted on its proposed pricing principles and the key priorities for determining a work program. We are currently considering the submissions made to the consultation process and expect to respond to submissions and confirm our work program in October 2020. We consider that the proposed taxation arrangements for AWLs are consistent with the draft guiding principles.[[8]](#footnote-9)

The draft guiding principles for spectrum pricing are based on:

* **Efficient allocation and use of the radiofrequency spectrum (efficiency).** An advantage of the pricing approach for AWLs is that the tax promotes deployment of a range of technologies and better aligns with the potential spectrum denial of services, which should aid in the efficient allocation and use of spectrum. The greater the amount of bandwidth and area over which services are deployed, the greater the denial of spectrum to other users, and therefore the greater the tax imposed.
* **Consistency and simplicity.** The pricing construct of a $/MHz/pop used is consistent with PMTS Class B licensing and taxation arrangements, making the AWL arrangements consistent and relatively simple to understand. However, the ACMA accepts that calculating taxes can be relatively complex. The ACMA is working on a guide and simple calculator to assist industry in these calculations.
* **Flexibility and adaptability to technology change.** By proposing a tax that is not dependent on the number of stations, the tax will be able to adapt to changes in technologies and deployment strategies.
* **Transparency in process.** The ACMA is using the consultation process to seek views about the taxation arrangements. There is limited information about spectrum valuations for mmWave spectrum in the Australian market. The ACMA is proposing to review the pricing arrangements for AWLs in the 26 and 28 GHz bands as more information becomes available, such as after the spectrum auction.

**Recovery of the costs of spectrum management.** The charging arrangements for the issue of AWL licences are outlined below.

## Charging arrangements

The ACMA is proposing to charge for the issue of an AWL licence based on the general service charge. The general service charge currently stands at $202 per hour. The charging arrangements are outlined in the [Radiocommunications (Charges) Determination 2017](https://www.legislation.gov.au/Details/F2018C00916).

# Appendix B—Technical Framework

The technical framework comprises:

* An update to the Radiocommunications Licence Conditions (Area-Wide Licence) Determination 2020 (the AWL LCD).[[9]](#footnote-10) This update will contain licence conditions applicable to radiocommunications devices operated under an AWL in the 26/28 GHz bands. The draft amendment determination is at **Attachment B** with key aspects discussed in the [AWL licence conditions](#_AWL_licence_conditions) section.
* Specified conditions included in an individual apparatus licence.[[10]](#footnote-11)
* Administrative policy (e.g. RALIs[[11]](#footnote-12) and BoPs[[12]](#footnote-13)).
* A new RALI (denoted RALI [new]). The RALI [new] is at **Attachment C**, with key aspects discussed later in the [Licensing and device registration instructions](#_Device_registration_and) section. The RALI will detail:
* The rules governing how AWLs are to be issued (for example, any frequency and/or geographic area limitations of proposed licences).
* The criteria which must be met before a transmitter can be registered and operated (in some cases, these criteria will be contained in other RALIs and BoPs).
* An update of RALI MS 38. It is proposed RALI MS38 will continue to be used for coordination between AWL-authorised earth stations and existing point-to-point fixed links. The remainder of the requirements in RALI MS38 will be replicated in the updated AWL LCD and RALI [new]. Minor changes to RALI MS38 to reflect this are detailed in **Attachment D**. RALI MS38 will continue being used for assignment of fixed earth stations authorised by an earth apparatus licence in the range   
  29.5–30 GHz.

## Overview of proposed arrangements

It is proposed to use AWLs to authorise both wireless broadband and FSS earth stations in the 26/28 GHz bands (the bands).

To give effect to the ACMA’s planning decisions, there will be limitations on the types of developments in certain parts of these bands. In particular:

* wireless broadband will be limited to the frequency range 24.7–29.5 GHz, with no mobile broadband use permitted above 27.5 GHz
* FSS earth stations will have priority over wireless broadband in the ranges   
  27.5–28.1 GHz outside specified areas and in 28.1–29.5 GHz range (these frequencies and areas are referred to as ‘sole-primary’).[[13]](#footnote-14)

FSS earth stations and wireless broadband services will have equal priority in the ranges 27–27.5 GHz (outside defined areas) and 27.5–28.1 GHz (inside defined areas). These frequencies and areas are referred to as ‘co-primary’.

Figure 1 summarises the existing and planned arrangements across the bands (noting that some aspects are yet to be implemented and will be the subject of further public consultation).

1. Overview of planning arrangements in the 26/28 GHz bands

Figure 1: Overview of planning arrangements in the 26/28 GHz bands 

C1/C2: Class licensing arrangements for wireless broadband services (subject of a separate consultation process)

S1/S2: Spectrum licensing (subject to auction)

A1: Apparatus licensing (Australia-wide) Restrictions on the number of base stations to manage interference by preventing wide and dense deployments.

A2: Apparatus licensing (outside specified areas).[[14]](#footnote-15) Includes additional conditions to protect space research service earth receive stations.

A3: Apparatus Licensing (outside specified areas). Additional conditions to protect domestic FSS uplinks.

A4: (inside specified areas). Restricted to FWA/FSS on a primary access basis and ubiquitous FSS on a secondary access basis.[[15]](#footnote-16) Additional conditions to protect domestic FSS uplinks.

A5: (outside specified areas). Restricted to fixed wireless on a secondary basis with regards to primary fixed satellite users (fixed gateway and ubiquitous earth stations). Additional conditions to protect domestic FSS uplinks.

A6: (Australia-wide). Restricted to fixed wireless on a secondary basis with regards to primary FSS users (fixed gateway and ubiquitous earth stations). Additional conditions to protect domestic FSS uplinks.

### Key aspects

The details of any transmitter operated under a 26 GHz or 28 GHz AWL will need to be included in the Register of Radiocommunications Licences (the RRL) before the transmitter can be operated, unless the transmitter is specifically exempt.

The updated AWL LCD will detail the types of transmitters that are exempt from the registration requirement (see the AWL licence conditions section). Any requirements (e.g. device coordination) which need to be met before a device can be included in the RRL is proposed to be contained in RALI [new]—see the [Licensing and device registration instructions](#_Device_registration_and) section.

It is proposed that, in general, an AWL will not be issued if it would overlap with an existing AWL in both frequency and area. This arrangement will provide a degree of exclusive spectrum access to a single licensee which will minimise the need for direct device-to-device coordination.

However, this arrangement could act to restrict spectrum access in some circumstances. For example, two earth stations can be operated in the same frequency and area without causing interference between the two satellite networks (assuming international satellite coordination has, or is being, completed). Similarly, FWA networks might be able to operate with stations in close proximity to co-frequency transmitting earth stations, if they are sited/planned in such a way that avoids interference from the earth station.

To avoid such restrictions, it is proposed that the ACMA may issue a new AWL that overlaps with an existing AWL or AWLs, in both frequency and area, in the following two scenarios:

* when the proposed licence includes a condition (denoted the ‘FSS-only’ condition) that:
* permits the operation of only earth stations
* requires that earth stations operated under the licence must not cause interference to existing or future receivers (operating in co-primary frequencies and areas) which operate under an existing AWL that is being overlapped[[16]](#footnote-17)
* when the proposed licence is issued on the condition:
* that they will not be afforded protection from transmitters operating under the AWL(s) being overlapped (through inclusion of a ‘no-protection’ advisory note on the licence)
* all the overlapped AWLs include the FSS-only condition.

This arrangement will:

* Allow earth stations, which are operated by different licensees, to operate on the same frequency in the same area (assuming appropriate international satellite coordination arrangements are in place).
* Ensure that access to spectrum by a prospective earth station operator will not be impeded by an AWL used to operate lower-priority services.
* Allow a new wireless broadband service to be deployed on a ‘best-effort’ basis by accepting any potential interference from earth stations operating under an existing AWL which is being overlapped.

Ensure that the utility of the overlapped AWL is not degraded as existing and future receivers will have priority over earth stations operated under the overlapping AWL (with the exception of receivers in sole-primary FSS frequencies and areas which will always have a lower priority than FSS earth stations).

Examples of this proposed arrangement are provided in Figures 2 and 3 below.

1. Examples of when AWLs may overlap in both frequency and area in co-primary frequencies and areas. (Yellow = AWL without FSS-only condition; blue = AWLs with FSS-only condition; green = AWL with no-protection advisory note.)

Proposed AWL

Proposed AWL

Normal adjacent frequency/area device coordination applies to non-overlapped AWL receivers (see later sections)

Normal adjacent frequency/area device coordination applies to non-overlapped AWL receivers (see later sections)

No protection afforded to AWL receivers associated with the proposed AWL

No protection required

Must protect overlapped existing and future AWL receivers

Existing AWL

Existing AWL

Geographic area

1. Examples of when AWLs may overlap in both frequency and area in sole-primary frequencies and areas. (Yellow = AWL without earth-station-only condition; blue = AWLs with earth-station-only condition.)

Proposed AWL

Proposed AWL

New earth stations not required to protect existing or future AWL receivers located in sole-primary frequencies and areas

New earth stations not required to protect existing or future AWL receivers located in sole-primary frequencies and areas

No protection required

Existing AWL

Existing AWL

Geographic area

It is proposed to import relevant portions of current FSS coordination arrangements into the new frameworks. RALI MS 38 will continue to contain the coordination requirements between new AWL earth stations and existing point-to-point fixed links. However, the remainder of RALI MS 38 will no longer apply to earth stations authorised under an AWL, as these arrangements will be transferred into the AWL LCD and RALI [new]. These are discussed further in later sections of this paper.[[17]](#footnote-18)

The earth station requirements currently contained in [business operating procedures](https://www.acma.gov.au/business-operating-procedures-spectrum) (BoPs), such as the ‘[Submission and processing of applications for earth and earth receiver apparatus licences from fixed earth stations’](https://www.acma.gov.au/publications/2019-10/report/business-operating-procedure-submission-and-processing-applications-earth-and-earth-receive-apparatus-licences-fixed-earth-stations), will still be required to be met and will be incorporated by reference into RALI [new].

### Shared use of the band

To give effect to the ACMA’s planning decisions in the 28 GHz band (27.5–29.5 GHz), for fixed wireless access (FWA)[[18]](#footnote-19) and FSS, the following arrangements are proposed:

* FSS earth stations will have priority over FWA in sole-primary frequencies and areas.

FSS earth stations and wireless broadband services will have equal priority in co-primary frequencies and areas.

These sole-primary and co-primary arrangements will be implemented by not requiring earth stations to be coordinated with or protect secondary FWA receivers. In particular:

* An AWL which only permits the operation of earth stations will be able to overlap (in frequency and area) with any existing AWL in the sole-primary frequencies and areas.

New or existing earth stations will not be required to protect new or existing FWA receivers operating in sole-primary frequencies and areas. Therefore, these earth stations will not be required to comply with AWL area and frequency boundary conditions when operating in sole-primary frequencies and areas (except at any co-primary frequency and area boundary). This is because these boundary conditions have been developed to protect FWA receivers—it is not appropriate to impose them on sole-primary earth stations. As a result, only the single HCIS cell in which the earth station is located will be required to be included in the AWL in frequencies and areas where FSS is sole-primary.

# Draft technical framework for consultation

This section discusses the key aspects of the proposed technical framework for AWLs, In particular, the *AWL licence conditions* section discusses the key proposed amendments to the AWL LCD, and the *Licensing and device registration instructions* section summarises the key aspects of the RALI [new].

RALI MS 38 will continue to be used for coordination between AWL-authorised earth stations and existing point-to-point fixed links. Other aspects currently contained in RALI MS 38 (such as the special conditions and antenna requirements) will be replicated in the AWL LCD and RALI [new], noting that it is proposed that the minimum antenna elevation angle is not required and only the current horizontal EIRP limit of -60 dBW/Hz is maintained (this amendment will apply for all new earth stations in the range 27–30 GHz). RALI MS 38 will still be used for coordinating FSS earth stations in the range 29.5–30 GHz with other services. A draft update of RALI MS 38 is at **Attachment D**.

### AWL licence conditions

Proposed licence conditions are included in the draft AWL LCD at **Attachment B**.

Some of the key aspects are included below.

**Unwanted emission limits**:

* All transmitters, including earth stations, are required to comply with unwanted emission limits in co-primary frequencies and areas. This will help facilitate adjacent-channel coexistence between all co-primary services. However, earth stations do not need to comply with these limits for emissions into a sole-primary FSS frequency and area, i.e. at frequencies:
* above 27.5 GHz for earth stations located outside defined areas
* above 28.1 GHz for earth stations located inside defined areas.
* All transmitters, excluding earth stations, will be required to comply with these limits in sole-primary frequencies and areas, noting that RALI [new] requires stations to comply with the spurious emission limits provided in Appendix 3 of the ITU Radio Regulations (this is a current requirement in RALI MS 38).
* Additional unwanted emission limits are included to protect sensitive passive earth exploration satellite services (EESS) in the adjacent 23.6–24 GHz band. These limits align with those agreed at WRC-19 and do not apply to earth stations.
* Unwanted emission limits in the LCD will align with international wireless broadband equipment standards.

**Maximum power limits:**

* Maximum total radiated power (TRP) limits for transmitters other than earth stations:
* 45 dBm/200 MHz for transmitters in the range 24.7–27 GHz
* 42 dBm/200 MHz for transmitters in the range 27–27.5 GHz and located outside gateway footprint areas
* 30 dBm/200 MHz for transmitters in the ranges:

27–27.5 GHz located inside gateway footprint areas

27.5–29.5 GHz Australia-wide.

* There are also additional conditions which will apply to transmitters which exceed defined TRP levels (which are lower than the maximum limits outlined above). See the *TRP limit and coexistence with space receive stations* section for further information.
* Earth stations operating in the 27–29.5 GHz band and within highly-populated areas must not exceed an equivalent isotropically radiated power (EIRP) of -60 dBW/Hz in the direction of the horizontal plane. This is a current requirement set out in RALI MS 38.

**Registration.** Transmitters are to be registered before they can be operated, unless specifically exempt. The following transmitters are exempt from registration:

* transmitters with a TRP less than or equal to 23 dBm per occupied bandwidth
* transmitters located indoors
* fixed transmitters that are not base stations and operate with a TRP greater than 23 dBm and less than or equal to 35 dBm per occupied bandwidth.

**Record keeping.** Additional record keeping requirements apply to outdoor transmitters (which are not base stations) that operate with a TRP in the range   
23–35 dBm. For such transmitters, licensees must keep a record of transmitters’ key technical details and make these records available to the ACMA on request.

**Fallback synchronisation requirement:**

* If interference occurs between AWL devices (other than earth stations) and spectrum licensed devices, and cannot be resolved between affected parties, the AWL licensee is required to synchronise its device(s) with the affected devices operated by other licensees (limited only to those devices causing or receiving interference).
* The uplink/downlink configuration to use when the synchronisation requirement is triggered is proposed to be contained in section 3.4 of RALI [new] at **Attachment C**.

The 26/28 GHz bands TLG did not come to a conclusion on the uplink/downlink configuration to use when the fallback synchronisation requirement is triggered. Two options are included in section 3.4 of the RALI [new]. Both these options are sourced from 3GPP documentation and, in the ACMA’s preliminary view, are suitable for synchronising devices if/when required. As the fallback synchronisation requirement can only detail a single uplink/downlink configuration, the ACMA is seeking further stakeholder views on which configuration should be adopted into the technical framework.

**Coexistence with other services:**

* Transmitters in the frequency range 27.5–29.5 GHz are not permitted to operate while in motion.
* To manage coexistence with the Canberra Deep Space Communications Complex at Tidbinbilla and the New Norcia Deep Space Ground Station in Western Australia, AWL transmitters are not permitted to operate in the 25.5–27 GHz range within the HCIS cells listed in Table 2.
* To manage coexistence with space receive stations (including domestic fixed satellite services), AWL transmitters (other than earth stations) are required to:
* comply with antenna pointing limitations detailed in ITU-R Resolution 242 (WRC-19).
* comply with antenna pointing restrictions and EIRP masks described in the *TRP limit and coexistence with space receive stations* section.
* Class licensed devices operating within the frequency range 25.1–27.5 GHz:
* AWL devices must not cause harmful interference to, nor will they be afforded protection from, devices operated under the Radiocommunications (Body Scanner – Aviation Security) Class Licence 2018.[[19]](#footnote-20)

Table 2: Earth receive station exclusion zones

| Area name | HCIS |
| --- | --- |
| New Norcia | BU7K, BU7L, BU7O, BU7P, BU8E, BU8F, BU8G, BU8I, BU8J, BU8K, BU8L, BU8M, BU8N, BU8O, BU8P, BV2A, BV2B |
| Tidbinbilla | MW4H1, MW4H2, MW4H4, MW4H5, MW4H6, MW4H7, MW4H8, MW4D7, MW4L2 |

#### TRP limit and coexistence with space receive stations

The 26/28 GHz bands are currently used by domestic and foreign satellite services. Internationally, there are fixed-satellite and inter-satellite services operating in the entire 26/28 GHz bands. Domestically, there are fixed satellite services operated at discrete locations in the range 27–29.5 GHz, including gateway uplinks operated by NBN Co Ltd (NBN). These satellite services operate in the earth-to-space direction, therefore there is a risk of interference from terrestrial services to space receive stations.

Australia is a member of the International Telecommunication Union (ITU) and has ratified the *Constitution and Convention of the ITU.* Under the Constitution, member states are bound to comply with the ITU’s Radio Regulations (RRs). Article 21 of the RRs (chapter 6) contains provisions which manage coexistence in frequency bands shared between terrestrial and satellite services above 1 GHz, including prescribed conducted and radiated emission limits on terrestrial services.[[20]](#footnote-21) The ACMA must have regard to the RRs in determining domestic planning arrangements.[[21]](#footnote-22)

In the context of defining TRP limits and EIRP limits in certain angular directions, we had regard to Articles 21.2, 21.3 and 21.5 which (respectively) deal with:

* EIRP limits for certain angles of separation from the geostationary orbit
* maximum overall EIRP limits from a station in the fixed or mobile service (55 dBW)

total power delivered to the antenna for stations in the fixed or mobile service (10 dBW above 10 GHz).[[22]](#footnote-23)

Article 4.4 of the RR provides some flexibility to allow the operation of stations which contravene the RRs “on the express condition that such a station, when using such a frequency assignment, shall not cause harmful interference to, and shall not claim protection from harmful interference caused by, a station operating in accordance with the provision of the Constitution, the Convention and these Regulation*”.* In this regard, while the proposals in this paper do not necessarily directly mirror the provisions of the abovementioned Articles under chapter 6 of the RR, they are broadly aligned with those provisions.

Placing a maximum power limit on spectrum licensed transmitters is one of a number of methods to enable terrestrial services to coexist with 26/28 GHz bands satellite services (additional methods are discussed later in this section). However, setting limits too low will unnecessarily restrict terrestrial deployments and degrade the utility of the band.

In recognition of the domestic satellite services which currently operate in the range 27–29.5 GHz, as well as the conditions contained in the ITU-R RRs, the following maximum TRP limits were proposed in the 26/28 GHz bands TLG:

* 37 dBm/200 MHz for transmitters in the range:
* 25.1–27 GHz
* 27–27.5 GHz and located outside of gateway footprint areas.[[23]](#footnote-24)

25 dBm/200 MHz for outdoor transmitters in the range 27–27.5 GHz and located inside a gateway footprint area and outdoor transmitters in the range   
27.5–29.5 GHz. Additional antenna pointing restrictions were also proposed to be placed on these transmitters.

There was disagreement within the 26/28 GHz bands TLG on whether the proposed limits would be too restrictive and lead to increased deployment costs and a degradation of the band’s utility. It was also argued that studies considering the coexistence of terrestrial and satellite services showed large interference margins which suggested that the TRP limits can be increased while still maintaining coexistence with satellite services.

In recognition of these concerns, the ACMA indicated to the 26/28 GHz bands TLG that higher TRP limits could be considered if this increase is accompanied by additional mitigation measures to maintain coexistence with satellite services. The ACMA also noted that it would expect any additional proposals that may be brought forward after the TLG process would reflect an agreement reached between interested or affected stakeholders (specifically, stakeholders in the terrestrial wireless broadband and satellite sectors). While the ACMA is aware that discussions on this matter were progressing, no agreed proposals were presented to the ACMA prior to the release of this paper.

#### Additional flexibility

To provide additional flexibility for services deployed under a 26/28 GHz bands AWL, while also maintaining coexistence with existing services (in particular foreign and domestic satellite services) a range of TRP limits and additional mitigation measures are proposed by the ACMA in Table 3 (set out below). The proposed limits and conditions vary depending on frequency range and location of the transmitter to account for different coexistence scenarios.

In each frequency/area segment, there are two TRP limits proposed:

* a ‘baseline’ limit

an ‘upper’ limit which will require adherence to the additional mitigation measures (which consist of antenna pointing restrictions and EIRP masks).

The baseline limits are those proposed in the 26/28 GHz bands TLG—anything above those limits triggers the need for additional mitigations—with the exception of the baseline limits for frequencies below 27 GHz which have been raised by 3dB (to 40 dBm).

It is proposed that the TRP limits in Table 3 will apply to all transmitters (e.g. base stations and user equipment).[[24]](#footnote-25) It is also proposed that the TRP limits will apply to a device’s entire antenna array (e.g. if the antenna array is ‘subdivided’ to produce two concurrent beams using the same 200 MHz channel, then the TRP limit applies to the aggregate TRP of both beams). Further, the TRP limit is to be scaled appropriately for transmitters which operate with a bandwidth other than 200 MHz (e.g. the maximum TRP limit for a transmitter in the range 24.7–27 GHz operating with a 100 MHz bandwidth would be 42 dBm, essentially retaining a common power spectral density across all bandwidth profiles).

The additional mitigations (EIRP masks and antenna pointing restrictions) would apply to all outdoor transmitter types which exceed the baseline TRP limit noting that licensees will be required to adhere to the provisions in resolves 2.1 and 2.2 of ITU-R Resolution 242 (WRC-19) for deployments in the range 24.7–27.5 GHz.[[25]](#footnote-26)

These provisions are proposed to be included in the AWL LCD—see draft at **Attachment B**.

Table 3: Proposed TRP limits (except earth stations) and additional mitigations—except earth stations

| **Frequency/area** | **TRP limit** | **Additional conditions[[26]](#footnote-27)** |
| --- | --- | --- |
| 24.7–27 GHz all areas | 40 dBm/200 MHz (baseline) | No extra conditions |
| 45 dBm/200 MHz  (upper limit) | Antenna pointing restrictions\* and  EIRP mask |
| 27–27.5 GHz outside footprint areas | 37 dBm/200 MHz (baseline) | No extra conditions |
| 42 dBm/200 MHz  (upper limit) | Antenna pointing restrictions\* and  EIRP mask |
| 27–27.5 GHz inside footprint areas | 25 dBm/200 MHz (baseline) | Extra antenna restrictions developed in the TLG\*\* |
| 30 dBm/200 MHz  (upper limit) | Antenna pointing restrictions\* and  EIRP mask |
| 27.5–29.5 GHz | 25 dBm/200 MHz (baseline) | Antenna pointing restrictions\*\*\* |
| 30 dBm/200 MHz  (upper limit) | Antenna pointing restrictions\* and  EIRP mask |

\* The main antenna beam is not to be mechanically or electrically steered above the horizon. This restriction applies to all outdoor transmitters.

\*\* Outdoor base stations must not be mechanically steered above the horizon and must not direct the main beam (via electrical steering) to elevation angles greater than 5° above the horizon for more than 5% of time within a 24-hour period. Outdoor fixed transmitters, which are not base stations, must not direct their main beam to within defined angles from the geostationary orbit.

\*\*\* The main base station antenna beam is not to be mechanically or electrically steered above the horizon. Outdoor fixed transmitters, which are not base stations, must not direct their main beam to within defined angles from the geostationary orbit.

The rationale for the proposed TRP limits and additional conditions in Table 3 is below.

In the range 24.7–27 GHz:

* 40 dBm is the highest conducted power permitted by Article 21.5 of the RRs. Assuming no ohmic losses, this equates to a TRP of 40 dBm.
* A TRP limit which exceeds 40 dBm could be permitted if it is offset by additional mitigation measures which limit radiation above the horizon. These additional measures are necessary to satisfy Article 4.4 of the RRs (i.e. that a station operating in contravention of the RRs (namely Article 21.5) will not cause harmful interference to another station).

The majority of proponents for an increased TRP in the 26/28 GHz band TLG indicated that a maximum TRP of 45 dBm/200 MHz would be suitable.

In the range 27–27.5 GHz outside gateway footprint areas:

37 dBm is consistent with the outcome of the TLG. This baseline limit, and the upper limit of 42 dB, are 3 dB less than the proposed limits below 27 GHz in recognition that the frequency range is shared with domestic satellite services and that high power transmitters located near (but just outside) the gateway footprint areas will contribute to the aggregate interference level at the satellite receiver.

In the range 27–27.5 GHz inside gateway footprint areas, and in 27.5–29.5 GHz:

* The baseline limit is consistent with the 26/28 GHz bands TLG outcome and preliminary views articulated in the decision paper.

The upper limit of 30 dBm/200 MHz is based on NBN’s input to the 26/28 GHz bands TLG which indicated that this limit, together with an appropriate EIRP mask, is acceptable to protect its satellite receivers in the 28 GHz band. As the coexistence scenario in the 27–27.5 GHz segment of the 26 GHz band is almost identical to the 28 GHz band (the key difference being that mobile use is contemplated in the 26 GHz band but not the 28 GHz band), it could be considered that a TRP of 30 dBm/200 MHz plus additional mitigations would also be appropriate in the range 27–27.5 GHz inside footprint areas.

There is a unique EIRP mask proposed for each for the frequencies/area combinations detailed in Table 4. These proposed masks (shown in Figure 4 and detailed in Table 4) aim to provide an equivalent level of emissions above the horizon as would be permitted for transmitters operating at the baseline TRP limit. Specifically, these proposed EIRP masks are based on the EIRP levels of a notional base station transmitter consisting of:

* a total conducted power (into all antenna elements, inclusive of losses) of:
* 40 dBm/200 MHz for transmitters in the range 24.7–27 GHz
* 37 dBm/200 MHz for transmitters in the range 27–27.5 GHz located outside footprint areas.
* 25 dBm/200 MHz for transmitters in the range:

27–27.5 GHz located inside footprint areas, or

27.5–29.5 GHz Australia-wide.

* an 8 x 8 antenna array complying with Recommendation ITU-R M.2101

main beam pointing to the horizon with no electrical tilt/scan.

The proposed EIRP mask in the 27–27.5 GHz and 27.5–29.5 GHz segments (limited to inside footprint areas for 27–27.5 GHz) is consistent with a mask proposed by NBN during the 26/28 GHz bands TLG.

The proposed masks in the segments 27–27.5 GHz outside footprint areas and   
24.7–27 GHz are 12 and 15 dB higher respectively (to account for the difference between the baseline TRP limits in these frequencies/areas).

Derivation of the proposed EIRP masks

Table 4: Proposed EIRP masks

|  |  |  |  |
| --- | --- | --- | --- |
|  | **Radiated maximum true mean power**  **(dBm/200 MHz EIRP)** | | |
| **Elevation angle above the horizontal plane**  **(el)** | **For transmitters in the range 24.7–27 GHz** | **For transmitters in the range  27–27.5 GHz and outside footprints** | **For transmitters in the range  27–27.5 GHz and inside footprints, or 27.5–29.5 GHz** |
| 5 degrees ≤ el < 15 degrees |  | - | - |
| 15 degrees ≤ el < 25 degrees | 49 | 46 | 34 |
| 25 degrees ≤ el < 55 degrees |  |  |  |
| 55 degrees ≤ el ≤ 90 degrees | 36.1 | 33.1 | 21.1 |

Subject to consultation outcomes, changes to the proposed values for the baseline and/or upper TRP limits or the specific approach to the implementation of the additional conditions (such as the values of the antenna pointing conditions and/or the EIRP mask) could also be considered.

Alternative measures to the specific proposals outlined above could also be considered. These might include the following approaches:

* restricting emissions towards the geostationary orbit or specific satellite orbital locations in the geostationary arc
* base station deployment density limitations
* maximum base station antenna heights
* minimum antenna performance requirements

combinations of these (and potentially other) approaches.

Each of these possible additional conditions will raise a different balance of risks and benefits. For example, restricting emissions only towards specific orbital slots would potentially adversely affect other parts of the geostationary arc and might preclude an Australian (or other) operator, e.g. NBN, from deploying additional satellite services in the band in the future.

The ACMA’s current view is that the proposed arrangements shown in Table 3 represent a balanced approach where other services are protected without unnecessary restriction on AWL licensees. However, we are interested to hear views on this issue. If the ACMA receives submissions that suggest an alternative arrangement that provides a better balance, the ACMA may decide to implement that arrangement without further consultation. However, the ACMA will carefully consider the implications for incumbent and prospective licensees before taking any such step.

### Device registration and licensing instructions

The RALI [new] is provided in **Attachment C**. Some of the key aspects are:

* Before the details of a radiocommunications transmitter can be included in the RRL it must comply with the coordination provisions detailed in RALI [new] (this includes provisions contained in other relevant RALIs and BoPs).
* Interference across the area boundary between adjacent AWLs is managed through setting the following power flux density (pfd) limits which are to apply at the geographic boundary of an AWL:
* -83 dBW/m2/MHz for transmitters which incorporate an active antenna system (AAS)
* -91 dBW/m2/MHz for transmitters without AAS.
* The above pfd limits do not apply at the boundary of:
* A spectrum licensed area, as AWL transmitters need to comply with the spectrum licence device boundary criteria (DBC) at this boundary.[[27]](#footnote-28)
* The HCIS[[28]](#footnote-29) cells MW4H6 and BV2A3 which contains the Canberra Deep Space Communications Complex and New Norcia Deep Space Ground Station, respectively. A requirement to protect these earth receive stations will be managed through a pre-registration requirement the RALI [new]—see **Attachment C**.
* The licensed area for earth stations located in sole-primary frequencies and areas, except at a boundary of a defined area for emissions in the range 27.5–28.1 GHz.
* An earth station must not be included in the Register unless the regulatory assessment detailed in the document [*Submission and processing of applications for earth and earth receiver apparatus licences from fixed earth stations*](https://www.acma.gov.au/publications/2019-10/report/business-operating-procedure-submission-and-processing-applications-earth-and-earth-receive-apparatus-licences-fixed-earth-stations) has been met.[[29]](#footnote-30)
* Coexistence with adjacent AWL and 26 GHz band spectrum licensed services:
* New AWL-authorised devices are to be coordinated with existing devices operated under adjacent AWLs and 26 GHz band spectrum licences.
* If interference occurs between AWL-authorised services, or between AWL and 26 GHz band spectrum-licensed services, and a negotiated solution cannot be reached:
* For devices other than earth stations, the affected devices are to synchronise their operation (limited to devices causing/receiving interference only).[[30]](#footnote-31)
* For AWL-authorised FSS earth stations, new earth stations must not cause interference to existing and registered receivers, except FWA receivers in sole-primary frequencies and areas.
* Coexistence with earth receive stations operating in the frequency range   
  25.5–27 GHz:
* AWL licensees are required to ensure that their transmitters (other than low powered or indoor transmitters) will not exceed a defined interference threshold at specified earth receive stations.
* This requirement includes fixed transmitters that are not base stations and operate with a TRP greater than 23 dBm and less than or equal to 35 dBm per occupied bandwidth. As these transmitters are exempt from the registration requirement (and therefore the pre-registration requirements in RALI [new] would not normally apply to them) a licence condition is proposed to be included in the LCD requiring these transmitters to adhere to the provisions in RALI [new].
* Coexistence with passive EESS stations in the band 23.6–24 GHz:
* deployment density limits for registered transmitters in the frequency range 24.7–25.1 GHz to limit potential aggregate interference to EESS satellites.
* Coexistence with legacy fixed point-to-point services operating in the frequency range 27.5–28.5 GHz:
* AWL transmitters must be coordinated with existing point-to-point services using:

for earth stations, the criteria in RALI MS 38

for all other transmitters, the criteria detailed in section 3.7 of RALI [new] at **Attachment C**. This criterion has been based on unwanted emissions from wireless broadband equipment standards.

* Notional receiver:
* A notional receiver performance (based on international equipment standards) is established to aid coordination with AWL receivers. While not mandatory, the ACMA will take these provisions into account in determining whether interference has occurred.
* The notional receiver to be used is the same as proposed for 26 GHz spectrum licensed receivers and is specified in the draft Radiocommunications Advisory Guidelines (Managing Interference to Spectrum Licensed Receivers — 26 GHz Band) 2020(available on the [ACMA website](https://www.acma.gov.au/consultations/2020-07/26-ghz-band-spectrum-licence-draft-legislative-instruments-consultation-192020)).
* Rules about the issuing of new AWLs, including:
* Following a 50 MHz channel raster (can be aggregated) and assignment priority, except for AWLs which permit only earth stations to be operated in sole-primary frequencies and areas.
* Geographic areas must consist of whole HCIS cells. The smallest geographic area authorised by an AWL is a single HCIS level 00 cell comprising an area of 20x15 seconds (equating to approximately 500m by 500m).[[31]](#footnote-32)
* AWLs must not overlap in frequency and area, except for the scenarios discussed in the [Key aspects](#_Key_aspects) section.
* Restrictions on issuing new AWLs in specific areas to manage coexistence with earth receive stations.

# Appendix C—International allocations

Some overseas regulators have already undertaken allocations of mmWave spectrum. Table 5 below shows a summary of the spectrum amounts obtained by participants.

1. Allocation amounts in international mmWave spectrum allocations

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Country | Allocation method | Date | Spectrum supply (MHz) | Spectrum amounts per participant (MHz) |
| South Korea (28 GHz) | Auction | 18 June 2018 | 2,400 | 800 |
| Japan  (28 GHz) | Tender | April 2019 | 1,600 | 400 |
| Italy  (26 GHz) | Auction | 2 October 2018 | 1,000 | 200 |
| Hong Kong  (26 and 28 GHz) | Administrative | 27 March 2019 | 1,200 | 400 |
| USA  (28 GHz) | Auction | 24 January 2019 | 850 | up to 1,850~ |
| USA  (24 GHz) | Auction | 28 May 2019 | 700 | up to 1,850~ |
| USA  (37–47 GHz) | Auction | 5 March 2020 | 3,400 | up to 1,850~ |
| Singapore  (26 and 28 GHz) | Tender | April 2020 | 3,200 | 800^ |
| Taiwan  (28 GHz) | Auction | 16 January 2020 | 2,500 | up to 800 |
| Finland  (26 GHz) | Auction | 8 June 2020  (The lower part of the band,  24.25–25.1 GHz, was excluded from the auction) | 2,400 | 800 |

~ The 1,850 MHz threshold applies to spectrum held across all the mmWave bands (24, 28, 37–47 GHz) and triggers an FCC market review rather than functioning as a limit during the auction.

^ The Singaporean regulator, IMDA, has announced 4 x 800 MHz blocks will be allocated in 2020.

1. The mmWave bands are in ’high-band’ spectrum, above 6 GHz, and until recently were unused for widespread wireless broadband purpose. [↑](#footnote-ref-2)
2. Based on stakeholder feedback, we will consider facilitating this change to the draft framework by amending relevant instruments, such as the Radiocommunications (Interpretation) Determination 2015. [↑](#footnote-ref-3)
3. For example, in April 2020, Fujitsu was awarded Japan’s first commercial local 5G licence. Fujitsu says it will be using its licence to power an AI-based security system in its Shin-Kawasaki Technology Square office, which covers an area of approximately 28,000 square metres. [↑](#footnote-ref-4)
4. The HCIS is the system used by the ACMA to define geographic areas for radiocommunications licensing and is based on the Australian Spectrum Map Grid (ASMG). HCIS is a naming convention developed by the ACMA that applies unique ‘names’ to each of the cells that make up the ASMG. More information is on the [ACMA website](https://www.acma.gov.au/australian-spectrum-map-grid). [↑](#footnote-ref-5)
5. The taxation arrangements for PMTS Class B licences that use the $/MHz/Pop pricing construct assume a population from at least a HCIS 02 cell. If more than one HCIS 02 cell is authorised, the populations from those cells are added together to estimate the population in the tax calculation. However, the AWL pricing arrangements assume that the minimum cell size is HCIS 00. [↑](#footnote-ref-6)
6. Prices have been adjusted to reflect a one-year licence in Australian dollars. As the auctions have occurred over the last two years, we have assumed a weighted average cost of capital of 5.5 per cent and cash flows of 2.5 per cent. The ACMA is mindful that economic circumstances are changing, and particularly the WACC may be lower for some of the more recent auctions. However, given the low tax rates calculated and accounting for rounding, there would only be marginal differences in the estimates prices outlined in Table 1. The one-year price conversion uses the duration adjustment formula exhibited in <https://www.legislation.gov.au/Details/F2013L00011/Explanatory%20Statement/Text>. Note the only difference relates to the previous WACC of 8.4 per cent, which is now 5.5 per cent. [↑](#footnote-ref-7)
7. The US ‘Auction 102’ sold 700 MHz in two different categories: 500 MHz and 200 MHz blocks, with lot sizes of 100 MHz. These results reflect the average prices paid within each category. [↑](#footnote-ref-8)
8. The guiding principles can be found in the ACMA’s consultation concerning the [implementation of the Spectrum Pricing Review](https://www.acma.gov.au/consultations/2020-02/implementation-spectrum-pricing-review-consultation-072020). [↑](#footnote-ref-9)
9. Existing LCDs are available on the Federal Register of Legislation [website](https://www.legislation.gov.au/Browse/Results/ByTitle/LegislativeInstruments/InForce/Ra/0/0/Principal). [↑](#footnote-ref-10)
10. If a licence contains conditions which are inconsistent with a relevant LCD, then the licence condition takes precedence. [↑](#footnote-ref-11)
11. Radiocommunications Assignment and Licensing Instructions or RALIs. Existing RALIs are available on the [ACMA website](https://www.acma.gov.au/ralis-frequency-coordination). [↑](#footnote-ref-12)
12. Business Operating Procedures or BoPs—existing BoPs are available on the [ACMA website](https://www.acma.gov.au/business-operating-procedures-spectrum). [↑](#footnote-ref-13)
13. Specified areas means large population centres as named in the [Radiocommunications (Spectrum Re-allocation—26GHz Band) Declaration 2019 (the Re-allocation Declaration)](https://www.legislation.gov.au/Details/F2019L01374). [↑](#footnote-ref-14)
14. ‘Specified areas’ in A2, A3, A4 and A5 are large population centres as named in the [Radiocommunications (Spectrum Re-allocation—26GHz Band) Declaration 2019 (the Re-allocation Declaration)](https://www.legislation.gov.au/Details/F2019L01374). [↑](#footnote-ref-15)
15. For both A4 and A5 class licensed ubiquitous FSS earth stations are contingent on the appropriate space receive apparatus licence being in place. Expansion of regulatory arrangements supporting ubiquitous earth stations below 28.3 GHz requires amendment to the CSO class licence which will be subject to a separate consultation process. The extent of any expansion will be determined by the viability of different types of ubiquitous earth stations to coexist with primary uses. [↑](#footnote-ref-16)
16. AWL receiver means a radiocommunications receiver for reception of radio emission from area-wide stations and that do not require an area-wide receive licence. [↑](#footnote-ref-17)
17. All the arrangements in RALI MS 38 will still apply for FSS earth stations operating in the range   
    29.5–30 GHz. [↑](#footnote-ref-18)
18. FWA is a subset of the wireless broadband service, limited to operation at fixed locations only. [↑](#footnote-ref-19)
19. This arrangement will avoid the need for changes to body scanner operating requirements, noting that the risk of interference is extremely small. [↑](#footnote-ref-20)
20. Copies of the ITU-R Radio Regulations are available on the [ITU-R website](https://www.itu.int/pub/R-REG-RR-2016). [↑](#footnote-ref-21)
21. See section 299 of the Act. [↑](#footnote-ref-22)
22. How Article 21.5 should be applied to transmitters which employ modern beam-steering antennas and wide channel bandwidths was discussed during WRC-19. This issue will continue to be discussed internationally in preparation for the 2023 World Radiocommunication Conference. [↑](#footnote-ref-23)
23. The gateway footprints areas are defined in the draft LCD amendment determination at Attachment B. [↑](#footnote-ref-24)
24. Licensees will still need to comply with the licence condition which requires transmitters to be registered before operation unless specifically exempt. [↑](#footnote-ref-25)
25. ITU-R Resolution 242 (WRC-19) is contained in the Final Acts of WRC-19, available from the [ITU-R website](https://www.itu.int/pub/R-ACT-WRC.14-2019/en). [↑](#footnote-ref-26)
26. In addition to adhering to *resolves* 2.1 and 2.2 of ITU-R Resolution 242 (WRC-19) for transmitters in the range 24.7–27.5 GHz. [↑](#footnote-ref-27)
27. The proposed 26 GHz spectrum licence DBC is detailed in the draft Radiocommunications (Unacceptable Levels of Interference – 26 GHz Band) Determination 2020, available on the [ACMA website](https://www.acma.gov.au/consultations/2020-07/26-ghz-band-spectrum-licence-draft-legislative-instruments-consultation-192020). [↑](#footnote-ref-28)
28. Hierarchical Cell Identification Scheme or HCIS is a way of describing geographic areas within the [Australian Spectrum Map Grid](https://www.acma.gov.au/sites/default/files/2019-08/australian-spectrum-map-grid-2012%20pdf.pdf). [↑](#footnote-ref-29)
29. This document will be modified to include the procedural differences between AWLs and fixed-earth apparatus licences—in particular, to outline that these regulatory procedures apply after licence issue for AWLs as opposed to pre licence issue for fixed earth licences. [↑](#footnote-ref-30)
30. Licence conditions for AWLs in the 26/28 GHz band will be consulted on in a separate process. [↑](#footnote-ref-31)
31. The ASMG has been updated to include additional HCIS levels—level 0 cells comprising an area of 1 x 1 minutes and level 00 cells comprising an area of 20 x 15 seconds. [↑](#footnote-ref-32)