26 GHz (25.1–27.5 GHz) band spectrum licence technical framework

Consultation paper

JuLY 2020

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Executive summary

On 18 October 2019, the Minister for Communications, Cyber Safety and the Arts made the [Radiocommunications (Spectrum Re-allocation — 26 GHz Band) Declaration 2019](https://www.legislation.gov.au/Details/F2019L01374) (the re-allocation declaration), declaring that spectrum in the frequency range 25.1–27.5 GHz in metropolitan and certain regional areas (the 26 GHz band) is to be reallocated by issuing spectrum licences. Accordingly, the Australian Communications and Media Authority (the ACMA) is preparing to allocate the spectrum by auction.

The auction is expected to commence in late March 2021.

A necessary part of this process is the development of a technical framework that will apply to the band. Information and advice received during the 26 GHz band TLG process (which ran from November 2019 to April 2020) provides the basis for the technical framework presented for comment in this paper.

This paper briefly summarises the matters included in the technical instruments, and invites comments from interested parties on those instruments, and any other issues relevant to the allocation of spectrum licences in the 26 GHz band.

The technical instruments are:

A sample licence included in the draft Radiocommunications Spectrum Marketing Plan (26 GHz Band) 2020(draft marketing plan), to be made under section 39A of the *Radiocommunications Act 1992* (the Act). A draft version accompanies the allocation instruments consultation paper, which is published alongside this paper on the ACMA website.

An unacceptable interference determination to be made under subsection 145(4) of the Act, a draft version of which is at Attachment A.

Two advisory guidelines, to be made under section 262 of the Act. Draft versions are at attachments B and C.

An amendment to the [Radiocommunications (Trading Rules for Spectrum Licences) Determination 2012](https://www.legislation.gov.au/Details/F2018C00564). A draft amendment determination is at Attachment D.

A new Radiocommunications Assignment and Licensing Instruction (RALI) (denoted RALI [new] in this paper) is being developed for the introduction of area-wide apparatus-licensed (AWL) services in 24.7–29.5 GHz (the 26/28 GHz band).[[1]](#footnote-2) Parts of RALI [new] are proposed to be incorporated by reference into the 26 GHz band spectrum licence technical framework. These relevant parts of draft RALI [new] are at Attachment E, noting that there will be an opportunity for comment and feedback on the entire draft RALI when we consult on arrangements for 26/28GHz band AWLs.

We have also prepared draft allocation instruments that describe the products we are offering for auction in the 26 GHz band, as well as setting out the rules and procedures that we propose will govern the auction process. Draft allocation instruments are described in a separate consultation paper, which is published alongside this paper on the ACMA website.

As well as seeking comment on the draft technical instruments, this paper also directs readers to information about processes that are being undertaken in parallel to this allocation process. These matters will be relevant to the use of 26 GHz spectrum into the future:

changes to licensing arrangements for the wider 26 GHz band (24.25−27.5 GHz) and 28 GHz band (27.5−29.5 GHz), including the implementation of both apparatus and class licensing arrangements

the ongoing [reform](https://www.communications.gov.au/what-we-do/spectrum/spectrum-reform) of the Act being undertaken by the Department of Infrastructure, Transport, Regional Development and Communications (the Department).

# Introduction

The Australian Communications and Media Authority (the ACMA) develops a technical framework for each spectrum-licensed frequency band. Each framework is a collection of technical and regulatory conditions applicable to the use of radiocommunications devices in a spectrum-licensed band. The technical framework defines the technical conditions and constraints under which a device may be deployed and operated within the geographic area and frequency bands specified in the licence.

Although the technical framework is optimised for technologies or services most likely to be deployed in the band, it is intended to be technology-flexible. This means licensees can operate any type of radiocommunications device for any purpose, provided they comply with the technical framework relevant to the licence.

The Minister for Communications, Cyber Safety and the Arts made the [Radiocommunications (Spectrum Re-allocation — 26GHz Band) Declaration 2019](https://www.legislation.gov.au/Details/F2019L01374) (the re-allocation declaration) for metropolitan and certain regional areas in October 2019. A technical framework for the 26 GHz band needs to be developed before spectrum licences can be allocated. This consultation paper outlines the proposed 26 GHz spectrum licence technical framework.

## Legislative context and policy environment

We are guided in our spectrum management functions by [the object of the *Radiocommunications Act*](https://www.acma.gov.au/object-and-scope-radiocommunications-act-1992) *1992* (the Act), set out in section 3 of the Act. A balanced application of regulatory and market mechanisms is necessary to achieve key elements of the object of the Act—in particular, maximising the overall public benefit from the efficient allocation and use of the radiofrequency spectrum and meeting the government’s policy objectives, as advised for the 26 GHz band allocation. The draft technical instruments are informed by, and consistent with, the object of the Act and communications policy objectives for the 26 GHz band allocation.

### Object of the Act

Management of the radiofrequency spectrum seeks to achieve outcomes including:

* Maximising, by ensuring the efficient allocation and use of the spectrum, the overall public benefit derived from using the radiofrequency spectrum.
* Providing a responsive and flexible approach to meeting the needs of users of the spectrum.
* Providing an efficient, equitable and transparent system of charging for use of the spectrum, taking account of the value of both commercial and non-commercial use of spectrum.

Supporting the communications policy objectives of the Commonwealth Government.

### Communications policy objectives for the allocation of the 26 GHz band

As noted, the object of the Act includes supporting the communications policy objectives of the Australian Government:

supporting the deployment of fifth generation (5G) technologies

promoting competitive market outcomes for the long-term benefit of consumers

promoting the efficient allocation and use of spectrum

promoting co-existence with existing services

supporting technological innovation and a range of wireless broadband use cases

encouraging investment in infrastructure, including in regional Australia.

Further detail for these objectives are available on the Department’s [website](https://www.communications.gov.au/documents/communications-policy-objectives-allocation-26-ghz-band).

The ACMA seeks to further these objectives in the development of the technical instruments.

The draft technical instruments are informed by, and consistent with, the object of the Act.

### Spectrum reform

The Department is consulting on a [staged approach to reforms](https://www.communications.gov.au/have-your-say/exposure-draft-radiocommunications-legislation-amendment-reform-and-modernisation-bill) to the Act. An exposure draft amendment bill proposes to provide spectrum users with greater protection against interference while also improving investment certainty. The amendments propose to remove unnecessary constraints in spectrum allocation and re-allocation processes.

The duration of a spectrum licence is proposed to be extended from a maximum of 15 years to 20 years, with clearer licence renewal processes. The arrangements for apparatus licences are also proposed to be aligned with spectrum licences to the extent possible. Proposed transition arrangements provide that spectrum re-allocation declarations and any marketing plans in force before commencement of the amendment Bill will continue to apply.

The three-year re-allocation period set in the 26 GHz band re-allocation declaration means that arrangements applying to incumbent apparatus licensees in the 26 GHz band will not be affected by legislative change. We may continue to authorise incumbent licensees to operate until the end of the re-allocation period, should they choose to do so.

Given the timing of consideration of possible changes to the Act, we intend that the 26 GHz band allocation, having commenced under the terms of the current Act, will use those terms throughout the allocation and issue of licences. This maximises regulatory certainty for participants. The 26 GHz band allocation will be conducted under the current Act and spectrum licences will be issued for a maximum term of 15 years.

Further information on spectrum reform is available by emailing [spectrumreform@communications.gov.au](mailto:spectrumreform@communications.gov.au).

## Background

Work towards the standardisation and harmonisation for mmWave (millimetre wave[[2]](#footnote-3)) bands for 5G is well advanced, with a strong focus internationally on the use of mmWave bands to provide short-range, high capacity services. The radiocommunications sector of the International Telecommunication Union examined bands above 24.25 GHz for wireless broadband 5G services at the 2019 World Radiocommunication Conference (WRC-19).

Amongst other mmWave bands, the frequency range 24.25–27.5 GHz (the wider 26 GHz band) was identified globally for international mobile telecommunications at the WRC-19. Separately, a number of countries considered allocation of mmWave bands before the WRC-19; with the USA, South Korea, Italy, Hong Kong and Singapore having already completed allocation processes.

The wider 26 GHz band is considered a pioneer mmWave band for 5G services internationally. This is a shorter-range, higher capacity band, which can complement the lower coverage bands (like the 3.6 GHz band) currently being used for 5G services in Australia and internationally.

### Wider 26 GHz band consultation

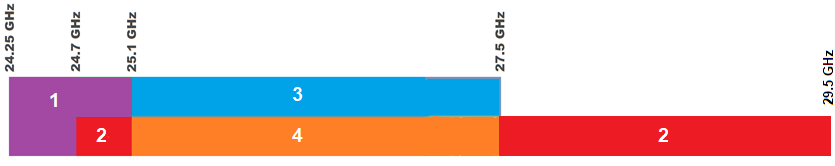
In September 2018, we released an [options paper](https://www.acma.gov.au/sites/default/files/2019-08/IFC%2032-2018_Options%20paper_Wireless%20broadband%20in%20the%2026%20GHz%20band.docx) for consultation on the wider 26 GHz band. This was followed by the release of our [April 2019 planning decisions and preliminary views paper](https://www.acma.gov.au/sites/default/files/2019-08/IFC_32-2018-Future%20use%20of%20the%2026%20GHz%20band%E2%80%94Planning%20decisions%20and%20preliminary%20views.docx) (26 GHz band decisions paper) on the future use of the band. The 26 GHz band decisions paper identified a suite of possible class-, apparatus- and spectrum-licensing measures to facilitate a broad range of wireless broadband use cases, underpinning the government’s policy objective to support technological innovation.

### 28 GHz band consultation

In parallel with the release of the 26 GHz band decisions paper, we also consulted on options for replanning the adjacent [28 GHz band](https://www.acma.gov.au/consultations/2019-08/planning-options-28-ghz-band-consultation-092019) (27.5–29.5 GHz) including the potential introduction of mmWave 5G wireless broadband services. In September 2019, we released the [28 GHz band planning decisions and preliminary views](https://www.acma.gov.au/sites/default/files/2019-11/Future-use-of-the-28-GHz-band-Final.docx) paper (28 GHz decisions paper). The 28 GHz band decisions paper indicated we would develop and consult on apparatus licence arrangements to support fixed wireless access (FWA) use in the 28 GHz band, as well as expanded arrangements for fixed-satellite earth stations. This included investigating the use of the proposed new AWL concept for authorising access.

Figure 1 summarises the planned licensing arrangements across the wider 26 GHz band and the 28 GHz band.

1. Licensing arrangements to be implemented in 26−28 GHz band



Key:  
1 – Class licensed Australia-wide  
2 – Area wide apparatus licences (AWL) Australia-wide (available no earlier than Q4 2020)  
3 – Spectrum licensed in major population centres (auction Q1 2021)  
4 – AWL outside major population centres (available shortly after spectrum licence auction)

### Class licensing

The [26 GHz decisions paper](https://www.acma.gov.au/sites/default/files/2019-08/IFC_32-2018-Future%20use%20of%20the%2026%20GHz%20band%E2%80%94Planning%20decisions%20and%20preliminary%20views.docx) included the planning decision to consult on adding the frequency range 24.25–25.1 GHz to the [Radiocommunications (Low Interference Potential Devices) Class Licence 2015](https://www.legislation.gov.au/Details/F2019C00681) (LIPD class licence) to enable uncoordinated time-division duplex (TDD) wireless broadband deployments. A number of conditions were outlined in the paper, including limiting operation in 24.25–24.7 GHz to indoor use only, while allowing operation both indoors and outdoors in 24.7–25.1 GHz. A draft variation to the LIPD class licence is expected to be released for consultation later in 2020.

### Apparatus licensing

Following our July 2019 [consultation on the proposed AWL](https://www.acma.gov.au/consultations/2019-08/proposed-area-wide-apparatus-licence-consultation-192019?utm_medium=email&utm_campaign=ACMA%20releases%20response%20to%20submissions%20and%20approach%20to%20introducing%20area-wide%20licence%20types&utm_content=ACMA%20releases%20response%20to%20submissions%20and%20approach%20to%20introducing%20area-wide%20licence%20types+CID_d1a0469099c729162681a7e17b8942ca&utm_source=SendEmailCampaigns&utm_term=summary%20of%20submissions), we are preparing draft technical instruments and policy documents to provide the technical and interference framework for the operation of AWLs in both the wider 26 GHz band and the adjacent 28 GHz band. The draft technical framework for AWLs in these bands will be examined in a future consultation paper.

### Spectrum licensing

The [26 GHz decision paper](https://www.acma.gov.au/sites/default/files/2019-08/IFC_32-2018-Future%20use%20of%20the%2026%20GHz%20band%E2%80%94Planning%20decisions%20and%20preliminary%20views.docx) formed the basis for a [draft spectrum re-allocation recommendation](https://www.acma.gov.au/consultations/2019-08/draft-spectrum-reallocation-recommendation-26-ghz-band-consultation-142019) we proposed to make to the Minister about reallocating spectrum in the band. Following consideration of stakeholder submissions, we made such a recommendation to the Minister under section 153F of the Act.

On 18 October 2019, following consideration of our recommendation, the Minister made the re-allocation declaration.

A spectrum re-allocation declaration has the effect of cancelling apparatus licences in the spectrum to be re-allocated, at the end of the re-allocation period. The re-allocation declaration provides for a re-allocation period of three years, ending on 14 November 2022. Any apparatus licences remaining in the band on that date are automatically cancelled.

Following the making of the re-allocation declaration, the ACMA commenced development of the draft 26 GHz spectrum licence technical framework. One of the key steps in this process is undertaking preliminary industry engagement through a Technical Liaison Group (TLG). The 26 GHz band TLG was convened in November 2019 and concluded in April 2020.[[3]](#footnote-4)

The TLG outcomes provide a basis for the proposed technical framework detailed in this paper—a summary of the TLG outcomes is available on the [ACMA website](https://www.acma.gov.au/spectrum-licence-technical-liaison-groups).

## Scope

The scope of this consultation paper is limited to the technical framework instruments for spectrum licences in the 26 GHz band only—these are included in attachments A–D, as well as the sample licence in the draft marketing plan. A new RALI is being developed primarily to provide guidance on licensing and registration of devices authorised to operate under AWLs in the 26/28 GHz bands. Parts of this new RALI are proposed to be incorporated by reference into the spectrum licence technical framework. Relevant parts of this draft new RALI (denoted RALI [new] in this paper) are included in Attachment E. The entire draft RALI will be publicly consulted on when we consult on arrangements for 26/28GHz band AWLs.

We are consulting on the proposed allocation instruments for the 26 GHz band spectrum licences in parallel to this paper. Further details are available on the [ACMA website](https://www.acma.gov.au/theACMA/Consultations/Consultations/Current-and-Closed-Consultations).

Consultation on the proposed technical framework for AWLs (including broader parts of RALI [new]) in the 26/28 GHz band will be carried out in a separate process and is outside the scope of this paper, except for the parts of RALI [new] that are incorporated by reference in the spectrum licence technical framework.

## Indicative timeline

We have prepared an indicative timeline, shown in Table 1, to assist those interested in the 26 GHz band technical framework, as well as potential bidders in the 26 GHz band auction. We emphasise that the dates in this timeline are estimates only, and may change as the allocation process progresses, including as a result of information provided by industry stakeholders during consultation. The final allocation process will take into account feedback from submissions.

We propose to commence the application process in mid-December 2020. We will provide updated timelines on our website.

1. Indicative timeline for the 26 GHz band auction

|  | Event | Date |
| --- | --- | --- |
| 1. 1. | Release of this consultation paper inviting comments on the draft technical instruments. | 9 July 2020[[4]](#footnote-5) |
| 2. | The ACMA makes technical instruments and registers them on the Federal Register of Legislation. | Late November 2020 |
| 3. | The ACMA undertakes preparations for the auction of 26 GHz band spectrum licences—see the allocation instruments consultation paper for more details (published alongside this paper on the ACMA website). | Mid-December 2020 to mid-March 2021 |
| 10. | Estimated auction commencement | Late March 2021 |

# Proposed technical framework

A technical framework consists of three interlocking regulatory elements provided for under the Act:

* The conditions specified on the spectrum licence—in particular, the core conditions that define the spectrum space (both frequency and geographical area) and the maximum level of emissions permitted inside and across the frequency boundaries of the licence (section 66). Section 71 also provides for the ACMA to include other conditions in a spectrum licence.
* A determination of unacceptable interference for the purpose of device registration in each band (subsection 145(4)).

Radiocommunications advisory guidelines that provide assistance and advice for coordination with stations in other services when and where required (section 262). These may sometimes be wholly or partly mandatory, by incorporation in spectrum licence conditions.

A more comprehensive explanation of spectrum licence technical frameworks is provided in the document [*Know your obligations—Spectrum licensees*](http://www.acma.gov.au/theACMA/Library/Industry-library/Spectrum/know-your-obligationshelp-for-spectrum-licensees).

## Technical Liaison Groups (TLGs)

The ACMA generally reviews or develops a new technical framework through the formation of a TLG. A TLG is a short-term advisory body convened by the ACMA, which provides a discussion forum between the ACMA, industry and other stakeholders with an interest in the technical aspects of spectrum licences.

In November 2019, the ACMA formed the 26 GHz band TLG to provide advice on the development of each component of the spectrum licence technical framework for the 26 GHz band. The TLG completed consideration of the draft technical framework in April 2020. The outcomes of the 26 GHz band TLG are available on the [ACMA website](https://www.acma.gov.au/spectrum-licence-technical-liaison-groups), with a summary of these outcomes provided in the next section.

The parallel 26/28 GHz band TLG looked at apparatus-licensing frameworks, which are beyond the scope of this paper.

## Draft instruments for consultation

Based on the outcomes of the 26 GHz band TLG, we have drafted the relevant technical framework instruments—these are included at Attachments A–D. The sample licence included in the draft marketing plan also forms part of the technical framework.

While we aim to resolve all technical issues during a TLG process, it is not always possible. At the conclusion of the 26 GHz band TLG, there were still some diverging views within the TLG membership. One particular issue related to total radiated power (TRP) limits for coexistence conditions. We indicated to the TLG that higher TRP limits could be considered if this increase is accompanied by additional mitigation measures to maintain coexistence with satellite services. While we were open to receiving additional information from stakeholders prior to public consultation on the proposed technical framework, no agreed proposals were received. In this paper, we have considered what additional flexibility could be offered in technical conditions. The rationale for providing additional flexibility on power limits is discussed in subsequent sections of this paper.

## Conditions in the spectrum licence

Each spectrum licence includes both core and statutory conditions specified under relevant sections of the Act. The Act also allows us to include other specific conditions.

* **Core conditions**—required under section 66, these define the spectrum space within which the licensee is authorised to operate radiocommunications devices, and the maximum permitted level of radio emissions in parts of the spectrum outside of the band or outside of the area. These conditions are included in all spectrum licences.
* **Statutory conditions**—required under sections 67 to 69A of the Act, these include requirements about payment of charges, use by third parties, residency, registration of transmitters and devices exempt from registration. These conditions are included in all spectrum licences.

**Other conditions**—these are placed on licences under section 71 and generally provide for the efficient management of the spectrum and administration of the Act. These conditions may vary from one band or licence to another.

The core conditions of a spectrum licence form the fundamental building blocks for operation of a spectrum-licensed device, and for managing interference with adjacent frequency bands and geographic areas. Section 66 of the Act states spectrum licences must specify the following core conditions:

the part or parts of the spectrum in which operation of radiocommunications devices is authorised under the licence (frequency range of operation)

the maximum permitted level of radio emission, in parts of the spectrum outside the frequency range specified on the licence, that may be caused by operation of radiocommunications devices under the licence (out-of-band core condition)

the area within which operation of radiocommunications devices is authorised under the licence (geographic area of operation)

the maximum permitted level of radio emission that may be caused by the operation of radiocommunications devices under the licence (out-of-area core condition).

The proposed sample licence is included in the draft marketing plan. Some of the key aspects are discussed below.

### Core conditions

This comprises:

* out-of-band core condition:
* alignment of unwanted emission limits with international equipment standards
* 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
* higher unwanted emissions are permitted in the frequency range 24.7–29.5 GHz range if agreement can be reached with affected spectrum and apparatus licensees (known as a core condition agreement)

out-of-area core condition:

maximum total radiated power (TRP) limits of:

* 45 dBm/200 for transmitters in 25.1–27 GHz
* 42 dBm/200 MHz for transmitters in 27–27.5 GHz and located outside gateway footprint areas[[5]](#footnote-6)
* 30 dBm/200 MHz for transmitters in 27–27.5 GHz located inside gateway footprint areas

no provision to permit operation above the prescribed TRP limits via a core condition agreement.

See the *TRP limit and coexistence with space receive stations* section for further information.

### Statutory conditions

* Spectrum licensed 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.

### Other conditions

* Record keeping—there are additional record-keeping requirements for transmitters at communal sites and for fixed outdoor transmitters (which are not base stations) that operate with a TRP in 23–35 dBm. This condition requires licensees to keep a record of the transmitter’s key technical details and make these records available to the ACMA on request.
* Fallback synchronisation requirement:
* If interference occurs between spectrum-licensed devices (or with devices operated under an AWL, other than earth stations), and a resolution cannot be negotiated between affected parties, a spectrum 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 draft RALI [new] at Attachment E.
* The 26 GHz band TLG did not settle on the uplink/downlink configuration to use when the fallback synchronisation requirement is triggered. Two options are included in section 3.4 of the draft RALI [new]. Both options are sourced from 3GPP documentation and, in our preliminary view, are suitable for synchronising devices if/when required. As the fallback synchronisation requirement can only detail a single uplink/downlink configuration, we are seeking further stakeholder views on which configuration should be adopted into the technical framework.
* Coexistence with other services:
* To manage coexistence with the Canberra Deep Space Communications Complex at Tidbinbilla, spectrum-licensed transmitters are not permitted to operate in the 25.5–27 GHz range within the following HCIS cells: MW4H3, MW4H9, MW4L3, MW5I1.
* To manage coexistence with space receive stations (including domestic fixed satellite services), a licence condition will require adherence to the protection requirements contained in the draft Radiocommunications Advisory Guidelines (Managing Interference from Spectrum Licensed Transmitters – 26 GHz Band) 2020 (RAG Tx)—see Attachment B. These protection requirements are discussed further in the *TRP limit and coexistence with space receive stations* section.

## TRP limit and coexistence with space receive stations

The 26 GHz band is currently used by domestic and international satellite services. Internationally, there are fixed-satellite and inter-satellite services operating in 25.1–27.5 GHz. Domestically, there are fixed satellite services operated at discrete locations in 27–27.5 GHz (and above), including gateway uplinks operated by NBN Co Ltd (NBN). These satellite services operate in the earth-to-space direction, creating 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 that manage coexistence in frequency bands shared between terrestrial and satellite services above 1 GHz, including prescribed conducted and radiated emission limits on terrestrial services.[[6]](#footnote-7) The ACMA must have regard to the RRs in determining domestic planning arrangements.[[7]](#footnote-8)

In the context of defining TRP limits and equivalent isotropically radiated power (EIRP) limits in certain angular directions, we have had particular 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).[[8]](#footnote-9)

While Australia has international obligations to adhere to the provisions in the RRs, Article 4.4 of the RRs provides some flexibility to allow the operation of stations that 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 Regulations.

In any case, 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 satellite services that operate in 25.1–27.5 GHz (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 that currently operate in 27–27.5 GHz, as well as the conditions contained in the ITU-R RRs, the following maximum TRP limits were proposed in the 26 GHz band 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

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

There was disagreement within the 26 GHz band 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, we indicated to the 26 GHz band TLG that higher TRP limits could be considered if this increase is accompanied by additional mitigation measures to maintain coexistence with satellite services. We also noted that we would expect any additional proposals 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 we are aware that some discussions were progressing, no agreed proposals were presented before the release of this paper.

### Additional flexibility

To provide additional flexibility for services deployed under a 26 GHz band spectrum licence, while also maintaining coexistence with existing services (in particular international and domestic satellite services), a range of TRP limits and additional mitigation measures are proposed in Table 2 (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 GHz band 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 2 will apply to all transmitters (for example, base stations and user equipment) and will be specified as the out-of-area core condition—see the draft marketing plan.[[9]](#footnote-10)

It is also proposed that the TRP limits will apply to a device’s entire antenna array (for example, 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 that operate with a bandwidth other than 200 MHz (for example, the maximum TRP limit for a transmitter in 21.5–27 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 that 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 all frequency ranges and areas.[[10]](#footnote-11)

These provisions are proposed to be included in the RAG Tx—see draft at Attachment B, with a condition on the licence requiring compliance with these provisions.

1. Proposed TRP limits and additional mitigations

|  |  |  |
| --- | --- | --- |
| **Frequency/area** | **TRP limit** | **Additional conditions[[11]](#footnote-12)** |
| 25.1–27 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 gateway 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 gateway 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 |

\* 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 rationale for the proposed TRP limits and additional conditions in Table 2 is:

In 25.1–27 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 that exceeds 40 dBm could be permitted if it is offset by additional mitigation measures that limit radiation above the horizon. These additional measures are necessary to satisfy Article 4.4 of the RRs (that is, 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 GHz band TLG indicated that a maximum TRP of 45 dBm/200 MHz would be suitable.

In 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. This recognises 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 27–27.5 GHz inside gateway footprint areas:

the baseline limit is consistent with the 26 GHz band 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 GHz band 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 be appropriate in the 26 GHz spectrum-licensed band.

There is a unique EIRP mask proposed for each for the frequencies/area combinations detailed in Table 2. These proposed masks (shown in Figure 2 and detailed in Table 3) aim at providing 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 25.1–27 GHz
* 37 dBm/200 MHz for transmitters in 27–27.5 GHz located outside footprint areas
* 25 dBm/200 MHz for transmitters in 27–27.5 GHz located inside footprint areas
* an 8x8 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 segment inside footprint areas is consistent with a mask proposed by NBN during the 26 GHz band TLG. The proposed masks in the segments 27–27.5 GHz outside footprint areas and 25.1–27 GHz are 12 and 15 dB higher respectively (to account for the difference between the baseline TRP limits in these frequencies/areas).

1. Derivation of the proposed EIRP masks
2. Proposed EIRP masks

|  |  |  |  |
| --- | --- | --- | --- |
|  | **Radiated maximum true mean power**  **(dBm/200 MHz EIRP)** | | |
| **Elevation angle above the horizontal plane**  **(el)** | **For transmitters in 25.1–27 GHz** | **For transmitters in 27–27.5 GHz and outside footprints** | **For transmitters in 27–27.5 GHz and inside footprints** |
| 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, including:

* 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, for example NBN, from deploying additional satellite services in the band in the future.

Our current view is that the proposed arrangements shown in Table 2 represent a balanced approach, where other services are protected without unnecessary restriction on spectrum licensees. However, we are interested to hear views on this issue. If we receive submissions suggesting an alternative arrangement that provides a better balance, we may decide to implement that arrangement without further consultation. However, we will carefully consider the implications for incumbent and prospective licensees before taking any such step.

**Draft spectrum marketing plan (26 GHz band)**

We seek stakeholder views on the sample licence conditions set out in the draft marketing plan, including the uplink/downlink configuration to be used when the fallback synchronisation requirement is invoked (two options are included in section 3.4 of the draft RALI [new] at Attachment E).

## Unacceptable levels of interference

Spectrum licensees are required to register a radiocommunications transmitter in the Register of Radiocommunications Licences before the transmitter may be operated, unless the transmitter is of a kind exempt from registration.

Subsection 145(1) of the Act allows the ACMA to refuse to register a radiocommunications transmitter if the operation of the transmitter could cause an unacceptable level of interference to the operation of other radiocommunications devices. We make determinations under subsection 145(4) of the Act (section 145 determinations) that set out the unacceptable levels of interference for each spectrum-licensed band.

These determinations set out the circumstances in which devices may cause unacceptable levels of interference, which include:

* if any part of the device boundary falls outside the licensed geographical area of the licence
* if the operation of the transmitter will cause a breach of a core condition of the licence

if the deployment of the device is outside the deployment constraints set for the band.

For the 26 GHz band, the proposed section 145 determination is available at Attachment A and reflects the outcomes of the 26 GHz band TLG. Some of the key proposals for the device boundary criteria set out in the determination are:

Setting two levels of protection:

–102 dBm/MHz for transmitters that incorporate an active antenna system (AAS)

–110 dBm/MHz for transmitter without AAS.

Setting the resolution of calculations to 100 m, with a maximum radial length of 53 km (this is an increase in radial length above that proposed in the TLG, to account for the proposed increase in TRP limits).

Use of the Geocentric Datum of Australia (GDA2020) coordinate reference system.[[12]](#footnote-13)

Use of a 3-second digital elevation model.[[13]](#footnote-14)

Inclusion of propagation loss due to clutter (using a defined model) for paths from transmitters with an antenna height of less than or equal to 6 m above ground level.

Exemption of spectrum licensees from the device boundary criteria inside the HCIS[[14]](#footnote-15) cell MW4H6, which contains the Canberra Deep Space Communications Complex at Tidbinbilla. A requirement to protect this earth station will be managed through a provision in the RAG Tx (see the *Managing interference from spectrum-licensed transmitters* section).

**The draft Radiocommunications (Unacceptable Levels of Interference - 26 GHz Band) Determination 2020**

The ACMA seeks stakeholder views on the draft section 145 determination at Attachment A.

## Radiocommunications Advisory Guidelines

Further guidance on interference management with other services is provided in Radiocommunications Advisory Guidelines (RAGs) made under section 262 of the Act. RAGs can refer to any aspect of radiocommunications or radio emissions.

Generally, RAGs include provisions to help assess the possible interference between spectrum-licensed devices and services operating under spectrum, apparatus or class licences. Potentially affected services are identified in the RAGs to enable licensees to assess and mitigate the risk of interference with these services.

Where interference arises between a spectrum-licensed service and another service, we will assess each case on its merits. We will, however, take into account the provisions of the RAGs in resolving the matter. Some provisions may also be incorporated by reference as a licence condition, and hence, would be mandatory for the licensee to meet.

In most spectrum-licensed bands, the ACMA makes two RAGs for managing:

* interference from spectrum licensed transmitters; and

interference to spectrum licensed receivers.

### Managing interference from spectrum-licensed transmitters

The ACMA proposes to make the Radiocommunications Advisory Guidelines (Managing Interference from Spectrum Licensed Transmitters – 26 GHz Band) 2020 (RAG Tx) to provide guidance on the protection of apparatus and class-licensed receivers from interference caused by transmitters operating under a spectrum licence. The RAG Tx identifies those apparatus-licensed services potentially affected by transmitters operated under a spectrum licence in the 26 GHz band and outlines the protection criteria and coordination arrangements that apply to these services.

The draft RAG Tx outlines how coexistence is to be managed with the following services:

* Earth receive stations operating in the frequency range 25.5–27 GHz:

spectrum-licensed transmitters (other than low powered or indoor transmitters) are required to coordinate with specified earth receive stations to ensure a defined interference threshold is not exceeded.

* Space receive stations operating in 25.1–27.5 GHz:

spectrum-licensed transmitters 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.

* Devices operated under AWLs, planned to operate in the frequency ranges 24.7–25.1 GHz and 27.5–29.5 GHz Australia-wide, and in the frequency range 25.1–27.5 GHz in areas adjacent to 26 GHz band spectrum-licensed areas:

if interference occurs between a spectrum-licensed transmitter and an AWL receiver, and a negotiated solution cannot be reached, the spectrum-licensed transmitter and AWL receiver are to synchronise their operation (limited to devices causing/receiving interference only).[[15]](#footnote-16)

* Class-licensed devices operating within the frequency range 25.1–27.5 GHz:

devices operated under the Radiocommunications (Body Scanner – Aviation Security) Class Licence 2018 will be afforded protection from harmful interference caused by spectrum-licensed transmitters

this arrangement will avoid the need for changes to body scanner operating requirements, noting that the risk of interference is extremely small

* Legacy fixed point-to-point services operating in the frequency range 27.5–29.5 GHz:

spectrum-licensed transmitters must be coordinated with existing point-to-point services using the criteria detailed in section 3.7 of draft RALI [new] at Attachment E.

**The draft Radiocommunications Advisory Guidelines (Managing Interference from Spectrum Licensed Transmitters - 26 GHz Band) 2020 (the RAG Tx)**

The ACMA seeks stakeholder views on the draft RAG Tx at Attachment B.

### Managing interference to spectrum-licensed receivers

The ACMA proposes to make the Radiocommunications Advisory Guidelines (Managing Interference to Spectrum Licensed Receivers - 26 GHz Band) 2020 (the RAG Rx) to primarily provide guidance on the management of out-of-band interference to receivers operating under a 26 GHz band spectrum licence. However, it also provides some guidance on the management of in-band interference.

A key part of the management of this type of interference is the specification of a notional receiver performance level and a compatibility requirement. This provides a baseline for the operators of radiocommunications transmitters to coordinate their services against. For this reason, we recommend that all receivers operating under a spectrum licence have a performance level at least equal to the notional performance level.

The draft RAG-Rx is available at Attachment C and reflects the outcome of the 26 GHz band TLG. Some of the key proposals in the draft RAG Rx are:

* aligning the notional level of receiver performance and compatibility requirement with international equipment standards

outlining that spectrum-licensed receivers are not afforded protection from devices operated under the Radiocommunications (Body Scanner – Aviation Security) Class Licence 2018. This arrangement will avoid the need for changes to body scanner operating requirements, noting that the risk of interference is extremely small.

**The draft Radiocommunications Advisory Guidelines (Managing Interference to Spectrum Licensed Receivers - 26 GHz Band) 2020 (the RAG Rx)**

The ACMA seeks stakeholder views on the draft RAG Rx at Attachment C.

## Standard trading units and minimum contiguous bandwidth

Spectrum licences give the licensee flexibility to use a parcel of spectrum space that incorporates a specific frequency band within a particular geographic area for up to 15 years. This spectrum space is divided into standard trading units (STUs) and the ACMA specifies the minimum contiguous bandwidth (MCB) for the purpose of allocating and trading spectrum licences.

A spectrum licence may be traded in whole, or in part, by geographic area or bandwidth—or both. Section 88 of the Act permits the ACMA to determine the rules for trading of spectrum licences. These rules are set out in the [Radiocommunications (Trading Rules for Spectrum Licences) Determination 2012](https://www.legislation.gov.au/Details/F2018C00564) (Trading Rules Determination).

The Trading Rules Determination specifies an MCB that limits the smallest contiguous bandwidth that can generally be licensed and reduces the potential for fragmentation in the band.

For the 26 GHz band, the ACMA proposes to:

set the MCB to 50 MHz

maintain the same STU as all other spectrum licensed bands:

a geographic area of a Level 1 HCIS cell

a frequency bandwidth of 1 Hertz.

The draft Radiocommunications (Trading Rules for Spectrum Licences) Amendment Determination 2020 (No. 1) (the draft amendment determination) is at Attachment D.

**The draft amendment determination**

The ACMA seeks stakeholder views on the draft amendment determination at Attachment D.

# Invitation to comment

## Making a submission

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

[Online submissions](https://www.acma.gov.au/have-your-say) can be made by uploading a document. Submissions in PDF or Microsoft Word are preferred.

Submissions by post can be sent to:

The Manager

Major Spectrum Allocations Section

Australian Communications and Media Authority

PO Box 78

Belconnen ACT 2616

**The closing date for submissions is COB, Monday 10 August 2020.**

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

#### Publication of submissions

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

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

#### Privacy

View information about our policy on the [publication of submissions](https://www.acma.gov.au/publication-submissions), including collection of personal information during consultation and how we handle that information.

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).

1. The ACMA is also considering arrangements to authorise fixed-satellite service earth stations in 27–30 GHz using AWLs. Stakeholders will have an opportunity to provide feedback on these proposed arrangements in separate consultation process. [↑](#footnote-ref-2)
2. mmWaves span 30 to 300 GHz (that is a wavelength of 1 cm to 1 mm), however, in the current 5G context, the mmWave bands in consideration span from around 24 GHz up to 86 GHz. [↑](#footnote-ref-3)
3. Membership of the 26 GHz band TLG consisted of representatives from prospective 26 GHz band spectrum licensees, incumbent apparatus licensees, adjacent band apparatus licensees, equipment manufacturers and accredited persons. [↑](#footnote-ref-4)
4. Consultation closes 10 August 2020. [↑](#footnote-ref-5)
5. The gateway footprints areas are defined in the Schedule 1 of the draft RAG Tx at Attachment B. [↑](#footnote-ref-6)
6. 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-7)
7. See section 299 of the Act. [↑](#footnote-ref-8)
8. How Article 21.5 should be applied to transmitters that 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-9)
9. Licensees will still need to comply with the licence condition that requires transmitters to be registered before operation, unless specifically exempt. [↑](#footnote-ref-10)
10. 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-11)
11. In addition to adhering to *resolves* 2.1 and 2.2 of ITU-R Resolution 242 (WRC-19). [↑](#footnote-ref-12)
12. The [Australian Spectrum Map Grid 2012](https://www.acma.gov.au/sites/default/files/2019-10/The%20Australian%20spectrum%20map%20grid%202012.PDF) will also be updated to include information on the new GDA 2020 datum. [↑](#footnote-ref-13)
13. The [*Digital elevation model interpretation*](https://www.acma.gov.au/sites/default/files/2019-11/Digital%20elevation%20model%20interpretation%20-%202013_0.pdf) document will also be updated to include examples for the 3-second elevation model. The existing methodology for determining heights when a calculation location is on a cell boundary will be maintained for both 3-second and 9-second elevation models. [↑](#footnote-ref-14)
14. 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-15)
15. Licence conditions for AWLs in the 26/28 GHz band will be consulted on in a separate process. [↑](#footnote-ref-16)