Licensing and coordination procedures for area-wide apparatus licensed services in the 26/28 GHz bands

Radiocommunications Assignment and Licensing Instruction

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Amendment history

| Date | Comments |
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| Month 2020 | Initial draft covering arrangement for area-wide apparatus licences in the 26 GHz and 28 GHz bands |
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|  |  |

Suggestions for improvements to Radiocommunications Assignment and Licensing Instruction MS xx may be addressed to:

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Please notify the ACMA of any inaccuracy or ambiguity found in this RALI, so that it can be investigated and appropriate action taken.

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# Introduction

## Purpose

The purpose of this Radiocommunications Assignment and Licensing Instruction (RALI) is to provide information about, and describe the necessary steps for:

* administratively issuing area-wide licences (AWLs) in the 26 GHz (24.7-27.5 GHz) and 28 GHz (27.5-29.5 GHz) bands, and
* the coordination of devices operated under these licences.

The information in this document reflects the ACMA’s statement of current policy in relation to devices authorised under an AWL in the 26 GHz and 28 GHz bands.[[1]](#footnote-2) In making decisions, accredited frequency assigners and the ACMA’s officers should take all relevant factors into account and decide each case on its merits. Issues relating to this document that appear to fall outside the enunciated policy should be referred to:

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## Scope

The scope of the RALI covers the administrative allocation and coordination arrangements AWLs in the 26/28 GHz bands.

### Basic principles

The basic principles for issuing and operating devices under an AWL in the 26/28 GHz bands are:

* An AWL provides service and technology flexible access to a frequency range and geographic area specified on the licence. Conditions applicable to all AWLs in the 26/28 GHz band is detailed in the Radiocommunications Licence Conditions (Area-Wide Licence) Determination 2020 (the AWL LCD), as in force from time to time
* An AWL is issued prior to device coordination (if required). Any necessary device coordination is to be undertaken prior to including applicable devices in the Register of Radiocommunications Licences (RRL).
* An AWL can only be administratively issued if it complies with the licensing arrangements detailed in Chapter 4 of this RALI.
* Subject to the limitations detailed in Chapter 4, an AWL can be issued to authorise access:
* In any area within the ranges 24.7-25.1 GHz and 27.5-29.5 GHz
* In the range 25.1-27.5 GHz in areas not subject to the [*Radiocommunications (Spectrum Re-allocation—26 GHz band) Declaration 2019*](https://www.legislation.gov.au/Details/F2019L01374) (26 GHz band reallocation declaration)
* A device must not be operated under an AWL in the 26 GHz or 28 GHz band unless it complies with the AWL LCD and with any conditions detailed on individual licences.
* Before a device can be operated under an AWL, details of the device must be in RRL (except for exempted devices listed in the AWL LCD)
* Before a device can be included in RRL, it must comply with the provisions in this RALI and any other applicable RALI.[[2]](#footnote-3)

# Coexistence arrangements Frequency coordination procedures

## Identification of potentially affected services

Services operated under an AWL in the 26/28 GHz bands will need to coexist with the following services:

* Other AWL services in the 26/28 GHz bands
* 26 GHz spectrum licensed devices operating in the range 25.1-27.5 GHz
* Space station receivers operating in the range 24.25-27.5 GHz
* Space research service (SRS) earth stations operating in the range 25.5-27 GHz
* Fixed satellite service (FSS) gateway up-links operating in the range 27-29.5 GHz
* Ubiquitous FSS earth station up-links operating in the range 27.5-29.5 GHz
* Passive earth exploration satellite services (EESS) operating in the range 23.6-24 GHz
* Legacy fixed point-to-point services operating in the range 27.5-28.5 GHz

Class licensed devices operating in the frequency range 24.25-29.5 GHz.

Coexistence arrangements with the above services are detailed in the section 2.2.

## Coexistence arrangements

### Coexistence with adjacent AWL services

All AWL devices which are required to be included in the RRL must meet a defined power flux density (pfd) limit at the geographic boundary of the licence[[3]](#footnote-4) – see Table 1 in section 3.1.1. This pfd limit is designed to provide adequate protection of user devices (which are not included in the RRL) without placing overly onerous restrictions on where base stations could be deployed.

Coexistence between base stations operated under adjacent AWLs is managed on a case-by-case basis as detailed in section 3.1. These arrangements are intended to be applied as needed which improves the utility AWLs (i.e. protection requirements are only applied when needed). Negotiation between impacted parties is also encouraged which can result in more efficient solutions. A fall-back requirement is also in place to ensure coexistence in the event that negotiations fail.

Section 3.3 details the applicable uplink-downlink configuration to be used when the synchronisation requirement has been triggered.

### Coexistence with 26 GHz band spectrum licensed services

Similar to spectrum licences, AWLs authorise the operation of devices in a defined frequency/area combination with licence conditions to manage out-of-area and out-of-band interference. Therefore, interference is primarily managed at the AWL boundary (frequency and area) and not the device.

The technical framework for AWLs in the 26/28 GHz bands has been optimised for 5G wireless broadband services and is in effect very similar to the proposed technical framework for 26 GHz band spectrum licences. This will result in a reciprocal interference scenario at the licence boundaries between apparatus and spectrum licences.

It is proposed that coexistence between spectrum licensed and AWL services will be managed by the following:

* At the frequency boundary:
* The unwanted emission limits specified in the AWL LCD
* The synchronisation requirement specified in the AWL LCD and on spectrum licences
* At the geographic area boundary between AWL and spectrum licensed areas:
* The device boundary criteria (DBC) specified in the Radiocommunications (Unacceptable Levels of Interference — 26 GHz band) Determination 2020. This coordination requirement is detailed in section 3.2.
* The synchronisation requirement specified in the AWL LCD and on the spectrum licences

At both the frequency and area boundaries the synchronisation requirement provides the fallback (on a case-by-case basis) should interference occur which cannot be resolved through negotiation between relevant parties. This same requirement is placed on both AWLs in the 26/28 GHz bands as well as 26 GHz band spectrum licences.

Coordination procedures are contained in section 3.1.

Section 3.3 details the applicable uplink-downlink configuration to be used when the synchronisation requirement has been triggered.

### Coexistence with space station receivers

Article 5 of the ITU-R Radio Regulations provides allocations for various space services in the range 24.25-27.5 MHz on a co-primary basis with terrestrial services (including IMT). ITU-R Resolution COM4/8 (WRC-19) resolves that administrations shall apply a number of conditions on IMT base station deployments in the range 24.25-27.5 GHz to protect space station receivers.

AWL licensees are to adhere to the provisions detailed in resolves 2.1 and 2.2 of ITU-R Resolution COM4/8 (WRC-19) for deployments in the range 24.7-27.5 GHz.

Coexistence provisions for specific space services are detailed in the following sections.

### Coexistence with SRS earth stations

Earth receive stations support space research activities in the range 25.5-27 GHz and are currently limited to space communications facilities at New Norcia, WA, and Tidbinbilla, ACT. Coexistence of AWL devices with these SRS earth stations is managed via:

* Exclusion zones around SRS earth stations where AWL transmitters cannot be operated. These exclusion zones are included as a condition in the AWL LCD.
* A requirement for AWL transmitters (limited to transmitters which are required to be included in the RRL and high-powered outdoor UEs[[4]](#footnote-5)) not to exceed a defined maximum aggregate interference level at the receiver input of these SRS earth stations. Protection requirements and coordination details are contained in section 3.3.
* A restriction on issuing AWLs in the HCIS level 1 cells which contain these SRS earth stations – see section 4.3.1.

### Coexistence with passive EESS

Space-borne passive sensing EESS services operate in the 23.6-24 GHz band. Coexistence between AWL devices and passive EESS is managed through imposing more restrictive unwanted emission limits in the frequency range 23.6-24 GHz – these additional limits are detailed in the AWL LCD.

Section 3.4 mandates density limits for AWL base stations operating in the range 24.7-25.1 GHz.

### Coexistence with FSS gateway uplinks

FSS gateway uplinks operate in the range 27-29.5 GHz. The AWL LCD places additional licence conditions on some AWL services to safeguard coexistence with FSS gateway uplinks. These conditions which apply to AWL devices operating in the range 27-29.5 GHz (limited to defined areas[[5]](#footnote-6) for the frequency range 27-27.5 GHz) are:

* The maximum total radiated power (TRP), for any outdoor transmitter, is 25 dBm/200 MHz
* Outdoor base stations must have mechanical down tilt equal to or greater than 0˚
* Outdoor base stations operating in the range 27-27.5 GHz must not direct antenna beams (via electrical steering) to elevation angles greater than 5˚ above the horizon for more than 5% in any 24 hour period
* Outdoor base stations operating in the range 27.5-29.5 GHz must not direct antenna beams (via electrical steering) to an elevation angle above the horizon.

Outdoor fixed UEs, when the antenna beam is pointed at elevation angles of greater than or equal to 11° above the horizon, must not direct their antenna beam (via electrical or mechanical steering) to:

1.5 degrees of the GSO arc if the antenna gain is greater than or equal to 34.7 dBi, or

25 degrees of the GSO arc if the antenna gain is less than 34.7 dBi.

The potential of interference from FSS gateway earth stations to receivers operated under an AWL will depend on a number of factors, in particular the geographical separation and antenna discrimination. The probability of interference to spectrum licensed receivers is low given:

* Studies undertaken by Task Group 5/1 indicate maximum separation distances of up to 7.5 km (for earth stations with a 13m antenna and elevation angles of at least 20˚) are required to protect IMT stations, however actual distances will depend on specific circumstances.[[6]](#footnote-7)
* the majority of existing FSS earth stations in the range 27-29.5 GHz have an elevation angle greater than 20˚

Given FSS gateways are operated at known locations and the interference potential will likely be limited to only short distances from the gateway, the onus is on the AWL licensee to ensure their devices do not receive harmful interference from existing gateways. No protection will be afforded to receivers operated under an AWL from interference caused by an existing FSS gateway earth station (i.e. an earth station operated under a licence which was issued before the AWL was issued). Advisory note XX is to be attached to all AWLs issued in the 26/28 GHz band – see section 4.1.4

AWL services in the range 27.5-28.1 GHz in areas not subject to the 26 GHz band reallocation declaration or in the range 28.1-29.5 GHz in all areas are secondary in relation to FSS services. Therefore, AWL receivers in these frequency ranges and areas will not be provided protection from existing or future FSS gateway earth stations. Advisory note YY is to be attached to all AWLs issued in the range 27.5-28.1 GHz in areas not subject to the 26 GHz band reallocation declaration or in the range 28.1-29.5 GHz – see section 4.1.4.

In planning deployments under an AWL, the licensee should take account of the above arrangements and plan their services accordingly.

### Coexistence with ubiquitous FSS earth stations

Ubiquitous FSS earth stations operate in accordance with the Radiocommunications (Communication with Space Object) Class Licence 2015. In the 28 GHz band, ubiquitous FSS earth stations operate:

On a primary basis in the range 27.5-28.1 GHz in areas not subject to the 26 GHz band reallocation declaration, and in the range 28.1-29.5 GHz

On a secondary basis in the range 27.5-28.1 GHz in areas subject to the 26 GHz band reallocation declaration.

Primary ubiquitous FSS earth stations have priority over AWL services operating in the range 27.5-28.1 GHz in areas not subject to the 26 GHz band reallocation declaration, and in the range 28.1-29.5 GHz. Therefore, AWL receivers in these frequency ranges and areas will not be provided protection from existing or future ubiquitous FSS earth stations. Advisory note YY is to be attached to all AWLs issued in the range 27.5-28.1 GHz and areas not subject to the 26 GHz band reallocation declaration or in the range 28.1-29.5 GHz – see section 4.1.4.

In planning deployments under an AWL, the licensee should take account of the above arrangements and plan their services accordingly.

### Coexistence with legacy point-to-point services

As detailed in the paper [Future use of the 28 GHz band – Planning decisions and preliminary](https://www.acma.gov.au/sites/default/files/2019-11/Future-use-of-the-28-GHz-band-Final.docx), no new point-to-point links are permitted in the 28 GHz band.[[7]](#footnote-8) Legacy point-to-point services will be able to continue to operate for a minimum of 7 years with a possibility of continued operation beyond this timeframe (subject to further review). During this time, AWL services will need to coexist with existing point-to-point services.

Coordination requirements to protect legacy point-to-point links are detailed in section 3.5.

AWL receivers will not be afforded protection from interference from existing point-to-point links. Advisory note XX, which is to be attached to all AWLs in the 26/28 GHz band, is also applicable to this interference scenario – see section 4.3.4. In planning deployments under an AWL, the licensee should take account of existing point-to-point transmitters and plan their services accordingly.

### Coexistence with class licensed services

Various class licensed devices currently operate in the 24.25-29.5 GHz range, including:

* Aviation security body scanning devices operating in the frequency range 24.25-30 GHz, authorised under the Radiocommunications (Body Scanning – Aviation Security) Class Licence 2018
* Devices authorised under the Radiocommunications (Low Interference Potential Devices) Class Licence 2015 (the LIPD class licence) including:
* Wireless broadband services operating in the frequency range 24.25-25.1 GHz
* Radiofrequency identification transmitters operated in the frequency range 24.1-26.5 GHz
* Radiodetermination transmitters operating in the frequency range 24.05-26.5 GHz
* Ultra-wideband short-range vehicle radar systems operating in the range 22-26.5 GHz

The risk of interference between AWL services and class licensed systems is low, however in the unlikely event there is interference services the following arrangements apply:

* LIPD class licensed devices operate on a no-interference, no-protection basis with other radiocommunications devices, including AWL services in the 26/28 GHz bands.
* A device operated under an AWL must not cause interference to, nor is it provided protection from, a device operated under the Radiocommunications (Body Scanning – Aviation Security) Class Licence 2018, as in force from time to time (see the AWL LCD)

### Notional receiver and compatibility requirement

In addition to the coexistence arrangements identified above, a notional receiver and compatibility requirement is established to aid in the resolution of interference of 26/28 GHz band AWL receivers.

The level of interference caused by unwanted emissions depends on the interference susceptibility of a receiver and the level of the unwanted signal. Emission levels from transmitters should not have to be reduced below a point where the performance of the radiocommunications receiver is the main cause of the problem.

Therefore, it is necessary to establish a benchmark notional receiver performance level when setting a compatibility requirement for radiocommunications receivers. The recommended notional receiver performance for AWL receivers in the 26/28 GHz bands is detailed in Schedule 1 of the RAG Rx.

Unless otherwise stated[[8]](#footnote-9), receivers operated under a 26/28 GHz band AWL will be afforded protection from apparatus and spectrum licensed transmitters to the level specified in Schedule 1 of the RAG Rx, if the receiver:

* Has at least the notional level of receiver performance set out in Schedule 2 of the RAG Rx; and

Has its details included in the RRL prior to the transmitter with which compatibility is sought has its details included in the Register.

Advisory note ZZ is to be attached to all AWLs issued in the 26/28 GHz bands – see section 4.3.4.

The notional receiver is typically used when coordinating a proposed transmitter with an existing receiver (i.e. the coordination will be based on protecting the existing receiver to the level of the notional receiver). The adjacent channel selectivity and in-band blocking requirements are specified in Schedule 1 of the RAG Rx using relative values (i.e. the ratio between the minimum wanted signal level and the interference signal level).

To calculate the maximum tolerable absolute interference signal level at frequencies adjacent to an existing receiver, a reference bandwidth of 50 MHz is to be used. For example:

* the maximum interference level within the adjacent 50 MHz from the receiver is calculated as:

wanted signal level + ACS – Rx antenna gain in the direction of the transmitter (from the RRL)

=-88 dBm/50 MHz +21.7 dB – 23 dBi

=-89.3 dBm/50 MHz at the receive antenna input

* the maximum interference level at a frequency offset of greater than 50 MHz is:

Wanted signal level (from the RAG Rx) + in-band blocking – antenna gain in the direction for the transmitter (from the RRL)

= -88 dBm/50 MHz + 27 dB – 23 dBi

= -84 dBm/50 MHz at the receive antenna input

# Coordination procedures

## Preliminary coordination procedures

Licensees planning to deploy radiocommunications transmitters in the 26/28 GHz bands under an AWL should have regard to radiocommunications receivers recorded in the RRL operating under another AWL or a 26 GHz spectrum licence.

In planning for the operation of fixed transmitters under an AWL, the licensee should coordinate with any radiocommunications receivers recorded in the RRL. The coordination performed should:

* use the parameters of the radiocommunications receivers as recorded in the Register;
* use the compatibility requirement set out in Schedule 2 of the *Radiocommunications Advisory Guidelines (Managing Interference to Spectrum Licensed Receivers — 26 GHz Band) 2020* as in force from time to time;
* although there are no receiver performance requirements, the notional receiver performance level set out in Schedule 1 of *Radiocommunications Advisory Guidelines (Managing Interference to Spectrum Licensed Receivers — 26 GHz Band) 2020,* as in force from time to time, is to be used for coordination purposes.
* make use of a suitable propagation model to model path loss between the fixed transmitters and radiocommunications receivers;[[9]](#footnote-10) and

take into account terrain and any other relevant factors.

In the event that the above coordination indicates harmful interference may occur, the AWL licensees should consider:

* replanning the deployment of the fixed transmitters to avoid causing harmful interference; or

negotiating with the licensee of the affected receiver to find a resolution.

In the event that replanning the deployment is not possible and a negotiated resolution could not be reached, interference is managed in accordance with the synchronisation requirementcondition included in the AWL LCD, unless other arrangements are agreed to by the affected licensees.

*Note:* For a device with an active antenna system, the radiated power in the direction of a receiver operated under another licence, is defined as the sum of the gain of the antenna towards in the direction of the receiver (accounting for azimuth and elevation) and the Total Radiated Power (dBm). This allowance is based on the assumption that beam pointing angles and/or power can be controlled dynamically to ensure a defined level of radiated power in a specific direction is not exceeded.

The ACMA will take these coordination procedures into account when resolving an interference dispute.

## Coordination at the geographic boundary

### Coordination at the AWL boundary

The details of an AWL transmitter must not be included in the RRL if the power flux density the geographic area authorise by the licence, caused by the proposed transmitter, would exceed the levels detailed in Table 1. The limits in Table 1 only need to be met at the licence boundary, higher power flux density levels beyond the boundary can be ignored. Further examples are contained in Appendix A.

|  |  |
| --- | --- |
|  | Power flux density limit (dBW/m²/MHz measured at a height of 5 metres above the ground) |
| Transmitter with an active antenna system[[10]](#footnote-11) | -83 |
| Transmitter without an active antenna system9 | -91 |

1. Power flux density limits at the geographic boundary

The power flux density limits in Table 1 do not apply:

* In the range 25.1-27.5 GHz and at parts of the geographic boundary authorised by the AWL which are directly adjacent to the geographic areas listed in the Radiocommunications (Spectrum Re-allocation—26 GHz Band) Declaration 2019 (the 26 GHz reallocation declaration). See subsection 3.1.2 for coordination at the spectrum licence boundary.
* In the range 25.5-27 GHz and at parts of the geographic boundary authorised by the AWL which are directly adjacent to HCIS cells MW4H6 or BV2A3.

Calculation of the power flux density at the area boundary is only required when the distance from the proposed transmitter to the licence boundary exceeds the minimum distances shown in Figure 1. When calculating the power flux density at the boundary the assigner should apply good engineering practices and consider all factors which may impact the actual pfd level for the proposed transmitter. These factors may include, but are not limited to, the following:

* Transmitter parameters including:
* Transmit and feeder losses
* Antenna gain and directivity. For transmitters with an active antenna system, the radiated power at a particular bearing can be defined as the sum of the gain of the antenna in the bearing and the total radiated power. This allowance is based on the assumption that beam pointing angles and/or power can be controlled dynamically.
* Propagation losses including losses from:
* Terrain – all modelling must use a 9 second digital elevation model (such as RadDEM) or better
* Clutter/shielding from structure/vegetation etc
* Building penetration loss (for transmitter located indoors).

As radio waves propagate in different ways because of factors such as frequency, terrain, atmospheric conditions and topography, there are a number of ways to predict path loss. ITU-R Recommendation P.1144 “Guide to the application of the propagation methods of Radiocommunications Study Group 3” provides a guide on the application of various propagation methods developed internationally by the ITU‑R. It advises users on the most appropriate methods for particular applications as well as the limits, required input information, and output for each of these methods. It is recommended that the most recent version of propagation models defined by the ITU-R should be used.

1. Minimum distance from licence boundary where the power flux density limits do not apply

### Coordination at the boundary of a 26 GHz band spectrum licence

The details of an AWL transmitter must not be included in the RRL if it would operate in the range 25.1-27.5 GHz and any part of the device boundary of the transmitter lies inside a geographic area subject to the 26 GHz reallocation declaration. The device boundary is to be calculated in accordance with Part 1 of Schedule 2 of *Radiocommunications (Unacceptable Levels of Interference — 26 GHz band) Determination 2020*, as in force from time to time*.*

## Fallback synchronisation uplink-downlink configuration

Spectrum licences in the 26 GHz band and the AWL LCD (for AWLs in the 26/28 GHz bands) include a synchronisation requirement which may be invoked to resolve interference if negotiation between affected parties to resolve the interference fails (also see sections 2.2.1 and 2.2.2.).[[11]](#footnote-12) The uplink-downlink configuration to be used when the synchronisation requirement is invoked is:

* [An uplink-downlink configuration which is consistent with the FR2.120-2 UL-DL pattern described in Table A.1.3-2 of 3GPP TS 38.101-4 V15.4.0[[12]](#footnote-13), where:
* The period of the slot configuration pattern is 0.5 ms;
* The period of a slot is 0.125 ms; and
* There are 14 symbols within a slot.]
* [An uplink-downlink configuration which is consistent with the FR2.120-1 UL-DL pattern described in Table A.1.3-2 of 3GPP TS 38.101-4 V15.4.0[[13]](#footnote-14), where:
* The period of the slot configuration pattern is 0.625 ms;
* The period of a slot is 0.125 ms; and
* There are 14 symbols within a slot.]

The uplink-downlink configuration detailed above is incorporated by reference by 26 GHz band spectrum licences and in the AWL LCD. The ACMA will not make any amendment to the uplink-downlink configuration detailed in this section without firstly consulting with relevant licensees.

## Coordination requirements with SRS earth stations

This section details the requirements for coordinating relevant transmitters with SRS earth stations. ‘Relevant transmitters’ are transmitters which are operated under the licensee’s 26/28 GHz AWLs in the range 25.5-27 GHz and:

* Are required to be included in the RRL; or

Are exempt from registration under subsection 4(c) of Schedule 1 of the AWL LCD.

The details of an AWL transmitter must not be included in the RRL if it would operate in the 25.5-27 GHz range and the aggregate interference level of the proposed transmitter and all other relevant transmitters exceeds the limit detailed in Table 2.

A transmitter which is exempt from registration under subsection 4(c) of Schedule 1 of the AWL LCD must not be operated in the 25.5-27 GHz range if the aggregate interference level of the proposed transmitter and all other relevant transmitters exceeds the limit detailed in Table 2.

In undertaking assessment against the maximum interference level, the SRS earth station operating parameters as recorded in the RRL, in addition those included in Table 2, are to be used.

|  |  |  |
| --- | --- | --- |
|  | Canberra Deep Space Communications Complex | New Norcia Deep Space Ground Station |
| Maximum co-channel aggregate interference level[[14]](#footnote-15) | -156 dBW/MHz at the input of the receiver | |
| Location | Latitude: -35.3951°N  Longitude: 148.9785°E | Latitude: -31.0484°N  Longitude: 116.1914°E |
| Antenna pattern | Defined in ITU-R Recommendation SA.509-3 | |
| Minimum antenna elevation angle above horizon | Maximum of:   * 6 degrees, or * The angle to clear terrain in the direction of the proposed transmitter plus 0.5° | Maximum of:   * 5 degrees, or * The angle to clear terrain in the direction of the proposed transmitter plus 0.5° |

1. Additional SRS earth station parameters to be used in coordination

## Coexistence with passive EESS

Table 3 provides the maximum number of transmitters in the range 24.7-25.1 GHz (which are required to be included in the RRL) which can be deployed within a 9km radius. The details of an AWL transmitter must not be included in the RRL if it would operate in the range 24.7-25.1 GHz and the number of existing AWL transmitters in the RRL is equal to or exceeds the limit in Table 3 for the operating range of the proposed transmitter.

In assessing compliance with Table 3, a transmitter (either existing or proposed) with emissions overlapping more than one frequency segment in Table 3 is to be counted as a service in each of the overlapping frequency ranges.

There is no deployment limit in the frequency range 25.1-29.5 GHz.

|  |  |
| --- | --- |
| Wireless broadband operating frequency range | Maximum number of AWLs transmitters (which are required to be recorded in the RRL) within a 9km radius |
| 24.7–24.9 GHz | 44 |
| 24.9­­–25.1 GHz | 44 |

1. Deployment limits for AWL transmitters (which are required to be recorded in the RRL) in the frequency range 24.7–25.1 GHz

## Coordination with legacy point-to-point fixed links

Interference from a proposed AWL transmitter into a fixed link receiver is assessed using the steps described below. There is no requirement to assess interference from a point-to-point transmitter to an AWL receiver – see section 2.1.7.

The coordination process calculates a wanted-to-unwanted signal level ratio at the fixed link receiver input and compares it against the relevant protection ratio value(s) given in the tables at Appendix B.

A prospective AWL transmitter is not to be included in the RRL if it fails this coordination process.

**Step 1**: The first step is to identify all fixed link receivers that may be affected by the operation of the proposed AWL transmitter. To identify potentially affected fixed link receivers, a recommended minimum distance cull around the site of the proposed transmitter of 100 km is required.

A frequency cull is then applied to further reduce the number of cases requiring more detailed coordination calculations and are based on protecting fixed link receivers from emissions at frequency offsets up to and including the second adjacent channel of the AWL transmitter. Assuming a maximum transmit channel bandwidth of 400 MHz[[15]](#footnote-16), all fixed links with a centre frequency within 1056 MHz of the proposed transmitter centre frequency are to be included in the detailed coordination calculations.

**Step 2**: Calculate the level of wanted power at each receiver identified in step 1.

**Step 3**: Calculate the level of unwanted power at each receiver identified in step 1. Two separate cases exist (unwanted levels are to be calculated for both cases):

Case 1 – applies to AWL transmitters which are required to be included in the RRL. Calculate the unwanted power level on the basis of the application details for the AWL transmitter, using transmit power and antenna gain (with any discrimination taken into account), the licensed fixed point-to-point receiver gain (with any discrimination taken into account), and propagation loss from an appropriate propagation model.

Case 2 – applies to AWL transmitters which are not required to be in the RRL. If the geographical location of the transmitter in case 1 is within 20 km[[16]](#footnote-17) of the fixed link receiver, coordination is deemed to fail. However, an AWL transmitter may still be included in the RRL it can be shown that the coverage area of the case 2 transmitter does not overlap the interference zone of the fixed link receiver, assuming the notional transmitter characteristics in Table 4.

|  |  |  |
| --- | --- | --- |
| **Parameter** | **Value** | **Unit** |
| TRP | 35 (for transmitters operating in the 26 GHz band in areas outside those defined in Schedule 1 of Radiocommunications Advisory Guidelines (Managing Interference from Spectrum Licensed Transmitters – 26 GHz Band) 2020  23 (for all other transmitters) | dBm/occupied bandwidth |
| Antenna gain | 17 (in the direction of the case 1 transmitter for calculation of coverage area and in the direction of the fixed link receiver for unwanted level calculations) | dBi |
| Antenna height | 5 | metres |

1. Notional parameters for transmitters not required to be included in the RRL

If the fixed link receiver is greater than 20 km from the case 1 transmitter, calculate the unwanted power level at the fixed link receiver assuming a transmitter located at the same coordinates as the case 1 transmitter and operating with the notional parameters in Table 4, the licensed fixed point-to-point receiver gain (with any discrimination taken into account), and propagation loss from an appropriate propagation model.

**Step 4**: Determine the applicable protection criteria for each victim receiver identified in step 1. To protect receivers from unacceptable interference, the unwanted power levels at a victim receiver must not exceed the required protection criteria for that receiver.

In this RALI protection ratios are used for the protection of fixed link receivers. Protection ratios should be adjusted to take account of actual path length and rainfall rate. Protection ratio correction factor graphs are also provided in Appendix B.

**Step 5**: A comparison of the calculated wanted-to-unwanted rations from steps 2 and 3 with the relevant protection ratio value(s) in the tables in Appendix B will determine if the protection criteria at the victim fixed link receiver is achieved. If the required protection ratio is not met, the coordination is deemed to fail and the prospective AWL transmitter is not to be included in the RRL.

# Licensing

## Overview of Licensing

An AWL authorises the operation of radiocommunications devices within a frequency range and geographic area specified on the licence.

AWLs authorising operation in the 24.7-29.5 GHz band will only be issued in geographic areas that are located outside the embargo areas defined in *RALI MS03: Spectrum Embargos* for the 24.7-29.5 GHz bands.

## Licence conditions

The operation of radiocommunications devices authorised by an AWL in the 26/28 GHz bands is subject to:

* Conditions specified in the *Radiocommunications Act 1992* (the Act), including an obligation to comply with the Act;
* Conditions specified in the Radiocommunications Licence Conditions (Apparatus Licence) Determination 2015 (as is force from time to time), the Radiocommunications Licence Conditions (Area-Wide Licence) Determination 2020 (as in force from time to time), and any other determinations made by the ACMA under section 107(1)(f) of the Act;
* Conditions specified in the licence; and
* Any further conditions imposed by the ACMA under section 111 of the Act.

## Assignment rules

This section outlines the rules for administratively issuing an AWL in the 26/28 GHz bands. An AWL in the 26/28 GHz bands can be issued, subject to the rules in this section, prior to device coordination requirements detailed in Chapter 3.

### Assignment instructions

AWLs administratively issued in the 26/28 GHz bands must comply with the below instructions:

* The upper and lower frequency limits authorised by the licence must align with the channel raster in section 4.1.2.
* An AWL cannot be issued if its frequency range would overlap with the frequency range authorised by an existing AWL in the same HCIS cell. Only a single apparatus licence can be issued for a frequency range in a particular geographic area.
* The geographic area authorised by an AWL must consist of only whole HCIS cells.[[17]](#footnote-18) The smallest geographic area authorised by an AWL is a single HCIS level 00 cell comprising an area of 20x15 seconds.
* An AWL must not be issued if it includes frequencies in the range 25.5-27 GHz and it:
* Contains either of the following HCIS: MW4H6 or BV2A3, or
* Only contains one or more of the HCIS listed in Table 5.
* The allocation must comply with any Spectrum Embargo issued by the ACMA[[18]](#footnote-19)

| 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 |

1. SRS exclusion zones

### Channel raster

Channelling arrangements in 26/28 GHz band provide for a total of 96 x 50 MHz channels across the frequency range 24.7-29.5 GHz. The upper and lower frequency limits of the 50 MHz channels are calculated using the following formula:

Lower frequency limit = [24.65 + n(0.05)] MHz

Upper frequency limit = [24.7 + n(0.05)] MHz

Where:

n = channel number (integer range is between 1 to 96).

A licence can be issued which authorises operation over multiple aggregated 50 MHz channels.

### Assignment priority

The frequency range assigned to a licence must either:

* align with any existing 26/28 GHz band licences held by the licensee (either apparatus or spectrum), if that frequency range is available; or
* if the licensee does not already hold licences in the 26/28 GHz bands, the first frequency range available in the desired geographic area is to be assigned, noting the assignment priority in Table 6.

|  |  |
| --- | --- |
| **Frequency range (GHz)** | **Channel assignment direction** |
| 24.7-25.1 | Descending order |
| 25.1-27.5 | Ascending order |
| 27.5-29.5 | Ascending order |

1. Assignment priority

### Advisory notes

The following user selectable advisory note XX must be attached to all AWLs in the 26/28 GHz bands:

*A radiocommunications receiver operated under this licence is not afforded protection from interference by a radiocommunications transmitter operated under an apparatus licence which was issued before the commencement of this licence. This condition does not apply if the transmitter is operated under an area-wide apparatus licence.*

*In planning deployments under this licence, the licensee should take account of existing apparatus licensed services and plan their services accordingly.*

The following user selectable advisory note YY must be attached to all AWLs in the range 27.5-28.1 GHz in areas not subject to the 26 GHz band reallocation declaration or in the range 28.1-29.5 GHz:

*A radiocommunications receiver operated under this licence in the range 27.5-28.1 GHz and located outside the areas subject to the Radiocommunications (Spectrum Re-allocation—26 GHz band) Declaration 2019, or in the range 28.1-29.5 GHz is not afforded protection from interference caused by a radiocommunications transmitter operated under an earth apparatus licence or under the Radiocommunications (Communication with Space Object) Class Licence 2015, as in force from time to time.*

The following user selectable advisory note ZZ must be attached to all AWLs in the 26/28 GHz bands:

*The notional receiver performance level and compatibility requirement for receivers recorded in the RRL and operated under this licence are detailed in Schedule 1 and 2 of the Radiocommunications Advisory Guidelines (Managing Interference to Spectrum Licensed Receivers — 26 GHz Band) 2020, as in force from time to time.*

*Compliance with these provisions is not mandatory for receivers operated under this licence, however the ACMA will take these provisions into account in determining whether interference has occurred.*

# Exceptions

Exceptions to the requirements of this RALI for prospective assignments require case-by-case consideration by the Manager, Spectrum Planning Section.

A request for exemption from the requirements of this RALI would need to be accompanied by evidence to support the request.

All requests for exemptions should be submitted to [freqplan@acma.gov.au](mailto:freqplan@acma.gov.au).

# RALI Authorisation

[not approved] xx/xx/2020

Manager  
Spectrum Planning Section  
Spectrum Planning and Engineering Branch

Communications Infrastructure Division  
Australian Communications and Media Authority

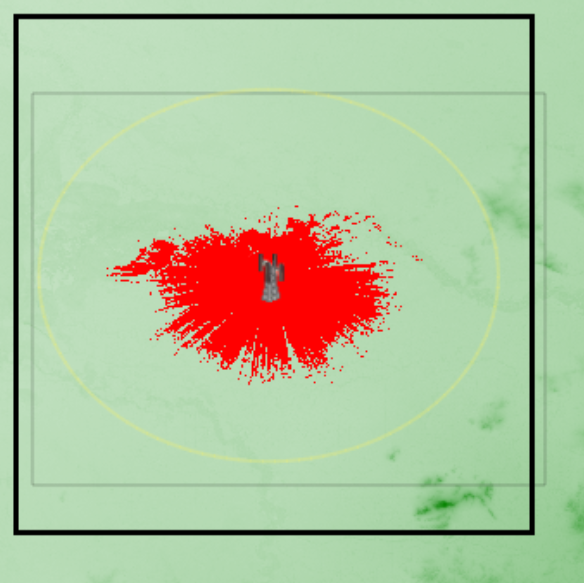
# Appendix A: Examples of compliance at the geographic boundary

As detailed in section 3.1.1, the prescribed power flux density limits in Table 1 are to be met at the boundary of the geographic area authorised by the AWL. The follow figures provide examples of when a transmitter would pass or fail this criterion.

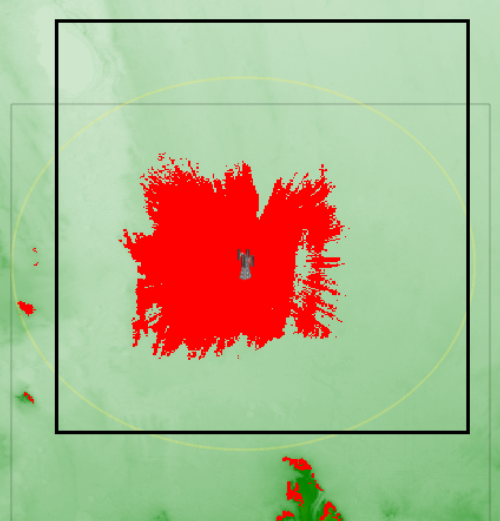
In Figure 2, the calculated pfd limit (red) from a proposed AWL transmitter is fully contained within the AWL licence area (black square), therefore this transmitter will comply with the boundary criteria.

In Figure 3, the calculated pfd limit is not exceeded at the licence boundary, therefore this transmitter would comply with the boundary criteria even though there are locations beyond the boundary where the pfd limit is exceeded.

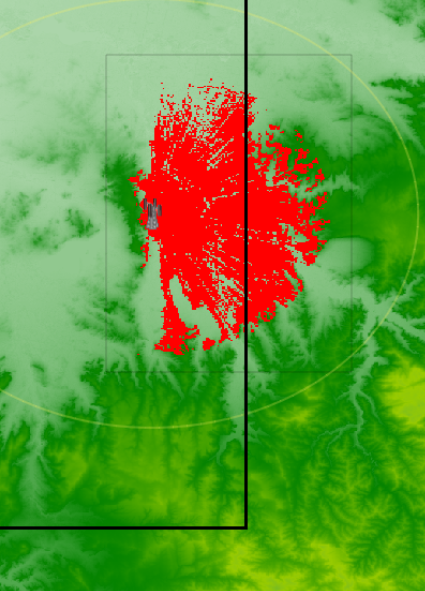
In Figure 4, the calculated pfd level (red) exceeds the limit at the licence boundary, therefore this transmitter would not comply with the boundary criteria.



1. Example of pass



1. Example of pass



1. Example of fail

# Appendix B: Protection criteria for fixed link receivers

Protection ratios for 28 GHz band fixed services are provided in the following tables. Protection ratios apply at frequency offsets (between the channel edge of the receiver and the edge of the transmitter’s occupied bandwidth) of up to and including two-times the transmitters occupied channel bandwidth.

1. Protection ratios for victim 28 MHz channel fixed link receiver and interfering AWL transmitter

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Frequency offset (foffset)  (note 1) | BW < 100 MHz | 100 MHz ≤ BW < 200 MHz | 200 MHz ≤ BW < 400 MHz | BW ≥ 400 MHz |
| foffset < 0 MHz (note 2) | 62 | 59 | 56 | 53 |
| 0 MHz ≤ foffset < BW | 50 | 47 | 44 | 41 |
| BW ≤ foffset < 2xBW | 42 | 39 | 36 | 33 |

1. Protection ratios for victim 56 MHz channel fixed link receiver and interfering AWL transmitter

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Frequency offset (foffset)  (note 1) | BW < 100 MHz | 100 MHz ≤ BW < 200 MHz | 200 MHz ≤ BW < 400 MHz | BW ≥ 400 MHz |
| foffset < 0 MHz (note 2) | 64 | 62 | 59 | 56 |
| 0 MHz ≤ foffset < BW | 52 | 49 | 46 | 43 |
| BW ≤ foffset < 2xBW | 44 | 42 | 39 | 36 |

1. Protection ratios for victim 112 MHz channel fixed link receiver and interfering AWL transmitter

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Frequency offset (foffset)  (note 1) | BW < 100 MHz | 100 MHz ≤ BW < 200 MHz | 200 MHz ≤ BW < 400 MHz | BW ≥ 400 MHz |
| foffset < 0 MHz (note 2) | 64 | 64 | 62 | 59 |
| 0 MHz ≤ foffset < BW | 52 | 49 | 47 | 44 |
| BW ≤ foffset < 2xBW | 47 | 44 | 42 | 39 |

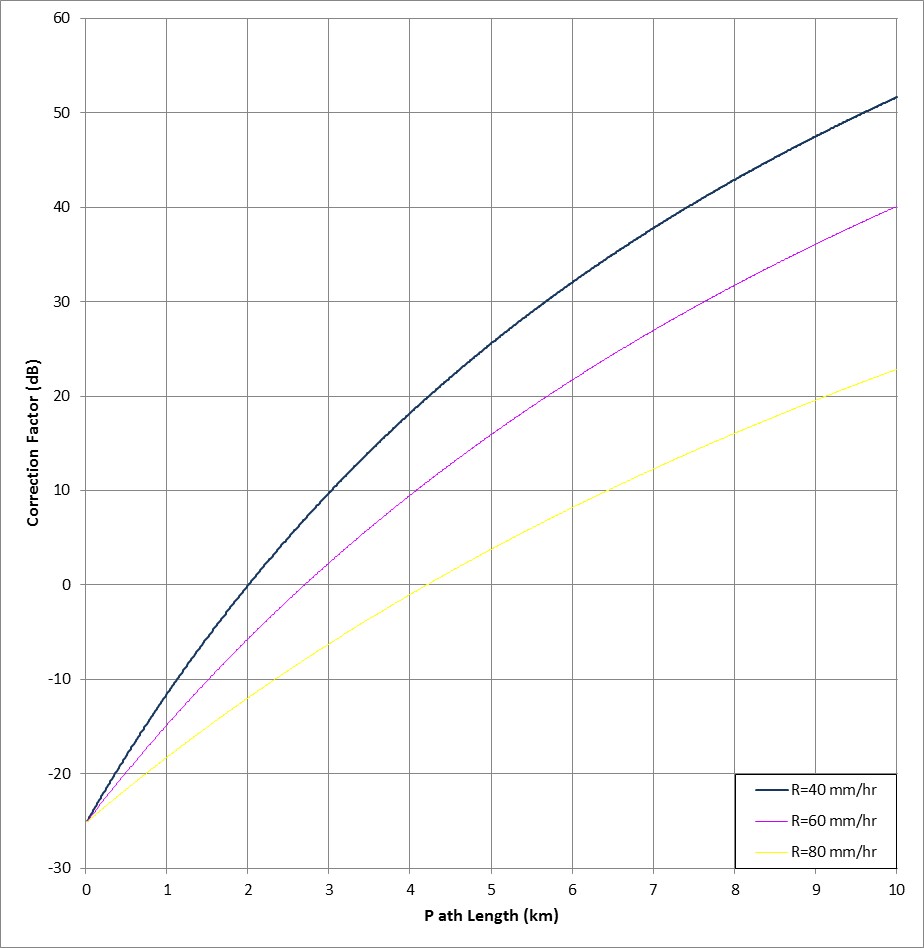
General notes:

1. foffset is the frequency offset between the channel edge of the receiver and the edge of the transmitter’s occupied bandwidth.
2. foffset is less than 0 MHz when there is an overlap of the receiver channel and the occupied bandwidth of the transmitter.
3. BW is the occupied bandwidth of the AWL transmitter
4. Protection ratios are based on a 2 km path length and R (Rainfall rate in mm/hr for 0.01% of the worst month) of 40 mm/hr using Recommendation ITU-R P.530-15, section 2.4 as outlined in spectrum planning report SPP 2014/07. For other path lengths and rainfall rates refer to the appropriate path length correction factors graph on the following page.
5. Separate protection ratios for analog victims have not been defined. The above-mentioned protection ratios for digital systems shall be applied in such cases.

**THE 28 GHz BAND (27.5 – 29.5 GHz)**

**PROTECTION RATIO CORRECTION FACTORS**

**RAIN FADE**



R: Rainfall rate in mm/hr for 0.01% of the worst month.

For further details refer to Annex A to Appendix 1 of RALI FX-3.

1. In the RALI, the 26 GHz and 28 GHz bands are collectively referred to as the 26/28 GHz bands. [↑](#footnote-ref-2)
2. Other applicable RALIs include RALI MS 31 ‘Coordination of apparatus licensed services within the Australia radio quiet zone’ and RALI MS 44 ‘Frequency coordination procedures for the earth station protection zones’. [↑](#footnote-ref-3)
3. The pfd limit is not required to be met at some geographic boundaries – see the [applicable Licence Condition Determination] [↑](#footnote-ref-4)
4. High-powered outdoor UEs (operate with a TRP of > 23 dBm and ≤ 35 dBm per occupied bandwidth) are exempt from registration under subsection 4(c) of Schedule 1 of the AWL LCD. [↑](#footnote-ref-5)
5. These areas are defined in Schedule 1 of the Radiocommunications Advisory Guidelines (Managing Interference from spectrum Licensed Transmitters – 26 GHz Band) 2020. [↑](#footnote-ref-6)
6. See studies B, C, L and O in Attachment 3 to Annex 3 of Document [5-1/478](https://www.itu.int/md/R15-TG5.1-C-0478/en). These studies found that separation distances of up to 18km (assuming 1% clutter) may be required for gateway earth station elevation angles of 5°. [↑](#footnote-ref-7)
7. Also see Appendix 1 of RALI FX 3. [↑](#footnote-ref-8)
8. In this RALI, or another document published by the ACMA. [↑](#footnote-ref-9)
9. An example of a suitable propagation model is that set out in section 4.5.2 of ITU-R Recommendation P.526-14 *Propagation by diffraction.* [↑](#footnote-ref-10)
10. An active antenna system refers to an antenna system where the amplitude and/or phase between antenna elements is continually adjusted resulting in an antenna pattern that varies in response to short term changes in the radio environment. [↑](#footnote-ref-11)
11. The synchronisation requirement is detailed on 26 GHz band spectrum licences and in the AWL LCD. [↑](#footnote-ref-12)
12. Available on the [3GPP website](https://www.3gpp.org/DynaReport/38-series.htm). [↑](#footnote-ref-13)
13. Available on the [3GPP website](https://www.3gpp.org/DynaReport/38-series.htm). [↑](#footnote-ref-14)
14. The interference level is based on Recommendation ITU-R SA.609-2 [↑](#footnote-ref-15)
15. Based on the maximum channel bandwidth of 400 MHz in the current 3GPP 38-series standard. [↑](#footnote-ref-16)
16. 20 km is considered the maximum cell radius expected to be achievable under an AWL. Should larger cells be used, AWL licensees are remined that transmitters which are not required to be recorded in the RRL operate on a no interference basis as defined in the AWL LCD. [↑](#footnote-ref-17)
17. HCIS is a naming convention developed by the ACMA that applies unique ‘names’ to each of the cells that make up the Australian Spectrum Map Grid (ASMG) – more information is on the [ACMA website](https://www.acma.gov.au/-/media/Spectrum-Engineering/Information/pdf/The-Australian-spectrum-map-grid-2012.PDF?la=en). [↑](#footnote-ref-18)
18. Spectrum embargos are detailed on the [ACMA website](https://www.acma.gov.au/Industry/Spectrum/Radiocomms-licensing/Class-licences/spectrum-embargoes-spectrum-planning-acma). [↑](#footnote-ref-19)