

# Frequency coordination and licensing procedures for Area-Wide Licences (AWL) in the 3400–4000 MHz band

Radiocommunications Assignment and Licensing Instruction

RALI MS 47

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## Amendment history

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October 2022	Version with initial mitigations for radio altimeters
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Please notify the ACMA of any inaccuracy or ambiguity found in this RALI.

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# 1 Introduction

## 1.1 Purpose

The purpose of this Radiocommunications Assignment and Licensing Instruction (RALI) is to provide information about, and describe necessary steps for, the frequency coordination and licensing of Area-Wide Licences (AWL) in the 3400–4000 MHz band.

The information in this document reflects the ACMA’s statement of current policy in relation to frequency coordination for devices authorised under an AWL in the 3400–4000 MHz bands. In making decisions, [Accredited Persons](#) 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 stated policy should be referred to:

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## 1.2 Background

In January 2021, the Australian Communications and Media Authority (ACMA) released the [Replanning the 3700-4200 MHz band - Outcomes paper](#) (the 2021 Outcomes paper). That paper described the ACMA’s planning outcomes and preliminary views to introduce wireless broadband services in the 3700-4200 MHz band, using a combination of apparatus and spectrum licensing arrangements.

The Outcomes paper also stated that the ACMA would, as far as practical, extend or align frameworks and the timing of their development with similar ones in the 3400-3700 MHz (3.4 GHz) band. The paper [Optimising arrangements for the 3400-3575 MHz band: Planning decisions and preliminary views](#) (the 2019 Outcomes paper) outlines the planning outcomes for the 3.4 GHz band.

To facilitate development of apparatus and spectrum licence arrangements, the ACMA formed a technical liaison group (TLG) to review/develop spectrum and apparatus licence technical frameworks for the broader 3400-4000 MHz range (where applicable). A TLG is a short-term advisory body convened by the ACMA. Its purpose is to provide advice on the development of, or possible changes to, a spectrum or apparatus licence technical framework. The TLG was formed in July 2021 and finished its work for remote areas, excepting coexistence with radio altimeter, in December 2021. The interim outcomes of the TLG are available on the [ACMA website](#).

Public consultation on a draft version of this RALI occurred in [March 2022](#), including two spectrum tune-up sessions in March and July 2022. The TLG was reconvened over September – October 2022 to consider coexistence with radio altimeters and the interrelation with a draft spectrum licensing technical framework. This version of the RALI includes the outcomes of those discussions.

This RALI consolidates arrangements for incumbent point to multipoint apparatus services and proposed Area-Wide Licences across the 3400–4000 MHz band. It replaces [RALI FX14 – Point to Multipoint Fixed Services in Specified Parts of the 3.4–3.5 GHz Band](#); and the parts of

[RALI FX19 — Frequency Coordination and Licensing Procedures for apparatus licensed Broadband Wireless Access Services in the 1900–1920 and 3575–3700 MHz bands](#) that concern the 3575–3700 MHz band.

## 1.3 Scope

The scope of the RALI covers frequency assignment and coordination arrangements for AWLs in the 3400-4000 MHz frequency range. It also describes the ACMA's policy in relation to the issue of other apparatus licence types in the 3400-4000 MHz range. Additional detail on applying for a new AWL can be found in the [3.4-4 GHz Applicant Information Pack].

This RALI also includes elements relevant to coordination between earth station receive apparatus licence with both AWLs and spectrum-licensed services.

This, first version of the RALI is applicable to AWLs in remote areas, as defined in Appendix A.

It is expected that the RALI will be further updated when allocation arrangements in other geographical areas are developed.

This RALI provides instructions to be used by the ACMA and Accredited Persons when assessing whether proposed new systems will cause (or receive) unacceptable interference to (or from) existing services. Technical arrangements detailed in this RALI have been developed using information from the 3400-4000 MHz Technical Liaison Group (TLG) – TLG papers are available on the [ACMA website](#).

If interference occurs after an AWL is issued and the AWL transmitter is registered, and the issue cannot be resolved between the relevant parties, the ACMA will have regard to this RALI and relevant legislative instruments in resolving the matter.

### 1.3.1 Basic principles

The basic principles for issuing and operating devices under an AWL in the 3400-4000 MHz range are:

- > An AWL provides service-flexible and technology-flexible access to a frequency range and geographic area (its 'licence area') specified on the licence. Conditions applicable to all AWLs in the 3400-4000 MHz range are detailed in the Radiocommunications Licence Conditions (Area-Wide Licence) Determination 2020 (the AWL LCD),<sup>1</sup> as in force from time to time.
- > Consistent with the [Radiocommunications \(Interpretation\) Determination 2015](#) (the Interpretation Determination), an AWL may be used to operate an area-wide service that consists of one or more area-wide stations (radiocommunications transmitters), and which may also consist of one or more area-wide receive stations.
- > The technical arrangements for AWLs in the 3400-4000 MHz bands have been designed to accommodate wireless broadband services– although other services, other than earth receive stations, may be deployed if devices comply with the applicable licence conditions.
- > An overview of how the AWL technical framework operates is provided in section 1.4.
- > RF arrangements, including frequency ranges and geographic areas where AWLs may be issued, and channel arrangements are detailed in Chapter 2.

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<sup>1</sup> The AWL LCD and all other legislative instruments referred to in this RALI may be accessed, free of charge, on the Federal Register of Legislation at [www.legislation.gov.au](http://www.legislation.gov.au).

- > An AWL is issued prior to device coordination (if required). An AWL will generally only be issued if it complies with the licensing arrangements detailed in Chapter 3 of this RALI.
- > Where applicable, any necessary device coordination is to be undertaken prior to including applicable devices in the [Register of Radiocommunications Licences](#) (RRL) – see Chapter 4.

## 1.4 Operation of the technical framework

The technical framework for AWLs in the frequency range 3400–4000 MHz sets out the minimum conditions and arrangements that allow coexistence with other services operating in and adjacent to the 3400–4000 MHz range. The conditions or arrangements are set out in:

- > individual licences
- the Radiocommunications Licence Conditions (Area-Wide Licence) Determination 2020 (AWL LCD)
- > this RALI
- > the [Radiocommunications Licence Conditions \(Apparatus Licence\) Determination 2015](#).

The technical framework operates using the 3 steps described below:

### Step 1: Determine your needs, then apply for a licence

#### Define the area and frequency range first:

- > Unlike most other types of apparatus licences, AWLs are issued *before* formal device coordination. You will need to know the area and frequency range you wish to operate in before applying for an AWL.
- > Go to the ACMA's [Register of Radiocommunications Licences](#) to check if your desired geographical area(s) and frequency range(s) are available.
- > Additional spectrum and/or area may be required so that:
  - > The intended operation complies with all requirements at the frequency and area boundaries of the licence (detailed in the AWL LCD and section 4 of this RALI).
  - > There is enough frequency and/or geographic separation from existing and future transmitters to satisfy the desired level of protection for receivers operated under the AWL (especially in cases where the required protection is greater than explicitly provided by the technical framework (e.g., where a licensee seeks to avoid invoking the fall-back synchronisation requirement in the AWL LCD).

This will make sure that enough 'spectrum space' (geographic area and bandwidth) is licensed. This may require some "device coordination-like" activities to be prudently undertaken.

Applicants should seek the services of an Accredited Person (AP) to check the areas and frequencies to ensure an AWL they wish to obtain will be fit for purpose. Importantly, incumbent apparatus licences must be afforded ongoing protection as detailed in this RALI. An AP can assist in determining whether incumbent apparatus licences or any other technical restrictions will affect the availability and utility of spectrum in an area.

**Apply to the ACMA, in accordance with the [3.4-4 GHz Applicant Information Pack] during the initial application window:**

- > Chapter 3 of this RALI contains the basic arrangements for AWLs in the 3400-4000 MHz range.
- > You should engage an [Accredited Person](#) to assist with your application.

**After you apply:**

- > After we receive your application, we will send you an invoice for the application fee.
- > After we approve your licence, we will send you an invoice for the apparatus licence tax. The licence will only be issued once the apparatus licence tax is paid.
- > You may only operate a transmitter once your licence is issued (and all conditions below are met).

**Follow the conditions and registration requirements** – see next steps.

**Step 2: Coordinate and register devices**

**Before registering a device, meet the requirements in Chapter 4 of this RALI.** These include:

- > Coordinating with existing services – see sections 4.2, 4.5 and 4.6.
- > Complying with area boundary conditions – see sections 4.1.
- > Complying with arrangements detailed in other documents to be met prior to registration – see sections 4.2 and 4.3.

**Register the device:**

- > Meet the requirements in Chapter 4 of this RALI before you register the device.
- > Engage an [Accredited Person](#) to register the device in the [Register of Radiocommunications Licences](#).
- > You must register any transmitters *before operation* unless they are exempt. Schedule 4 Section 3 paragraph 2 of the AWL LCD shows the types of transmitters that are exempt from registration – registration-exempt transmitters must still comply with other applicable licence conditions (see Step 3).
- > Noting that earth station receivers are not permitted under the AWL, other types of receivers can be optionally registered. Only registered devices will be afforded the protection detailed in this RALI.

**Step 3: Follow the operating conditions**

- > **Conditions for operation are detailed in the AWL LCD, on the licence and in this RALI.**
- > **All transmitters (including transmitters exempt from registration) must comply with conditions where applicable,** including:
  - > Maximum power levels (within the licensed frequency range and in adjacent frequencies) – see paragraphs 1 and 8 of Schedule 4 of the AWL LCD.

- > Any technical restrictions that may apply in certain frequency ranges and geographic areas
- > Obligations for licensees to help manage and resolve interference – see paragraphs 4, 5, 6, and 7 of Schedule 4 of the AWL LCD.

## 2 RF arrangements

### 2.1 Frequency ranges and areas available for AWLs

This RALI defines arrangements for the frequency assignment and coordination of AWLs in the frequency ranges and areas described in Table 1. HCIS descriptions of the geographic areas are provided in Appendix A. Assignment of AWLs are subject to the rules detailed in section 3.3, therefore not all frequency ranges will be available in all locations within a AWL geographic area.

**Table 1** AWL frequency ranges and areas

Geographic area	Frequency range
Remote	3400-4000 MHz

### 2.2 Channel arrangements

The RF channel arrangement for AWLs in 3400-4000 MHz range provides for a total of 60 x 10 MHz channels across the frequency range – see Table 2. The upper and lower frequency limits of the 10 MHz channels are derived as follows:

$f_r$  be the frequency of the lower edge of the band of frequencies occupied (MHz)

$f_L$  be the frequency of the lower edge of the RF channel (MHz)

$f_U$  be the frequency of the upper edge of the RF channel (MHz)

$f_n$  be the centre frequency of the RF channel (MHz)

n be the channel number (integer range is between 1 to 60).

$$f_n = f_r + 5 \cdot (2n - 1) \text{ in MHz}$$

$$f_L = (f_n - 5) \text{ in MHz}$$

$$f_U = (f_n + 5) \text{ in MHz,}$$

where  $n = 1, 2, 3, 4, 5, \dots, 60$ . The value of  $f_r$  is 3 400 MHz.

A licence can be issued which authorises operation over multiple, aggregated, 10 MHz channels.

**Table 2 10 MHz channel plan centre frequencies for the 3400–4000 MHz band.**

<b>10 MHz channel number</b>	<b>Centre frequency (MHz)</b>
A1	3405
A2	3415
A3	3425
A4	3435
A5	3445
A6	3455
A7	3465
A8	3475
A9	3485
A10	3495
A11	3505
A12	3515
A13	3525
A14	3535
A15	3545
A16	3555
A17	3565
A18	3575
A19	3585
A20	3595
A21	3605
A22	3615
A23	3625
A24	3635
A25	3645
A26	3655
A27	3665
A28	3675
A29	3685
A30	3695

<b>10 MHz channel number</b>	<b>Centre frequency (MHz)</b>
A31	3705
A32	3715
A33	3725
A34	3735
A35	3745
A36	3755
A37	3765
A38	3775
A39	3785
A40	3795
A41	3805
A42	3815
A43	3825
A44	3835
A45	3845
A46	3855
A47	3865
A48	3875
A49	3885
A50	3895
A51	3905
A52	3915
A53	3925
A54	3935
A55	3945
A56	3955
A57	3965
A58	3975
A59	3985
A60	3995

# 3 Licensing

This chapter provides an overview of the licensing arrangements for AWLs in the 3400-4000 MHz range and sets out the ACMA's policy for considering applications for these licences. [The Applicant Information Pack (AIP) for AWLs in the band contains information regarding the initial licence application process and should be read in conjunction with this RALI.]

## 3.1 Overview of Licensing

An AWL authorises the operation of radiocommunications devices within a frequency range and geographic area specified on the licence, subject to the conditions applicable to the licence. The ACMA's policy is to only issue AWLs authorising operation in the 3400-4000 MHz band in geographic areas that are located outside those embargoed frequencies and areas defined in *RALI MS03* and spectrum licensed spectrum spaces defined in *RALI SM26*.

### 3.1.1 Other licence types

The ACMA's policy in relation to the issue of other licence types in the 3400-4000 MHz range is as follows:

- > No new Public Telecommunications Service apparatus licences are to be issued in the 3400-4000 MHz range.
- > No new Point to Multipoint apparatus licences are to be issued in the 3400-4000 MHz range in the areas defined by Appendix A. However, licences may be issued in areas outside the Australia Spectrum Map Grid.
- > No new Earth Receive or Point-to-Point apparatus licences are to be issued that authorise the operation of device in a frequency range and area encompassed by an existing AWL.
- > Services under an incumbent apparatus licence in the frequency range may continue to operate, as the ACMA's policy at this time will be to offer such incumbent licences renewal.

## 3.2 Licence conditions

The operation of radiocommunications devices authorised by an AWL in the 3400-4000 bands are subject to:

- > conditions specified in the *Radiocommunications Act 1992* (the Act), including an obligation to comply with the Act;
- > conditions specified in an applicable determination made by the ACMA under section 107(1)(f) of the Act, including the [Radiocommunications Licence Conditions \(Apparatus Licence\) Determination 2015](#), the Radiocommunications Licence Conditions (Area-Wide Licence) Determination 2020 (the AWL LCD);
- > relevant requirements of this RALI as referenced in clause 4 of Schedule 4 of the AWL LCD; and
- > conditions specified in an individual licence.

If interference occurs after a licence is issued and the device is registered, and the issue cannot be resolved between the affected parties, the ACMA will have regard to this RALI and relevant legislative instruments when resolving the matter.

### 3.2.1 Advisory notes – all AWLs

The following advisory notes are to be included on all AWLs in the 3400-4000 MHz range.

#### **Coexistence with radiolocation services**

*Allocations exist in the Australian Radiofrequency Spectrum Plan for the Radiolocation service in the 3100–3300 MHz and the 3300–3600 MHz bands on a primary or co-primary basis under the AUS 1 and AUS11 footnotes respectively. The licensee is advised that the operation of Radiolocation devices by the Department of Defence in these bands may result in interference to receivers operating under this licence which may reduce system performance.*

The ACMA will continue to consult on and monitor this issue with AWL licensees and Defence to best enable the coexistence of both services.

#### **Coexistence with existing apparatus licensed services**

*A radiocommunications receiver, that is:*

- a) Receiving wanted radio emissions from a radiocommunications transmitter that is operated under this licence;*
- b) Is a primary service as defined by the Australian Radiofrequency Spectrum Plan;*
- c) Located within an area authorised by this licence; and*
- d) Has its location recorded on the register of radiocommunications licences;*

*is not afforded protection from interference caused by a radiocommunications transmitter that:*

- a) Is operated under another apparatus licence which was first issued before the commencement of this licence;*
- b) Is a primary service as defined by the Australian Radiofrequency Spectrum Plan*

*This provision does not apply if the transmitter is operated under another area-wide licence.*

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

#### **Operation of earth receive stations prohibited**

*Earth receive stations are not authorised to operate under this licence.*

#### **Notional level of receiver performance**

*The notional receiver performance level and compatibility requirement detailed in schedules 1 and 2 of the Radiocommunications Advisory Guidelines (Managing Interference to Spectrum Licensed Receivers — 3.4 GHz Band) 2015 (RAG Rx), as in force from time to time, or in any instrument made under s.262 of the Radiocommunications Act 1992 as a replacement to those guidelines (as in force from time to time), applies for radiocommunications receivers that:*

- a) Are recorded in the RRL;*
- b) Receive radio emissions from radiocommunications transmitters that are operated under this licence; and*
- c) Are located within an area authorised by this licence;*
- d) Have their location recorded on the register of radiocommunications licences;*

*For application of the receiver blocking, the frequency range in subsection 5(a) of schedule 1 of RAG Rx should be replaced with 3340-4060 MHz when assessing coordination with AWL receivers;*

*While compliance with these provisions is not mandatory, the ACMA will take them into account when assessing any interference disputes.*

### **3.3 AWL issue policy**

This section outlines the ACMA policy procedures for administratively issuing an AWL in the 3400-4000 MHz range. An AWL in the band can be issued, subject to the rules in this section, prior to device coordination requirements detailed in Chapter 4.

#### **3.3.1 Assignment instructions**

The ACMA's policy will be to consider applications for AWLs in accordance with the following:

- > AWLs in the 3400-4000 MHz band will not authorise operation of devices in geographic areas that are subject to a spectrum embargo defined in *RALI MS03*<sup>2</sup>, or in areas described in sections 3.3.2, 3.3.3, 3.3.4 and 3.3.5, as applicable.
- > No AWL licence is to be issued if any part of the AWL is proposed to be within 20 km of a licensed co-frequency Point to Multipoint service, or within 5 km if the proposed AWL is adjacent in frequency by 10 MHz or less, unless by mutual agreement.
- > The upper and lower frequency limits authorised by the licence should comply with the frequencies and areas defined in section 2.1 and align with the channel raster in section 2.2.
- > AWLs should follow assignment priority guidelines in section 3.3.5.
- > An AWL should not be issued if its frequency range would overlap with the frequency range authorised by an existing AWL in the same HCIS cell.
- > The geographic area authorised by an AWL will consist of only whole HCIS cells incorporating levels 0 and above (level 00 cells are not to be used). The smallest geographic area authorised by an AWL is a single HCIS level 0 cell comprising an area of approximately 1.8km x 1.8km.
- > For any given HCIS level 0 cell in a remote area, each AWL will be assigned not more than 100 MHz of spectrum in the 3400-4000 MHz range in remote areas.

#### **3.3.2 Radiolocation authorised under section 10(7) of the Australian Radiofrequency Spectrum Plan (ARSP)**

Existing Defence radiolocation services operate in the range 3400-4000 MHz under section 10(7) of the [ARSP](#). These radiolocation licences have a special condition that states that “No interference shall be caused to any Radiocommunication station or service and no protection from interference by such stations or services shall be afforded.”

Because of the higher potential for mutual interference caused by the introduction of wireless broadband (WBB) services compared with incumbent service types in the area across 3400-4000 MHz, AWLs will not normally be issued in the range of 3700-4000 MHz and within 100 km of, or within 3600-3700 MHz and within 60km of, latitude 15°38'55" South and longitude 131°54'04" East (GDA94 Datum).

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<sup>2</sup> Available on the [ACMA website](#).

### 3.3.3 Darwin and Geraldton coordination zones

There are existing conditions in several RALIs<sup>3</sup> stating that “Requests for any assignments within 150 km of latitude 12°26’59” South and longitude 130°50’0” East (GDA94 Datum) in Darwin (NT) and latitude 28°45’59” South and longitude 114°37’0” East (GDA94 Datum) in Geraldton (WA), are to be referred to the ACMA for preliminary coordination consultation.”

Because of the higher potential for mutual interference caused by the introduction of AWL services compared with incumbent service types in these areas within the 3400-4000 MHz frequency range, the ACMA’s policy will be to not issue AWLs within the Darwin and Geraldton coordination zones. HCIS descriptions of the coordination zones are defined in Appendix B.

### 3.3.4 Woomera Protected Area

There are existing conditions in several RALIs<sup>4</sup> in relation to the WPA stating that “Requests for any assignments inside and within 100 km of the Woomera Prohibited Area (WPA), as defined in embargo 52, are to be referred to the ACMA for preliminary coordination consultation.”

Because of the higher potential for mutual interference caused by the introduction of WBB services compared with incumbent service types in the area across 3400-4000 MHz, the ACMA’s policy will be to not issue AWLs within the Woomera Protected Area, as defined in Embargo 52. An advisory note is to be placed on all AWLs issued within 100km of the WPA stating that “*no protection from interference from transmissions from within the WPA is afforded*”

### 3.3.5 Exmouth coordination zone

The ACMA’s policy will be to not issue AWLs within the Exmouth coordination zones HCIS descriptions of the coordination zone in two frequency ranges are defined in Appendix B.

### 3.3.6 Assignment priority

AWLs are to be assigned using contiguous channels of 10 MHz consistent with the following guidance:

- a. for all AWLs, where possible:
  - > Existing 3.4 GHz band spectrum licence holders should be assigned spectrum below 3800 MHz and preferably occupying the same frequencies as any of their existing 3.4 GHz spectrum licences.
  - > Entities without 3.4 GHz spectrum licence holdings should be assigned spectrum above 3800 MHz, unless available equipment frequency range limitations exist, and preferably occupying the same frequencies as any existing apparatus licences in 3400 – 4000 MHz.
- b. subject to 3.3.6a, in ascending order (lowest frequency available).

These rules are aimed at improving spectral efficiency, maximising spectrum availability for prospective licensees and enabling the prospect of contiguous spectrum holdings across geographic boundaries. Alternative ways of assigning spectrum can be considered on a case-by-case basis by the ACMA where it is deemed to improve the efficiency in use and allocation of spectrum.

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<sup>3</sup> RALI FX19, FX 03

<sup>4</sup> E.g. RALI FX19

## 4 Frequency coordination procedures and pre-registration requirements

This chapter details the coordination procedures and requirements which must be met before the details of a radiocommunications transmitter can be included in the RRL. As required by Paragraph 2 of Schedule 4 of the AWL LCD, a transmitter must not be operated under an AWL in the range 3400-4000 MHz if its details are not included in the RRL, except for transmitters which are specifically exempt.

### 4.1 Coordination at the geographic boundary

#### 4.1.1 Coordination at the AWL geographic boundary

The details of an AWL transmitter must not be included in the RRL if any part of the device boundary of the transmitter lies outside a geographic area authorised by the licence, except when one or more of the following apply:

- > In situations as described in subsection 9(3) of *Radiocommunications (Unacceptable Levels of Interference — 3.4 GHz band) Determination 2015*, as in force from time to time (the s.145 determination) and when the area authorised by the licence is directly adjacent to an area described in RALI MS44.
- > In situations as described in subsection 9(4) of the s.145 determination.
- > The part of the device boundary that is outside the area authorised by the licence falls entirely within an area authorised by another AWL (which also authorises operation in the frequency range of the proposed transmitter), and there is an active agreement in place with the other licensee(s). This exception would no longer apply if any relevant AWL is no longer effective in the future (e.g., they have expired or were cancelled).

For the purposes of this section, the device boundary is to be calculated in accordance with Part 1 of Schedule 2 of the s.145 determination.

#### 4.1.2 Coordination at the geographic boundary of a spectrum licensed (SL) area

The details of an AWL transmitter must not be included in the RRL if:

- > Any part of the device boundary of the AWL transmitter lies inside a geographic area defined by, and would operate in a frequency range described by, any relevant section of RALI SM26.

The above requirement does not apply if the non-compliant part of the device boundary falls entirely within an area authorised by a spectrum licence (which authorises operation in the frequency range of the proposed transmitter), and there is an active agreement in place with the spectrum licensee. This exception would no longer apply if any relevant spectrum licence is no longer effective in the future (e.g., they have expired or were cancelled).

For the purposes of this section, the device boundary is to be calculated in accordance with Schedule 2 of the s.145 determination, with the following amendments:

- > The maximum value of 'm' is 2000 (max radial length = 200km, 100m increments)
- > Level of protection (LOP) is to be set to -115 dBm/MHz;
- > Nominal receiver antenna gain ( $G_r$ ) is set to 24 dBi;

- > The height of the nominal receiver is set to 30m above ground level.

## 4.2 Coordination with AWL receivers

This section outlines the coordination procedures for the protection of AWL receivers. These procedures are to be followed for all proposed apparatus licensed transmitters (including AWL transmitters but excepting AWL transmitters that exempt from registration). In this RALI, 'AWL receiver' means a radiocommunications receiver which is:

- > Used for the reception of radio emissions from area-wide stations;
- > Does not require an area-wide receive licence; and
- > Is located within the area authorised by the licence under which the area-wide station is operating.

### 4.2.1 Co-channel coordination

For proposed AWL transmitters, co-channel interference to AWL receivers is managed through coordination with the area authorised by an existing AWL (detailed in section 4.1.1) and the fallback synchronisation requirement included in the AWL LCD. As the device boundary criterion detailed in section 4.1.1 assumes that area-adjacent AWL services are adhering to the synchronisation requirement, if more protection is desired, the AWL-receiver licensee can consider taking out a licence with a larger geographical area.

For all other apparatus licence types, co-channel interference to AWL receivers is solely managed through coordination with the area authorised by an existing AWL (i.e., no assumption of synchronisation). The proposed transmitter will be considered to cause interference if the device boundary of the transmitter, calculated using the device boundary criterion in section 4.1.2, intrudes into the area of a co-channel AWL.

### 4.2.2 Adjacent-channel coordination

Licensees planning to deploy radiocommunications transmitters under an apparatus licence, including AWL transmitters that are not exempt from registration, must have regard to 3400-4000 MHz band AWL receivers that are recorded in the RRL and are operating on adjacent frequencies. The coordination performed must:

- > 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 — 3.4 GHz Band) 2015* (RAG Rx) as in force from time to time and interpret that it also applies to AWL receivers as well as spectrum licenced receivers;
- > Use the notional receiver performance level set out in Schedule 1 of RAG Rx, is to be used for coordination purposes for AWL receivers. It is noted that licensees can choose to deploy equipment that does not meet this minimum level or performance. However, in this case, licensees must then be prepared to accept a higher level of interference as all coordination will be based on the notional receiver performance. For application of the receiver blocking, the frequency range in subsection 5(a) of schedule 1 of RAG Rx should be replaced with 3340-4060 MHz;

- > Make use of a suitable propagation model to model path loss between the fixed transmitters and radiocommunications receivers;<sup>5</sup>
- > Take into account terrain and any other relevant factors (using a 3 second digital elevation model or better); and
- > Consider any special conditions and/or advisory notes which are included on the relevant licences.

## Failure of coordination

In the event that the above co-channel or adjacent channel coordination with AWL receivers indicates that interference may occur, the licensee of the proposed transmitter should consider:

- > Replanning the deployment of the transmitter 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 cannot be reached:

- > For proposed AWL transmitters: interference is managed in accordance with the synchronisation requirement condition included in the AWL LCD, unless other arrangements are agreed to by the affected licensees.
- > For all other proposed apparatus-licensed transmitters: the proposed licence must not be issued.

*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 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.

This same procedure detailed above, should also be used when planning to deploy radiocommunications receivers (other than earth receive stations) in the 3400-4000 MHz band under an AWL.

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

## 4.3 Registration of AWL receivers

AWL receivers, noting that earth receive stations cannot be operated under an AWL<sup>6</sup>, are not required to be registered before operation. However, registration of fixed receivers is encouraged as only registered devices will be afforded protection. An AWL receiver may only be registered if it complies with the spurious emission limits detailed in section 4.3.1.

There are no coordination procedures (other than the requirements detailed in section 4.2) defined for the protection for AWL receivers from existing apparatus licensed services.

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<sup>5</sup> 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*.

<sup>6</sup> As earth receive stations cannot be operated under an AWL, they are not to be registered in the RRL.

Prospective licensees should assess the risk of interference from existing services before deploying services – also see the advisory note detailed in section 3.2.2.

#### 4.3.1 Receiver spurious emission limits

Spurious emission limits for registered AWL receivers are detailed in Tables 3 and 4 for non-AAS and AAS receivers respectively. The applicable limits in Tables 3 and 4 apply at frequencies outside the 3360-4240 MHz frequency range<sup>7</sup>, during periods when any associated transmitter is not transmitting (in its off period).

**Table 3 Spurious emission limits for non-AAS receivers**

Frequency range (f)	Mean power per receiver (dBm)	Specified Bandwidth
$30 \text{ MHz} \leq f < 1 \text{ GHz}$	-57	100 kHz
$1 \text{ GHz} \leq f < 19 \text{ GHz}$	-47	1 MHz

**Table 4 Spurious emission limits for AAS receivers**

Frequency range (f)	Total radiated power per cell/sector (dBm)	Specified Bandwidth
$30 \text{ MHz} \leq f < 1 \text{ GHz}$	-27	100 kHz
$1 \text{ GHz} \leq f < 19 \text{ GHz}$	-21	1 MHz

## 4.4 Coordination requirements contained in other RALIs

AWL transmitters that are required to be registered must be coordinated with existing receivers from other licensed services. The details of an AWL transmitter must not be included in the RRL if the protection and coordination requirements of receivers of other services are not met. These requirements are detailed in the individual RALIs for those services which are available from the [RALIs](#) page of the ACMA website. Note that some RALIs provide protection for geographic areas rather than an individual service.

Applicable RALIs to consider include, but are not limited to:

- > For fixed links, refer to [RALI FX3](#). The applicable protection ratios for the coordination of AWL transmitters with fixed link receivers are detailed in Appendix 1 of RALI FX3. In this instance the size of the first adjacent channel is defined as being the larger bandwidth of the two services being coordinated.
- > For earth station protection zones (ESPZs), refer to [RALI MS44](#).

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<sup>7</sup> It is expected that receivers that are not registered will comply with the limits in Tables 3 and 4, for frequencies outside the 3295-4105 MHz frequency range. The ACMA will take into account these limits when dealing with interference complaints.

> For the Australian Radio Quiet Zone in Western Australia (ARQZWA), refer to [RALI MS32](#). Details of existing services for performing coordination calculations can be found on the [Register of Radiocommunications Licences](#) (RRL) page of the ACMA website.

Some services that require protection from AWL transmitters do not have RALIs. The coordination requirements for these services are detailed later in this RALI.

#### **4.4.1 Protection from AWL transmitters that are registration exempt**

If the proposed AWL base station site is within 20 km of a receiver from another service that requires protection, not including ESPZs, detailed coordination is required. Coordination is deemed to be successful if it can be shown that the coverage area of the AWL system does not overlap the interference zone of the receiver (where the receiver is provided protection to the levels defined in the RALI that the receiver is coordinated by). Refer to Appendix C for details.

Note that this does not completely remove the risk of interference from registration exempt transmitters. Licensees should use judgement to assess transmitters that have a high potential to cause interference such as those on hills higher than the associated base station. In the event that interference occurs the AWL LCD contains a condition that transmitters exempt from registration must not cause interference to other services.

## **4.5 Coexistence with incumbent point to multipoint services**

This section outlines the requirements for the protection of existing point to multipoint services from transmitters operated under an AWL. This coordination procedure is also to be used when coordinating spectrum licensed transmitters with existing point to multipoint receivers.

As no new point to multipoint licences are to be issued in the 3400-4000 MHz range in areas where AWLs are available (i.e., as detailed at Appendix A), no procedure is defined for the protection for AWL receivers. This means that AWL receivers are not afforded protection from existing point to multipoint services. Prospective licensees should assess the risk of interference from existing point to multipoint services before deploying services. Details of existing services for performing coordination calculations against can be found on the RRL page of the ACMA website and in Appendix D.

#### **4.5.1 Protection of legacy point to multipoint base stations**

Incumbent point to multipoint services may continue to operate in the range 3400-3700 MHz, using a variety of channel sizes between 5 to 30 MHz in either time or frequency division duplexing modes. Existing point to multipoint base station receivers shall be protected to the levels listed in Table 5 for base stations with bandwidths of 20 MHz or less, or **Error! Reference source not found.**6 for base stations with bandwidths greater than 20 MHz.

**Table 5 Protection criteria for incumbent point to multipoint base station receivers with bandwidths of 20 MHz or less.**

Frequency offset	Base station protection criteria (at the input of the receiver)
Co-channel	-115 dBm/MHz
$F_{\text{offset}} \leq 5 \text{ MHz}$	-57.5 dBm/MHz
$5 \text{ MHz} < F_{\text{offset}} \leq 15 \text{ MHz}$	-50 dBm/MHz
$F_{\text{offset}} > 15 \text{ MHz}$	No coordination required, however before registering an AWL transmitter, the AWL licensee (or their Accredited Person) is required to notify the licensee of any receivers identified in the below steps. This allows time for affected parties to negotiate with prospective licensees and implement any additional mitigation that may be required. See Appendix E for notification requirements.

**Table 6 Protection criteria for incumbent point to multipoint base station receivers with bandwidths greater than 20 MHz.**

Frequency offset	Base station protection criteria (at the input of the receiver)
Co-channel	-115 dBm/MHz
$F_{\text{offset}} \leq 20 \text{ MHz}$	-63.5 dBm/MHz
$20 \text{ MHz} < F_{\text{offset}} \leq 30 \text{ MHz}$	-56 dBm/MHz
$F_{\text{offset}} > 30 \text{ MHz}$	No coordination required, however before registering an AWL transmitter, the AWL licensee (or their Accredited Person) is required to notify the licensee of any receivers identified in the below steps. This allows time for affected parties to negotiate with prospective licensees and implement any additional mitigation that may be required. See Appendix E for notification requirements

Frequency offset ( $F_{\text{offset}}$ ) is the frequency separation between the edge of the transmitter's occupied bandwidth and the receiver's licence channel edge

The following minimum separation distance between the proposed AWL transmitter and existing point to multipoint base station receivers applies:

- > For co-channel operation, a minimum separation distance of 20 km
- > For adjacent channel operation with a  $F_{\text{offset}}$  of less than 10 MHz, a minimum separation distance of 5 km
- > For adjacent channel operation with a  $F_{\text{offset}}$  of 10 MHz or greater, there is no minimum separation distance required.

When coordinating a proposed AWL transmitter with a point to multipoint receiver, the following procedure applies:

1. Area Cull: Identify any licensed point to multipoint receivers within a 95km radius.
2. Frequency Cull: include all point to multipoint receivers that are co-channel or within a:

- a. 40 MHz offset for PMP receivers with a bandwidth of 20 MHz or less
  - b. 60 MHz offset for PMP receivers with a bandwidth of greater than 20 MHz.
3. To manage interference, two scenarios need to be assessed:
- a. Assessment of interference potential from AWL transmitters which are required to be included in the RRL. Unwanted emissions into a point to multipoint receiver must not exceed the values in Table 5 or Table 6, and logarithmic scaling should be used to find the appropriate protection level for different point to multipoint receiver bandwidths. The scaling must be based on the values in Table 5 for receivers operating in 20 MHz of bandwidth or less, or the values in Table 6 for all other receivers.
  - b. Assessment of interference potential from AWL transmitters which are not required to be in the RRL (e.g., user equipment). If the geographical location of an AWL that is required to be included in the RRL transmitter, associated with the user equipment that is not required to be included in the RRL, is within 20 km of the point to multipoint receiver, coordination is deemed to fail. However, the associated AWL transmitter (that is required to be included in the RRL) may still be included in the RRL if it can be shown that the coverage area of the associated AWL transmitter does not overlap the interference zone of the point to multipoint receiver – also see section 4.4.1 and Appendix C.

In the event interference occurs to remote or supplemental stations from AWL transmitters, section 4.5.2 of this RALI applies.

#### **4.5.2 Protection of remote and supplemental base stations**

Remote point to multipoint stations are authorised to operate via the [Radiocommunications Licence Conditions \(Fixed Licence\) Determination 2015](#), (the Fixed LCD). The Fixed LCD authorises the use of remote stations only when communicating with a base station or supplemental base station operating under a valid fixed licence (point to multipoint station).

Supplemental base stations are also authorised to operate via the Fixed LCD. The Fixed LCD restricts the use of supplemental base stations to overcoming deficiencies within the coverage area of a base station. Supplemental base stations cannot be used to extend the coverage of a base station.

The Fixed LCD states that remote stations and supplemental base stations must not cause interference to another radiocommunications service. Since the location of these stations is not recorded, it is also ACMA policy that these stations are not afforded protection from interference from another radiocommunications services. It is noted that these stations are afforded a degree of protection via the coordination requirements in place.

#### **4.6 Compatibility with radio-altimeters**

This section contains interim requirements intended to protect the operation of radio altimeters due to safety and/or important operational requirements. The text may be revised as more knowledge on the issue is obtained.

Radio-altimeters are an aircraft station used for radionavigation in the 4200-4400 MHz range under the *Radiocommunications (Aircraft and Aeronautical Mobile Stations) Class Licence 2016*. This section outlines the requirements to manage coexistence with the use of these devices under a range of operational aircraft scenarios.

#### 4.6.1 Definitions

An “**identified runway**” is a landing approach identified by CASA, reproduced in *Appendix G*:

An “**exclusion zone**” is an area comprised of three segments:

- 1) A segment of length “**exclusion zone extension length**” from the landing end of an identified runway.
- 2) A segment of length “**exclusion zone half-width**” at the opposite end of the landing end of an identified runway”
- 3) A segment the length of the runway.

The width of each segment is the “**exclusion zone half-width**” either side of the identified runway’s centre-line. Dimensions are the applicable maximum operating frequency row in Table 7 columns B and C.

A “**restricted zone**” is defined as an area extending lengthwise from each end of the exclusion zone, and horizontally from an identified runway centerline. The applicable dimensions that apply for a given transmitter is the *maximum* operating frequency row in Table 7 column C. Figure 1 below is instructive for an example specific maximum operating frequency.

The “**PFD limit**” value that applies for a given transmitter is defined in table 7 column E for the *maximum* operating frequency row of the transmitter.

The “**PFD limit height**” value that applies for a given transmitter is defined in table 7 column G for the *maximum* operating frequency row of the transmitter.

The “**Additional unwanted emission limits**” that apply for a given transmitter are the value for the *minimum* operating frequency row from Table 7 column E.

Figure 1: Example zone sizes definitions – where both approaches to a runway require protection (not to scale)

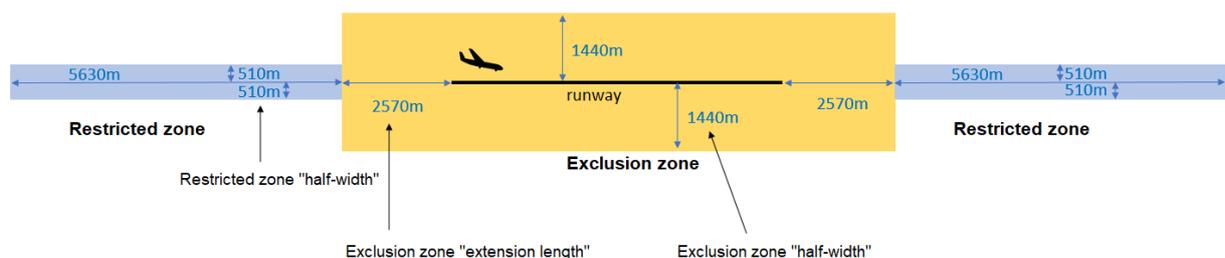
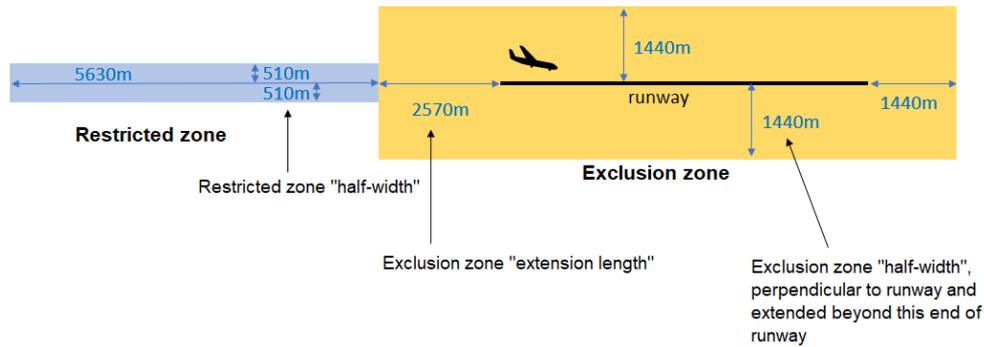


Figure 2: Example zone sizes definitions – where only one approach to a runway require protection (not to scale)



It should be noted that potential exclusion or restricted zones may need to change as airport runways are re-developed or upgraded to improved landing systems. These planning timeframes are expected to be in the order of 5 to 10 years.

**Table 7 Radio altimeter frequency specific limits**

A	B	C	D	E	F	G
Base station operating frequency (MHz)	Exclusion zone extension length (m)	Exclusion zone half-width (m)	Restricted zone size (m) (Length x half-width)	Unwanted emissions limit EIRP (dBm/MHz)	Power flux density limit (dBW/m <sup>2</sup> /MHz)	Power flux density limit restriction height (m)
(>3800, 3850]	2890	1760	5310 x 560	5.1	-41	140
(>3850, 3900]	3000	1870	5200 x 680	5.5	-42.4	145
(>3900, 3950]	3110	1980	5090 x 840	5.8	-43.7	150
(>3950, 4000]	3230	2100	4970 x 1030	6	-45.2	155

#### 4.6.2 Registration requirements

The details of a non-exempt AWL transmitter must not be included in the RRL when the transmitter operates above 3800 MHz and one or more of the following apply:

- 4.6.2.1 The transmitter is located in an *exclusion zone*.
- 4.6.2.2 The transmitter is located in a *restricted zone* and the power flux density from the transmitter exceeds the applicable *PFd limit* at the applicable *PFd limit height* above the ground, for any percentage of the time for all combinations of elevation and azimuth angles above the horizon, in any part of the restricted zone.
- 4.6.2.3 The transmitter's peak EIRP density exceeds 62 dBm/MHz.
- 4.6.2.4 The transmitter's EIRP density exceeds the applicable *additional unwanted emission limit* anywhere in the 4200-4400 MHz range for unwanted emissions.

### 4.6.3 Licence special condition requirements

For the purposes of coordination with radio altimeters (see Schedule 4, clause 4 of the Radiocommunications Licence Conditions (Area-Wide Licence) Determination 2020), the following special conditions are to apply to the operation of a transmitter above 3800 MHz under an AWL:

- 4.6.3.1 If the transmitter is located in a restricted zone, the power flux density from the transmitter must not exceed the applicable *PFD limit* at the applicable *PFD limit height* above the ground, for any percentage of the time for all combinations of elevation and azimuth angles above the horizon, in any part of the restricted zone.
- 4.6.3.2 The transmitter must not scan or direct its highest gain above the horizontal plane when forming beams in any way (i.e. passive or active).
- 4.6.3.3 The transmitter should, as much as is practicable, avoid the formation of grating lobes in the antenna array.
- 4.6.3.4 The transmitter's EIRP density must not exceed 62 dBm/MHz.
- 4.6.3.5 The transmitter's EIRP density must not exceed the applicable *additional unwanted emission limit* anywhere in the 4200 - 4400 MHz range for unwanted emissions.

### 4.6.4 Licence advisory notes

The below clause is not proposed to be implemented but is kept in the consultation version of this RALI to indicate how such possible clauses originally proposed would be incorporated in the technical framework.

[The following advisory note is to apply to all AWLs in the 3400 – 4000 MHz range:

- 4.6.4.1 It is recommended when planning and deploying their networks, to take note of the co-existence issues that may arise due to aeronautical radio-navigation services, typically radio altimeters on aircraft, that may operate in the 4200 – 4400 MHz band. It is also recommended that affected licensees seek to coordinate with airports, heliports and aircraft operators to help prevent, manage and resolve interference that may arise to aeronautical radio-navigation stations.]

## 4.7 Coexistence with earth station receivers

### 4.7.1 Earth station receivers authorised under an earth receive licence

#### 3400–3600 MHz band

Protection from AWL transmitters and coordination of AWL transmitters with Earth receive stations authorised under an earth receive licence and operating in the 3400–3600 MHz band is the same as detailed in Part 4.2 of the [Radiocommunications Advisory Guidelines \(Managing Interference from Spectrum Licensed Transmitters — 3.4 GHz Band\) 2015](#).

Earth receive stations operate on a secondary basis in the 3400–3600 MHz band. Therefore, in the event coordination indicates that interference may occur, the AWL licensee must notify<sup>8</sup> and make reasonable efforts to work with the affected Earth station licensees operating in the 3400–3600 MHz band to enable coexistence. If there is no practical solution, services operated under an AWL have priority.

#### 3600–4200 MHz band

Protection from AWL transmitters and coordination of AWL transmitters with Earth receive stations authorised under an earth receive licence and operating in the 3600–4200 MHz band is substantially the same as detailed in Part 4.3 of the [Radiocommunications Advisory Guidelines \(Managing Interference from Spectrum Licensed Transmitters — 3.4 GHz Band\) 2015](#). (“RAG Tx”).

Part 4.3(2) of the RAG Tx describes co-channel coordination to apply between AWL transmitters and Earth receive stations.

Part 4.3(3) of the RAG Tx describes the coordination procedure for unwanted emissions from AWL transmitters into earth receive stations.

Part 4.3(4) of the RAG Tx describes overload mechanism coordination to apply between AWL transmitters and Earth receive stations. For the use of part 4.3(4) of the RAG Tx for AWLs, the Table 8 below is to be used in place of Table 1 of 4.3(4), which involves the overload interference mechanism, with the additional requirements:

The frequency edge or edges at which the filter is assumed to apply for an FSS Earth station receiver licensed for operation in the 3600-4200 MHz frequency range are

- > For earth receive stations licenced before 16 July 2022:
  - > Before 16 July 2027, the filter is to be assumed to apply below the lower frequency edge of the licence only. In case there are multiple earth receive licences (or multiple devices on one licence) operating on the same antenna in the 3600-4200 MHz frequency range, the lower edge is the lowest licensed frequency of all these devices or licences.
  - > On or after 16 July 2027, the filter is to be assumed to apply below the lower and above the upper frequency limits of each licence. If there are multiple devices recorded on a licence, the filter applies below the lower and above the upper frequency of operation authorised by each individual device.
- > For earth receive stations licensed on or after 16 July 2022, the filter is to be assumed to apply below the lower and above the upper frequency limits of the licence. If there are multiple devices recorded on a licence, the filter applies below the lower and above the upper frequency of operation authorised by each individual device.

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<sup>8</sup> Refer to Appendix E for details of the notification requirements.

**Table 8 Minimum frequency response of earth receive station’s RF filter**

Frequency offset from appropriate edge/s of Earth station receiver licensed frequency (MHz)	Rejection (dB)
< 50	$0.5 + 0.6 * f_{\text{offset}} \text{ (MHz)}$
<110	45.5
< 150	$30.5 + 0.25 * (f_{\text{offset}} \text{ (MHz)} - 50)$
< 200	55.5
$\geq 200$	70

*Note* The earth receive licence may have a different frequency range that that indicated in special conditions used for space coordination purposes.

While earth receive stations in remote areas will be able to be licensed as site-based apparatus licences, the intent is that any new earth station registrations should minimise impact on the utility of any existing area-wide or spectrum licences, even if AWL or SL device registrations have yet to be made i.e., the AWL or SL is first-in-time, but all devices have not been registered.

Consequently, new earth receive stations proposed to be registered under an earth receive licence need to demonstrate that within a 200km radius the above coordination requirements can be met for any possible AWL or SL device that could be registered under the AWL or SL that would meet the device boundary criteria as described at 4.1.1. Appendix F describes a method to be used to perform this coordination requirement to accommodate future AWL and spectrum licenced device registrations under any AWL or spectrum licence.

Where AWLs or SLs have existing device registrations (i.e., an AWL or SL device registration is first-in-time), a new earth receive station receives no specific protection from those existing devices, but the Appendix E method should minimise potential interference from existing registered AWL or SL devices.

When new devices are registered under an existing AWL, or new AWL and are second-in-time to an earth station in the 3700-4200 MHz range, then protection is afforded to the earth station as per the referenced parts of 4.3 of the RAG Tx with the modifications noted under Table 7. For earth stations established after the licensing of the AWL, required to have undergone coordination as per Appendix F, in most cases the new AWL device should be able to be registered due to this earth station pre-coordination.

## **4.8 Other coordination scenarios**

### **4.8.1 Radiodetermination services**

High power radiolocation services in the 3100–3500 MHz band are operated by the Department of Defence on a largely itinerant basis. These radiolocation services have the potential to

disrupt the throughput of receivers operating in-band or in the adjacent band to radiolocation services, particularly on the uplink channel (base station receiver).

The Exmouth coordination zone, described at 3.3.5, has been designed to manage coexistence with a Defence radiodetermination facility which is expected to be operating on a more than itinerant basis. Consequently, interference managed required special consideration of arrangements.

The Department of Defence is expected to take all reasonable measures to minimise the impact of radiolocation services to other in-band and adjacent band services. However, there will be occasions when interference cannot be fully mitigated. In such instances the interference may be due to blocking, strong out-of-band radar emissions or other susceptibilities within a fixed or mobile wireless network configuration.

When planning service deployments, 3400–3700 MHz band apparatus licensees are urged to consider additional measures to reduce the likelihood of impact to services operating under their licence. If such measures are necessary, it is likely that they would only apply in specific areas that are subject to regular radar use. They may include additional RF filtering, network redundancy, or resilience of network configuration where vulnerabilities to radar signal interference are identified. The ACMA will work with the Department of Defence to make available, where feasible, any additional information that may assist existing or prospective 3400–3700 MHz band apparatus licensees on this matter.

Radiocommunications transmitters operated under an area wide licence in the 3400 MHz to 4000 MHz band, in accordance with the conditions of the licence, are not taken to cause unacceptable interference to radiolocation services operating in the 3100-3400 MHz or 3400-3600 MHz bands.

#### 4.8.2 Amateur service

The [Radiocommunications Licence Conditions \(Amateur Licence\) Determination 2015](#) allows the Advanced Amateur licensees to operate in various portions of the 3400–3600 MHz band in defined geographical areas. The [Australian Radiofrequency Spectrum Plan 2017](#) sets a secondary status for all Amateur services in the 3400–3600 MHz band. This status means that incumbent amateur services must not cause interference to a primary service and cannot claim protection from interference from a primary service.

Coordination of Amateur Beacon or Repeater licences with registered AWL receivers operating in the 3400–3600 MHz band is conducted using the notional receiver performance level set out in Schedule 1 of *Radiocommunications Advisory Guidelines (Managing Interference to Spectrum Licensed Receivers — 3.4 GHz Band) 2015*, as in force from time to time. In the event coordination indicates that interference may occur to a registered AWL receiver, it is recommended that the AWL licensee notify<sup>9</sup> and make reasonable efforts to work with the affected amateur licensees operating to enable coexistence and prevent harmful interference from occurring. However, in the event there is no practical solution, services operated under an AWL have priority (i.e., Amateur services cannot claim protection from or cause interference to an AWL service).

### 4.9 Site engineering aspects

At shared sites, that is sites within 500 m of each other, several potential interference mechanisms other than co-channel or adjacent channel interference may occur. These include

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<sup>9</sup> Refer to Appendix E for details of the notification requirements.

intermodulation, transient and spurious emissions, receiver and desensitisation, and physical blocking. These mechanisms are caused by non-linear and often complex processes that are, usually, not readily predicted using information contained in the ACMA's [RRL](#). Nevertheless, several site engineering methods can be applied to address these potential interference scenarios. These include, but are not limited to, RF filtering, site shielding, frequency separation, site location and power reduction.

Most of the methods mentioned above require co-operation and co-ordination between licensees. This is easily achieved where the two systems are owned by the same licensee. Where neighbouring systems are not owned by the same licensee formal discussions may be required.

In the case of co-siting with spectrum licensed devices or other AWL licensees (i.e., sites within 500 m of each other), if interference occurs and both devices are operating in accordance with the condition of their licence and any other conditions that may apply, then licensees must take reasonable steps to negotiate arrangements likely to reduce the interference to acceptable levels. To assist in such situations, operators are also referred to the relevant Radiocommunications Advisory Guideline (stated on the spectrum licence) which specifies a minimum spectrum licence notional receiver performance, with also applies to AWL receivers. The advisory guidelines are part of the [3.4 GHz Spectrum Licence Technical Framework](#).

It is a condition in the AWL LCD that licensees (or their site managers) work cooperatively with other co-sited licensees and apply good site engineering practice to resolve problems when they occur.

#### **4.10 Additional information on technical records**

The following applies when providing details of AWL stations to be recorded on the [Register of Radiocommunications Licences](#):

- > Where sectorised antennas are used, details of the antenna model, down-tilt, polarisation and azimuth should be recorded for each sector. However, where:
  - > there are multiple sectorised antennas on a single site (used for example to achieve 360-degree coverage); and
  - > all sectors are using the same frequency.

it is not necessary to specify the azimuth of each sector antenna. Instead, the site can be recorded as a single registration (i.e., effectively registering the device as non-directional). When performing coordination, the highest radiated power on any one sector should be assumed in all directions — irrespective of the actual antenna configuration. The details of the antenna on the sector that results in the highest radiated power should be recorded on the [RRL](#).

- > Where steerable beam (including beam forming) antennas are used, details of the highest gain achievable through antenna phasing should be recorded.

## 5 Exceptions

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

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

For exemptions related to AWL transmitter coordination and device boundary criteria please also see the formal requirements under the AWL LCD.

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

# 6 RALI Authorisation

[not approved]      XX/YY/20XX

Chris Worley

Manager  
Spectrum Planning Section  
Spectrum Planning and Engineering Branch  
Communications Infrastructure Division  
Australian Communications and Media Authority

# Appendix A: Areas available for AWL licensing

In this RALI, the areas available for AWL licensing are defined by the HCIS area descriptions in the following table, except where otherwise precluded in this RALI.

The Australian Spectrum Map Grid (ASMG) is used to define geographical areas over which spectrum licences are issued. The Hierarchical Cell Identification Scheme (HCIS) is a naming convention developed by the ACMA that applies unique ‘names’ to each of the cells that make up the ASMG. The ASMG and HCIS are described in detail in the document [The Australian spectrum map grid 2012](#). HCIS description of areas can be converted into a Placemark file (viewable in Google Earth) through a facility on the [ACMA website](#).

AWL licences will not be issued outside of the ASMG, where point to multipoint licences can be issued.

Area (frequency)	Sub-area name	HCIS
Remote (3400-4000 MHz)	–	BR, BS, BT, CR, CS, CT, CU, DQ, DR, DS, DT, DU, EP, EQ, ER, ES, ET, EU, FP, FQ, FR, FS, FT, FU, GP, GQ, GR, GS, GT, GU, HO, HP, HQ, HR, HS, HT, HU, IO, IP, IQ, IR, IS, IT, IU, JO, JP, JQ, JR, JS, JT, JU, KR, KS, KT, KU, LS, LT, LU, AR8, AR9, AS2, AS3, AS5, AS6, AS8, AS9, AT1, AT2, AT3, AT5, AT6, AT8, AT9, AU2, AU3, BU1, BU2, BU3, BU6, GO3, GO4, GO5, GO6, GO7, GO8, GO9, AU6A, AU6B, AU6C, AU6D, AU6E, AU6F, AU6G, AU6H, BU4A, BU4B, BU4C, BU4D, BU4E, BU4F, BU4G, BU5A, BU5B, BU5C, BU5D, BU9C, BU9D, BU9G, BU9H, BU9K, BU9L, BU9O, BU9P

# Appendix B: coordination zone definitions

AWLs in the ranges specified in the “frequency range” column will not normally be issued in the areas defined by the HCIS area description the following table.

Coordination Zone	Frequency range (MHz)	HCIS
Darwin (NT)	3400 - 3800	GO7, GO8, FP3D, GO4F, GO4G, GO4H, GO4I, GO4J, GO4K, GO4L, GO4M, GO4N, GO4O, GO4P, GO5E, GO5F, GO5I, GO5J, GO5K, GO5M, GO5N, GO5O, GO5P, GP1A, GP1B, GP1C, GP1D, GP1E, GP1F, GP1G, GP1H, GP1K, GP1L, GP2A, GP2B, GP2C, GP2E, GP2F, GP2I, FP3C3, FP3C6, FP3H2, FP3H3, FP3H5, FP3H6, GO4B8, GO4B9, GO4C7, GO4C8, GO4C9, GO4D4, GO4D5, GO4D7, GO4D8, GO4D9, GO4E3, GO4E5, GO4E6, GO4E7, GO4E8, GO4E9, GO5A7, GO5A8, GO5A9, GO5B7, GO5G4, GO5G7, GO5G8, GO5G9, GO5L1, GO5L4, GO5L5, GO5L7, GO5L8, GO6M7, GO9A1, GO9A4, GO9A5, GO9A7, GO9A8, GO9E1, GO9E2, GO9E4, GO9E5, GO9E7, GO9E8, GO9I1, GO9I2, GO9I4, GO9I5, GO9I7, GO9I8, GO9M1, GO9M2, GO9M4, GO9M7, GP1I2, GP1I3, GP1J1, GP1J2, GP1J3, GP1J4, GP1J5, GP1J6, GP1J9, GP2D1, GP2D2, GP2D3, GP2D4, GP2D5, GP2D6, GP2D7, GP2D8, GP2G1, GP2G2, GP2G3, GP2G4, GP2G5, GP2G6, GP2G7, GP2G8, GP2H1, GP2H4, GP2J1, GP2J2, GP2J3, GP2J4, GP2J5, GP2K1, FP3C1E, FP3C1J, FP3C2A, FP3C2B, FP3C2C, FP3C2D, FP3C2E, FP3C2F, FP3C2G, FP3C2H, FP3C2I, FP3C2J, FP3C2K, FP3C2L, FP3C2M, FP3C2N, FP3C2O, FP3C2P, FP3C2Q, FP3C2R, FP3C2S, FP3C2T, FP3C2V, FP3C2W, FP3C2X, FP3C2Y, FP3C5B, FP3C5C, FP3C5D, FP3C5E, FP3C5H, FP3C5I, FP3C5J, FP3C5M, FP3C5N, FP3C5O, FP3C5S, FP3C5T, FP3C5X, FP3C5Y, FP3C8E, FP3C9A, FP3C9B, FP3C9C, FP3C9D, FP3C9E, FP3C9F, FP3C9G, FP3C9H, FP3C9I, FP3C9J, FP3C9K, FP3C9L, FP3C9M, FP3C9N, FP3C9O, FP3C9Q, FP3C9R, FP3C9S, FP3C9T, FP3C9W, FP3C9X, FP3C9Y, FP3G3D, FP3G3E, FP3G3I, FP3G3J, FP3G3O, FP3H1A, FP3H1B, FP3H1C, FP3H1D, FP3H1E, FP3H1F, FP3H1G, FP3H1H, FP3H1I, FP3H1J, FP3H1K, FP3H1L, FP3H1M, FP3H1N, FP3H1O, FP3H1P, FP3H1Q, FP3H1R, FP3H1S, FP3H1T, FP3H1V, FP3H1W, FP3H1X, FP3H1Y, FP3H4C, FP3H4D, FP3H4E, FP3H4H, FP3H4I, FP3H4J, FP3H4N, FP3H4O, FP3H4T, FP3H8B, FP3H8C, FP3H8D, FP3H8E, FP3H8H, FP3H8I, FP3H8J, FP3H8N, FP3H8O, FP3H9A, FP3H9B, FP3H9C, FP3H9D, FP3H9E, FP3H9F, FP3H9G, FP3H9H, FP3H9I, FP3H9J, FP3H9K, FP3H9L, FP3H9M, FP3H9N, FP3H9O, FP3H9P, FP3H9Q, FP3H9R, FP3H9S, FP3H9T, FP3H9V, FP3H9W, FP3H9X, FP3H9Y, FP3L3C, FP3L3D, FP3L3E, FP3L3I, FP3L3J, GO4A9S, GO4A9T, GO4A9V, GO4A9W, GO4A9X, GO4A9Y,

Coordination Zone	Frequency range (MHz)	HCIS
		GO4B5X, GO4B5Y, GO4B6Q, GO4B6R, GO4B6S, GO4B6T, GO4B6U, GO4B6V, GO4B6W, GO4B6X, GO4B6Y, GO4B7I, GO4B7J, GO4B7K, GO4B7L, GO4B7M, GO4B7N, GO4B7O, GO4B7P, GO4B7Q, GO4B7R, GO4B7S, GO4B7T, GO4B7U, GO4B7V, GO4B7W, GO4B7X, GO4B7Y, GO4C4K, GO4C4L, GO4C4M, GO4C4N, GO4C4O, GO4C4P, GO4C4Q, GO4C4R, GO4C4S, GO4C4T, GO4C4U, GO4C4V, GO4C4W, GO4C4X, GO4C4Y, GO4C5F, GO4C5G, GO4C5H, GO4C5I, GO4C5J, GO4C5K, GO4C5L, GO4C5M, GO4C5N, GO4C5O, GO4C5P, GO4C5Q, GO4C5R, GO4C5S, GO4C5T, GO4C5U, GO4C5V, GO4C5W, GO4C5X, GO4C5Y, GO4C6D, GO4C6E, GO4C6F, GO4C6G, GO4C6H, GO4C6I, GO4C6J, GO4C6K, GO4C6L, GO4C6M, GO4C6N, GO4C6O, GO4C6P, GO4C6Q, GO4C6R, GO4C6S, GO4C6T, GO4C6U, GO4C6V, GO4C6W, GO4C6X, GO4C6Y, GO4D6A, GO4D6B, GO4D6F, GO4D6G, GO4D6H, GO4D6I, GO4D6J, GO4D6K, GO4D6L, GO4D6M, GO4D6N, GO4D6O, GO4D6P, GO4D6Q, GO4D6R, GO4D6S, GO4D6T, GO4D6U, GO4D6V, GO4D6W, GO4D6X, GO4D6Y, GO4E1T, GO4E1X, GO4E1Y, GO4E2E, GO4E2I, GO4E2J, GO4E2L, GO4E2M, GO4E2N, GO4E2O, GO4E2P, GO4E2Q, GO4E2R, GO4E2S, GO4E2T, GO4E2U, GO4E2V, GO4E2W, GO4E2X, GO4E2Y, GO4E4B, GO4E4C, GO4E4D, GO4E4E, GO4E4F, GO4E4G, GO4E4H, GO4E4I, GO4E4J, GO4E4K, GO4E4L, GO4E4M, GO4E4N, GO4E4O, GO4E4P, GO4E4Q, GO4E4R, GO4E4S, GO4E4T, GO4E4U, GO4E4V, GO4E4W, GO4E4X, GO4E4Y, GO5A4F, GO5A4G, GO5A4H, GO5A4I, GO5A4J, GO5A4K, GO5A4L, GO5A4M, GO5A4N, GO5A4O, GO5A4P, GO5A4Q, GO5A4R, GO5A4S, GO5A4T, GO5A4U, GO5A4V, GO5A4W, GO5A4X, GO5A4Y, GO5A5K, GO5A5L, GO5A5M, GO5A5N, GO5A5O, GO5A5P, GO5A5Q, GO5A5R, GO5A5S, GO5A5T, GO5A5U, GO5A5V, GO5A5W, GO5A5X, GO5A5Y, GO5A6P, GO5A6Q, GO5A6R, GO5A6U, GO5A6V, GO5A6W, GO5A6X, GO5A6Y, GO5B4U, GO5B4V, GO5B8F, GO5B8G, GO5B8K, GO5B8L, GO5B8M, GO5B8N, GO5B8P, GO5B8Q, GO5B8R, GO5B8S, GO5B8T, GO5B8U, GO5B8V, GO5B8W, GO5B8X, GO5B8Y, GO5B9P, GO5B9Q, GO5B9U, GO5B9V, GO5B9W, GO5B9X, GO5G1F, GO5G1G, GO5G1K, GO5G1L, GO5G1M, GO5G1N, GO5G1P, GO5G1Q, GO5G1R, GO5G1S, GO5G1T, GO5G1U, GO5G1V, GO5G1W, GO5G1X, GO5G1Y, GO5G2P, GO5G2U, GO5G2V, GO5G5A, GO5G5B, GO5G5C, GO5G5D, GO5G5F, GO5G5G, GO5G5H, GO5G5I, GO5G5J, GO5G5K, GO5G5L, GO5G5M, GO5G5N, GO5G5O, GO5G5P, GO5G5Q, GO5G5R, GO5G5S, GO5G5T, GO5G5U, GO5G5V, GO5G5W,

Coordination Zone	Frequency range (MHz)	HCIS
		GO5G5X, GO5G5Y, GO5G6K, GO5G6P, GO5G6Q, GO5G6R, GO5G6U, GO5G6V, GO5G6W, GO5G6X, GO5H7F, GO5H7K, GO5H7L, GO5H7P, GO5H7Q, GO5H7R, GO5H7U, GO5H7V, GO5H7W, GO5H7X, GO5L2F, GO5L2K, GO5L2L, GO5L2P, GO5L2Q, GO5L2R, GO5L2U, GO5L2V, GO5L2W, GO5L2X, GO5L6K, GO5L6P, GO5L6Q, GO5L6U, GO5L6V, GO5L6W, GO5L9A, GO5L9B, GO5L9C, GO5L9F, GO5L9G, GO5L9H, GO5L9I, GO5L9K, GO5L9L, GO5L9M, GO5L9N, GO5L9O, GO5L9P, GO5L9Q, GO5L9R, GO5L9S, GO5L9T, GO5L9U, GO5L9V, GO5L9W, GO5L9X, GO5L9Y, GO6I7U, GO6M1A, GO6M1B, GO6M1F, GO6M1G, GO6M1K, GO6M1L, GO6M1M, GO6M1P, GO6M1Q, GO6M1R, GO6M1U, GO6M1V, GO6M1W, GO6M1X, GO6M4A, GO6M4B, GO6M4C, GO6M4D, GO6M4F, GO6M4G, GO6M4H, GO6M4I, GO6M4J, GO6M4K, GO6M4L, GO6M4M, GO6M4N, GO6M4O, GO6M4P, GO6M4Q, GO6M4R, GO6M4S, GO6M4T, GO6M4U, GO6M4V, GO6M4W, GO6M4X, GO6M4Y, GO6M5P, GO6M5U, GO6M8A, GO6M8B, GO6M8F, GO6M8G, GO6M8K, GO6M8L, GO6M8M, GO6M8P, GO6M8Q, GO6M8R, GO6M8U, GO6M8V, GO6M8W, GO9A2A, GO9A2B, GO9A2C, GO9A2D, GO9A2F, GO9A2G, GO9A2H, GO9A2I, GO9A2K, GO9A2L, GO9A2M, GO9A2N, GO9A2P, GO9A2Q, GO9A2R, GO9A2S, GO9A2T, GO9A2U, GO9A2V, GO9A2W, GO9A2X, GO9A2Y, GO9A6F, GO9A6K, GO9A6P, GO9A6U, GO9A9A, GO9A9F, GO9A9G, GO9A9K, GO9A9L, GO9A9P, GO9A9Q, GO9A9U, GO9A9V, GO9E3A, GO9E3B, GO9E3F, GO9E3G, GO9E3H, GO9E3K, GO9E3L, GO9E3M, GO9E3P, GO9E3Q, GO9E3R, GO9E3U, GO9E3V, GO9E3W, GO9E6A, GO9E6B, GO9E6C, GO9E6F, GO9E6G, GO9E6H, GO9E6K, GO9E6L, GO9E6M, GO9E6P, GO9E6Q, GO9E6R, GO9E6U, GO9E6V, GO9E6W, GO9E9A, GO9E9B, GO9E9C, GO9E9F, GO9E9G, GO9E9H, GO9E9K, GO9E9L, GO9E9M, GO9E9P, GO9E9Q, GO9E9R, GO9E9U, GO9E9V, GO9E9W, GO9I3A, GO9I3B, GO9I3C, GO9I3F, GO9I3G, GO9I3H, GO9I3K, GO9I3L, GO9I3M, GO9I3P, GO9I3Q, GO9I3R, GO9I3U, GO9I3V, GO9I3W, GO9I6A, GO9I6B, GO9I6C, GO9I6F, GO9I6G, GO9I6H, GO9I6K, GO9I6L, GO9I6M, GO9I6P, GO9I6Q, GO9I6U, GO9I6V, GO9I9A, GO9I9B, GO9I9F, GO9I9G, GO9I9K, GO9I9L, GO9I9P, GO9I9Q, GO9I9U, GO9M3A, GO9M3F, GO9M3K, GO9M5A, GO9M5B, GO9M5C, GO9M5D, GO9M5E, GO9M5F, GO9M5G, GO9M5H, GO9M5I, GO9M5J, GO9M5K, GO9M5L, GO9M5M, GO9M5N, GO9M5P, GO9M5Q, GO9M5R, GO9M5S, GO9M5U, GO9M5V, GO9M5W, GO9M5X, GO9M8A, GO9M8B, GO9M8C, GO9M8F, GO9M8G, GO9M8H, GO9M8K, GO9M8L, GO9M8P, GO9M8Q, GO9M8U, GO9M8V, GP1I1A, GP1I1B, GP1I1C, GP1I1D, GP1I1E,

Coordination Zone	Frequency range (MHz)	HCIS
		GP1I1F, GP1I1G, GP1I1H, GP1I1I, GP1I1J, GP1I1K, GP1I1L, GP1I1M, GP1I1N, GP1I1O, GP1I1Q, GP1I1R, GP1I1S, GP1I1T, GP1I1W, GP1I1X, GP1I1Y, GP1I4E, GP1I5A, GP1I5B, GP1I5C, GP1I5D, GP1I5E, GP1I5G, GP1I5H, GP1I5I, GP1I5J, GP1I5M, GP1I5N, GP1I5O, GP1I5T, GP1I6A, GP1I6B, GP1I6C, GP1I6D, GP1I6E, GP1I6F, GP1I6G, GP1I6H, GP1I6I, GP1I6J, GP1I6K, GP1I6L, GP1I6M, GP1I6N, GP1I6O, GP1I6P, GP1I6Q, GP1I6R, GP1I6S, GP1I6T, GP1I6V, GP1I6W, GP1I6X, GP1I6Y, GP1I9D, GP1I9E, GP1J7A, GP1J7B, GP1J7C, GP1J7D, GP1J7E, GP1J7F, GP1J7G, GP1J7H, GP1J7I, GP1J7J, GP1J7M, GP1J7N, GP1J7O, GP1J8A, GP1J8B, GP1J8C, GP1J8D, GP1J8E, GP1J8F, GP1J8G, GP1J8H, GP1J8I, GP1J8J, GP1J8K, GP1J8L, GP1J8M, GP1J8N, GP1J8O, GP1J8P, GP1J8Q, GP1J8R, GP1J8S, GP1J8T, GP1J8X, GP1J8Y, GP1N3B, GP1N3C, GP1N3D, GP1N3E, GP1O1A, GP1O1B, GP1O1C, GP1O1D, GP1O1E, GP1O1F, GP1O1G, GP1O1H, GP1O1I, GP1O1J, GP1O1O, GP1O2A, GP1O2B, GP1O2C, GP1O2D, GP1O2E, GP1O2F, GP1O2G, GP1O2H, GP1O2I, GP1O2J, GP1O2K, GP1O2L, GP1O2M, GP1O2N, GP1O2O, GP1O3A, GP1O3B, GP1O3C, GP1O3D, GP1O3E, GP1O3F, GP1O3G, GP1O3H, GP1O3I, GP1O3J, GP1O3K, GP1O3L, GP1O3M, GP1O3N, GP1O3O, GP1O3Q, GP1O3R, GP1O3S, GP1O3T, GP1P1A, GP1P1B, GP1P1C, GP1P1D, GP1P1E, GP1P1F, GP1P1G, GP1P1H, GP1P1I, GP1P1J, GP1P1K, GP1P1L, GP1P1M, GP1P1N, GP1P1O, GP1P1P, GP1P1Q, GP1P1R, GP1P1S, GP1P1T, GP1P2A, GP1P2B, GP1P2C, GP1P2D, GP1P2E, GP1P2F, GP1P2G, GP1P2H, GP1P2I, GP1P2J, GP1P2K, GP1P2L, GP1P2M, GP1P2N, GP1P2O, GP1P2P, GP1P2Q, GP1P2R, GP1P2S, GP1P2T, GP1P3A, GP1P3B, GP1P3C, GP1P3D, GP1P3E, GP1P3F, GP1P3G, GP1P3H, GP1P3I, GP1P3J, GP1P3K, GP1P3L, GP1P3M, GP1P3N, GP1P3O, GP1P3P, GP1P3Q, GP1P3R, GP2D9A, GP2D9B, GP2D9C, GP2D9D, GP2D9E, GP2D9F, GP2D9G, GP2D9H, GP2D9I, GP2D9J, GP2D9K, GP2D9L, GP2D9M, GP2D9N, GP2D9P, GP2D9Q, GP2D9R, GP2D9S, GP2D9U, GP2D9V, GP2D9W, GP2G9A, GP2G9B, GP2G9C, GP2G9D, GP2G9E, GP2G9F, GP2G9G, GP2G9H, GP2G9I, GP2G9J, GP2G9K, GP2G9L, GP2G9M, GP2G9N, GP2G9O, GP2G9P, GP2G9Q, GP2G9R, GP2G9S, GP2G9T, GP2G9U, GP2G9V, GP2G9W, GP2G9X, GP2H2A, GP2H2B, GP2H2C, GP2H2D, GP2H2E, GP2H2F, GP2H2G, GP2H2H, GP2H2I, GP2H2J, GP2H2K, GP2H2L, GP2H2M, GP2H2N, GP2H2O, GP2H2P, GP2H2Q, GP2H2R, GP2H2S, GP2H2T, GP2H2U, GP2H2V, GP2H2W, GP2H2X, GP2H3A, GP2H3B, GP2H3F, GP2H3G, GP2H3K, GP2H5A, GP2H5B, GP2H5C, GP2H5F, GP2H5G, GP2H5K, GP2H5P, GP2H7A, GP2H7B, GP2H7C, GP2H7D, GP2H7F, GP2H7G, GP2H7K, GP2J6A, GP2J6B, GP2J6C, GP2J6D,

Coordination Zone	Frequency range (MHz)	HCIS
		GP2J6E, GP2J6F, GP2J6G, GP2J6H, GP2J6I, GP2J6J, GP2J6K, GP2J6L, GP2J6M, GP2J6N, GP2J6O, GP2J6P, GP2J6Q, GP2J6R, GP2J6S, GP2J6T, GP2J6U, GP2J6V, GP2J6W, GP2J6X, GP2J7A, GP2J7B, GP2J7C, GP2J7D, GP2J7E, GP2J7F, GP2J7G, GP2J7H, GP2J7I, GP2J7J, GP2J7K, GP2J7L, GP2J7M, GP2J7N, GP2J7O, GP2J7P, GP2J7Q, GP2J7R, GP2J7S, GP2J7T, GP2J7U, GP2J7V, GP2J8A, GP2J8B, GP2J8C, GP2J8D, GP2J8E, GP2J8F, GP2J8G, GP2J8H, GP2J8I, GP2J8J, GP2J8K, GP2J8L, GP2J8M, GP2J9A, GP2J9B, GP2K2A, GP2K2B, GP2K2C, GP2K2D, GP2K2E, GP2K2F, GP2K2G, GP2K2H, GP2K2I, GP2K2J, GP2K2K, GP2K2L, GP2K2M, GP2K2N, GP2K2O, GP2K2P, GP2K2Q, GP2K2R, GP2K2S, GP2K2U, GP2K2V, GP2K3A, GP2K3B, GP2K3C, GP2K3F, GP2K3G, GP2K4A, GP2K4B, GP2K4C, GP2K4D, GP2K4E, GP2K4F, GP2K4G, GP2K4H, GP2K4I, GP2K4K, GP2K4L, GP2K4M, GP2K4P, GP2K5A, GP2M1A, GP2M1B, GP2M1C, GP2M1D, GP2M1E, GP2M1F, GP2M1G, GP2M1H, GP2M1I, GP2M1J, GP2M1K, GP2M1L, GP2M1M, GP2M1N, GP2M1O, GP2M2A, GP2M2B, GP2M2C, GP2M2D, GP2M2E, GP2M2F, GP2M2G, GP2M2H, GP2M2I, GP2M2J, GP2M2K, GP2M3A, GP2M3B, GP2M3C, GP2M3D, GP3A1A, GP3A1B, GP3A1C, GP3A1D, GP3A1E, GP3A1F, GP3A1G, GP3A1H, GP3A1I, GP3A1J, GP3A1K, GP3A1L, GP3A1M, GP3A1N, GP3A1O, GP3A1P, GP3A1Q, GP3A1R, GP3A1S, GP3A1T, GP3A1U, GP3A1V, GP3A1W, GP3A1X, GP3A2A, GP3A2F, GP3A4A, GP3A4B, GP3A4C, GP3A4D, GP3A4F, GP3A4G, GP3A4H, GP3A4K, GP3A4L, GP3A4M, GP3A4P, GP3A4Q, GP3A4U, GP3A7A.
Geraldton (WA)	3400 -4000	AU3, AU6, AT8P, AT9J, AT9K, AT9L, AT9M, AT9N, AT9O, AT9P, AU2C, AU2D, AU2F, AU2G, AU2H, AU2J, AU2K, AU2L, AU2N, AU2O, AU2P, BT7M, BT7N, BU1A, BU1B, BU1C, BU1E, BU1F, BU1G, BU1H, BU1I, BU1J, BU1K, BU1L, BU1M, BU1N, BU1O, BU1P, BU4A, BU4B, BU4C, BU4D, BU4E, BU4F, BU4G, BU4I, BU4J, BU4M, AT8L5, AT8L6, AT8L7, AT8L8, AT8L9, AT8N9, AT8O2, AT8O3, AT8O4, AT8O5, AT8O6, AT8O7, AT8O8, AT8O9, AT9F9, AT9G7, AT9G8, AT9G9, AT9H7, AT9I2, AT9I3, AT9I4, AT9I5, AT9I6, AT9I7, AT9I8, AT9I9, AU2B2, AU2B3, AU2B5, AU2B6, AU2B7, AU2B8, AU2B9, AU2E6, AU2E9, AU2I3, AU2I5, AU2I6, AU2I8, AU2I9, AU2M2, AU2M3, AU2M5, AU2M6, AU2M8, AU2M9, AU9B1, AU9B2, AU9B3, AU9C1, AU9C2, AU9C3, AU9D1, AU9D2, AU9D3, BT7I1, BT7I2, BT7I4, BT7I5, BT7I6, BT7I7, BT7I8, BT7I9, BT7J4, BT7J7, BT7J8, BT7J9, BT7O1, BT7O4, BT7O5, BT7O6, BT7O7, BT7O8, BT7O9, BT7P7, BU1D1, BU1D4, BU1D5, BU1D7, BU1D8, BU1D9, BU2E4, BU2E7, BU2I1, BU2I4, BU2I7, BU2M1, BU2M2, BU2M4, BU2M7, BU4H1, BU4H2, BU4H3, BU4H4, BU4H5, BU4H7, BU4H8, BU4K1, BU4K2, BU4K3, BU4K4, BU4K5, BU4K6, BU4K7, BU4K8, BU4L1,

Coordination Zone	Frequency range (MHz)	HCIS
		BU4N1, BU4N2, BU4N3, BU4N4, BU4N5, BU4O1, BU5A1, BU5A4, AT8K6X, AT8K6Y, AT8K8O, AT8K8R, AT8K8S, AT8K8T, AT8K8V, AT8K8W, AT8K8X, AT8K8Y, AT8K9C, AT8K9D, AT8K9E, AT8K9F, AT8K9G, AT8K9H, AT8K9I, AT8K9J, AT8K9K, AT8K9L, AT8K9M, AT8K9N, AT8K9O, AT8K9P, AT8K9Q, AT8K9R, AT8K9S, AT8K9T, AT8K9U, AT8K9V, AT8K9W, AT8K9X, AT8K9Y, AT8L2T, AT8L2W, AT8L2X, AT8L2Y, AT8L3J, AT8L3M, AT8L3N, AT8L3O, AT8L3P, AT8L3Q, AT8L3R, AT8L3S, AT8L3T, AT8L3U, AT8L3V, AT8L3W, AT8L3X, AT8L3Y, AT8L4I, AT8L4J, AT8L4M, AT8L4N, AT8L4O, AT8L4P, AT8L4Q, AT8L4R, AT8L4S, AT8L4T, AT8L4U, AT8L4V, AT8L4W, AT8L4X, AT8L4Y, AT8N6E, AT8N6I, AT8N6J, AT8N6M, AT8N6N, AT8N6O, AT8N6Q, AT8N6R, AT8N6S, AT8N6T, AT8N6U, AT8N6V, AT8N6W, AT8N6X, AT8N6Y, AT8N8E, AT8N8I, AT8N8J, AT8N8M, AT8N8N, AT8N8O, AT8N8R, AT8N8S, AT8N8T, AT8N8V, AT8N8W, AT8N8X, AT8N8Y, AT8O1J, AT8O1M, AT8O1N, AT8O1O, AT8O1Q, AT8O1R, AT8O1S, AT8O1T, AT8O1U, AT8O1V, AT8O1W, AT8O1X, AT8O1Y, AT9E7Y, AT9E8S, AT9E8T, AT9E8U, AT9E8V, AT9E8W, AT9E8X, AT9E8Y, AT9E9L, AT9E9M, AT9E9N, AT9E9O, AT9E9P, AT9E9Q, AT9E9R, AT9E9S, AT9E9T, AT9E9U, AT9E9V, AT9E9W, AT9E9X, AT9E9Y, AT9F7G, AT9F7H, AT9F7I, AT9F7J, AT9F7K, AT9F7L, AT9F7M, AT9F7N, AT9F7O, AT9F7P, AT9F7Q, AT9F7R, AT9F7S, AT9F7T, AT9F7U, AT9F7V, AT9F7W, AT9F7X, AT9F7Y, AT9F8B, AT9F8C, AT9F8D, AT9F8E, AT9F8F, AT9F8G, AT9F8H, AT9F8I, AT9F8J, AT9F8K, AT9F8L, AT9F8M, AT9F8N, AT9F8O, AT9F8P, AT9F8Q, AT9F8R, AT9F8S, AT9F8T, AT9F8U, AT9F8V, AT9F8W, AT9F8X, AT9F8Y, AT9G4V, AT9G4W, AT9G4X, AT9G4Y, AT9G5U, AT9G5V, AT9G5W, AT9G5X, AT9G5Y, AT9G6U, AT9G6V, AT9G6W, AT9H8A, AT9H8B, AT9H8C, AT9H8F, AT9H8G, AT9H8H, AT9H8I, AT9H8J, AT9H8K, AT9H8L, AT9H8M, AT9H8N, AT9H8O, AT9H8P, AT9H8Q, AT9H8R, AT9H8S, AT9H8T, AT9H8U, AT9H8V, AT9H8W, AT9H8X, AT9H8Y, AT9H9F, AT9H9G, AT9H9H, AT9H9K, AT9H9L, AT9H9M, AT9H9N, AT9H9O, AT9H9P, AT9H9Q, AT9H9R, AT9H9S, AT9H9T, AT9H9U, AT9H9V, AT9H9W, AT9H9X, AT9H9Y, AT9I1C, AT9I1D, AT9I1E, AT9I1F, AT9I1G, AT9I1H, AT9I1I, AT9I1J, AT9I1K, AT9I1L, AT9I1M, AT9I1N, AT9I1O, AT9I1P, AT9I1Q, AT9I1R, AT9I1S, AT9I1T, AT9I1U, AT9I1V, AT9I1W, AT9I1X, AT9I1Y, AU2A6Y, AU2A9E, AU2A9I, AU2A9J, AU2A9N, AU2A9O, AU2A9R, AU2A9S, AU2A9T, AU2A9W, AU2A9X, AU2A9Y, AU2B1J, AU2B1O, AU2B1S, AU2B1T, AU2B1W, AU2B1X, AU2B1Y, AU2B4C, AU2B4D, AU2B4E, AU2B4G, AU2B4H, AU2B4I, AU2B4J, AU2B4K, AU2B4L, AU2B4M, AU2B4N, AU2B4O, AU2B4P, AU2B4Q, AU2B4R, AU2B4S, AU2B4T, AU2B4U, AU2B4V, AU2B4W, AU2B4X, AU2B4Y, AU2E2Y, AU2E3B, AU2E3C, AU2E3D, AU2E3E, AU2E3G, AU2E3H, AU2E3I, AU2E3J, AU2E3K, AU2E3L,

Coordination Zone	Frequency range (MHz)	HCIS
		AU2E3M, AU2E3N, AU2E3O, AU2E3P, AU2E3Q, AU2E3R, AU2E3S, AU2E3T, AU2E3U, AU2E3V, AU2E3W, AU2E3X, AU2E3Y, AU2E5E, AU2E5J, AU2E5N, AU2E5O, AU2E5S, AU2E5T, AU2E5X, AU2E5Y, AU2E8C, AU2E8D, AU2E8E, AU2E8H, AU2E8I, AU2E8J, AU2E8M, AU2E8N, AU2E8O, AU2E8Q, AU2E8R, AU2E8S, AU2E8T, AU2E8V, AU2E8W, AU2E8X, AU2E8Y, AU2I2B, AU2I2C, AU2I2D, AU2I2E, AU2I2G, AU2I2H, AU2I2I, AU2I2J, AU2I2L, AU2I2M, AU2I2N, AU2I2O, AU2I2P, AU2I2Q, AU2I2R, AU2I2S, AU2I2T, AU2I2U, AU2I2V, AU2I2W, AU2I2X, AU2I2Y, AU2I7J, AU2I7O, AU2I7T, AU2I7Y, AU2M1E, AU2M1J, AU2M1O, AU2M1T, AU2M1Y, AU2M4E, AU2M4J, AU2M4O, AU9A1A, AU9A1B, AU9A1C, AU9A1D, AU9A1E, AU9A1G, AU9A1H, AU9A1I, AU9A1J, AU9A1O, AU9A2A, AU9A2B, AU9A2C, AU9A2D, AU9A2E, AU9A2F, AU9A2G, AU9A2H, AU9A2I, AU9A2J, AU9A2K, AU9A2L, AU9A2M, AU9A2N, AU9A2O, AU9A2R, AU9A2S, AU9A2T, AU9A3A, AU9A3B, AU9A3C, AU9A3D, AU9A3E, AU9A3F, AU9A3G, AU9A3H, AU9A3I, AU9A3J, AU9A3K, AU9A3L, AU9A3M, AU9A3N, AU9A3O, AU9A3P, AU9A3Q, AU9A3R, AU9A3S, AU9A3T, AU9A3V, AU9A3W, AU9A3X, AU9A3Y, AU9B4A, AU9B4B, AU9B4C, AU9B4D, AU9B4E, AU9B5A, AU9B5B, AU9B5C, AU9B5D, AU9B5E, AU9B5F, AU9B5G, AU9B5H, AU9B5I, AU9B5J, AU9B6A, AU9B6B, AU9B6C, AU9B6D, AU9B6E, AU9B6F, AU9B6G, AU9B6H, AU9B6I, AU9B6J, AU9C4A, AU9C4B, AU9C4C, AU9C4D, AU9C4E, AU9C4F, AU9C4G, AU9C4H, AU9C4I, AU9C4J, AU9C4K, AU9C4L, AU9C4M, AU9C4N, AU9C4O, AU9C5A, AU9C5B, AU9C5C, AU9C5D, AU9C5E, AU9C5F, AU9C5G, AU9C5H, AU9C5I, AU9C5J, AU9C5K, AU9C5L, AU9C5M, AU9C5N, AU9C5O, AU9C6A, AU9C6B, AU9C6C, AU9C6D, AU9C6E, AU9C6F, AU9C6G, AU9C6H, AU9C6I, AU9C6J, AU9C6K, AU9C6L, AU9C6M, AU9C6N, AU9D4A, AU9D4B, AU9D4C, AU9D4D, AU9D4E, AU9D4F, AU9D4G, AU9D4H, AU9D4I, AU9D4J, AU9D5A, AU9D5B, AU9D5C, AU9D5D, AU9D5E, AU9D5F, AU9D5G, AU9D5H, AU9D6A, AU9D6B, AU9D6C, AU9D6D, BT7E7K, BT7E7L, BT7E7P, BT7E7Q, BT7E7R, BT7E7S, BT7E7T, BT7E7U, BT7E7V, BT7E7W, BT7E7X, BT7E7Y, BT7E8P, BT7E8U, BT7E8V, BT7E8W, BT7E8X, BT7I3A, BT7I3B, BT7I3F, BT7I3G, BT7I3H, BT7I3I, BT7I3J, BT7I3K, BT7I3L, BT7I3M, BT7I3N, BT7I3O, BT7I3P, BT7I3Q, BT7I3R, BT7I3S, BT7I3T, BT7I3U, BT7I3V, BT7I3W, BT7I3X, BT7I3Y, BT7J1K, BT7J1L, BT7J1P, BT7J1Q, BT7J1R, BT7J1S, BT7J1T, BT7J1U, BT7J1V, BT7J1W, BT7J1X, BT7J1Y, BT7J2U, BT7J2V, BT7J5A, BT7J5B, BT7J5C, BT7J5D, BT7J5F, BT7J5G, BT7J5H, BT7J5I, BT7J5J, BT7J5K, BT7J5L, BT7J5M, BT7J5N, BT7J5O, BT7J5P, BT7J5Q, BT7J5R, BT7J5S, BT7J5T, BT7J5U, BT7J5V, BT7J5W, BT7J5X, BT7J5Y, BT7J6F, BT7J6K, BT7J6L, BT7J6P, BT7J6Q, BT7J6R, BT7J6S, BT7J6U, BT7J6V, BT7J6W, BT7J6X, BT7J6Y, BT7K4U, BT7K7A,

Coordination Zone	Frequency range (MHz)	HCIS
		BT7K7B, BT7K7F, BT7K7G, BT7K7H, BT7K7I, BT7K7K, BT7K7L, BT7K7M, BT7K7N, BT7K7O, BT7K7P, BT7K7Q, BT7K7R, BT7K7S, BT7K7T, BT7K7U, BT7K7V, BT7K7W, BT7K7X, BT7K7Y, BT7K8P, BT7K8U, BT7K8V, BT7K8W, BT7O2A, BT7O2B, BT7O2C, BT7O2D, BT7O2F, BT7O2G, BT7O2H, BT7O2I, BT7O2J, BT7O2K, BT7O2L, BT7O2M, BT7O2N, BT7O2O, BT7O2P, BT7O2Q, BT7O2R, BT7O2S, BT7O2T, BT7O2U, BT7O2V, BT7O2W, BT7O2X, BT7O2Y, BT7O3K, BT7O3P, BT7O3Q, BT7O3R, BT7O3U, BT7O3V, BT7O3W, BT7O3X, BT7P4F, BT7P4K, BT7P4L, BT7P4P, BT7P4Q, BT7P4R, BT7P4U, BT7P4V, BT7P4W, BT7P4X, BT7P8K, BT7P8P, BT7P8Q, BT7P8U, BT7P8V, BT7P8W, BU1D2A, BU1D2B, BU1D2C, BU1D2D, BU1D2F, BU1D2G, BU1D2H, BU1D2I, BU1D2K, BU1D2L, BU1D2M, BU1D2N, BU1D2O, BU1D2P, BU1D2Q, BU1D2R, BU1D2S, BU1D2T, BU1D2U, BU1D2V, BU1D2W, BU1D2X, BU1D2Y, BU1D3P, BU1D3U, BU1D3V, BU1D6A, BU1D6B, BU1D6F, BU1D6G, BU1D6H, BU1D6K, BU1D6L, BU1D6M, BU1D6N, BU1D6P, BU1D6Q, BU1D6R, BU1D6S, BU1D6U, BU1D6V, BU1D6W, BU1D6X, BU1D6Y, BU2A7F, BU2A7K, BU2A7P, BU2A7Q, BU2A7U, BU2A7V, BU2E1A, BU2E1B, BU2E1C, BU2E1F, BU2E1G, BU2E1H, BU2E1K, BU2E1L, BU2E1M, BU2E1N, BU2E1P, BU2E1Q, BU2E1R, BU2E1S, BU2E1U, BU2E1V, BU2E1W, BU2E1X, BU2E5K, BU2E5P, BU2E5U, BU2E8A, BU2E8B, BU2E8F, BU2E8G, BU2E8K, BU2E8L, BU2E8P, BU2E8Q, BU2E8U, BU2E8V, BU2E8W, BU2I2A, BU2I2B, BU2I2C, BU2I2F, BU2I2G, BU2I2H, BU2I2K, BU2I2L, BU2I2M, BU2I2P, BU2I2Q, BU2I2R, BU2I2U, BU2I2V, BU2I2W, BU2I2X, BU2I5A, BU2I5B, BU2I5C, BU2I5D, BU2I5F, BU2I5G, BU2I5H, BU2I5I, BU2I5K, BU2I5L, BU2I5M, BU2I5N, BU2I5P, BU2I5Q, BU2I5R, BU2I5S, BU2I5U, BU2I5V, BU2I5W, BU2I5X, BU2I8A, BU2I8B, BU2I8C, BU2I8D, BU2I8F, BU2I8G, BU2I8H, BU2I8I, BU2I8K, BU2I8L, BU2I8M, BU2I8N, BU2I8P, BU2I8Q, BU2I8R, BU2I8S, BU2I8T, BU2I8U, BU2I8V, BU2I8W, BU2I8X, BU2I8Y, BU2M5A, BU2M5B, BU2M5C, BU2M5D, BU2M5F, BU2M5G, BU2M5H, BU2M5I, BU2M5K, BU2M5L, BU2M5M, BU2M5N, BU2M5P, BU2M5Q, BU2M5R, BU2M5S, BU2M5U, BU2M5V, BU2M5W, BU2M5X, BU2M8A, BU2M8B, BU2M8C, BU2M8D, BU2M8F, BU2M8G, BU2M8H, BU2M8I, BU2M8K, BU2M8L, BU2M8M, BU2M8N, BU2M8P, BU2M8Q, BU2M8R, BU2M8S, BU2M8U, BU2M8V, BU2M8W, BU4H6A, BU4H6B, BU4H6C, BU4H6D, BU4H6E, BU4H6F, BU4H6G, BU4H6H, BU4H6I, BU4H6J, BU4H6K, BU4H6L, BU4H6M, BU4H6N, BU4H6O, BU4H6P, BU4H6Q, BU4H6R, BU4H6S, BU4H6T, BU4H6U, BU4H6V, BU4H6W, BU4H6X, BU4H9A, BU4H9B, BU4H9C, BU4H9F, BU4H9G, BU4H9H, BU4H9K, BU4H9L, BU4H9P, BU4H9Q, BU4H9U, BU4K9A, BU4K9B, BU4K9C, BU4K9D, BU4K9E, BU4K9F, BU4K9G, BU4K9H, BU4K9I, BU4K9J, BU4K9K, BU4K9L, BU4K9M, BU4K9N,

Coordination Zone	Frequency range (MHz)	HCIS
		BU4K9P, BU4K9Q, BU4K9R, BU4K9U, BU4K9V, BU4L2A, BU4L2B, BU4L2C, BU4L2D, BU4L2E, BU4L2F, BU4L2G, BU4L2H, BU4L2I, BU4L2K, BU4L2L, BU4L2M, BU4L2N, BU4L2P, BU4L2Q, BU4L2R, BU4L2U, BU4L2V, BU4L4A, BU4L4B, BU4L4C, BU4L4D, BU4L4E, BU4L4F, BU4L4G, BU4L4H, BU4L4I, BU4L4J, BU4L4K, BU4L4L, BU4L4M, BU4L4N, BU4L4P, BU4L4Q, BU4L4R, BU4L4U, BU4L4V, BU4L5A, BU4L7A, BU4N6A, BU4N6B, BU4N6C, BU4N6D, BU4N6E, BU4N6F, BU4N6G, BU4N6H, BU4N6I, BU4N6J, BU4N6K, BU4N6L, BU4N6M, BU4N6N, BU4N6O, BU4N6P, BU4N6Q, BU4N6R, BU4N6S, BU4N6T, BU4N6U, BU4N6V, BU4N6W, BU4N7A, BU4N7B, BU4N7C, BU4N7D, BU4N7E, BU4N7F, BU4N7G, BU4N7H, BU4N7I, BU4N7J, BU4N7K, BU4N7L, BU4N7M, BU4N7N, BU4N7O, BU4N7P, BU4N7Q, BU4N7R, BU4N7S, BU4N7T, BU4N7U, BU4N7V, BU4N7W, BU4N8A, BU4N8B, BU4N8C, BU4N8D, BU4N8E, BU4N8F, BU4N8G, BU4N8H, BU4N8I, BU4N8K, BU4N8L, BU4N9A, BU4O2A, BU4O2B, BU4O2C, BU4O2D, BU4O2E, BU4O2F, BU4O2G, BU4O2H, BU4O2I, BU4O2J, BU4O2K, BU4O2L, BU4O2M, BU4O2P, BU4O2Q, BU4O2U, BU4O3A, BU4O4A, BU4O4B, BU4O4C, BU4O4D, BU4O4F, BU4O4G, BU4O4H, BU4O4K, BU5A2A, BU5A2B, BU5A2C, BU5A2F, BU5A2G, BU5A2H, BU5A2K, BU5A2L, BU5A2M, BU5A2P, BU5A2Q, BU5A2R, BU5A2U, BU5A2V, BU5A5A, BU5A5B, BU5A5F, BU5A5G, BU5A5K, BU5A5L, BU5A5P, BU5A5U, BU5A7A, BU5A7B, BU5A7C, BU5A7D, BU5A7E, BU5A7F, BU5A7G, BU5A7H, BU5A7I, BU5A7J, BU5A7K, BU5A7L, BU5A7M, BU5A7N, BU5A7O, BU5A7P, BU5A7Q, BU5A7R, BU5A7S, BU5A7U, BU5A7V, BU5A7W, BU5A7X, BU5A8A, BU5E1A, BU5E1B, BU5E1C, BU5E1D, BU5E1F, BU5E1G, BU5E1H, BU5E1K, BU5E1L, BU5E1M, BU5E1P, BU5E1Q, BU5E1U, BU5E1V, BU5E4A, BU5E4F, BU7A1A, BU7A1B, BU7A1C, BU7A1D, BU7A1E, BU7A1F, BU7A1G, BU7A1H, BU7A1I, BU7A1J, BU7A1K, BU7A1L, BU7A1M, BU7A1N, BU7A1O, BU7A1P, BU7A1Q, BU7A1R, BU7A1S, BU7A1T, BU7A1U, BU7A1V, BU7A1W, BU7A2A, BU7A2B, BU7A2C, BU7A2D, BU7A2E, BU7A2F, BU7A2G, BU7A2H, BU7A2I, BU7A2J, BU7A2K, BU7A2L, BU7A2M, BU7A2N, BU7A2O, BU7A2P, BU7A2Q, BU7A3A, BU7A3B, BU7A3C, BU7A3D, BU7A3E, BU7A3F, BU7A3G, BU7A3H, BU7B1A.
Exmouth (WA)	3400 – 3500	AR8, AR9, AS3, AS2A, AS2B, AS2C, AS2D, AS2G, AS2H, AS2K, AS2L, AS6B, AS6C, AS6D, BR4A, BR4B, BR4C, BR4E, BR4F, BR4G, BR4I, BR4J, BR4K, BR4L, BR4M, BR4N, BR4O, BR4P, BR5F, BR5I, BR5J, BR5M, BR7A, BR7B, BR7C, BR7D, BR7E, BR7F, BR7G, BR7H, BR7I, BR7J, BR7K, BR7L, BR7M, BR7N, BR7O, BR8A, BR8E, BR8I, BS1A, BS1B, BS1E, BS1F, BS1I, BS1J, BS1M, AS2E1, AS2E2, AS2E3, AS2E5, AS2E6, AS2F1, AS2F2, AS2F3, AS2F4, AS2F5, AS2F6, AS2F8, AS2F9, AS2J2, AS2J3, AS2N3, AS2O1, AS2O2, AS2P1, AS2P2, AS2P3,

Coordination Zone	Frequency range (MHz)	HCIS
		AS2P5, AS2P6, AS2P8, AS2P9, AS5D3, AS5D6, AS6A1, AS6A2, AS6A3, AS6A4, AS6A5, AS6A6, AS6A7, AS6A9, AS6F1, AS6F2, AS6F3, AS6F6, AS6G1, AS6G2, AS6G3, AS6G4, AS6G5, AS6G6, AS6H1, AS6H2, AS6H3, BR4D1, BR4D3, BR4D4, BR4D5, BR4D6, BR4D7, BR4D8, BR4D9, BR4H1, BR4H2, BR4H4, BR4H5, BR4H6, BR4H7, BR4H8, BR4H9, BR5A1, BR5A2, BR5A4, BR5B5, BR5B6, BR5B7, BR5B8, BR5B9, BR5C1, BR5C4, BR5E2, BR5E3, BR5E4, BR5E5, BR5E6, BR5E7, BR5E8, BR5E9, BR5G1, BR5G2, BR5G4, BR5K1, BR5K4, BR5N1, BR7P1, BR7P2, BR7P3, BR7P4, BR7P5, BR7P6, BR7P7, BR7P8, BR8B4, BR8B5, BR8B7, BR8B8, BR8J7, BS1C1, BS1C2, BS1C3, BS1C4, BS1C5, BS1C6, BS1C7, BS1C8, BS1D1, BS1D2, BS1D4, BS1D8, BS1G1, BS1G2, BS1G4, BS1G5, BS1G7, BS1G8, BS1H2, BS1K1, BS1K2, BS1K4, BS1K7, BS1N1, BS1N2, BS1N3, BS1N4, BS1N5, BS1N6, BS1N7, BS1N8, BS1O1, BS4A1, BS4A2, BS4A3, BS4A4, BS4A5, BS4A6, BS4A7, BS4A8, BS4B1, BS4B2
Exmouth (WA)	3500 – 4000	AR9E, AR9I, AR9J, AR9M, AR9N, AR8H3, AR8H6, AR8H8, AR8H9, AR8L2, AR8L3, AR8L6, AR8L9, AR8P3, AR8P6, AR9A5, AR9A6, AR9A7, AR9A8, AR9A9, AR9F1, AR9F4, AR9F5, AR9F7, AR9F8, AR9K7, AR9O1, AR9O4, AR9O7, AS2D3, AS2D6, AS3A1, AS3A2, AS3A3, AS3A4, AS3A5, AS3A6, AS3A8, AS3A9, AS3B1, AS3B2, AS3B3, AS3B4, AS3B5, AS3B6, AS3B7, AS3B8, AS3C1, AS3E3

# Appendix C: Coverage and interference calculations

## C.1 Coverage area

Unless specifically provided by the AWL licensee, the coverage area of a registered AWL transmitter is the area around the registered transmitter that a notional customer premises equipment (CPE) (see below) can receive a signal of  $-103$  dBm/MHz<sup>10</sup> or greater when measured at the input to the receiver.

For the purpose of determining coverage area:

- > the propagation model defined in [Recommendation ITU-R P.452](#), with the parameter  $p = 50\%$ <sup>11</sup>, should be used to calculate propagation loss.
- > Transmit power =  $\min(\text{PSD}_{\text{BS}}, \text{PSD}_{\text{CPE}})$ , where:
  - >  $\text{PSD}_{\text{BS}}$  is the power spectral density of the proposed base station
  - >  $\text{PSD}_{\text{CPE}}$  is the power spectral density of the notional CPE, set to 28 dBm per occupied bandwidth
- > the notional CPE parameters below should be assumed for CPE communicating with the base station:
  - > Maximum antenna gain of 18 dBi.
  - > Antenna height of 5 metres.
  - > Maximum cell radius of 15 km. For AWL licences the coverage area cannot extend beyond the area occupied by the licence.

## C.2 Interference area

The interference area of a fixed receiver (including for point-to-point) is defined as those locations (or the area) where a registration exempt transmitter, when deployed, would exceed the protection criteria defined for the fixed receiver.

For the purpose of determining interference area:

- > the propagation model defined in [Recommendation ITU-R P.452](#), with the parameter  $p = 20\%$ , should be used to calculate propagation loss.
- > the notional CPE parameters detailed in section C.1 should be used to model the interferer, with the following clarifications:
  - > a maximum transmitter power of 28 dBm per occupied bandwidth should also be assumed, where occupied bandwidth is the minimum of receiver licensed bandwidth or 20 MHz.

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<sup>10</sup> The level  $-103$  dBm/MHz is the reference sensitivity for which throughput meets or exceeds the minimum requirements for CPE operating in the 3400–3600 MHz band as specified in the 3GPP document TS 36.101.

<sup>11</sup> The parameter  $p$  is the required time percentage for which the calculated basic transmission loss is not exceeded.

- > the CPE antenna is assumed to be pointed towards the proposed base station and meets the radiation pattern envelope in ETSI EN 302 085 V1.2.3 (Pattern TS 2, Range 1).

# Appendix D: Incumbent Apparatus Licenced Point to Multipoint (PMP) Services

The incumbent PMP services will continue to operate in the frequency band 3400-3700 MHz, noting that no new PMP licences are to be issued in any area where AWLs are available. Given that AWL receivers are not afforded protection from existing PMP services, the legacy PMP operating arrangements set out in this appendix are intended to aid AWL licensees in determining the likely interference to their receivers.

The arrangements for incumbent point to multipoint systems in the 3400–3700 MHz frequency range are intended for both single frequency deployments using time division duplex (TDD) and paired channels using frequency division duplex (FDD).

Licensed point to multipoint base station receivers shall be protected and the frequency coordination procedures for protection of TDD and legacy FDD PMP services is defined in Section 4.5.1 and 4.5.2 respectively.

## D.1 TDD PMP emission limits

Incumbent PMP services operate in the 3400 -3700 MHz band are subject to band specific conditions detailed below. Some of these conditions include EIRP density limits, constraints, and relevant technical standards that need to be adhered to. These arrangements were previously detailed in RALI FX19.

**Table A.1 Band Specific Requirements**

Devices with AAS	<ul style="list-style-type: none"><li>• Coordination is to be conducted based on the highest achievable gain of a system</li></ul>
Emission Masks	<ul style="list-style-type: none"><li>• All transmitters are to adhere to relevant emission masks stated in ETSI EN 302 326.</li><li>• The additional limits detailed in A.1.1 and A.1.2 also apply where relevant.</li></ul>

### A.1.1 Out-of-band Emission Limits

PMP transmitters (both base and remote stations) in the 3575-3700 MHz band shall comply with the applicable out-of-band spectrum density masks as detailed in ETSI EN 302 326-2. PMP licensees are required to take reasonable steps to ensure that any device operating on their networks comply with this standard.

In addition, band edge masks are specified at both the 3575 MHz and 3700 MHz frequency boundaries. It is a requirement that all PMP base stations adhere to the band edge masks specified here and ensure that emissions leaving the band adhere to the required levels.

The equivalent isotropic radiated power (EIRP) of PMP base stations shall not exceed the following levels below the 3575 MHz band edge:

- (a) +20 dBm *eirp* per 30 kHz within the range 3574.75 MHz to 3575 MHz;
- (b) -5 dBm *eirp* per 30 kHz within the range 3574 MHz to 3574.75 MHz;
- (c) -30 dBm *eirp* per 30 kHz within the range 3573 MHz to 3574 MHz; and

(d) -40 dBm *eirp* per 30 kHz lower than 3573 MHz.

The equivalent isotropic radiated power (EIRP) of BWA base stations shall not exceed the following levels at and above the 3700 MHz band edge:

- (e) -5 dBm in the 30 kHz bandwidth within the frequency range 3700-3700.03 MHz;
- (f) -15 dBm measured in any 30 kHz bandwidth in the frequency range 3700.2-3700.7 MHz; and
- (g) -40 dBm measured in any 30 kHz bandwidth at any point above the frequency 3701.6 MHz.

For frequencies between the ranges defined by (e) and (f), or (f) and (g) the EIRP shall not exceed the level defined by a straight line joining the levels specified in (e), (f) and (g).

## A.2 FDD PMP emission limits

Transmitters operated under a FDD point to multipoint licence are subject to the in-band emission limit defined as in Table A.2. FDD Transmitter emission limits are symmetrical about the assigned frequency.

**Table A.2: FDD PMP Transmitter emission limits**

Frequency offset ( $f_{\text{offset}}$ )	EIRP (dBm)	Specified Bandwidth
Co-channel	+35	30 kHz
$0 \text{ kHz} \leq f_{\text{offset}} < 100 \text{ kHz}$	$+35 - (1/4) \times f_{\text{offset}} \text{ (kHz)}$	30 kHz
$100 \text{ kHz} \leq f_{\text{offset}} < 350 \text{ kHz}$	+10	30 kHz
$350 \text{ kHz} \leq f_{\text{offset}} < 600 \text{ kHz}$	$+45 - (1/10) \times f_{\text{offset}} \text{ (kHz)}$	30 kHz
$600 \text{ kHz} \leq f_{\text{offset}} < 1.1 \text{ MHz}$	-15	30 kHz
$1.1 \text{ MHz} \leq f_{\text{offset}} < 2 \text{ MHz}$	$+16 - (1/36) \times f_{\text{offset}} \text{ (kHz)}$	30 kHz
$f_{\text{offset}} \geq 2 \text{ MHz}$	-40	30 kHz

# Appendix E: Notification requirements

When notifying licensees, the following information (as a minimum) must be provided:

- > The reason the licensee is being notified, for example:
  - In accordance with section [section number] of RALI MS47, [the licensee] is being notified of a proposed new area-wide licensed service that will be operated within [X] MHz of [one/a number] of your existing licensed point to multipoint services.
- > Information identifying the affected licensed service or services (e.g., licence number, site ID)
- > Details of the proposed area-wide licensed service required for the coordination of services (e.g., location, transmitter characteristics, receiver characteristics etc); and,
- > Contact details of an appropriate person for further discussion of the issue.

# Appendix F: Earth station coordination with existing AWLs or SLs

As described under 4.7.1, new apparatus licensed earth receive stations will only be permitted where there is limited impact on the ability to register future devices under any existing AWLs or SLs in the 3400 – 4000 MHz range. This includes whether the AWLs are on the same frequency or on any frequency that has the potential to cause interference. To ensure this is likely, the earth receive station must perform coordination checks against all existing AWLs and SLs using the following method.

1. Path loss (PL) between the proposed earth station receiver to a notional AWL or SL transmitter is calculated using the same procedure detailed for the device boundary criteria (DBC) in the *Radiocommunications (Unacceptable Levels of Interference - 3.4 GHz Band) Determination 2015* or any instrument made under s.145 of the *Radiocommunications Act 1992* to replace it. In this case, the following changes are made to the DBC PL calculation:
  - a. the proposed earth station receiver replaces the proposed transmitter,
  - b. the notional AWL or SL transmitter replaces the notional receiver and has a height of 30m.
  - c. the propagation model detailed in Recommendation ITU-R P.452 with  $p = 20\%$  should be used.
2. The proposed earth station receiver should be modelled using the parameters intended for inclusion on the licence with the following additions:
  - a. If the earth station antenna pattern is not known, then the antenna gain with a particular azimuth and elevation, should be modelled using Recommendation ITU-R S.465.
  - b. The earth station should be assumed to have earth station filter as detailed in section 4.7.1.
3. A device boundary (DB) for the proposed earth station receiver needs to be calculated using a modified procedure for DBC in the *Radiocommunications (Unacceptable Levels of Interference - 3.4 GHz Band) Determination 2015* or any instrument made under s.145 of the *Radiocommunications Act 1992* to replace it. For the following scenarios:

Co-channel emissions from AWLs/SLs into the earth station:

  - a. Calculate DB to check all existing AWL/SL licence areas within 200 km of the proposed earth station receiver assuming:
    - i. Modifications detailed in (1) and (2) above.
    - ii. a notional AWL/SL transmitter with an EIRP density of 61dBm/10 MHz<sup>12</sup> across the entire AWL licensed bandwidth in all directions.
    - iii. Level of protection equal to -128.6 dBm/MHz, which assumes a receiver noise temperature of 100K which is not to be exceeded for more than 20% of the time (as per TX RAG)

Unwanted emissions from AWLs/SLs into the earth station:

  - b. Calculate DB to check with existing AWL/SL licence areas within 100 km of the proposed earth station receiver assuming:

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<sup>12</sup> Based on ITU-R M.2292 rural macro < 3GHz or macro suburban 3-6 GHz, no activity or loading factors or downtilt

- i. Modifications detailed in (1) and (2) above.
- ii. a notional AWL or SL transmitter using an Active Antenna System (AAS) with unwanted emissions as detailed in section 9 of schedule 4 of the AWL LCD and an antenna gain of 23.7 dBi in all directions.
- iii. Level of protection equal to -128.6 dBm/MHz, which assumes a receiver noise temperature of 100K which is not to be exceeded for more than 20% of the time (as per TX RAG)

Overload from AWL/SL emissions to the earth station:

- c. Calculate DB to check all existing AWL/SL licence areas within 100 km of the proposed earth station receiver assuming:
  - i. Modifications detailed in (1) and (2) above.
  - ii. a notional AWL/SL transmitter with an EIRP density of 61dBm/10 MHz<sup>13</sup> across the entire AWL/SL licensed bandwidth in all directions.
  - iii. Level of protection equal to -65 dBm (as per TX RAG).
- 4. If all parts of the DBs calculated in (3) above fall outside all existing AWL/SL licence areas, the earth station is deemed to pass these criteria.
- 5. If the DBs of the proposed earth station receiver fails the DB criteria, but the applicant can demonstrate additional mitigations, such as site shielding, will enable it to pass these criteria, the applicant can apply for an exemption from RALI MS47 on that basis.
- 6. If the DBs of the proposed earth station receiver fails the DB criteria, but the applicant can come to an agreement with all of the relevant AWL/SL licensee/s, the applicant can apply for an exemption from RALI MS47 on that basis.

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<sup>13</sup> Based on ITU-R M.2292 rural macro < 3GHz or macro suburban 3-6 GHz, no activity or loading factors or downtilt

# Appendix G: List of Identified Runways

This section described the identified runways in remote areas. These have been provided by CASA and may be updated from time to time.

<b>CASA Identifier</b>	<b>Location</b>	<b>Runway</b>	<b>Approach(s)</b>
YBAS	Alice Springs	12	RNP M, P & U (AR)
YBAS	Alice Springs	30	RNP M, P & U (AR)
YBRM	Broome	10	RNP U RWY 10 (AR) (0.3)
YBRM	Broome	28	RNP U RWY 28 (AR) (0.3 and 0.1)
YPDN	Darwin	11	RNP Y & X RWY 11 (AR) (0.3 and 0.15)
YPDN	Darwin	29	RNP Y & X RWY 29 (AR) (0.3 and 0.15)
YBMA	Mount Isa	16	RNP U RWY 16 (AR) (0.3 and 0.2)
YBMA	Mount Isa	34	RNP U RWY 34 (AR) (0.3, 0.2 and 0.15)