



# **Radiocommunications Advisory Guidelines (Managing Interference from Spectrum Licensed Transmitters — 3.4 GHz Band) 2015**

*Radiocommunications Act 1992*

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made under section 262 of the  
*Radiocommunications Act 1992.*

## **Compilation No. 1**

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**Includes amendments up to:** F2018L01063

Prepared by the Australian Communications and Media Authority, Melbourne.

# Part 1 Introduction

## 1.1 Name of Advisory Guidelines

These guidelines are the *Radiocommunications Advisory Guidelines (Managing Interference from Spectrum Licensed Transmitters — 3.4 GHz Band) 2015*.

## 1.4 Purpose of these guidelines

- (1) The purpose of these guidelines is to manage interference to apparatus licensed or class licensed radiocommunications receivers operating in and adjacent to the 3.4 GHz band.
- (2) These guidelines also provide guidance on managing interference across the geographical boundaries of spectrum licences issued in the 3.4 GHz band.
- (3) The ACMA takes these guidelines into account in determining whether a spectrum licensed radiocommunications transmitter is causing interference to an apparatus licensed or class licensed radiocommunications receiver operating in any of the circumstances set out in these guidelines.
- (4) These guidelines do not prevent a licensee negotiating other protection requirements with another licensee.

## 1.5 Interpretation

- (1) In these guidelines, unless the contrary intention appears:

**3.4 GHz band** means the following frequency bands:

- (a) 3425 MHz to 3492.5 MHz; and
- (b) 3542.5 MHz to 3700 MHz.

**Act** means the *Radiocommunications Act 1992*.

**harmful interference** has the same meaning as in the Spectrum Plan.

**in-band** means:

- (a) for a radiocommunications transmitter or radiocommunications receiver operated under a spectrum licence, the frequencies within the frequency band in which operation of those radiocommunications devices is authorised under the licence; and
- (b) for a radiocommunications transmitter or radiocommunications receiver operating under an apparatus licence, the frequencies within the lower frequency limit and the upper frequency limit specified in the licence.

**ITU** means the International Telecommunication Union.

**ITU-R** means the International Telecommunication Union Radiocommunication Sector.

**ITU-R Recommendation** means a Recommendation made by the ITU-R as in force from time to time.

*Note* ITU-R Recommendations are available on the ITU website at <http://www.itu.int>.

**out-of-band** means:

- (a) for a radiocommunications transmitter or radiocommunications receiver operated under a spectrum licence, the frequencies outside the frequency band in which

operation of those radiocommunications devices is authorised under the licence;  
and

- (b) for a radiocommunications transmitter or radiocommunications receiver operating under an apparatus licence, the frequencies outside the lower frequency limit and upper frequency limit specified in the licence.

**RALI FX 3** means the Radiocommunications Assignment and Licensing Instruction No. FX 3, *Microwave Fixed Services Frequency Coordination*, published by the ACMA, as existing from time to time.

*Note* RALI FX 3 is available on the ACMA website at <http://www.acma.gov.au>.

**RALI FX 14** means the Radiocommunications Assignment and Licensing Instruction No. FX 14, *Point to Multipoint Fixed Services in Specified Parts of the 3.4 – 3.59 GHz Band*, published by the ACMA, as existing from time to time.

*Note* RALI FX 14 is available on the ACMA website at <http://www.acma.gov.au>.

**RALI FX 19** means the Radiocommunications Assignment and Licensing Instruction No. FX 19, *Frequency Coordination and Licensing Procedures for Apparatus Licensed Broadband Wireless Access Services in the 1900-1920 and the 3575-3700 MHz Bands*, published by the ACMA, as existing from time to time.

*Note* RALI FX 19 is available on the ACMA website at <http://www.acma.gov.au>.

**RALI MS 39** means the Radiocommunications Assignment and Licensing Instruction No. MS 39, *Frequency Coordination and Licensing Procedures for Apparatus Licensed Public Telecommunications Services in the 3400-3425 MHz & 3492.5-3542.5 MHz Bands*, published by the ACMA, as existing from time to time.

*Note* RALI MS 39 is available on the ACMA website at [www.acma.gov.au](http://www.acma.gov.au).

**RALI MS 44** means the Radiocommunications Assignment and Licensing Instruction MS 44, *Frequency coordination procedures for the Earth station protection zones*, published by the ACMA, as in existence from time to time.

*Note:* RALI MS44 is available on the ACMA website at [www.acma.gov.au](http://www.acma.gov.au).

**Spectrum Plan** means the *Australian Radiofrequency Spectrum Plan 2013* prepared under subsection 30(1) of the Act, as in force from time to time.

**subsection 145(4) Determination** means the *Radiocommunications (Unacceptable Levels of Interference – 3.4 GHz Band) Determination 2015*.

*Note* A number of terms used in these guidelines are defined in the Act and, unless the contrary intention appears, have the meaning given to them by the Act. These include:

- ACMA
- apparatus licence
- class licence
- core condition
- frequency band
- interference
- radiocommunications receiver
- radiocommunications transmitter
- Register
- spectrum licence.

- (2) Unless the contrary intention appears, terms used in these guidelines that are defined in the subsection 145(4) Determination have the same meaning as in that determination.

*Note* The following terms that are used in these guidelines are defined in the subsection 145(4) Determination:

- fixed transmitter
- Radio Regulations.

- (3) Unless the contrary intention appears, terms used in these guidelines that are defined in the *Radiocommunications (Interpretation) Determination 2015* have the same meaning as in that determination.

## Part 2 Background

- 2.1** The 3.4 GHz band has been designated for spectrum licensing Australia-wide. Radiocommunications receivers of apparatus licensed and class licensed services may operate in and adjacent to this frequency band. These receivers may suffer interference from unwanted emissions and blocking caused by a radiocommunications transmitter operating under a spectrum licence in the 3.4 GHz band.
- 2.2** Unwanted emissions are by-products of a radiocommunications transmitter's emissions and include broadband noise, harmonics, intermodulation products, transient signals and other spurious signals. Blocking occurs when a high level off-tune signal overloads a radiocommunications receiver's front-end and causes a degradation in the quality of the wanted output signal. Intermodulation products can be generated in-band in the input stages of receivers in the presence of two or more high level signals at the receiver input.
- 2.3** These guidelines have been made for the management of these types of interference to licensed radiocommunications receivers operating in the following circumstances:
- Point-to-point fixed services operating in and adjacent to the 3.4 GHz band (Part 3 of these guidelines);
  - Fixed satellite service (FSS) Earth receive stations operating in the 3400-4200 MHz band (Part 4 of these guidelines);
  - Broadband wireless access (BWA) services operating in the 3400-3700 MHz band (Part 5 of these guidelines);
  - Radiolocation services operating in the 3300-3400 MHz and 3400-3600 MHz bands (Part 6 of these guidelines);
  - Class licensed services (Part 7 of these guidelines);
  - Earth station protection zones (Part 9 of these guidelines);
  - Earth station facility near Uralla, NSW (Part 10 of these guidelines).
- 2.4** These guidelines also provide advice regarding managing interference across the geographical boundaries of 3.4 GHz spectrum licences (Part 8 of these guidelines).
- 2.5** As radio waves propagate in different ways because of factors such as frequency, terrain, atmospheric conditions and topography, there are a number of ways to predict path loss. ITU-R Recommendation P.1144 "*Guide to the application of the propagation methods of Radiocommunications Study Group 3*" provides a guide on the application of various propagation methods developed internationally by the ITU-R. It advises users on the most appropriate methods for particular applications as well as the limits, required input information, and output for each of these methods. It is recommended that the most recent version of propagation models defined by the ITU-R should be considered when modelling propagation in the 3.4 GHz band.

*Note* The use of other published propagation models applicable to the 3.4 GHz band may also be suitable.

## **Part 3 Point-to-point fixed service receivers**

### **3.1 Background**

- (1) Point-to-point fixed service receivers operating on frequencies in and adjacent to the 3.4 GHz band are licensed in accordance with the frequency assignment criteria detailed in RALI FX 3. RALI FX 3 provides details about channel plans for individual microwave bands and guidance on interference criteria and frequency coordination between microwave links to achieve certain performance objectives. It provides assignment criteria for each frequency band and specifies protection ratios.
- (2) RALI FX 3 is subject to continuing review in consultation with industry, to incorporate improved assignment techniques and changing technology requirements. Particular account is taken of changes in ITU-R Recommendations and standards made by other bodies. As revisions seek to improve spectrum access opportunities, without undue detriment to current licensees, users of RALI FX 3 are urged to consult the current version when planning systems, to increase spectrum productivity.

### **3.2 Protection requirements**

- (1) The protection requirements for point-to-point fixed service receivers are specified in RALI FX 3 and apply to radiocommunications transmitters operated under a spectrum licence that were registered in the Register after the date of issue of the apparatus licence under which the receiver operates.
- (2) In planning for the operation of radiocommunications transmitters under a spectrum licence in the 3.4 GHz band, spectrum licensees are to provide a level of out-of-band and in-band protection from those transmitters as would be provided from apparatus licensed fixed service transmitters whose frequencies are assigned in accordance with RALI FX 3.

## Part 4 Fixed satellite service Earth receive stations

### 4.1 Background

Fixed satellite service (FSS) Earth receive stations operate across the 3400-4200 MHz band. The Spectrum Plan allocates the 3400-3600 MHz and 3600-4200 MHz bands to the FSS on a secondary and primary basis respectively.

### 4.2 Protection requirements – FSS Earth receive stations operating in the 3400-3600 MHz band

- (1) As indicated in section 12 of Part 1 to the Spectrum Plan, a secondary service:
  - must not cause interference to a primary service, irrespective of who was operating first-in-time;
  - cannot claim protection from harmful interference caused by a primary service.
- (2) Radiocommunications transmitters operated under a spectrum licence in the 3.4 GHz band in accordance with the conditions of the licence, are not taken to cause unacceptable interference to FSS Earth receive stations operating in the 3400-3600 MHz band.
- (3) In planning for the operation of fixed transmitters under a spectrum licence in the 3.4 GHz band, before registering devices, spectrum licensees must notify the licensee of an FSS Earth receive station if frequency coordination indicates that interference may occur. This gives notice to the affected FSS licensee to implement mitigation measures, implement alternative arrangements for the delivery of their service or negotiate with the relevant spectrum licensee for the continued operation of their service.

*Note* Where practical, spectrum licensees are encouraged to work with incumbent FSS Earth receive licensees to resolve any interference issues.

### 4.3 Protection requirements – Earth receive stations operating in the 3600-4200 MHz band for fixed-satellite services

- (1) Radiocommunications transmitters operated under a spectrum licence in the 3.4 GHz band must protect earth receive stations for fixed-satellite services from co-channel emissions, unwanted emissions and receiver overload, if the radiocommunications receiver for the earth receive station:

- (a) is licensed under the Act;
  - (b) was registered in the Register prior to the date on which the radiocommunications transmitter operated under the spectrum licence is registered;
  - (c) is located within:
    - (i) 100 km of and not operating co-channel to a radiocommunications transmitter operated under a spectrum licence in the 3.4 GHz band; or
    - (ii) 200 km of and operating co-channel to a radiocommunications transmitter operated under a spectrum licence in the 3600-3700 MHz frequency band; and
  - (d) is operating in the 3600 to 4200 MHz band.
- (2) Earth receive stations for fixed-satellite services are to be protected from co-channel emissions to a maximum interference level of -128.6 dBm/MHz not to be exceeded for more than 20% of the time.

*Note* Refer to Recommendation ITU-R SF.1006 for further guidance on the procedure to use for the protection of earth receive stations for fixed-satellite services.

- (3) Earth receive stations are to be protected from unwanted emissions (out-of-band and spurious) to a level of -128.6 dBm/MHz, assuming a receiver noise temperature of 100K which is not to be exceeded for more than 20% of the time.

*Note* When assessing interference from unwanted emissions, the highest level of out-of-band or spurious emissions that fall within the licensed bandwidth of the FSS Earth station receiver should be considered in calculations.

- (4) A radiocommunications transmitter operated under a spectrum licence in the 3.4 GHz band is not considered to overload the receiver of an FSS Earth station if the total power received from the interfering service at the input of an FSS Earth station receiver (i.e. after considering Antenna gain, radiofrequency (RF) filtering and other losses) does not exceed -65 dBm. The minimum RF filtering level described in Table 1, at the front end of the Earth receive station for different frequency offsets, should be assumed.

Frequency offset from lower edge of Earth station receiver (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

**Table 1: Minimum frequency response of earth receive station's RF filter**

*Note* When there are multiple earth receive licences operating on the same antenna, the RF filter characteristics described in Table 1 should only be applied from the lower edge of the lowest frequency licence.

- (5) When assessing interference caused by unwanted emissions or receiver overload:



- Propagation loss between a radiocommunications transmitter and an earth receive station for a fixed-satellite service should be calculated using Recommendation ITU-R P.452 with  $p = 20\%$ .

*Note:* The parameter  $p$  is defined in Recommendation ITU-R P.452 as the required time percentage for which the calculated basic transmission is not exceeded.

- In the event actual antenna radiation patterns are not available for an earth receive station in a fixed-satellite service, the antenna radiation pattern defined in ITU-R Recommendation S.465 can be assumed.
- The first time a spectrum licensee performs adjacent channel coordination with an apparatus licensed earth receive station operating in the 3600 to 4200 MHz band, and before the spectrum licensee registers their device, the spectrum licensee must notify the affected earth receive station licensee. This is to ensure the FSS licensee has installed an RF filter with the relevant characteristics from Table 1 to the front end of their earth station receiver.

#### **4.4 Additional protection requirements for incumbent Earth receive stations operating in the 3600-3700 MHz band**

- (1) An incumbent earth receive station is one that operates in the 3600–3700 MHz band and falls within one of the frequencies and areas contained in the following re-allocation declarations:
  - (a) *Radiocommunications (Spectrum Re-allocation—3.6 GHz Band for Adelaide and Eastern Metropolitan Australia) Declaration 2018*;
  - (b) *Radiocommunications (Spectrum Re-allocation—3.6 GHz Band for Perth) Declaration 2018*; and
  - (c) *Radiocommunications (Spectrum Re-allocation—3.6 GHz Band for Regional Australia) Declaration 2018*.
- (2) Incumbent earth receive stations are to be provided with the protection defined in section 4.2 and section 4.3 of these guidelines.
- (3) Incumbent earth receive stations within 300 km of a transmitter operated under a 3.4 GHz spectrum licence are also to be protected from co-channel emissions to a maximum interference level of -119.9 dBm/MHz not to be exceeded for more than 0.005% of the time.

*Note 1:* Details of earth receive stations and site ID's are contained on the Register of Radiocommunications Licensees, accessible at [www.acma.gov.au](http://www.acma.gov.au).

*Note 2:* Refer to Recommendation ITU-R SF.1006 for further guidance on the procedure to use for the protection of FSS Earth receive stations.

## **Part 5 Broadband wireless access (BWA) service**

### **5.1 Background**

Broadband wireless access (BWA) services are authorised to operate in the 3400-3700 MHz band under apparatus licence arrangements. Frequency assignment arrangements for BWA are defined in RALI FX14, RALI FX19 and RALI MS39.

### **5.2 Protection requirements**

- (1) Radiocommunications transmitters operated under a spectrum licence in the 3.4 GHz band must comply with the requirements specified in RALI FX14, RALI FX19 and RALI MS39 relating to the levels of interference protection to be afforded to point-to-multipoint receivers and PMTS class B receivers, if the receiver:
  - (a) is licensed under the Act; and
  - (b) was registered in the Register prior to the date on which the device operated under the spectrum licence is registered.
- (2) The licensee who is second-in-time is responsible for bearing the costs of any changes required to facilitate coexistence.

## **Part 6 Radiolocation service**

### **6.1 Background**

The Spectrum Plan provides a primary allocation to the radiolocation service in the 3100-3400 MHz and 3400-3600 MHz bands.

### **6.2 Protection requirements**

Radiocommunications transmitters operated under a spectrum licence in the 3.4 GHz 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.

## Part 7 Class licensed services

### 7.1 Background

- (1) The *Radiocommunications (Overseas Amateurs Visiting Australia) Class Licence 2008* and *Radiocommunications (Low Interference Potential Devices) Class Licence 2000* class licences permit the operation of a number of different types of radiocommunications transmitters in the 3400-3700 MHz band.
- (2) The operation of radiocommunications transmitters under these class licences is on a no-interference and no-protection basis.

### 7.2 Protection requirements

Radiocommunications transmitters operated under a spectrum licence in the 3.4 GHz band in accordance with the conditions of the licence are not taken to cause unacceptable interference to services operating under a class licence.

## Part 8 Adjacent area spectrum licensed receivers

### 8.1 Background

The device boundary criterion, as defined in the subsection 145(4) Determination, is the primary mechanism for managing interference across geographical boundaries. However, at times it may be necessary for licensees operating radiocommunications transmitters in the 3.4 GHz band to negotiate with other spectrum licensees when deploying services in order to avoid harmful interference.

### 8.2 Recommended preliminary coordination procedures

- (1) Spectrum licensees planning to deploy radiocommunications transmitters in the 3.4 GHz band should have regard to radiocommunications receivers registered in the Register operating under other 3.4 GHz band spectrum licences.
- (2) In planning for the operation of fixed transmitters under a spectrum licence in the 3.4 GHz band, spectrum licensees should coordinate with any radiocommunications receivers registered in the Register. The coordination performed should:
  - (a) use the parameters of the radiocommunications receivers as recorded in the Register;
  - (b) use the level of protection set out in the subsection 145(4) Determination;
  - (c) make use of a suitable propagation model to model path loss between the fixed transmitters and radiocommunications receivers; and
  - (d) take into account terrain and any other relevant factors.

*Note* An example of a suitable propagation model is that set out in section 4.5.2 of ITU-R Recommendation P.526-13 *Propagation by diffraction*.

- (3) In the event that coordination performed under subsection (2) indicates harmful interference may occur, spectrum licensees should consider:
  - (a) replanning the deployment of the fixed transmitters to avoid causing harmful interference; or
  - (b) negotiating with the affected spectrum licensee to find a resolution.
- (4) In the event a solution under subsection (3) is not possible, interference is managed in accordance with any synchronisation requirement condition included in the spectrum licence, unless other arrangements are agreed to by the affected licensees.

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

## **Part 9 Earth station protection zones**

### **9.1 Background**

The ACMA has identified a number of locations that may be suitable as earth station protection zones (ESPZs) in eastern and western Australia. The purpose of these ESPZs is to define areas outside of reasonably sized population centres that provide long-term certainty and flexibility for investment in and operation of commercial space communications teleport facilities in Australia. The general protection requirements for these ESPZs are defined in RALI MS44.

### **9.2 Protection requirements**

Radiocommunications transmitters operated under a spectrum licence in the 3.4 GHz band must comply with the coordination and protection requirements specified in RALI MS44.

*Note* Should it become apparent that an ESPZ is not viable, the ACMA will remove any protection requirements in place in relation to it.

## Part 10 Earth station facility near Uralla

### 10.1 Background

There is an Earth station facility located near Uralla (the *Uralla facility*) within the HCIS NU7K4. Services at the Uralla facility operate at various frequencies in the 3400-4200 MHz band.

### 10.2 Protection requirements

- (1) Radiocommunications transmitters operated under a spectrum licence in the 3.4 GHz band must protect earth stations operating in the 3600-4200 MHz band at the Uralla facility to the levels specified in RALI MS44.
- (2) No protection is afforded to earth stations operating in the 3400-3600 MHz band at the Uralla facility. However, the notification requirements specified in subsection 4.2(3) of these guidelines apply.

*Note 1:* Given some of the services operating at the Uralla facility are temporal in nature and/or may only track certain parts of the sky, there may be opportunity for detailed negotiations between licensees to manage interference while improving spectrum utilisation.

*Note 2:* The long-term viability of the Uralla facility may be reviewed in the future. This is in light of the increasing demand for fixed and mobile broadband capacity, growing international interest in the 3700–4200 MHz band for use by fixed and mobile wireless broadband services and the proximity of the site to major regional population centres. However, if it is shown that fixed and mobile broadband service deployments in nearby major towns are not unreasonably restricted (noting there is likely to be some restrictions), this would be taken into consideration when assessing the long term viability of the Uralla facility.

## Endnotes

### Endnote 1 – About the endnotes

The endnotes provide information about this compilation and the compiled law.

Endnote 2 (Abbreviation key) sets out abbreviations that may be used in the endnotes.

Endnote 3 (Legislation history) provides information about each law that has amended (or will amend) the compiled law. The information includes commencement details for amending laws and details of any application, saving or transitional provisions that are not included in this compilation.

Endnote 4 (Amendment history) provides information about the amendments at the provision (generally section or equivalent) level and includes information about any provision of the compiled law that has been repealed in accordance with a provision of the law.

It also includes information about any misdescribed amendment (that is, an amendment that does not accurately describe the amendment to be made). If, despite the misdescription, the amendment can be given effect as intended, the amendment is incorporated into the compiled law and the abbreviation “(md)” added to the details of the amendment included in the amendment history. If a misdescribed amendment cannot be given effect as intended, the abbreviation “(md not incorp)” is added to the details of the amendment included in the amendment history.

### Endnote 2—Abbreviation key

ad = added or inserted

am = amended

amdt = amendment

c = clause(s)

Ch = Chapter(s)

Dict = Dictionary

Div = Division(s)

exp = expires/expired or ceases/ceased to have effect

F = Federal Register of Legislation

gaz = gazette

LA = *Legislation Act 2003*

(md not incorp) = misdescribed amendment  
cannot be given effect

mod = modified/modification

No. = Number(s)

par = paragraph(s)/subparagraph(s)

Pt = Part(s)

rep = repealed

rs = repealed and substituted

s = section(s)/subsection(s)

Sch = Schedule(s)

Sdiv = Subdivision(s)



### Endnote 3 – Legislation history

Title	Date of FRLI registration	Date of commencement	Application, saving or transitional provisions
<i>Radiocommunications Advisory Guidelines (Managing Interference from Spectrum Licensed Transmitters – 3.4 GHz Band) 2015</i>	25 May 2015 (see F2015L00728)	14 December 2015	
<i>Radiocommunications – 3.4 GHz Band Omnibus Variation 2018 (No. 1)</i>	27 July 2018 (see F2018L01063)	28 July 2018	-

### Endnote 4 – Amendment history

ad. = added or inserted    am. = amended    rep. = repealed    rs. = repealed and substituted

Provision affected	How affected
s 1.2.....	rep. LA s 48D;
s 1.3.....	rep. LA s 48C;
s 1.5(1).....	am. 2018 No. 1;
s 2.3.....	am. 2018 No. 1;
s 3.1.....	am. 2018 No. 1;
s 4.2.....	am. 2018 No. 1;
s 4.3.....	rs. 2018 No. 1;
s 4.4.....	ad. 2018 No. 1;
s 5.1.....	am. 2018 No. 1;
s 5.2.....	am. 2018 No. 1;
s 6.1.....	am. 2018 No. 1;
s 6.2.....	am. 2018 No. 1;
s 7.1.....	am. 2018 No. 1;
s 8.2.....	am. 2018 No. 1;
Pt 9.....	ad. 2018 No. 1;
Pt 10.....	ad. 2018 No. 1;