



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

Radiocommunications Act 1992

The AUSTRALIAN COMMUNICATIONS AND MEDIA AUTHORITY makes these Advisory Guidelines under section 262 of the *Radiocommunications Act 1992*.

Dated 20 May 2015

Richard Bean
[signed]
Member

Brendan Byrne
[signed]
Member/General Manager

Australian Communications and Media Authority

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*.

1.2 Commencement

These guidelines commence on 14 December 2015.

Note All legislative instruments and compilations are registered on the Federal Register of Legislative Instruments kept under the *Legislative Instruments Act 2003*. See <http://www.comlaw.gov.au>.

1.3 Revocation

The *Radiocommunications Advisory Guidelines (Managing Interference to Apparatus Licensed Receivers — 3.4 GHz Band) 2000* [F2009C00972] are revoked.

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 3442.5 MHz;
- (b) 3442.5 MHz to 3475 MHz;
- (c) 3475 MHz to 3492.5 MHz; and
- (d) 3542.5 MHz to 3575 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, 2010-2025 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 <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 frequency bands 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).
- 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 in frequencies 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 – FSS Earth receive stations operating in the 3600-4200 MHz band

- (1) Radiocommunications transmitters operated under a spectrum licence in the 3.4 GHz band must protect FSS Earth stations from unwanted emissions and receiver overload, if the receiver:
 - (a) is licensed under the Act;
 - (b) was registered in the Register prior to the date on which the device operated under the spectrum licence is registered;
 - (c) is located within 100 km of a radiocommunications transmitter operated under a spectrum licence in the 3.4 GHz band; and
 - (d) is operating in the 3600-4200 MHz band.
- (2) FSS Earth station receivers 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, not to be exceeded for more than 20% of the time.

Note 1 Recommendation ITU-R SF.1006 also provides guidance on the procedure to use for the protection of FSS Earth receive stations.

Note 2 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.

- (3) 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, 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)
< 25	0
< 50	15
< 150	45
< 200	50
≥ 200	70

Table 1: Minimum frequency response of Earth receive station’s RF filter

- (4) When assessing interference caused by unwanted emissions or receiver overload:
- Propagation loss between a radiocommunications transmitter and an FSS Earth station receiver 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 FSS Earth station, the antenna radiation pattern defined in ITU-R Recommendation S.465 can be assumed.

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 licensees of radiocommunications transmitters operating under a spectrum licence are expected to reduce their out-of-band emissions to the levels defined in Schedule 3 of the *Radiocommunications Advisory Guidelines (Managing Interference to Spectrum Licensed Receivers — 3.4 GHz Band) 2015*, if it would facilitate compatibility with receivers operating under an adjacent frequency apparatus licence. This is irrespective of which device was registered first-in-time. Licensees are responsible for bearing the costs of changes to their own system. In the event that reducing out-of-band emissions does not facilitate compatibility between services, the device registered first-in-time has priority.

Note: This requirement recognises that strict out-of-band core condition limits at the frequency boundaries between apparatus licences and other spectrum licences have not been imposed on spectrum licensees. This:

- avoids any unnecessary costs and burdens on licensees to implement arrangements that are only required to enable compatibility in specific situations; and
- simplifies any potential future retuning process as part of a 3400-3600 MHz band replan.

Consequently, it is only expected that 3.4 GHz band spectrum licensees will reduce out-of-band emissions when required to facilitate compatibility with other services.

Part 6 Radiolocation service

6.1 Background

The Spectrum Plan provides a primary allocation to the radiolocation service in the 3300-3400 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 3300-3400 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 3400-3600 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.