Commonwealth Coat of Arms

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 [insert date]

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.

1. 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:

1. 3425 MHz to 3492.5 MHz; and
2. 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 MS44*** means the Radiocommunications Assignment and Licensing Instruction No. ES 1, *Frequency coordination procedures for the Earth station protection zones*, published by the ACMA, as existing from time to time.

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

***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 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

* 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. 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.
  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 stations facility near Uralla, NSW (Part 10 of these guidelines).
  1. These guidelines also provide advice regarding managing interference across the geographical boundaries of 3.4 GHz spectrum licences (Part 8 of these guidelines).
  2. 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 Planallocates 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 mustnotify 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 stations for fixed-satellite services from co-channel emissions, unwanted emissions and receiver overload, if the radiocommunications receiver for the earth receive station:

1. is licensed under the Act;
2. was registered in the Register prior to the date on which the radiocommunications transmitter operated under the spectrum licence is registered;
3. is located within:
   1. 100 km of and not operating co-channel to a radiocommunications transmitter operated under a spectrum licence in the 3.4 GHz band; or
   2. 200 km of and operating co-channel to a radiocommunications transmitter operated under a spectrum licence in the 3600-3700 MHz frequency band; and
4. 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; and

*Note* Refer toRecommendation 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, not to be exceeded for more than 20% of the time.

*Note* When assessing interference from unwanted emissions, the earth receive station can be assumed to have the filter characteristics in Table 1.

(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 (MHz)from the lower or upper frequency on the earth receive station licence** | **Rejection (dB)** |
| --- | --- |
| < 50 | 0.5 + 0.6\*foffset(MHz) |
| < 150 | 30.5 + 0.25\*foffset(MHz) |
| < 200 | 55.5 |
| ≥ 200 | 70 |

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

(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 inRecommendation 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 mustnotify the affected earth receive station licensee. This is intended to give notice to the affected earth receive station licensee to ensure they have installed an RF filter with the relevant characteristics to the front end of the receiver of their earth receive station.

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:

1. [Radiocommunications (Spectrum Re-allocation—3.6 GHz Band for Adelaide and Eastern Metropolitan Australia) Declaration 2018](https://www.legislation.gov.au/Details/F2018L00225);
2. [Radiocommunications (Spectrum Re-allocation—3.6 GHz Band for Perth) Declaration 2018](https://www.legislation.gov.au/Details/F2018L00221); and
3. [Radiocommunications (Spectrum Re-allocation—3.6 GHz Band for Regional Australia) Declaration 2018](https://www.legislation.gov.au/Details/F2018L00222)

(2) Incumbent earth receive station are to be provided with the protection defined in clause 4.2 and subclause 4.3(3) of these guidelines.

(3) Incumbent earth receive station within 300 km of a transmitter operated under a 3.4 GHz spectrum licence are to be protected from co-channel emissions as follows, to a maximum interference level of -119.9 dBm/MHz not to be exceeded for more than 0.005% of the time.

*Note 1* Refer toRecommendation 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:
   1. is licensed under the Act; and
   2. was registered in the Register prior to the date on which the device operated under the spectrum licence is registered.

When coordinating with point-to-multipoint and public mobile telecommunication service class B licences in the 3400-3542.5 MHz band, 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 with the levels applying at a 5 MHz offset from the licence edge*,* 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. In the event that reducing out-of-band emissions does not facilitate compatibility between services, the device registered first-in-time has priority.

Note: Licensees need not reduce their out-of-band emissions in the event agreement can be reached on the use of synchronisation of uplink and downlink emissions to manage interference.

1. 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:

* + 1. use the parameters of the radiocommunications receivers as recorded in the Register;
    2. use the level of protection set out in the subsection 145(4) Determination;
    3. make use of a suitable propagation model to model path loss between the fixed transmitters and radiocommunications receivers; and
    4. 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:

1. replanning the deployment of the fixed transmitters to avoid causing harmful interference; or
2. negotiating with the affected spectrum licensee to find a resolution.

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 are to have defined areas outside of reasonably sized population centres that provide long-term certainty and flexibility for the 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 frequency assignment requirements specified in RALI MS44.

*Note:* Should it become apparent that one or more of the ESPZs is not a viable, the ACMA will remove any protection requirements in place.

Part 10 Earth stations facility near Uralla

10.1 Background

There is an Earth station facility located near Uralla (the Uralla facility) within the HCIS NU7K4. Services at this facility operate at various frequencies across 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 clause 4.2 of these guidelines applies.

*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.