Radiocommunications Advisory Guidelines (Managing Interference from Spectrum Licensed Transmitters — 2 GHz Band) 2016

Radiocommunications Act 1992

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

Dated *31 October 2016*

Richard Bean
[signed]
Member

Brendan Byrne
[signed]
~~Member~~ / General Manager

Australian Communications and Media Authority

1 Name of Advisory Guidelines

These guidelines are the *Radiocommunications Advisory Guidelines (Managing Interference from Spectrum Licensed Transmitters — 2 GHz Band) 2016*.

2 Commencement

These guidelines commence on 12 October 2017.

Note All legislative instruments are registered on the Federal Register of Legislation kept under the *Legislation Act 2003.* See http://www.legislation.gov.au.

3 Revocation

The *Radiocommunications Advisory Guidelines (Protection of Apparatus-licensed and Class-licensed Receivers – 2 GHz Band) 2015* [F2015L00721] are revoked.

4 Purpose of these guidelines

(1) The purpose of these guidelines is to manage interference to apparatus licensed and class licensed radiocommunications receivers operating in or adjacent to the 2 GHz band:

(a) outside the spectrum licensed bands; or

(b) outside the spectrum licensed areas.

(2) The ACMA will take 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. These guidelines do not prevent a licensee negotiating other protection requirements with another licensee.

5 Interpretation

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

2 GHz band means the frequency bands:

(a) 1920 MHz to 1980 MHz (2 GHz Lower Band); and

(b) 2110 MHz to 2170 MHz (2 GHz Upper Band).

Act means the *Radiocommunications Act 1992.*

HAPS means a high altitude platform station, which is a station located on an object at an altitude of 20 to 50 km and at a specified, nominal, fixed point relative to the earth.

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 spectrum 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 apparatus licence.

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

Note ITU-R Recommendations are available from the ITU website: 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 spectrum 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 apparatus 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 Copies of RALI FX 3 are available from the ACMA website: www.acma.gova.au.

RALI FX 21 means the Radiocommunications Assignment and Licensing Instruction No. FX 21, *Television Outside Broadcasting Services in the bands 1980-2110 MHz and 2170-2300 MHz*, published by the ACMA, as existing from time to time.

Note Copies of RALI FX 21 are available from the ACMA website: www.acma.gova.au.

section 145 Determination means the *Radiocommunications (Unacceptable Levels of Interference – 2 GHz Band) Determination 2016.*

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

Note The following terms that are used in these guidelines are defined in the section 145 Determination:

- ITU
- ITU-R.

(3) Unless the contrary intention appears, terms and expressions used in these guidelines that are defined in the *Radiocommunications (Interpretation) Determination 2015* have the meanings given to them by that determination.

Note 1 The following terms that are used in these guidelines are defined in the *Radiocommunications (Interpretation) Determination 2015*:

- PTS
- station.

Note 2 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 terms include:

- ACMA

- apparatus licence
- class licence
- frequency band
- interference
- radiocommunications receiver
- radiocommunications transmitter
- Register
- spectrum licence
- spectrum plan.

(4) In these Advisory Guidelines, unless the contrary intention appears, a reference to another legislative instrument is a reference to that other legislative instrument as in force from time to time.

Note 1 For references to Commonwealth Acts, see section 10 of the *Acts Interpretation Act 1901*; and see also subsection 13(1) of the *Legislation Act 2003* for the application of the *Acts Interpretation Act 1901* to legislative instruments.

Note 2 All Commonwealth Acts and legislative instruments are registered on the Federal Register of Legislation.

Part 1 Background

The 2 GHz band has been allocated for spectrum licensing in capital cities (1920-1980 MHz paired with 2110-2170 MHz) and regional areas (1960-1980 MHz paired with 2150-2170 MHz). Radiocommunications receivers of apparatus licensed and class licensed services operate in and adjacent to these frequency bands. These receivers may suffer interference from unwanted emissions, blocking and intermodulation, caused by a radiocommunications transmitter operating under a spectrum licence in the 2 GHz band.

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.

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 2 GHz spectrum licensed bands (Part 2 of these guidelines);
- Mobile Satellite Services (MSS) operating in the bands above 1980 MHz and 2170 MHz, adjacent to the 2 GHz band that are spectrum licensed (Part 3 of these guidelines);
- Space services authorised by apparatus licences in the 2025-2120 MHz and 2200-2300 MHz bands (Part 4 of these guidelines);
- Television Outside Broadcast (TVOB) services authorised by apparatus licences provided for by the *Television Outside Broadcast Service (1980–2110 MHz and 2170–2300 MHz) Frequency Band Plan 2012* (Part 5 of these guidelines);
- Mobile services authorised by PTS apparatus licences operating in the 2 GHz band in regional and remote areas as well as on board aircraft (Part 6 of these guidelines); and
- Radiocommunications devices operating under a class licence in and adjacent to the 2 GHz band (Part 7 of these guidelines).

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 2 GHz band.

Note The use of other published propagation models applicable to the 2 GHz band may also be suitable.

Part 2 Point-to-point fixed service receivers

2.1 Background

(1) Point-to-point fixed services in and adjacent to the 2 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. The criteria are usually based on internationally accepted ITU-R Recommendations.

(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.

2.2 Point-to-point receiver categories

For the purpose of these guidelines on managing interference caused by radiocommunications transmitters operating under spectrum licences, radiocommunications receivers of a fixed service operating in the 2 GHz band are taken to belong to one of the following categories:

(a) ***Category (1)*** - a receiver operating under an apparatus licence issued before 12 October 2017; or

(b) ***Category (2)*** - a receiver operating outside the spectrum space of a 2 GHz band spectrum licence, under an apparatus licence issued on or after 12 October 2017.

2.3 Protection requirements

(1) The protection requirements for fixed services operating in and adjacent to the 2 GHz band are specified in RALI FX 3. In planning for the operation of radiocommunications transmitters under a spectrum licence, 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.

(2) For the categories of fixed service radiocommunications receivers listed in section 2.2:

(a) Category (1) receivers are to be provided with out-of-band and in-band protection from interference according to RALI FX 3; and

(b) Category (2) receivers:

(i) are to be provided with out-of-band protection from interference according to RALI FX 3 caused by frequency adjacent radiocommunications transmitters operated under a spectrum licence and registered in the Register after the date of issue of the apparatus licence under which the receiver operates; and

(ii) are required to accept levels of in-band emissions from a radiocommunications transmitter operated under a spectrum licence, if the radiocommunications transmitter is operated in accordance with the conditions of the spectrum licence it operates under and the section 145 Determination.

Part 3 Mobile Satellite Service

3.1 Background

(1) The Mobile Satellite Service (MSS) is allocated in the bands 1980-2010 MHz (Earth-to-space) and 2170-2200 MHz (space-to-Earth) on a primary basis.

(2) In relation to interference management issues for MSS:

(a) for 2 GHz band mobile terminal transmit compatibility with MSS satellite receivers in the adjacent band 1980-2010 MHz, at the 1980 MHz boundary, the 2 GHz band spectrum licence core conditions are considered adequate for the provision of reasonable spectrum access by the MSS in the 2 GHz band;

(b) for 2 GHz band base station transmit compatibility with mobile earth station (MES) receivers in the adjacent band 2170-2200 MHz, at the 2170 MHz boundary, the following factors are relevant:

(i) the anticipated low density of MSS subscribers, compared with likely 2 GHz band users;

(ii) the expectation that most MSS use would be in regional / remote areas; and in those areas where terrestrial systems are deployed, it is likely that the terminal would default to the terrestrial system in many instances; and

(iii) automatic frequency assignment techniques that lessen interference.

(3) For spectrum licensed terrestrial transmitters in the 2 GHz band, the conditions established in the spectrum licence are adequate protection for MSS.

(4) For HAPS transmitters, regard should also be paid to the requirements of Recommendation ITU-R M.1456-0 *Minimum performance characteristics and operational conditions for high altitude platform stations providing IMT-2000 in the bands 1 885-1 980 MHz, 2 010-2 025 MHz and 2 110-2 170 MHz in Regions 1 and 3 and 1 885-1 980 MHz and 2 110-2 160 MHz in Region 2* for the protection of MSS earth terminals.

3.2 Protection requirements

(1) The ACMA would not regard interference to MSS satellite receivers operating in the band 1980-2010 MHz as unacceptable if the spectrum licensee complies with all relevant conditions of the spectrum licence.

(2) For HAPS transmitters operating as base stations, the requirements of *recommends* 4 of Recommendation ITU-R M.1456-0 *Minimum performance characteristics and operational conditions for high altitude platform stations providing IMT-2000 in the bands 1 885-1 980 MHz, 2 010-2 025 MHz and 2 110-2 170 MHz in Regions 1 and 3 and 1 885-1 980 MHz and 2 110-2 160 MHz in Region 2*, apply.

Part 4 Space services

4.1 Background

(1) There is a primary allocation in the spectrum plan for the following services in the 2025-2110 MHz frequency range:

(a) Space Operation services (Earth-to-space, space-to-space);

(b) Earth Exploration-Satellite services (Earth-to-space, space-to-space); and

(c) Space Research services (Earth-to-space, space-to-space).

(2) There is a primary allocation in the spectrum plan for the Space Research services (deep space, Earth-to-space) in the 2110-2120 MHz band.

(3) Licensed space service segment receivers in the above bands are protected in accordance with relevant ITU-R Recommendations. The ACMA has taken account of studies of the interference into these space services from 2 GHz band mobile systems. Based on these studies, the risk of interference to these space services is very slight, even from high-density mobile systems.

(4) There is a primary allocation in the spectrum plan for the following services in the 2200-2290 MHz frequency range:

(a) Space Operation services (space-to-Earth, space-to-space);

(b) Earth Exploration-Satellite services (space-to-Earth, space-to-space); and

(c) Space Research services (space-to-Earth, space-to-space).

(5) There is a primary allocation in the spectrum plan for Space Research services (deep space, space-to-Earth) in the 2290-2300 MHz frequency range.

(6) Earth stations of these services operate in various locations throughout Australia as recorded in the Register. Spectrum licensees in the 2 GHz band are required to protect these stations in accordance with relevant ITU-R Recommendations. In particular, spectrum licensees implementing HAPS based services should have regard to the location of these stations. Because of the 30 MHz isolation between the spectrum licensed 2 GHz band and these space service bands due to MSS allocations, terrestrial IMT interference to space service earth stations is very unlikely. The ACMA encourages direct liaison between spectrum licensees and space station operators during the system planning phases of spectrum licence usage when near these stations.

4.2 Protection Requirements

(1) The protection requirements for space service station receivers operating in the bands 2025-2120 MHz and 2200-2300 MHz are set out in the following ITU-R Recommendations:

(a) ITU-R Recommendation SA.1154: *Provisions to protect the space research (SR), space operations (SO) and Earth exploration satellite services (EES) and to facilitate sharing with the mobile service in the 2 025-2 110 MHz and 2 200-2 290 MHz bands*;

(b) ITU-R Recommendation SA.363-5: *Space operation systems*; and

(c) ITU-R Recommendation SA.1157-1: *Protection criteria for deep-space research*.

Part 5 Television outside broadcast (TVOB) services

5.1 Background

The *Television Outside Broadcast Service (1980–2110 MHz and 2170–2300 MHz) Frequency Band Plan 2012* makes provision for television outside broadcast (***TVOB***) services in the 1980-2110 MHz and 2170-2300 MHz frequency bands.

Note The *Television Outside Broadcast Service (1980–2110 MHz and 2170–2300 MHz) Frequency Band Plan 2012* is available from the Federal Register of Legislation website: www.legislation.gov.au.

5.2 Protection Requirements

(1) The protection requirements for TVOB services operating in the 2170-2300 MHz band are specified in RALI FX 21. These requirements apply to radiocommunications transmitters operated under a spectrum licence in the 2 GHz band and registered in the Register after the date of issue of the TVOB apparatus licence. Only TVOB receivers with site details recorded in the Register may be afforded protection.

(2) In planning for the operation of radiocommunications transmitters under a spectrum licence in the 2 GHz band, spectrum licensees should consult the procedures specified in RALI FX 21.

Part 6 Public Telecommunications Services

6.1 Background

Public telecommunications services operate under PTS apparatus licences in the 2 GHz band. These services are limited to regional and remote areas of Australia that are not subject to spectrum licensing.

6.2 Protection Requirements

Radiocommunications transmitters operated under a spectrum licence in the 2 GHz band in accordance with the conditions of the spectrum licence are taken not to cause unacceptable interference to services operating under a PTS apparatus licence.

Part 7 Class Licensed Services

7.1 Background

(1) Various class licences permit the operation of a number of different types of radiocommunications transmitters in and adjacent to the 2 GHz band.

(2) The operation of radiocommunications transmitters under these class licences is typically on a no-interference and no-protection basis.

7.2 Protection Requirements

Radiocommunications transmitters operated under a spectrum licence in the 2 GHz band in accordance with the conditions of the spectrum licence are taken not to cause unacceptable interference to services operating under a class licence.