Radiocommunications Advisory Guidelines (Protection of Apparatus-licensed and Class-licensed Receivers — 2 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 *15th May 2015*

Chris Chapman
[signed]
Member

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[signed]
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BACKGROUND

Receivers of apparatus licensed and class licensed services currently operate in the 2 GHz band and in adjacent frequency bands. These receivers may suffer interference from unwanted emissions, blocking and intermodulation, caused by a spectrum licensed transmitter operating in the 2 GHz band. Unwanted emissions are by-products of a 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 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 2 or more high level signals at the receiver input.

These guidelines have been made for the management of all these types of interference to licensed receivers operating in the following circumstances:

- Point to point fixed services operating in and adjacent to the 2 GHz band that are spectrum licensed (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);
- Cordless Telecommunications Services (CTS) authorised by apparatus licences or class licences and operating in the band 1880-1900 MHz (Part 4 of these guidelines);
- Space Services authorised by apparatus licences in the 2025-2120 MHz and 2200-2300 MHz bands (Part 5 of these guidelines); and
- 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 6 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, in addition to those discussed in RALI FX 3.

Part 1 Introduction

Title

1.1 These guidelines are called the *Radiocommunications Advisory Guidelines (Protection of Apparatus-licensed and Class-licensed Receivers — 2 GHz Band) 2015*.

Commencement

1.2 These guidelines commence on the day after they are registered.

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.

Revocation

1.3 The *Radiocommunications Advisory Guidelines (Protection of Apparatus-licensed and Class-licensed Receivers – 2 GHz Band) 2000* [F2005B00285] are revoked.

Purpose of these guidelines

1.4 (1) The purpose of these guidelines is to manage interference by providing for the protection of receivers of apparatus-licensed and class-licensed services operating in or adjacent to the 2 GHz band.

(2) The ACMA will take these guidelines into account in determining whether a spectrum-licensed transmitter is causing interference to an apparatus-licensed or class-licensed receiver operating in the circumstances set out in these guidelines. These guidelines do not prevent a licensee negotiating other protection requirements with another licensee.

Interpretation

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

Act means the *Radiocommunications Act 1992*.

designation, for spectrum space, means a declaration made under subsection 153B (1) of the Act to subject parts of the spectrum in designated areas to re-allocation by the issue of spectrum licences.

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 transmitter operated under a spectrum licence, or for a receiver operated within the space of a spectrum licence — the frequencies within the frequency band to which the licence relates; and

(b) for a transmitter or a receiver operated under an apparatus licence — the frequencies within the lower and upper frequency limit of its spectrum access.

incumbent, for a receiver, means a receiver that has part of the frequency band of its spectrum access, and its location, within the 2 GHz band when that band was designated.

ITU means the International Telecommunication Union.

ITU-R means the ITU Radiocommunication Sector.

ITU-R Recommendation means a Recommendation made by the ITU-R.

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, copies of which are available from the ACMA.

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, copies of which are available from the ACMA.

section 145 determination means the *Radiocommunications (Unacceptable Levels of Interference — 2 GHz Band) Determination 2015*.

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

2 GHz band means the following frequency bands:

(a) 1900 MHz – 1920 MHz (the 2 GHz Lower Band);

(b) 1920 MHz – 1980 MHz (the 2 GHz Upper Band A);

(c) 2110 MHz – 2170 MHz (the 2 GHz Upper Band B).

Note: The following terms, used in these guidelines, are defined in the Act and have the meanings given to them by the Act:

- ACMA
- frequency band
- interference
- Register
- spectrum licence
- transmitter.

(2) A term used in these guidelines that is defined in the section 145 determination has the same meaning as in that determination.

Propagation models

1.6 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

Background

2.1 This Part applies to point to point fixed services operating in and adjacent to the 2 GHz band.

2.2 For managing interference caused by transmitters operating under spectrum licences, receivers of fixed services operating in the 2 GHz band, belong to one of the following categories:

Category 1 covers a receiver that is not an incumbent receiver and whose apparatus licence was issued before 4 December 2000; and

Category 2 covers a receiver that is not an incumbent receiver and whose apparatus licence was issued on or after 4 December 2000.

2.3 Fixed services in the above bands are licensed in accordance with the frequency assignment criteria in RALI FX 3. 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 the RALI are urged to consult the current version when planning systems, to increase spectrum productivity.

Protection requirements

2.4 (1) The protection requirements for fixed services are specified in RALI FX 3. In planning for the operation of transmitters under a spectrum licence, spectrum licensees are to provide the same 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 receivers:

Category 1 receivers are to be provided with continuing out-of-band and in-band protection from interference for the full period of the spectrum licence; and

Category 2 receivers:

(a) are to be provided with out-of-band protection from interference caused by frequency adjacent transmitters that were registered after the issue date of the apparatus licence under which the receiver operates; and

(b) are required to accept levels of in-band emissions from a device operated under a spectrum licence, if the device is operated in accordance with the core conditions of the licence and the relevant section 145 determination of unacceptable levels of interference.

Part 3 Mobile Satellite Service

Background

3.1 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. At the time these guidelines were made, no MSS systems were licensed in these bands in Australia.

3.2 It is possible that the operation of MSS systems in these bands will be authorised in the future by the apparatus licensing of the space stations and the class licensing of the mobile earth stations (MES). This is in line with similar arrangements for MSS and some fixed satellite services in other bands.

3.3 (1) The interference management issues for MSS are:

- 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 2 GHz band.

- For 2 GHz band base station transmit compatibility with MES receivers in the adjacent band 2170-2200 MHz, at the 2170 MHz boundary, the following factors are relevant:
  - the anticipated low density of MSS subscribers, compared with likely 2 GHz band users;
  - the expectation that most MSS use would be in regional / remote areas. In areas where terrestrial systems were deployed, it is likely that the terminal would default to the terrestrial system in many instances; and
  - automatic frequency assignment techniques that lessen interference.

(2) For spectrum licensed terrestrial transmitters in the 2 GHz band, the conditions established in the spectrum licence are adequate protection for MSS. For HAPS transmitters, regard should also be paid to the requirements of Recommendation ITU-R M.1456 for the protection of MES earth terminals.

Protection requirements

3.4 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.

3.5 The ACMA would not regard interference to MSS earth station receivers operating under a class licence in the band 2170-2200 MHz as unacceptable if the spectrum licensee complies with all relevant conditions of the spectrum licence for terrestrial transmitters. For HAPS transmitters operating as base stations, the requirements of *recommends* 4 of ITU-R Recommendation M.1456 *Minimum performance characteristics (HAPS) and operational conditions for High Altitude Platform Stations providing IMT-2000 in the bands 1885-1980 MHz, 2010-2025 MHz and 2110-2170 MHz in Regions 1 and 3 and 1885-1980 MHz and 2110-2160 MHz in Region 2*, apply.

Part 4 Cordless telecommunications services

Background

4.1 (1) Cordless communications devices authorised by the *Radiocommunications (Cordless Communications Devices) Class Licence 2014* operate in the frequency band 1880–1900 MHz. This band is adjacent to the 2 GHz band that is spectrum licensed. Technologies which may operate in the 1880–1990 MHz band (as at the commencement of these guidelines) are those complying with the following Digital Enhanced Cordless Telecommunications (DECT) and Personal Handyphone Service (PHS) standards:

(a) *Radiocommunications (Digital Cordless Communications Devices – DECT Devices) Standard 2007* (the DECT standard); and

(b) *Radiocommunications (Digital Cordless Communications Devices – PHS Devices) Standard 2007* (the PHS standard).

(2) Typical applications for these devices include domestic and business telephones, as well as wireless Private Automatic Branch Exchange. European studies contained in the Electronic Communications Committee Reports 96 and 146, and the European Conference of Postal and Telecommunications Administrations (CEPT) Report 41, show that no guard band is required for International Mobile Telecommunications (IMT) technologies operating below and directly adjacent to the 1880-1900 MHz band to co-exist with DECT services operating in the 1880-1900 MHz band. This is due to the ability of DECT services to dynamically select channels in order to avoid interference.

Protection requirements

4.2 The ACMA would not regard interference to cordless telecommunications devices in the frequency band 1800-1900 MHz as unacceptable if the spectrum licensee complies with all relevant conditions of the spectrum licence.

Part 5 Space Services

Background

5.1 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).

5.2 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.

5.3 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.

5.4 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 Service (space-to-Earth, space-to-space).

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

5.6 Earth stations of these services operate in the Canberra region (at Tidbinbilla), in Western Australia (at New Norcia and Gnangara) and at Mt Pleasant (Tasmania). 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.

Protection requirements

5.7 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:

- ITU-R Recommendation SA.1154: *Provisions to protect the Space Research (SR), Space Operations (SO) and Earth Explorations Satellite Services (EES) and to facilitate sharing with the Mobile Service in the 2025-2110 MHz and 2200-2290 MHz bands.*
- ITU-R Recommendation SA.363-5: *Space operation systems frequencies, bandwidths and protection criteria.*
- ITU-R Recommendation SA.1157-1: *Protection criteria for deep-space research.*

Additional information on space service protection

5.8 The following ITU Recommendations are relevant to, and provide information on, the prediction of appropriate coordination distances, propagation models, threshold coordination levels, and earth station receiver and antenna characteristics. These may assist in assessing compliance with interference criteria:

- ITU Recommendation M.1456: *Minimum performance characteristics (HAPS) and operational conditions for High Altitude Platform Stations providing IMT-2000 in the bands 1885-1980 MHz, 2010-2025 MHz and 2110-2170 MHz in Regions 1 and 3 and 1885-1980 MHz and 2110-2160 MHz in Region 2.*
- ITU Recommendation IS.847: *Determination of the coordination area of an earth station operating with a geostationary space station and using the same frequency band as a system in a terrestrial service.*
- ITU Recommendation IS.849: *Determination of the coordination area for earth stations operating with non-geo-stationary spacecraft in bands shared with terrestrial services.*

Part 6 Television outside broadcast (TVOB) services

Background

6.1 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.

Protection requirements

6.2 (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 that were 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.