Radiocommunications Advisory Guidelines (Managing Interference to Spectrum Licensed Receivers – 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

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1 Name of Advisory Guidelines

These guidelines are the *Radiocommunications Advisory Guidelines (Managing Interference to Spectrum Licensed Receivers – 2 GHz Band) 2016.*

2 Commencement

These guidelines commence on 12 October 2017.

Note All legislative instruments and compilations 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 (Managing Interference from Apparatus-licensed and Class-licensed Transmitters – 2 GHz Band) 2015* [F2015L00722] are revoked.

4 Purpose of these Advisory Guidelines

(1) The purpose of these guidelines is to:

(a) manage in-band and out-of-band interference by providing compatibility requirements for registered fixed receivers operating under spectrum licences issued for the 2 GHz band; and

(b) provide protection to radiocommunications receivers operating under spectrum licences issued for the 2 GHz band from interference caused by radiocommunications transmitters operating under a class licence, and from fixed transmitters operating under:

(i) an apparatus licence issued on or after 12 October 2017; or

(ii) a spectrum licence where the radiocommunications transmitter is registered under Part 3.5 of the Act on or after 12 October 2017.

(2) These guidelines should be used by operators of spectrum licensed services and apparatus licensed services in the planning of services or in the resolution of an interference case.

(3) These guidelines do not prevent a licensee negotiating and implementing other protection requirements with affected licensees.

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.*

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adjacent channel means a channel with a centre frequency offset on either side of the assigned channel frequency of the occupied channel by a specific frequency relation.

adjacent channel selectivity means a measure of the ability of a radiocommunications receiver to receive a wanted signal without exceeding a specified degradation in output quality due to the presence of an unwanted adjacent channel signal.

blocking means a measure of the ability of a radiocommunications receiver to receive a wanted signal in the presence of a high level unwanted interferer on frequencies other than those of the adjacent channels.

emission buffer zone means a zone along the frequency or geographic boundary of a spectrum licence where emission levels of radiocommunications transmitters are reduced to ensure that significant levels of emissions stay within the geographic area and frequency band of the spectrum licence.

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.

intermodulation response rejection means a measure of the ability of a radiocommunications receiver to receive a wanted signal in the presence of two or more unwanted signals with a specific amplitude and frequency relationship to the wanted signal frequency.

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.

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

spectrum space means a 3 dimensional space consisting of a frequency band and a geographic area.

unwanted signal means all emissions from any radiocommunications transmitter which is not communicating with the radiocommunications receiver of a service protected by these guidelines.

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wanted signal means the radiofrequency emission from a radiocommunications transmitter designed for communication between the transmitter and a radiocommunications receiver of a service protected by these guidelines.

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

- centre frequency
- device boundary
- fixed receiver
- fixed transmitter
- geographic area.

Note 2 A number of terms, used in these guidelines are defined in the Act and unless the contrary intention appears, have the meanings given to them by the Act. These terms include:

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

(3) 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.

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Part 1 Background

A spectrum licence consists of a frequency band and a geographic area. Interference occurring between adjacent spectrum licences consists of:

- in-band interference, across the geographic boundaries; and
- out-of-band interference, across the frequency boundaries.

This interference is managed by creating emission buffer zones along the geographic and frequency boundaries of the spectrum licence, using a number of provisions of the Act. These include:

- the core conditions that all spectrum licences are subject to (see section 66 of the Act), about:
    - emission limits outside the geographic area; and
    - emission limits outside the frequency band;
- the applicable determination under subsection 145 (4) of the Act about what constitutes unacceptable levels of interference; and
- advisory guidelines made under section 262 of the Act, about managing interference in specific circumstances.

The following guidelines have been made to provide guidance on the management and settlement of interference to radiocommunications receivers operating under spectrum licences in the 2 GHz band and caused by radiocommunications transmitters operating under any other licence issued under the Act.

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Part 2 Managing interference from other services

2.1 In-band interference

(1) In-band interference caused in a radiocommunications receiver operating under a spectrum licence in the 2 GHz band by a radiocommunications transmitter operating under an adjacent spectrum licence is managed by core conditions imposed on spectrum licences under section 66 of the Act and the device boundary criteria and deployment constraints prescribed in the section 145 Determination.

(2) 2 GHz band spectrum licensees must accept any in-band interference caused by a radiocommunications transmitter operating under an apparatus licence that was issued before 12 October 2017.

(3) In-band interference caused in a radiocommunications receiver operating under a spectrum licence in the 2 GHz band by a radiocommunications transmitter operating under an apparatus licence that is issued on or after 12 October 2017, is managed as if the transmitter is operated under a spectrum licence. The same device boundary criteria, as are applied to spectrum licensed radiocommunications transmitters are also applied to these apparatus licensed radiocommunications transmitters. Therefore, spectrum licensed radiocommunications receivers are afforded the same level of in-band protection from these apparatus licensed radiocommunications transmitters as they are afforded from radiocommunications transmitters operated under adjacent spectrum licences.

(4) Application of the device boundary criteria manages in-band interference and these criteria incorporate emission limits that provide reasonable protection within the geographic area of a spectrum licence. Emission limits are also used to manage out-of-band interference but these do not provide protection along the frequency boundaries of a spectrum licence. Because of the nature of out-of-band interference, emission limits cannot be used to provide protection from out-of-band interference for radiocommunications devices that are located near each other, for example, at multi-operator sites.

(5) The ACMA will not regard in-band interference to a radiocommunications receiver operating under a spectrum licence caused by a radiocommunications transmitter operating under a class licence as unacceptable if the operation of the transmitter complies with all relevant conditions of the class licence.

(6) The interference management framework, if any is required, for radiocommunications devices operated under a class licence is contained in the relevant class licence.

2.2 Out-of-band interference

(1) Out-of-band interference is difficult to predict because the levels and frequencies of unwanted emissions depend on both the nearness of, and the operating frequencies of, radiocommunications transmitters and radiocommunications receivers that are close in terms of both frequency and distance. In addition, out-of-band interference:

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(a) can extend for many megahertz either side of the frequency boundary of a spectrum licence;

(b) is dependent on the quality of the radiocommunications receiver as well as the levels of the radiocommunications transmitter's emission; and

(c) is difficult to model accurately.

(2) If emission limits were used to manage out-of-band interference for radiocommunications devices in close proximity, the interference modelling inaccuracy would require large probability margins to be added to those limits. These margins would place severe constraints on use of the spectrum because the frequency boundaries of a spectrum licence extend throughout the entire geographic area of a spectrum licence. Therefore, emission limits that manage out-of-band interference throughout the geographic area of a spectrum licence cannot be used because they would lead to a severe loss of utility of the spectrum on both sides of the frequency boundary.

(3) Instead of making large tracts of spectrum space unusable through the imposition of emission limits, out-of-band interference is managed through procedures based on a compatibility requirement for radiocommunications receivers. A minimum level of receiver performance is specified in conjunction with the compatibility requirement because the performance level of receivers:

(a) affects the level of interference; and

(b) can vary for receivers operating under spectrum licences.

2.3 Recording radiocommunications receiver details in the Register

(1) In these guidelines, for a radiocommunications receiver operated under a spectrum licence to be afforded protection from interference caused by an apparatus licensed radiocommunications transmitter, the details of the receiver must be recorded in the Register before the date of issue of the apparatus licence under which the transmitter operates.

(2) In these guidelines, for a radiocommunications receiver operated under a spectrum licence to be afforded protection from interference caused by a spectrum licensed radiocommunications transmitter, the details of the receiver must be recorded in the Register before the details of the transmitter are recorded in the Register.

Note See Part 4 (Compatibility requirement).

2.4 Mobile and nomadic devices

The compatibility requirement (specified in Part 4) does not apply to mobile or nomadic devices because the transient nature of these radiocommunications devices prevents the use of this requirement as an interference management procedure. Mobile and nomadic radiocommunications receivers have by their nature the ability to avoid an interference source unlike a fixed receiver.

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Part 3 Minimum level of receiver performance

3.1 Notional receiver performance

(1) The level of interference caused by out-of-band emissions depends on the interference susceptibility of a radiocommunications receiver. Emission levels from radiocommunications transmitters should not have to be reduced below a point where the performance of the radiocommunications receiver is really the problem.

(2) Therefore, it is necessary to establish a benchmark notional receiver performance level for the radiocommunications receiver when setting a compatibility requirement for radiocommunications receivers. The recommended notional receiver performance level is set out in Schedule 1. A radiocommunications receiver must meet the notional receiver performance level to gain protection from interference from radiocommunications transmitters under these guidelines.

Note Schedule 1 specifies the notional receiver performance level based on information available to the ACMA at the time of making these guidelines. The notional receiver performance level may be amended in the future. Any amendments to these guidelines would be made following consultation with 2 GHz band spectrum licensees.

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Part 4 Compatibility requirement

4.1 Compatibility

(1) The performance of a fixed receiver operated under a spectrum licence in the 2 GHz band meets the compatibility requirement if the receiver:

(a) has at least the notional level of receiver performance set out in Schedule 1;

(b) meets the compatibility requirement set out in Schedule 2; and

(c) has its details recorded in the Register before the date that the radiocommunications transmitter with which compatibility is sought has its details recorded in the Register.

(2) The interference management framework for radiocommunications devices operated under a class licence are contained in the relevant class licence.

(3) A radiocommunications transmitter operating under a class licence must comply with the conditions of the class licence.

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Schedule 1 Notional receiver performance level

(subsections 3.1(2) and 4.1(1))

(1) This notional level of performance for a radiocommunications receiver operating under a spectrum licence issued for the 2 GHz band in relation to interfering signals from a radiocommunications transmitter operated under an apparatus licence relates to:

(a) adjacent channel selectivity;

(b) intermodulation response rejection; and

(c) receiver blocking.

(2) The performance parameters of the radiocommunications receiver are defined at the antenna connector port of the receiver unit. All frequency offsets are specified with reference to the upper and lower limits of the frequency bands of the spectrum licence under which the radiocommunications receiver operates.

Adjacent channel selectivity

(3) The adjacent channel selectivity shall be greater than or equal to 43.5 dB with a frequency offset of less than 5 MHz from the frequency limit of the spectrum licence under which the radiocommunications receiver operates.

Intermodulation response rejection

(4) The intermodulation response rejection level is -52 dBm per occupied bandwidth for each out-of-band signal at frequency offsets greater than or equal to 5 MHz from the upper and lower frequency limit of the spectrum licence under which the radiocommunications receiver operates.

Receiver blocking

(5) The receiver blocking requirement is:

(a) -43 dBm per 5 MHz at frequency offsets greater than 5 MHz from the frequency limit of the spectrum licence; and

(b) a total mean power of -15 dBm for frequencies outside the band 1900 MHz to 2000 MHz;

under which the radiocommunications receiver operates.

Receiver antenna and feeder losses

(6) The antenna gain and feeder loss for the radiocommunications receiver recorded in the Register should be used for coordination. If an antenna gain or feeder loss is not recorded in the Register, then an antenna gain (including losses) of 18 dBi applies in all directions.

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Schedule 2 Compatibility requirement

(subsection 4.1(1))

(1) The compatibility requirement is an unwanted signal level of -108 dBm/5MHz more than 95% of the time in any 1 hour period.

(2) Logarithmic scaling should be used to find the appropriate level in alternative bandwidths.

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