Radiocommunications Advisory Guidelines (Managing Interference to Spectrum Licensed Receivers — 3.4 GHz Band) 2015

Radiocommunications Act 1992

made under section 262 of the

Radiocommunications Act 1992.

Compilation No. 1

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Prepared by the Australian Communications and Media Authority, Melbourne.

Part 1 Introduction

1.1 Name of Advisory Guidelines

These guidelines are the *Radiocommunications Advisory Guidelines (Managing Interference to Spectrum Licensed Receivers — 3.4 GHz Band) 2015.*

1.3 Purpose

(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 3.4 GHz band; and

(b) provide protection to radiocommunications receivers operating under spectrum licences issued for the 3.4 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 the date on which these guidelines commence; or

(ii) a spectrum licence where the transmitter is registered under Part 3.5 of the Act on or after the date on which these guidelines commence.

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

(3) The ACMA will take these guidelines into account in determining whether interference has occurred to a radiocommunications receiver operating under a 3.4 GHz band spectrum licence from a transmitter operating under another licence, in the absence of separate criteria agreed between affected licensees.

(4) These guidelines do not prevent a licensee negotiating other protection requirements with another licensee.

1.4 Interpretation

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

3.4 GHz band means the following frequency bands:

(a) 3425 MHz to 3492.5 MHz; and

(b) 3542.5 MHz to 3700 MHz.

Act means the *Radiocommunications Act 1992.*

active antenna system (AAS) refers to a base station antenna system where the amplitude and/or phase between antenna elements is continually adjusted, resulting in an antenna pattern that varies in response to short term changes in the radio environment.

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 the 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 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 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.

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 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 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 3.5 GHz band*, 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.

restricted block means any part of a spectrum licence that is subject to a core condition, as specified in paragraph 66 (1) (d) of the Act, of 18 dBm EIRP per 1 MHz.

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

spurious response immunity means a measure of the ability of a radiocommunications receiver to discriminate between the wanted signal and an unwanted signal at any frequency, outside the frequency band of the licence, to which the receiver responds.

subsection 145(4) Determination means the *Radiocommunications (Unacceptable Levels of Interference — 3.4 GHz Band) Determination 2015.*

unwanted emissions means any emissions (both out-of-band and spurious emissions) outside the lower and upper frequency limits of a spectrum licence.

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

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

Note 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 including:

- ACMA
- apparatus licence
- class licence
- core condition
- frequency band
- interference
- radiocommunications device
- 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:

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

Part 2 Background

2.1 A spectrum licence refers to 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.

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

- the core licence 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.

Part 3 Managing interference from other services

3.1 In-band interference

(1) In-band interference caused in a radiocommunications receiver operating under a spectrum licence in the 3.4 GHz band by a radiocommunications transmitter operating under an adjacent spectrum licence issued on or after 14 December 2015 is managed by:

(a) the core conditions imposed on the spectrum licences under section 66 of the Act;

(b) the device boundary criteria and deployment constraints prescribed in the subsection 145(4) Determination; and

(c) any condition set out in the spectrum licence relating to synchronisation (a ***synchronisation requirement***), unless other arrangements are agreed to by the affected licensees.

(2) In-band interference caused in a radiocommunications receiver operating under a spectrum licence in:

(a) the 3425-3492.5 MHz and 3542.5-3575 MHz frequency bands by a radiocommunications transmitter operating under an apparatus licence issued on or after 14 December 2015; or

(b) the 3575-3700 MHz frequency band by a radiocommunications transmitter operating under an apparatus licence issued on or after 9 March 2018;

is managed as if the transmitter is operated under a spectrum licence. The same device boundary criteria, as applied to spectrum licensed radiocommunications transmitters at the time of registration are also applied to new apparatus licensed radiocommunications transmitters. Therefore, spectrum licensed receivers are afforded the same level of in-band protection from new apparatus licensed radiocommunications transmitters as they are afforded from radiocommunications transmitters operated under adjacent spectrum licences.

(3) Application of the device boundary criteria manages in-band interference and these criteria incorporate emission limits that provide reasonable protection inside the geographic area of a 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 throughout the entire geographic area. Because of the nature of out-of-band interference, emission limits cannot be used to provide protection from out-of-band interference for devices that are located near each other, for example, at multi-operator sites.

(4) Radiocommunications transmitters operating under a Radiodetermination apparatus licence are not required to adhere to the device boundary criteria, provided the licensee implements measures to minimise the impact on services operated under 3.4 GHz band spectrum licences. In-band interference from radiodetermination licences is expected to be transient in nature. In the event this is not the case, the radiodetermination licensee will be required to implement further mitigation measures to reduce the impact on services operated under 3.4 GHz band spectrum licences. To further assist with managing interference, when planning and operating fixed or mobile wireless

networks, spectrum licensees should also have regard to subclause 3.2(4) of these guidelines.

(5) Spectrum licensees must accept any in-band interference to radiocommunications receivers operating in:

(a) the 3425-3492.5 MHz and 3542.5-3575 MHz frequency bands caused by radiocommunications transmitters operating under an apparatus licence issued before 14 December 2015; or

(b) the 3575-3700 MHz frequency bands caused by radiocommunications transmitters operating under an apparatus licence issued before 9 March 2018.

This subsection does not apply to radiodetermination apparatus licences.

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

3.2 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:

(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 emission; and
(c) is difficult to model accurately.

(2) If emission limits were used to manage out-of-band interference for 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 licence extend throughout the entire geographic area of a 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 interference management 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.

Note: The compatibility requirement is set out in Part 4.

(4) High power radiolocation services in the 3100-3500 MHz band are operated by the Department of Defence on an itinerant basis. These radiolocation services have the potential to disrupt the throughput of 3.4 GHz receivers particularly on the uplink channel (base station receiver). The Department of Defence already employ techniques to minimise impacting other in-band and adjacent band services. However, there will be occasions when interference cannot be fully mitigated by these

techniques. In such instances the interference may be due to blocking, strong out of band emissions of the radar, or other susceptibilities within a 3.4 GHz fixed or mobile wireless network configuration. When planning service deployments, spectrum licensees are urged to consider different engineering techniques to reduce the likelihood of impact to their spectrum licensed service. Such engineering techniques by spectrum licensees may include additional RF filtering, network redundancy, or resilience of network configuration where vulnerabilities to radar signal interference are identified. The ACMA will work with the Department of Defence to provide what additional information it can to assist spectrum licensees on this matter. Such information will only be given directly to existing or likely prospective spectrum licensees.

3.3 Recording radiocommunications receiver details in the Register

A radiocommunications receiver operated under a spectrum licence must be recorded in the Register to be afforded protection in accordance with these guidelines.

3.4 Mobile and nomadic devices

The compatibility requirement specified in Part 5 does not apply to mobile or nomadic radiocommunications receivers operated under a spectrum licence in the 3.4 GHz band because the transient nature of these devices prevents the use of this requirement as an interference management procedure.

Part 4 Minimum level of receiver performance

4.1 Notional receiver performance

(1) The level of interference caused by unwanted emissions depends on the interference susceptibility of a radiocommunications receiver and the level of the unwanted signal. Emission levels from radiocommunications transmitters should not have to be reduced below a point where the performance of the radiocommunications receiver is the main cause of the problem.

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

Part 5 Compatibility requirement

5.1 Compatibility

(1) Subject to subsection 2, the performance of a fixed receiver operated under a spectrum licence in the 3.4 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 included in the Register prior to the radiocommunications transmitter with which compatibility is sought has its details included in the Register.

Note: Application of the compatibility requirement is related solely to management of out-of-band interference and does not apply to in-band interference.

(2) The licensee of a radiocommunications transmitter operating under an apparatus or spectrum licence must ensure compatibility with a fixed receiver operating under a 3.4 GHz band spectrum licence that meets the compatibility requirement as stated in subsection (1).

(3) Unless alternative arrangements are negotiated and agreed to, in the event a 3.4 GHz band spectrum licensee claims interference from one or more radiocommunications transmitters operating under another 3.4 GHz band spectrum licence into a radiocommunications receiver operated under their 3.4 GHz band spectrum licence, all relevant 3.4 GHz band spectrum licensees are required to synchronise their services as specified in any synchronisation requirement condition included in their spectrum licence.

(4) Subsections (1), (2) and (3) do not apply to a radiocommunications transmitter operated under a radiodetermination licence. The licensee of a radiodetermination service ensures compatibility by meeting the criteria defined in subsection 3.1 (4).

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

Note: For a device with an active antenna system, the radiated power in the direction of a receiver operated under another licence, is defined as the sum of the gain of the antenna in the direction of the receiver (accounting for azimuth and elevation) and the total radiated power (dBm). This allowance is based on the assumption that beam pointing angles and/or power can be controlled dynamically to ensure a defined level of radiated power in a specific direction is not exceeded.

Schedule 1 Notional receiver performance level

(subsection 4.1 (2) and paragraph 5.1 (1) (a))

(1) Performance parameters

The notional level of performance for a radiocommunications receiver operating under a spectrum licence in the 3.4 GHz band in relation to interfering signals from a radiocommunications transmitter operated under an apparatus licence relates to:

(a) adjacent channel selectivity;

(b) receiver intermodulation rejection; and

(c) receiver blocking.

(2) The performance parameters of a 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 receiver operates.

(3) Adjacent channel selectivity

(a) For radiocommunications receivers operating in a bandwidth of 20 MHz or less, the adjacent channel selectivity shall be greater than or equal to 45 dB in the adjacent 5 MHz of the licence under which the radiocommunications receiver operates.

(b) For radiocommunications receivers operating in a bandwidth greater than 20 MHz, the adjacent channel selectivity shall be greater than or equal to 45 dB in the adjacent 20 MHz of the licence under which the radiocommunications receiver operates.

(4) Receiver intermodulation rejection

The receiver intermodulation 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 licence under which the radiocommunications receiver operates.

(5) Receiver blocking

(a) The receiver blocking requirement for a radiocommunications receiver operating in the 3340-3760 MHz frequency range with a bandwidth of:

(i) 20 MHz or less is -43 dBm per 5 MHz at frequency offsets greater than 5 MHz from the upper and lower frequency limit of the spectrum licence under which the radiocommunications receiver operates; or

(ii) more than 20 MHz is -43 dBm per 20 MHz at frequency offsets greater than 20 MHz from the upper and lower frequency limit of the spectrum licence under which the radiocommunications receiver operates.

(b) The receiver blocking requirement for a radiocommunications receiver operating at all other frequencies is a total mean power of -15 dBm.

(6) **Receiver antenna and feeder losses**

The antenna gain and feeder loss recorded for a radiocommunications receiver in the Register should be used for coordination. If an antenna gain or feeder loss is not available in the Register, then an antenna gain (including losses) of 17 dBi in all directions applies.

Schedule 2 Compatibility requirement

(paragraph 5.1 (1) (b))

(1) For the purpose of assessing compatibility with other radiocommunications services, the performance of a fixed radiocommunications receiver operated under a 3.4 GHz band spectrum licence is:

(a) a minimum wanted signal level of –95.5 dBm per 5 MHz for more than 95% of the time in any 1 hour period; and

(b) a wanted to unwanted ratio of 12.5 dB.

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

Endnotes

Endnote 1 – About the endnotes

The endnotes provide information about this compilation and the compiled law.

Endnote 2 (Abbreviation key) sets out abbreviations that may be used in the endnotes.

Endnote 3 (Legislation history) provides information about each law that has amended (or will amend) the compiled law. The information includes commencement details for amending laws and details of any application, saving or transitional provisions that are not included in this compilation.

Endnote 4 (Amendment history) provides information about the amendments at the provision (generally section or equivalent) level and includes information about any provision of the compiled law that has been repealed in accordance with a provision of the law.

It also includes information about any misdescribed amendment (that is, an amendment that does not accurately describe the amendment to be made). If, despite the misdescription, the amendment can be given effect as intended, the amendment is incorporated into the compiled law and the abbreviation "(md)" added to the details of the amendment included in the amendment history. If a misdescribed amendment cannot be given effect as intended, the abbreviation "(md not incorp)" is added to the details of the amendment included in the amendment history.

Endnote 2—Abbreviation key

ad = added or inserted
am = amended
amdt = amendment
c = clause(s)
Ch = Chapter(s)
Dict = Dictionary
Div = Division(s)
exp = expires/expired or ceases/ceased to have effect
F = Federal Register of Legislation
gaz = gazette
LA = *Legislation Act 2003*
(md not incorp) = misdescribed amendment cannot be given effect
mod = modified/modification
No. = Number(s)
par = paragraph(s)/subparagraph(s)
Pt = Part(s)
rep = repealed
rs = repealed and substituted
s = section(s)/subsection(s)
Sch = Schedule(s)
Sdiv = Subdivision(s)

Endnote 3 – Legislation history

Title	Date of FRLI registration	Date of commencement	Application, saving or transitional provisions
Radiocommunications Advisory Guidelines (Managing Interference to Spectrum Licensed Receivers — 3.4 GHz Band) 2015	25 May 2015 (see F2015L00729)	14 December 2015	-
Radiocommunications – 3.4 GHz Band Omnibus Variation 2018 (No. 1)	27 July 2018 (see F2018L01063)	28 July 2018	-

Endnote 4 – Amendment history

ad. = added or inserted am. = amended rep. = repealed rs. = repealed and substituted

Provision affected	How affected
s 1.2A…..……	rep. LA s 48D;
s 1.2B…….	rep. LA s 48C;
s 1.4(1)…….	am. 2018 No. 1;
Pt 3…….……..	rs. 2018 No. 1;
s 4.1…….	am. 2018 No. 1;
s 5.1(3)…….	rs. 2018 No. 1;
s 5.1(4)…….	rs. 2018 No. 1;
s 5.1(5)…….	rs. 2018 No. 1;
s 5.1(6)…….	rep. 2018 No. 1;
Sch 1 ……...	am. 2018 No. 1;
Sch 3……	rep. 2018 No. 1;