Radiocommunications Advisory Guidelines (Managing Interference to Spectrum Licensed Receivers – 1800 MHz Band) 2023

The Australian Communications and Media Authority makes the following guidelines under section 262 of the *Radiocommunications Act 1992*.

Dated: 16 March 2023

Chris Jose
[signed]
Member

Linda Caruso
[signed]
~~Member~~/General Manager

Australian Communications and Media Authority

Part 1—Preliminary

1 Name

These are the *Radiocommunications Advisory Guidelines (Managing Interference to Spectrum Licensed Receivers – 1800 MHz Band) 2023*.

2 Commencement

This instrument commences at the start of the day after the day it is registered on the Federal Register of Legislation.

Note: The Federal Register of Legislation may be accessed free of charge at www.legislation.gov.au.

3 Authority

This instrument is made under section 262 of the Act.

4 Repeal of other guidelines

(1) The *Radiocommunications Advisory Guidelines (Managing Interference to Spectrum Licensed Receivers – 1800 MHz Band) 2012* [F2012L02047] are repealed.

(2) The *Radiocommunications Advisory Guidelines (Additional Device Boundary Criteria – 1800 MHz Lower Band) 2012* [F2012L02046] are repealed.

5 Definitions

(1) In this instrument:

1800 MHz band means the 1800 MHz lower band and the 1800 MHz upper band.

1800 MHz lower band means the frequency band 1710 MHz to 1785 MHz.

1800 MHz receiver means a radiocommunications receiver operated under an 1800 MHz spectrum licence.

1800 MHz spectrum licence means a spectrum licence that authorises the operation of radiocommunications devices in the 1800 MHz band.

1800 MHz upper band means the frequency band 1805 MHz to 1880 MHz.

Act means the *Radiocommunications Act 1992*.

adjacent channel, in relation to another channel (***the occupied 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: see item 2 of Schedule 1.

centre frequency, in relation to a radiocommunications transmitter, means the frequency midway between the lower and upper frequency limits of the transmitter's occupied bandwidth.

compatibility requirement: see Part 5 and Schedule 2.

emission buffer zone, in relation to a spectrum licence, means a zone along the frequency or geographic boundary specified in a spectrum licence where emission levels of radiocommunications transmitters are reduced to ensure that significant levels of emissions stay within the geographic areas and frequencies of the licence.

fixed receiver means a radiocommunications receiver:

(a) located at a fixed point on land or sea; and

(b) not designed or intended for use while in motion.

fixed transmitter means a radiocommunications transmitter:

(a) located at a fixed point on land or sea; and

(b) not designed or intended for use while in motion.

frequency adjacent spectrum licence, in relation to a spectrum licence (***the first licence***), means a spectrum licence that authorises the operation of radiocommunications devices in a part of the spectrum that is adjacent to the parts of the spectrum specified in a core condition of the first licence.

geographic area, for a spectrum licence, means the area within which operation of a radiocommunications device is authorised under the licence.

in-band means:

(a) for a radiocommunications device operated under a spectrum licence – the part of the spectrum within which the operation of radiocommunications devices is authorised under the licence; or

(b) for a radiocommunications device operated under an apparatus licence that specifies a frequency band – the frequencies within the lower frequency limit and the upper frequency limit specified in the licence;

(c) for a radiocommunications device operated under an apparatus licence that specifies a specific frequency and bandwidth – the frequencies within that bandwidth, when centred on the specific frequency.

intermodulation response rejection: see item 3 of Schedule 1.

mobile device means a radiocommunications device that is used:

(a) while it is in motion on land, on water or in the air; or

(b) in a stationary position at unspecified points on land, on water or in the air.

notional receiver performance level: see subsection 12(2).

out-of-band, for a radiocommunications device, means a frequency other than an in-band frequency.

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

section 145 determination means the *Radiocommunications (Unacceptable Levels of Interference – 1800 MHz Band) Determination 2023*.

Note: The section 145 determination is available, free of charge, from the Federal Register of Legislation at www.legislation.gov.au.

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

spurious response immunity: see item 5 of Schedule 1.

unwanted signal means a radio emission from a radiocommunications transmitter that is not a wanted signal.

wanted signal means a radio emission from a radiocommunications transmitter that is intended for reception by a radiocommunications receiver protected by this instrument.

Note: A number of other expressions used in this instrument are defined in the Act, including the following:

(a) ACMA;
(b) apparatus licence;
(c) class licence;
(d) core condition;
(e) frequency band;
(f) interference;
(g) radiocommunications device;
(h) radiocommunications receiver;
(i) radiocommunications transmitter;
(j) radio emission;
(k) spectrum licence.

(2) In this instrument, unless the contrary intention appears, each term listed in subsection (3) has the meaning given by:

(a) the section 145 determination; or
(b) if another instrument replaces that determination – the other instrument.

(3) For the purposes of subsection (2), the terms are:

(a) ***additional device boundary criterion***;
(b) ***areas of high mobile use***;
(c) ***device boundary***;
(d) ***device boundary criterion***;
(e) ***effective antenna height***;
(f) ***high sited***;
(g) ***low sited***.

(4) In this instrument, unless otherwise specified, a reference to a part of the spectrum or a frequency band includes all frequencies that are greater than but not including the lower frequency, up to and including the higher frequency.

Note: This subsection means the lower number in a part of the spectrum or a frequency band is not included in the part of the spectrum or the frequency band.

6 References to other instruments

In this instrument, unless the contrary intention appears:

(a) a reference to any other legislative instrument is a reference to that other legislative instrument as in force from time to time; and
(b) a reference to any other kind of instrument or writing is a reference to that other instrument or writing as in force or existence 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.

Note 3: See section 314A of the Act.

Part 2—Overview

7 Background

(1) A spectrum licence authorises the operation of radiocommunications devices within a part of the spectrum and in 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) This interference is managed by creating emission buffer zones along the geographic and frequency boundaries of a spectrum licence, using a number of powers under the Act. Emission buffer zones may be created by, or as a result of, the following:

(a) specifying out-of-area and out-of-band emission limits in the core conditions of the licence, which must be included in all spectrum licences (see section 66 of the Act);

(b) a determination under section 145 of the Act, relating to unacceptable levels of interference and the registration of radiocommunications devices, and related licence conditions (see section 69 of the Act);

(c) advisory guidelines under section 262 of the Act, about managing interference in specific circumstances.

(3) This instrument:

(a) provides protection to 1800 MHz receivers from interference caused by radiocommunications transmitters operated under an apparatus licence, class licence, or spectrum licence;

(b) assists in the management of in-band and out-of-band interference by providing compatibility requirements for registered fixed receivers operated under 1800 MHz spectrum licences; and

(c) sets out minimum receiver performance requirements that the ACMA will assume are met by a radiocommunications receiver, when considering whether to provide protection to the receiver in accordance with this instrument, so that the onus of managing interference is not solely placed upon the operators of radiocommunications transmitters.

(4) This instrument is intended to provide guidance on the management and settlement of interference to 1800 MHz receivers, caused by radiocommunications transmitters operated under another class, apparatus or spectrum licence issued under the Act.

(5) This instrument should be used by spectrum licensees, apparatus licensees, and authorised third parties in the planning of services and in the resolution of interference.

(6) This instrument does not prevent a person negotiating and implementing other protection requirements with other persons.

Part 3—Managing interference from other services

8 In-band interference

(1) In-band interference to an 1800 MHz receiver, caused by a radiocommunications transmitter operated under an adjacent spectrum licence, is managed by the core conditions imposed on spectrum licences under section 66 of the Act, the device boundary criterion, and the additional device boundary criterion.

(2) In-band interference to an 1800 MHz receiver, caused by a radiocommunications transmitter operated under an apparatus licence that was first issued under section 100 of the Act on or after 18 June 2013, is managed as if the transmitter were operated under a spectrum licence. The device boundary criterion is to be applied to such radiocommunications transmitters, affording 1800 MHz receivers the same level of in-band protection from apparatus licensed radiocommunications transmitters as they are afforded from radiocommunications transmitters operated under adjacent area spectrum licences.

(3) The ACMA does not intend to afford protection from in-band interference to an 1800 MHz receiver caused by a radiocommunications transmitter operated under an apparatus licence that was first issued under section 100 of the Act before 18 June 2013.

(4) The ACMA does not intend to act in relation to in-band interference to an 1800 MHz receiver caused by a radiocommunications transmitter operated under a class licence where the operation complies with all relevant conditions of the class licence.

9 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 and the operating frequencies of radiocommunications transmitters and radiocommunications receivers that are spectrally or geographically close. In addition, out-of-band interference:

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

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

(c) is difficult to model accurately.

(2) 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 radiocommunications devices that are located near each other.

Example: Radiocommunications devices that are located near each other include devices located at multi-operator sites.

(3) Emission limits are not the sole mechanism used to manage out-of-band interference for devices in close proximity, because the interference modelling inaccuracy would require large probability margins to be added to those limits. Large probability margins would place severe constraints on the use of the spectrum because the upper and lower frequency limits of a spectrum licence extend throughout the geographic area. Emission limits to manage out-of-band interference throughout the geographic area cannot be used, because they would lead to a severe loss of utility of the spectrum on both sides of the frequency limits.

(4) To avoid large probability margins, 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 Part 4 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 minimum level of receiver performance is specified in Part 4. The compatibility requirement is set out in Part 5.

10 Recording radiocommunications receiver details in the Register

(1) In this instrument, for an 1800 MHz receiver to be afforded protection from interference caused by an apparatus licensed radiocommunications transmitter, the details of the receiver must have been included in the Register before the relevant apparatus licence was first issued under section 100 of the Act.

(2) In this instrument, for an 1800 MHz receiver to be afforded protection from interference caused by a spectrum licensed radiocommunications transmitter, the details of the receiver must have been included in the Register before the details of the relevant transmitter were included in the Register.

Note: See also Part 5.

11 Mobile devices

The compatibility requirement specified in Part 5 does not apply to radiocommunications receivers operated under an 1800 MHz band spectrum licence that are mobile devices, 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

12 Notional receiver performance level

(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) A notional receiver performance level is set out in Schedule 1 and is to be used when setting a compatibility requirement for a radiocommunications receiver. A receiver should meet the notional receiver performance level to gain protection from interference from a radiocommunications transmitter specified in this instrument.

Part 5—Compatibility requirement

13 Compatibility

(1) In relation to a fixed receiver specified in subsection (2), the licensee of a fixed transmitter operated under an apparatus licence or a spectrum licence must ensure that the transmitter meets the ***compatibility requirement*** in Schedule 2.

(2) For the purposes of subsection (1), a fixed receiver is specified if the receiver:

(a) is operated under a spectrum licence; and

(b) has at least the notional receiver performance level; and

(c) was included in the Register before:

(i) if the fixed transmitter mentioned in subsection (1) is operated under a spectrum licence – the fixed transmitter was included in the Register; or

(ii) if the fixed transmitter mentioned in subsection (1) is operated under an apparatus licence – the apparatus licence was issued; and

(d) one of the following applies

(i) the receiver is operated in the 1800 MHz lower band; or

(ii) the receiver is operated in the 1800 MHz upper band, and has an effective antenna height for each increment 1, $h_{e_1(\varphi_n)}$ that is less than or equal to 10 metres; or

(iii) the receiver is operated in the 1800 MHz upper band, and has an effective antenna height for each increment 1, $h_{e_1(\varphi_n)}$ that is greater than 10 metres, and does not operate within 10 MHz (measured from the lower or upper limit of the occupied bandwidth of the received signal) of a frequency adjacent spectrum licence (in relation to the licence mentioned in paragraph (a)) authorising the operation of radiocommunication devices in the same area, and is not in an area of high mobile use.

Note: Radiocommunications receivers operated in the 1800 MHz upper band are generally not afforded protection from radiocommunications devices exempt from registration. It is the responsibility of the operator of the receiver to manage any interference from such devices through negotiation and mechanisms such as implementing guard bands and appropriate site selection.

(3) Licensees of radiocommunications transmitters operated under a spectrum licence are expected to reduce their out-of-band emissions to the levels set out in Schedule 3, if it would facilitate compatibility with registered radiocommunications receivers operated under a frequency adjacent spectrum licence. This expectation applies irrespective of which radiocommunications device was registered first. Licensees are responsible for bearing the costs of changes to their own system. If reducing out-of-band emissions would not facilitate compatibility between services, generally the radiocommunications device first registered will be given priority.

Note: This requirement reflects the fact that the strict out-of-band emission limits in a spectrum licence core condition have not been imposed. This was done to avoid any unnecessary costs and burden on licensees to implement arrangements that are only required to enable compatibility in specific situations. Consequently, it is only expected that licensees of 1800 MHz spectrum licences reduce out-of-band emissions when required to facilitate compatibility with other services.

(4) For subparagraphs (2)(e)(ii) and (iii), the effective antenna height $h_{e_1(\varphi_n)}$ for a radiocommunications receiver is calculated in accordance with Schedule 3 to the section 145 determination, as if the receiver were a radiocommunications transmitter.

Note: The 10 metre effective antenna height limit for the 1800 MHz upper band was chosen to be consistent with common deployment practice at the time this instrument was made.

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

Schedule 1 Notional receiver performance level

(subsections 5(1) and 12(2))

1 Notional receiver performance level

(1) An 1800 MHz receiver meets the ***notional receiver performance level*** if it meets the following performance parameters:

(a) adjacent channel selectivity;

(b) intermodulation response rejection;

(c) receiver blocking; and

(d) spurious response immunity.

(2) These performance parameters are assessed at the antenna connector port of the radiocommunications 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.

2 Adjacent channel selectivity

(1) In this instrument, ***adjacent channel selectivity*** means the 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 signal from an adjacent channel.

(2) The adjacent channel selectivity parameter is expressed as a ratio between the unwanted signal and the compatibility requirement.

(3) The minimum adjacent channel selectivity is 43.5 dB, with a frequency offset of less than 5 MHz.

3 Intermodulation response rejection

(1) In this instrument, ***intermodulation response rejection*** means the 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.

(2) The intermodulation response rejection requirement is expressed as a maximum power level of an individual unwanted signal, when in the presence of another signal of equal or greater power level, and with a frequency relationship that may result in a third order or higher intermodulation product on the operating frequency of the radiocommunications receiver.

(3) The minimum intermodulation response rejection level is -74 dBm per 30 kHz, at a frequency offset greater than or equal to 5 MHz.

4 Receiver blocking

The minimum receiver blocking requirement, expressed as a tolerance to a minimum unwanted signal level, is:

(a) -65dBm per 30 kHz at frequency offsets greater than 5 MHz, within the 1690 MHz–1805 MHz frequency band; or

(b) a total mean power of -15 dBm outside the 1690 MHz–1805 MHz frequency band.

5 Spurious response immunity

(1) In this instrument, ***spurious response immunity*** means the measure of the ability of a radiocommunications receiver to discriminate between a wanted signal and an unwanted signal at any out-of-band frequency to which the receiver responds.

(2) The spurious response immunity, expressed as a ratio between the unwanted signal and the compatibility requirement, is 65 dB.

6 Receiver antenna gain and feeder losses

The antenna gain and feeder loss recorded for the radiocommunications receiver in the Register should be used for coordination. If an antenna gain or feeder loss is not specified in the Register, then use the following values:

(a) antenna gain of 18 dBi in all directions;

(b) feeder loss of 2 dB.

Schedule 2 Compatibility requirement

(subsections 5(1) and 13(1))

1 Compatibility requirement

(1) The compatibility requirement for a fixed receiver, operated under a spectrum licence (***the receiver's spectrum licence***), to be provided by a radiocommunications transmitter operated under an apparatus licence or a spectrum licence, is a maximum unwanted signal level, at the antenna connector port of the receiver, that is never more than -123.5 dBm for more than 1% of the time in any 1 hour period, when measured within a 30 kHz rectangular bandwidth that is within the frequency band of the receiver's spectrum licence.

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

Schedule 3 Additional out-of-band emission limit

(subsection 13(3))

1 Additional out-of-band emission limit

(1) The additional out-of-band emission limit is the emission limit derived from the combination of the following:

(a) the existing non-spurious emission limits defined in Licence Schedule 2 of an 1800 MHz spectrum licence;

(b) the additional radiofrequency filtering (between the antenna and the antenna connector of the radiocommunications transmitter) equal to:

(i) for FreqOffset ≤ 20.5 MHz :

$$\left(2 + 60log_{10}\left[1 + \left(2 \times \frac{FreqOffset}{10}\right)^{1.8}\right]\right) dBm$$

;

(ii) for FreqOffset > 20.5 MHz : 70 dB.

Note: All 1800 MHz spectrum licences are available, free of charge, from the Register on the ACMA's website at www.acma.gov.au.

(2) In subitem (1), ***FreqOffset*** is the smallest frequency difference between either the upper or lower limit of the frequency band of the spectrum licence under which the radiocommunications receiver operates, and a given frequency outside that band.