

Radiocommunications Advisory Guidelines (Managing Interference to Spectrum Licensed Receivers — 850/900 MHz Band) 2021

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

Dated:

Member

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 – 850/900 MHz Band) 2021*.

## 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](http://www.legislation.gov.au).

## 3 Revocation

The *Radiocommunications Advisory Guidelines (Managing Interference to Managing Interference to Spectrum Licensed Receivers – 800 MHz Band) 2012* (F2013C00674) are revoked.

## 4 Authority

This instrument is made under section 262 of the *Radiocommunications Act 1992*.

## 5 Definitions

(1) In this instrument:

***850 MHz band*** means the following frequency bands:

(a) 814 MHz to 825 MHz;

(b) 859 MHz to 870 MHz.

***900 MHz band*** means the following frequency bands:

(a) 890 MHz to 915 MHz; and

(b) 935 MHz to 960 MHz.

***Act*** means the *Radiocommunications Act 1992*.

***adjacent channel***, in relation to a particular channel,means a channel with a centre frequency offset on either side of the assigned channel frequency of the particular channel by a specific frequency relation.

***adjacent channel selectivity***, in relation to a radiocommunications receiver, means a measure of the receiver’s ability 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.

***adjacent spectrum licence***, in relation to a spectrum licence, means another spectrum licence that has either: a common frequency boundary; or a common geographic boundary adjacent to that licence.

***blocking***, in relation to a radiocommunications receiver operating on a particular channel,means a measure of the ability of the receiver to receive a wanted signal in the presence of a high power unwanted signal on frequencies other than those of the adjacent channels to the particular channel.

***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 area and frequencies of the licence.

***in-band*** means:

(a) for a radiocommunications device operated under a spectrum licence, the frequencies within which radiocommunications devices are authorised to operate; and

(b) for a radiocommunications device operated under an apparatus licence, the frequencies on which the radiocommunications device is authorised to operate.

***intermodulation response rejection***, in relation to a radiocommunications receiver, means a measure of the ability of the 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.

***mobile transmitter*** means a radiocommunications transmitter that is only designed or intended for use while in motion or during halts at unspecified points on land or sea.

***out-of-band*** means:

(a) for a radiocommunications device operated under a spectrum licence, a frequency on which the device is not authorised to operate; and

(b) for a radiocommunications device operated under an apparatus licence, a frequency on which the device is not authorised to operate.

***RALI FX 22*** means the Radiocommunications Assignment and Licensing Instruction FX 22 *Frequency assignment requirements for the fixed service in the 800 MHz band*, published by the ACMA.

Note The RALI FX 22 is available, free of charge, on the ACMA website: www.acma.gov.au.

***RALI LM 8*** means the Radiocommunications Assignment and Licensing Instruction LM 8 *Frequency Assignment Requirements for the Land Mobile Service*, published by the ACMA.

Note The RALI LM 8 can be accessed, free of charge, on the ACMA website: www.acma.gov.au.

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

***unwanted emissions***, in relation to a spectrum licence,means any radio emission (whether or not an out-of-band emission or a spurious emission) outside the lower frequency limit and upper frequency limit specified in a spectrum licence.

***unwanted signal*** means any radio emission from any radiocommunications transmitter that is not communicating with the radiocommunications receiver used for a service protected by this instrument.

***wanted signal*** means a radio emission from a radiocommunications transmitter designed for communication between the transmitter and radiocommunications receiver used for a service 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) Register; and

(k) spectrum licence.

(2) Unless the contrary intention appears, terms used in this instrument that are defined in the *Radiocommunications (Unacceptable Levels of Interference — 850/900 MHz Band) Determination 2021* have the same meaning as in that determination.

Note: The following terms that are used in this instrument are defined in the *Radiocommunications (Unacceptable Levels of Interference — 850/900 MHz Band) Determination 2021*:

(a) 850/900 MHz band;

(b) centre frequency;

(c) device boundary;

(d) device boundary criterion;

(e) fixed receiver; and

(f) geographic area.

(3) Unless the contrary intention appears, terms used in this instrument that are defined in:

(a) the *Radiocommunications (Interpretation) Determination 2015*; or

(b) if another instrument replaces that determination – that other instrument;

have the same meaning as in that determination or instrument.

Note: The following terms that are used in this instrument are defined in Schedule 1 to the *Radiocommunications (Interpretation) Determination 2015:*

1. land mobile service; and
2. spurious emission.

(4) In this instrument, unless otherwise specified, a reference to 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.

## 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 is a reference to that other instrument 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 operation of radiocommunications devices in a frequency band and in a geographic area, as specified in the relevant licence. Interference may occur between adjacent spectrum licences, and may include:

(a) in-band interference, across the geographic area; and

(b) out-of-band interference, across the frequency bands.

(2) The interference is managed by creating emission buffer zones along the boundaries of the geographic area and frequency bands specified in the spectrum licence. This is achieved through the application of:

(a) core licence conditions that all spectrum licences are subject to under section 66 of the Act, including both:

(i) emission limits outside the geographic area;

(ii) emission limits outside the frequency band; and

(b) the *Radiocommunications (Unacceptable Levels of Interference — 850/900  GHz Band) Determination 2021* about what are unacceptable levels of interference for the registration of radiocommunications devices under a spectrum licence; and

(c) advisory guidelines made under section 262 of the Act, which guide decisions about managing interference in specified circumstances.

## 8 Purpose

(1) The purpose of this instrument is to:

(a) manage in-band and out-of-band interference by providing compatibility requirements for registered fixed receivers operated under a spectrum licence issued for the 850/900 MHz band; and

(b) provide protection to radiocommunications receivers operated under spectrum licences issued for the 850/900 MHz band from interference caused by radiocommunications transmitters operated under an apparatus licence, class licence, or spectrum licence.

(2) This instrument 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 interference with radiocommunications under spectrum licences in the 850/900 MHz band.

(3) The ACMA will consider this instrument to determine whether a radiocommunications receiver operated under a spectrum licence in the 850/900 MHz band is affected by interference from a radiocommunications transmitter operated under an apparatus licence, class licence or spectrum licence, where there are no other interference protection arrangements between the relevant parties.

(4) This instrument does not prevent a spectrum licensee negotiating other interference protection arrangements with another person.

# Part 3 Managing interference from other services

## 9 In-band interference

(1) In-band interference caused to a radiocommunications receiver operated under a spectrum licence in the 850/900 MHz band by a radiocommunications transmitter operated under an adjacent spectrum licence, is managed by:

(a) imposing the core conditions in section 66 of the Act on each spectrum licence; and

(b) the device boundary criteria and deployment constraints specified in the *Radiocommunications (Unacceptable Levels of Interference — 850/900 GHz Band) Determination 2021*.

(2) In-band interference caused to a radiocommunications receiver operated under a spectrum licence in the 850/900 GHz band by:

(a) a radiocommunications transmitter operated under an apparatus licence issued on or after 18 June 2013, in the 825MHz to 845 MHz and 870 MHz to890 MHz frequency bands; or

(b) a radiocommunications transmitter operated under an apparatus licence, issued after the commencement of the *Radiocommunications Spectrum Marketing Plan (850/900 MHz Band) 2021*, in the 814 MHz to 825 MHz, 859 MHz to 915 MHz and 935 MHz to 960 MHz frequency bands;

is managed as if the transmitter were operated under a spectrum licence. The device boundary criteria mentioned in paragraph 9(1)(b), are taken to be applicable to an apparatus-licensed radiocommunications transmitter mentioned in paragraph (a) or (b). Spectrum licensed receivers should be afforded the same level of in-band protection from new apparatus-licensed radiocommunications transmitters as they would be afforded from radiocommunications transmitters operated under an adjacent spectrum licence.

(3) The device boundary criteria mentioned in paragraph 9(1)(b) incorporate emission limits that provide protection from in-band interference in the geographic area of a spectrum licence.

## 10 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. Out-of-band interference:

(a) can extend for many megahertz outside the upper and lower frequency limits of a spectrum licence;

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

(c) can be 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 devices that are located near each other.

Example: Devices that are located near each other include multi-operator sites.

(3) Emission limits are not solely 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.

## 11 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 under this instrument.

## 12 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 850/900 MHz band because the transient nature of these devices prevents the use of this requirement as an interference management procedure.

## 13 Apparatus licensed services near the 850 MHz band

1. A spectrum licensed radiocommunications base station and mobile receivers operated in the 850 MHz band use:
2. near-or-adjacent frequencies to trunked land mobile transmitters in the following frequency ranges:
3. 806 MHz to 809 MHz;
4. 851 MHz to 854 MHz;
5. Fixed service transmitters in the 845 MHz to 851 MHz band.

Note:1 For trunked land mobile transmitters mentioned in paragraph 1(a) see RALI LM8 for details about these services and coordination requirements with 850 MHz base station receivers.

Note For fixed service transmitters mentioned in paragraph 1(b), see RALI FX22 for details about these services and coordination requirements with 850 MHz base station receivers.

## 14 Spectrum licensed services near the 850 MHz band

1. Spectrum licensed radiocommunications mobile receivers operated in the 850 MHz band use near-or-adjacent frequencies to other spectrum licence mobile transmitters operated under 900 MHz band spectrum licences.
2. As mentioned in Section 10, the transient nature of mobile devices make it difficult to codify practical interference mitigation measures in these guidelines, and since mobile devices are not registered they are not afforded protection from other services. However, the first-in-time coordinated nature of base station transmitters and receivers operating in both the 850 MHz and 900 MHz bands does provide some natural, although only partial, mitigation of interference potential.

## 15 Apparatus licensed services near the 900 MHz band

Apparatus licensed aeronautical navigation services are operated in the 960 MHz to 215 MHz frequency range, above the 900 MHz spectrum licensed band upper boundary at 960 MHz. Immediately adjacent to or near-adjacent to the 960 MHz boundary, these services are limited to the operation of distance measuring equipment (DME) and tactical air navigation (TACAN) systems. As mobile receivers operating in the upper segment of the 900 MHz band are not registered, they are not afforded any protection from aeronautical services, but this is not expected to cause any issues because both mobile and aeronautical services have operated on either side the 960 MHz boundary for many years.

## 16 Spectrum licensed services near the 900 MHz band

1. Spectrum licensed base station radiocommunications receivers that are operated in the 900 MHz band use near-or-adjacent frequencies to base station radiocommunications transmitters operated under a spectrum licence in the 850 MHz band. New base station radiocommunications receivers operated under a spectrum licence in the 900 MHz band will generally not be given protection from existing registered base station radiocommunications transmitters operated under a spectrum licence in the 850 MHz band.
2. Coordination of a new base station radiocommunications receiver, under a spectrum licence in the 900 MHz band, with a registered base station radiocommunications transmitter, under a spectrum licence in the 850 MHz band, may occur through bilateral negotiation between licensees, or by applying the receiver compatibility requirements and notional receiver performance specified in Schedules 2 and 1 respectively, taking into account details of the transmitter as entered in the Register and core conditions on the spectrum licence in the 850 MHz band.

## 17 Class licensed services near the 900 MHz band

The *Radiocommunications (Low Interference Potential Devices) Class Licence 2015* authorises ubiquitous, uncoordinated operation by a range of radiocommunications transmitters in the frequency range 915 MHz to 935 MHz. This class licence prescribes operating conditions, including transmission limits and references to applicable equipment standards, that enable coexistence with other services.

# Part 4 Minimum level of receiver performance

## 18 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) A notional receiver performance level is set out in Schedule 1 to this instrument 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

## 19 Compatibility

(1) If a fixed radiocommunications transmitter is operated under an apparatus licence or is registered in relation to a spectrum licence, the licensee of that licence should ensure that the transmitter meets the compatibility requirements set out in Schedule 2, in relation to a fixed radiocommunications receiver protected by this instrument, if the receiver:

(a) has the notional level of performance set out in Schedule 1 to this instrument;

(b) is registered in the Register, before the date of issue of the apparatus licence the transmitter is operated under, or before the date of registration of the transmitter in relation to the spectrum licence; and

(c) operates under a spectrum licence in either:

(i) the 814 MHz to 845 MHz or 890 MHz to 915 MHz frequency ranges, with an effective antenna height (for any increment 1, he1(φn)) greater than 20 metres; or

(ii) the 859 MHz to 890 MHz or 935 MHz to 960 MHz frequency ranges, with an effective antenna height (for any increment 1, he1(φn)) less than 10 metres.

Note 1: An example of a fixed radiocommunications transmitter operated under an apparatus licence or registered in relation to a spectrum licence is a base station transmitter in the 850 MHz band. Such a fixed transmitter may cause interference to a base station receiver in the 900 MHz band.

Note 2; The effective antenna height (in each increment 1, he1(φn)) for a receiver is calculated in accordance with the formula specified in the *Radiocommunications (Unacceptable Levels of Interference — 850/900 MHz Band) Determination 2021*, as if the receiver were a transmitter.

Note 2: The 20 and 10 metre effective antenna height limit is chosen to be consistent with common deployment practice.

(2) Subsection (1) does not apply to trunked land mobile services that are operated in either the 806 MHz to 809 MHz frequency range or the 851 MHz to 854 MHz frequency range, under an apparatus licence:

(a) issued before 30 June 2024, and

(b) that replaced an apparatus licence issued in either the 820 MHz to 825 MHz frequency range or 865 MHz to 870 MHz frequency range.

# Schedule 1 Notional receiver performance level

(subsection 18(2) and paragraph 19(1)(a))

1 Performance parameters

(1) The notional level of performance for a radiocommunications receiver operated under a spectrum licence in the 850/900 MHz band in relation to an unwanted signal from a radiocommunications transmitter operated under an apparatus licence, relates to:

(a) adjacent channel selectivity;

(b) receiver intermodulation response rejection; and

(c) receiver blocking.

(2) This level of performance is taken to be a notional level of performance with reference to a radiocommunications receiver sensitivity level of -101dBm measured within a 5 MHz rectangular bandwidth that is within the frequency band of the spectrum licence.

(3) A notional radiofrequency selectivity for the radiocommunications receiver (between the antenna and the antenna connector of the equipment) may be assumed to be at least equal to:

(a) 2 + 60log10[1+(2FreqOffset/5)1.5] dB for FreqOffset 2.5 MHz;

(b) 2 + 60log10[1+(2FreqOffset/5)2] dB for 2.5 < FreqOffset 9 MHz; and

(c) 70dB for FreqOffset > 9 MHz,

where***FreqOffset*** is the smallest frequency difference between either the upper or lower limits of the frequency band of the spectrum licence under which the receiver operates and any frequency outside that frequency band.

(4) These performance parameters of the notional radiocommunications receiver are defined at the antenna connector port of the receiver unit or, in the case where additional devices such as filters or amplifiers are installed in the signal path ahead of the receiver, then the values are defined at the outer antenna connector port.

2 Adjacent channel selectivity

An adjacent channel selectivity of greater than or equal to the following relative figures for respective channel bandwidths is required:

|  |  |
| --- | --- |
| Channel Bandwidth | Relative adjacent channel selectivty |
| < 20 MHz | 44 dB |
| ≥ 20 MHz | 37 dB |

*Source: 3GPP TS 38.104 V17.0.0 (2020-12) Table 7.2.2-1-1*

3 Receiver intermodulation response rejection

A receiver intermodulation response rejection greater than or equal to the following figures for frequency offsets between the edge of the wanted channel and the centre of the interfering intermodulation product bandwidth is required:

|  |  |  |
| --- | --- | --- |
| **Base station channel bandwidth of the lowest/highest carrier received (MHz)** | **Interfering signal centre frequency offset from the lower/upper base Station radiofrequency bandwidth edge (MHz)** | **Intermodulation Performance Requirement (dB)** |
| 5 MHz | ± 7.5 MHz | 43.7 dB |
| 10 MHz | ± 7.465 MHz | 43.7 dB |
| 15 MHz | ± 7.43 MHz | 43.7 dB |
| 20 MHz | ± 7.395 MHz | 37.3 dB |
| 25 MHz | ± 7.465 MHz | 37.3 dB |
| 30 MHz | ± 7.43 MHz | 37.3 dB |

*Source: 3GPP TS 38.104 V17.0.0 (2020-12) Table 7.7.2-1 & 7.2.2.-2*

4 Receiver blocking

A receiver blocking level greater than or equal to the following figures for interfering signals in the frequency ranges set out below is required:

|  |  |  |
| --- | --- | --- |
| **Base station channel bandwidth of the lowest/highest carrier received (MHz)** | **Interfering signal centre frequency minimum offset from the lower/upper base station radiofrequency bandwidth edge or sub-block edge inside a sub-block gap (MHz)** | **Relative Blocking Requirements (dB)** |
| 5, 10, 15, 20 MHz | ± 7.5 | 52.7 dB |
| 25, 30, 40, 50, 60, 70, 80, 90 & 100 MHz | ± 30 | 52.7 dB |

*Source: 3GPP TS 38.104 V17.0.0 (2020-12) Table 7.4.2.2-1 & 7.2.2-2*

5 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 13 dBi in all directions applies.

# Schedule 2 Compatibility requirement

(subsection 19(1))

(1) For the purpose of assessing compatibility with other radiocommunications services, the performance of a fixed radiocommunications receiver operated under a spectrum licence in the 850/900 MHz band is:

(a) a minimum wanted signal level of -83 dBm per 5 MHz corresponding to a bit error rate of 0.001; and

(b) a wanted to unwanted ratio of 24 dB for an annual availability of 99.99%.

(2) The minimum wanted signal level is inclusive of a 1dB increase in the receiver noise floor. Logarithmic scaling should be used to find the appropriate level in alternative bandwidths.