



Radiocommunications Advisory Guidelines (Managing Interference from Spectrum Licensed Transmitters – 2.5 GHz 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

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[signed]
~~Member~~/General Manager

Australian Communications and Media Authority

Part 1—Preliminary

1 Name

These are the *Radiocommunications Advisory Guidelines (Managing Interference from Spectrum Licensed Transmitters – 2.5 GHz 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 the *Radiocommunications Advisory Guidelines (Managing Interference from Transmitters – 2.5 GHz Band) 2012*

The *Radiocommunications Advisory Guidelines (Managing Interference from Transmitters – 2.5 GHz Band) 2012* [F2012L02550] are repealed.

5 Definitions

(1) In this instrument, unless the contrary intention appears:

2.3 GHz band means the frequency band 2302 MHz to 2400 MHz.

2.5 GHz band means the 2.5 GHz lower band and the 2.5 GHz upper band.

2.5 GHz lower band means the frequency band 2500 MHz to 2570 MHz.

2.5 GHz mid-band gap means the frequency band 2570 MHz to 2620 MHz.

2.5 GHz spectrum licence means a spectrum licence that authorises the operation of radiocommunications devices in the 2.5 GHz band.

2.5 GHz upper band means the frequency band 2620 MHz to 2690 MHz.

Act means the *Radiocommunications Act 1992*.

ARS means aeronautical radionavigation service.

ARQZWA (short for Australian Radio Quiet Zone Western Australia) has the meaning given by the *Radiocommunications (Australian Radio Quiet Zone Western Australia) Frequency Band Plan 2023*, or any instrument made under section 32 of the Act as a replacement of that plan.

EESS means earth exploration-satellite service.

ENG means electronic news gathering.

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.

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; or
- (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.

ITU-R Recommendation means a recommendation made by the Radiocommunication Sector of the International Telecommunication Union.

Note: ITU-R Recommendations are available, free of charge, from the website of the International Telecommunication Union at www.itu.int.

MSS means mobile-satellite service.

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

Radio Regulations means the document titled ‘Radio Regulations’, published by the International Telecommunication Union.

Note 1: The Radio Regulations are not regulations made by the Governor-General under the Act.

Note 2: The Radio Regulations are available, free of charge, from the International Telecommunication Union’s website at www.itu.int.

RALI FX 3 means the Radiocommunications Assignment and Licensing Instruction FX 3 *Microwave fixed services frequency coordination*, published by the ACMA.

Note: RALI FX 3 is available, free of charge, from the ACMA’s website at www.acma.gov.au.

RALI MS 31 means the Radiocommunications Assignment and Licensing Instruction MS 31 *Notification zones for apparatus licensed services around radio astronomy facilities*, published by the ACMA.

Note: RALI MS 31 is available, free of charge, from the ACMA’s website at www.acma.gov.au.

RALI MS 32 means the Radiocommunications Assignment and Licensing Instruction MS 32 *Coordination of apparatus licensed services within the Australian Radio Quiet Zone Western Australia*, published by the ACMA.

Note: RALI MS 32 is available, free of charge, from the ACMA’s website at www.acma.gov.au.

RALI MS 35 means the Radiocommunications Assignment and Licensing Instruction MS 35 *Coordination of 2.5 GHz Band Spectrum Licensed Transmitters with Radiodetermination Stations operated by the Department of Defence in the 2700-2900 MHz band*, published by the ACMA.

Note: RALI MS 35 is available, free of charge, from the ACMA’s website at www.acma.gov.au.

RLS means radiolocation service.

RSS means radiodetermination-satellite service.

SRS means space research service.

TDD means time division duplex.

WAS means wireless access service.

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) frequency band;
- (e) interference;
- (f) radiocommunications device;
- (g) radiocommunications receiver;
- (h) radiocommunications transmitter;
- (i) Register;
- (j) spectrum licence;
- (k) spectrum plan.

(2) In this instrument, unless the contrary intention appears, each of following terms has the meaning given by the spectrum plan:

- (a) *aeronautical radionavigation service*;
- (b) *Australian footnote reference*;
- (c) *earth exploration-satellite service*;
- (d) *fixed service*;
- (e) *international footnote reference*;
- (f) *mobile-satellite service*;
- (g) *radio astronomy service*;
- (h) *radiodetermination-satellite service*;
- (i) *radiodetermination service*;
- (j) *radiolocation service*;
- (k) *space research service*.

(3) In this instrument, unless the contrary intention appears, each of the terms listed in subsection (4) has the meaning given by:

- (a) the *Radiocommunications (Interpretation) Determination 2015*; or
- (b) if another instrument replaces that determination and defines the term – the other instrument.

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

- (a) *fixed earth station*;
- (b) *point to point station*;
- (c) *space receive station*;
- (d) *station*.

(5) 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) The 2.5 GHz band has been allocated for spectrum licensing. Spectrum licensed, apparatus licensed and class licensed radiocommunications transmitters communicate with radiocommunications receivers in and adjacent to the 2.5 GHz band. These receivers may suffer interference from unwanted emissions, blocking and intermodulation caused by a radiocommunications transmitter operated under a 2.5 GHz spectrum licence.
- (2) This instrument has been made to provide guidance on the management of interference from radiocommunications transmitters operated under a 2.5 GHz spectrum licence to:
 - (a) spectrum licensed receivers operating in the 2.5 GHz mid-band gap, typically used for ENG (Part 3);
 - (b) apparatus licensed receivers used for fixed services, operating in and adjacent to the 2.5 GHz band (Part 4);
 - (c) apparatus licensed receivers used for space services, operating in the frequency bands 2483.5 MHz to 2500 MHz and 2690 MHz to 2700 MHz (Part 5);
 - (d) apparatus licensed receivers used for ARS, RLS and the Department of Defence, operating in the frequency band 2700 MHz to 2900 MHz (Part 7).
- (3) This instrument also provides advice (Part 6) on the following:
 - (a) the notification of sites to assist in the protection of radiocommunications receivers used for radio astronomy services, operating in the frequency bands 2500 MHz to 2550 MHz and 2655 MHz to 2700 MHz, on a fortuitous basis; and
 - (b) coordination with the ARQZWA.
- (4) As radio waves propagate in different ways because of factors such as frequency, terrain, atmospheric conditions and topography, there are a number of ways to predict path loss. The ITU-R Recommendation P.1144 “Guide to the application of the propagation methods of Radiocommunication Study Group 3” provides a guide on the application of various propagation methods developed by the Radiocommunication Sector of the International Telecommunication Union. It advises on the most appropriate methods for particular applications, as well as the limits, required input information and output for each of these methods. The most recent version of propagation models developed by the Radiocommunication Sector of the International Telecommunication Union should be considered when modelling propagation in the 2.5 GHz band.

Note 1: ITU-R Recommendation P.1144 is available, free of charge, from the International Telecommunication Union’s website at www.itu.int.

Note 2: The use of other published propagation models applicable to the 2.5 GHz band may also be suitable.
- (5) The ACMA may take this instrument into account in determining whether a radiocommunications transmitter operated under a 2.5 GHz spectrum licence is causing interference to an apparatus licensed or class licensed radiocommunications receiver operating in circumstances set out in this instrument.
- (6) This instrument does not prevent a person negotiating and implementing other protection requirements with other persons.

Part 3—Spectrum licensed receivers

8 Background

- (1) Fixed receivers operate under spectrum licences other than 2.5 GHz band spectrum licences. These include:
 - (a) receivers operating in the 2.3 GHz band, used at the time this instrument was made for TDD fixed and mobile broadband services;
 - (b) those operating in the 2.5 GHz mid-band gap, used at the time this instrument was made for ENG. ENG involves the use of a variety of link types, including low height short range wireless camera to news vehicle links, higher power directional links from nomadic news van stations to fixed radiocommunications receiver sites called collection stations and helicopter relay links.

Note: For more information see ITU-R Recommendation F.1777 “System characteristics of television outside broadcast, electronic news gathering and electronic field production in the fixed service for use in sharing studies”. ITU-R Recommendation F.1777 is available, free of charge, from the website of the International Telecommunication Union at www.itu.int.

- (2) Typically, the ACMA has not published documents setting out coordination requirements between radiocommunications devices operated under spectrum licences. It is necessary to look at the relevant spectrum licence technical framework for each band to determine system characteristics and coordination requirements.

9 Protection requirements

2.5 GHz mid-band gap

- (1) The protection requirements and minimum level of performance for a fixed receiver operating under a spectrum licence in the 2.5 GHz mid-band gap, that was first included in the Register before the registration of a fixed transmitter operating under a 2.5 GHz spectrum licence, are in the:
 - (a) compatibility requirement; and
 - (b) notional receiver performance levels;
 specified for these receivers in the *Radiocommunications Advisory Guidelines (Managing Interference to Spectrum Licensed Receivers – 2.5 GHz Mid Band Gap) 2023*.
- (2) The location and antenna details of fixed receivers operating under a spectrum licence in the 2.5 GHz mid-band gap can be found in the Register, and coordination with these receivers is typically necessary for outdoor fixed transmitters located within 1.5 kilometres of the receivers.

2.3 GHz band

- (3) The protection requirements and minimum level of performance for a fixed receiver operating under a spectrum licence in the 2.3 GHz band, that was first included in the Register before the registration of a fixed transmitter operating under a 2.5 GHz spectrum licence, are in the:
 - (a) compatibility requirement; and
 - (b) notional receiver performance levels;
 specified for these receivers in the:
 - (c) *Radiocommunications Advisory Guidelines (Managing Interference to Spectrum Licensed Receivers – 2.3 GHz Band) 2013*; or
 - (d) if a later instrument replaces those guidelines – the later instrument.

- (4) The location and antenna details of fixed receivers operating under a spectrum licence in the 2.3 GHz band can be found in the Register, and coordination is typically necessary for fixed transmitters located within 500 metres of the receivers.

Part 4—Fixed services

10 Background

- (1) Fixed receivers are used for fixed services in and adjacent to the 2.5 GHz band.
- (2) Apparatus licensed point to point stations generally operate in accordance with RALI FX 3.

11 Protection requirements

- (1) Protection requirements for an apparatus licensed point to point station, included in the Register before the registration of a fixed transmitter operating under a 2.5 GHz spectrum licence, are in RALI FX 3.
- (2) In planning for the operation of a radiocommunications transmitter under a 2.5 GHz spectrum licence, spectrum licensees must generally provide the same level of out-of-band and in-band protection to a point to point station as must be provided by the licensees of apparatus licensed fixed transmitters, the frequencies of which are generally assigned in accordance with RALI FX 3.

Part 5—Space services

12 Background

- (1) Radiocommunications receivers operate in spectrum adjacent to the 2.5 GHz band, for the following services:
 - (a) EESS;
 - (b) MSS;
 - (c) RSS; and
 - (d) SRS.
- (2) The spectrum plan allocates the frequency band 2690 MHz to 2700 MHz to EESS for passive (receive only) use, and to SRS for passive use. Radiocommunications receivers used for EESS in this band are located on satellites. Radiocommunications receivers for SRS in this band are fixed earth stations.
- (3) The spectrum plan allocates the frequency band 2483.5 MHz to 2500 MHz to MSS for space-to-Earth transmissions, and to RSS for space-to-Earth transmissions.

13 Protection requirements

- (1) A radiocommunications transmitter operating under a 2.5 GHz band spectrum licence is not taken to cause interference to adjacent band radiocommunications receivers used for EESS, MSS and RSS, provided it operates in accordance with all conditions (including the core conditions) of the licence.
- (2) Protection requirements for licensed SRS space receive and earth receive stations, included in the Register before the registration of a fixed transmitter operating under a 2.5 GHz spectrum licence, are set out in ITU-R SA.609 “Protection criteria for telecommunications links for Manned and Unmanned near-Earth research satellites”.

Note: ITU-R Recommendations are available, free of charge, from the International Telecommunication Union’s website at www.itu.int.
- (3) Additional information regarding the calculation of appropriate coordination distances, propagation models and threshold coordination levels is in Appendix 7 of the Radio Regulations.

Part 6—Radio astronomy

14 Background

- (1) The spectrum plan:
 - (a) recognises that certain radiocommunications receivers used for radio astronomy operate in the frequency band 2500 MHz to 2550 MHz (see Australian footnote reference AUS87); and
 - (b) allocates the frequency band 2655 MHz to 2690 MHz to, among other things, radio astronomy as a secondary service; and
 - (c) allocates the frequency band 2690 MHz to 2700 MHz to, among other things, radio astronomy as a primary service.

Note: For primary services and secondary services, see sections 5, 7 and 12 of the spectrum plan.

- (2) The site located in remote central Western Australia identified for radio astronomy use has been protected by the establishment of the ARQZWA across the radiofrequency spectrum from 70 MHz through to 25.25 GHz. The location of the site, and the definition of the ARQZWA, can be found in the *Radiocommunications (Australian Radio Quiet Zone Western Australia) Frequency Band Plan 2023*. An area within 70 km of the site has been excluded from the geographic area of the 2.5 GHz band spectrum licences.

15 Protection requirements

Receivers specified in AUS87

- (1) Licensees of 2.5 GHz spectrum licences should have regard to radiocommunications receivers used for radio astronomy that are specified in Australian footnote reference AUS87 (**AUS87 receivers**).
- (2) Although the AUS87 receivers operate on a fortuitous basis, the ACMA encourages direct liaison between licensees of 2.5 GHz spectrum licences with the operators of AUS87 receivers, particularly during the system planning phase for new fixed transmitters to be registered under 2.5 GHz spectrum licences, to minimise the potential for interference to AUSS87 receivers. Licensees of 2.5 GHz spectrum licences should follow the notification arrangements specified for apparatus licensed radiocommunications devices set out in RALI MS 31.

Receivers in 2655 MHz to 2690 MHz

- (3) No protection requirements are currently specified for radiocommunications receivers used for radio astronomy in the frequency band 2655 MHz to 2690 MHz.

Receivers in 2690 MHz to 2700 MHz

- (4) Licensees of 2.5 GHz spectrum licences are to comply with the protection criteria for radiocommunications receivers in the frequency band 2690 MHz to 2700 MHz, to protect them from unwanted emissions in that band, set out in ITU-R Recommendation RA.769-2 “Protection criteria used for radio astronomical measurements”.

Note: The Paul Wild Observatory near Narrabri, New South Wales, and the Parkes Observatory near Parkes, New South Wales, operate radiocommunications receivers in the frequency band 2690 MHz to 2700 MHz. The details of these receivers are set out in Australian footnote reference AUS87 of the spectrum plan and in the Register.

- (5) Historical ACMA studies suggest that coordination is typically necessary for fixed transmitters located within 100 kilometres of a protected radiocommunications receiver in the frequency band 2690 MHz to 2700 MHz. However, it should be possible to locate fixed transmitters to distances as close as 20 kilometres of these receivers, if appropriate antenna heights, antenna directions and power levels are used, and the terrain is appropriate.

ARQZWA

- (6) Licensees of 2.5 GHz spectrum licences in areas adjacent to the ARQZWA should coordinate proposed stations using the methods and limits set out for apparatus licensees in RALI MS 32.

Part 7—Radiodetermination service

16 Background

- (1) Radiocommunications receivers operate in the frequency band 2700 MHz to 2900 MHz for the following:
 - (a) ARS;
 - (b) RLS.
- (2) The receivers operated for ARS are used for air traffic control, and interference has a potential impact on air safety. Many of these receivers are located at major airports. These receivers are often part of radar systems.
- (3) The receivers operated for RLS are used for meteorological purposes, such as weather radar. These receivers are often part of radar systems.
- (4) The spectrum plan allocates the frequency band 2700 MHz to 2900 MHz for RLS as a secondary service; however, international footnote reference 423 recognises that ground base radars used for meteorological purposes operate on a basis of equality with ARS.

Note: For primary services and secondary services, see sections 5, 7 and 12 of the spectrum plan.

- (5) Radiocommunications receivers are also used by the Department of Defence for radiodetermination in the frequency band 2700 MHz to 2900 MHz.

17 Protection requirements

ITU-R Recommendations

- (1) Licensees of 2.5 GHz spectrum licences should have regard to:
 - (a) ITU-R Recommendation M.1464 “Characteristics of non-meteorological radiolocation radars and characteristics and protection criteria for sharing studies for the aeronautical radionavigation and radars in the radiodetermination service operating in the frequency band 2 700-2 900 MHz” for characteristics for coordination with ground-based radars;
 - (b) ITU-R Recommendation M.1461 “Procedures for determining the potential for interference between radars operating in the radiodetermination service and systems in other services” for information on procedures for coordination;
 - (c) ITU-R Recommendation M.1849 “Technical and operational aspects of ground-based meteorological radars” for technical and operational characteristics of meteorological radars and related interference protection criteria.

ARS

- (2) Protection is to be afforded for all licensed fixed receivers used for ARS operating in the frequency band 2700 MHz to 2900 MHz, included in the Register before a fixed transmitter operating under a 2.5 GHz spectrum licence was included in the Register.
- (3) Coordination is typically required for all fixed transmitters located within 10 kilometres of a fixed receiver used for ARS that is included in the Register with the station class ‘AL’.

Department of Defence

- (4) Protection is to be afforded for all radiocommunications receivers operating in the frequency band 2700 MHz to 2900 MHz for a radiodetermination service used by the Department of Defence. Protection is achieved if the out-of-band emissions from a station operating under a spectrum licence in the 2.5 GHz band do not exceed a maximum power flux density limit of -125 dBm/MHz/m^2 at the antenna height, at the radar site.
- (5) Additional guidance on coordination with radiodetermination services operated by the Department of Defence is provided in RALI MS 35.

RLS

- (6) Protection is to be afforded to all licensed fixed receivers used for RLS operating in the frequency band 2700 MHz to 2900 MHz, included in the Register before a fixed transmitter operating under a 2.5 GHz spectrum licence was included in the Register.
- (7) Coordination is typically required for all fixed transmitters located within 20 kilometres of a fixed receiver used for RLS that is included in the Register with the station class 'LR'.