

EXPLANATORY STATEMENT

Approved by the Australian Communications and Media Authority

Radiocommunications Act 1992

Radiocommunications Advisory Guidelines (Managing Interference from Spectrum Licensed Transmitters – 2.5 GHz Band) 2023

Radiocommunications Advisory Guidelines (Managing Interference to Spectrum Licensed Receivers – 2.5 GHz Band) 2023

Radiocommunications (Unacceptable Levels of Interference – 2.5 GHz Band) Determination 2023

Authority

The Australian Communications and Media Authority (**the ACMA**) has made the:

- *Radiocommunications Advisory Guidelines (Managing Interference from Spectrum Licensed Transmitters – 2.5 GHz Band) 2023* (**Transmitter Advisory Guidelines**); and
- *Radiocommunications Advisory Guidelines (Managing Interference to Spectrum Licensed Receivers – 2.5 GHz Band) 2023* (**Receiver Advisory Guidelines**);

under section 262 of the *Radiocommunications Act 1992* (**the Act**) and subsection 33(3) of the *Acts Interpretation Act 1901* (**the AIA**).

Section 262 of the Act provides that the ACMA may make written advisory guidelines about any aspect of radiocommunication or radio emission.

Subsection 33(3) of the AIA relevantly provides that where an Act confers a power to make a legislative instrument, the power shall be construed as including a power exercisable in the like manner and subject to like conditions (if any) to repeal, rescind, revoke, amend or vary any such instrument.

The ACMA has made the *Radiocommunications (Unacceptable Levels of Interference – 2.5 GHz Band) Determination 2023* (**the ULOI Determination**) under subsection 145(4) of the Act and subsection 33(3) of the AIA.

Subsection 145(1) of the Act provides that the ACMA may refuse to include details of a radiocommunications transmitter that is proposed to be operated under a spectrum licence in the Register of Radiocommunications Licences (**Register**), maintained by the ACMA under Part 3.5 of the Act. The ACMA may so refuse where it is satisfied that the transmitter could cause an unacceptable level of interference to the operation of other radiocommunications devices under that or any other spectrum licence, or any other licence. Subsection 145(4) of the Act provides that the ACMA may determine, by written instrument, what are unacceptable levels of interference for the purposes of section 145 of the Act.

Purpose and operation of the instruments

A spectrum licence permits a licensee, subject to specified conditions, to operate radiocommunications devices within a particular spectrum space, defined by 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. Interference can also occur between spectrum licensed services and services operating under apparatus and class licensing arrangements.

The Act provides a number of means by which the ACMA may manage interference resulting from the operation of a radiocommunications transmitter under a spectrum licence, including the ability to make advisory guidelines under section 262 of the Act and the ability to determine an unacceptable level of interference under section 145 of the Act.

Advisory guidelines

The ACMA has allocated spectrum licences in the following parts of the spectrum:

- 2500 MHz to 2570 MHz;
- 2620 MHz to 2690 MHz;

(collectively, the **2.5 GHz band**), and the ACMA has previously made two instruments under section 262 of the Act in relation to those licences:

- the *Radiocommunications Advisory Guidelines (Managing Interference from Transmitters – 2.5 GHz Band) 2012 (2012 Transmitter Advisory Guidelines)*; and
- the *Radiocommunications Advisory Guidelines (Managing Interference to Receivers – 2.5 GHz Band) 2012 (2012 Receiver Advisory Guidelines)*.

The Transmitter Advisory Guidelines and the Receiver Advisory Guidelines are part of a set of legal instruments made by the ACMA that comprise the technical framework applicable to spectrum licences in the 2.5 GHz band, and revoke and replace the 2012 Transmitter Advisory Guidelines and 2012 Receiver Advisory Guidelines, respectively.

The purpose of the Transmitter Advisory Guidelines is to provide guidance to assist in managing the potential for interference to particular radiocommunications receivers, operating under apparatus or class licences, from interference caused by radiocommunications transmitters operating under spectrum licences in the 2.5 GHz band (**2.5 GHz transmitters**), where the 2.5 GHz transmitters operate in adjacent geographic areas, or adjacent frequency bands, to those receivers. The Transmitter Advisory Guidelines also provide guidance on managing interference across the geographic areas of spectrum licences issued in the 2.5 GHz band.

The Transmitter Advisory Guidelines aim to manage the potential for unwanted emissions, blocking and intermodulation products caused by radiocommunications transmitters operating under a spectrum licence interfering with radiocommunications receivers in the circumstances specified in the Transmitter Advisory Guidelines. The Transmitter Advisory Guidelines provide advice regarding the management of interference across the geographical areas of the 2.5 GHz band, or in adjacent frequency bands. Operators of spectrum licensed and apparatus licensed services should use the Transmitter Advisory Guidelines in the planning of services or the resolution of interference. The ACMA will also take the Transmitter Advisory Guidelines into account when determining whether a spectrum licensee is causing interference to a licensed radiocommunications receiver that is operating in accordance with its licence conditions.

The purpose of the Receiver Advisory Guidelines is to provide guidance to assist in managing the potential for interference to particular radiocommunications receivers, operating under a spectrum licence, from interference caused by radiocommunications transmitters operated under an apparatus or class licence or from 2.5 GHz transmitters, where the transmitters operate in adjacent geographic areas, or adjacent frequency bands, to those receivers. The Receiver Advisory Guidelines also provide guidance on managing interference across the geographic areas of spectrum licences issued in the 2.5 GHz band.

The Receiver Advisory Guidelines aim to manage the potential for in-band and out-of-band interference caused by radiocommunications transmitters operated under an apparatus, class or spectrum licence interfering with radiocommunications receivers in the circumstances specified in the Receiver Advisory Guidelines. The Receiver Advisory Guidelines provide advice regarding the management of interference across the geographical areas of the 2.5 GHz band, or in adjacent frequency bands. Operators of spectrum, class or apparatus licensed services should use the Receiver Advisory Guidelines in the planning of services or in the resolution of interference with radiocommunications receivers operated under spectrum licences in the 2.5 GHz band. The ACMA will also take the Receiver Advisory Guidelines into account when determining whether an apparatus licensee, class licensee or spectrum licensee is causing interference to a spectrum licensed radiocommunications receiver that is operating in accordance with its licence conditions.

The Transmitter Advisory Guidelines and Receiver Advisory Guidelines do not limit the actions of a spectrum licensee in negotiating operating or protection arrangements with another licensee.

The Act does not prescribe any consequences for failing to comply with the Transmitter Advisory Guidelines or the Receiver Advisory Guidelines.

ULOI Determination

Section 69 of the Act requires each spectrum licence to include a condition that a radiocommunications transmitter must not be operated under the licence unless the requirements of the ACMA under Part 3.5 of the Act for registration of transmitters have been met.

The ULOI Determination aims to ensure that high levels of emission from radiocommunications transmitters operated under a spectrum licence issued in the 2.5 GHz band do not cause an unacceptable level of interference to radiocommunications.

The ULOI Determination sets out what is meant by an ‘unacceptable level of interference’ in relation to a radiocommunications transmitter operated under a spectrum licence issued in the 2.5 GHz band. If the ACMA is satisfied that the operation of the radiocommunications transmitter could cause interference of the kind set out in the ULOI Determination, the ACMA will be able to refuse to register the transmitter. Refusal to register a radiocommunications transmitter is subject to internal reconsideration and review by the Administrative Appeals Tribunal (see paragraph 285(n) of the Act).

Generally

A provision-by-provision description of:

- the Transmitter Advisory Guidelines is set out in the notes at **Attachment A**;
- the Receiver Advisory Guidelines is set out in the notes at **Attachment B**;
- the ULOI Determination is set out in the notes at **Attachment C**.

The Transmitter Advisory Guidelines, Receiver Advisory Guidelines and ULOI Determination are disallowable legislative instruments under the *Legislation Act 2003* (**the LA**). They are subject to the sunset provisions in Part 4 of Chapter 3 of the LA.

Documents incorporated by reference

Subsection 314A(2) of the Act provides that an instrument under the Act may make provision in relation to a matter by applying, adopting or incorporating (with or without modifications) matter contained in any other instrument or writing as in force or existing at a particular time, or from time to time.

The Transmitter Advisory Guidelines incorporate the following documents by reference, as existing from time to time, or otherwise refer to them:

- 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*, published by the Radiocommunications Sector (ITU-R) of the International Telecommunication Union (ITU), and available, free of charge, at www.itu.int;
- ITU-R Recommendation M.1461 *Procedures for determining the potential for interference between radars operating in the radiodetermination service and systems in other services*, published by the ITU-R, and available, free of charge, at www.itu.int;
- ITU-R Recommendation M.1464 *Characteristics of non-meteorological radiolocation radars, and characteristics and protection criteria for sharing studies for aeronautical radionavigation and radars in the radiodetermination service operating in the frequency band 2 700-2 900 MHz*, published by the ITU-R, and available, free of charge, at www.itu.int;
- ITU-R Recommendation M.1849 *Technical and operational aspects of ground-based meteorological radars*, published by the ITU-R, and available, free of charge, at www.itu.int;
- ITU-R Recommendation P.1144 *Guide to the application of the propagation methods of Radiocommunications Study Group 3*, published by the ITU-R, and available, free of charge, at www.itu.int;
- ITU-R Recommendation RA.769-2 *Protection criteria used for radio astronomical measurements*, published by the ITU-R, and available, free of charge, at www.itu.int;
- ITU-R Recommendation SA.609 *Protection criteria for telecommunications links for Manned and Unmanned near-Earth research satellites*, published by the ITU-R, and available, free of charge, at www.itu.int;
- the Radio Regulations published by the ITU (**Radio Regulations**). The Radio Regulations contain Articles, Appendixes, Resolutions and Recommendations of the ITU, relating to international radiocommunications coordination. The Radio Regulations are available, free of charge, at www.itu.int;
- Radiocommunications Assignment and Licensing Instruction (**RALI**) FX 3 *Microwave fixed services frequency coordination (RALI FX 3)*, published by the ACMA and available, free of charge, from the ACMA's website at www.acma.gov.au;
- RALI MS 31 *Notification zones for apparatus licensed services around radio astronomy facilities (RALI MS 31)*, published by the ACMA and available, free of charge, from the ACMA's website at www.acma.gov.au;
- RALI MS 32 *Coordination of apparatus licensed services within the Australian Radio Quiet Zone Western Australia (RALI MS 32)*, published by the ACMA and available, free of charge, from the ACMA's website at www.acma.gov.au;

- RALI 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 (RALI MS 35)*, published by the ACMA and available, free of charge, from the ACMA's website at www.acma.gov.au.

The ULOI Determination incorporates the following documents by reference, as existing from time to time:

- 3 Second SRTM Derived Digital Elevation Model (DEM) Version 1.0 (**DEM-3S**), created by Geoscience Australia, and available free of charge from its website at www.ga.gov.au. (Geoscience Australia has also published a smoothed variation of DEM-3S. This smoothed variation contains different elevation data than DEM-3S and is not to be used for the purposes of the ULOI Determination);
- the Australian Spectrum Map Grid 2012, published by the ACMA, and available free of charge from its website at www.acma.gov.au;
- the Radio Regulations.

The ULOI Determination also incorporates the designation of the Geocentric Datum of Australia in Commonwealth of Australia *Gazette* GN 35, dated 6 September 1995 (**GDA94**), as existing on that date. *Gazette* GN 35 is available, free of charge, from the Federal Register of Legislation at www.legislation.gov.au.

The Transmitter Advisory Guidelines also incorporate the following Acts and legislative instruments, as in force from time to time:

- the *Australian Radiofrequency Spectrum Plan 2021 (spectrum plan)*;
- the *Radiocommunications Advisory Guidelines (Managing Interference to Spectrum Licensed Receivers – 2.3 GHz Band) 2013*;
- the *Radiocommunications Advisory Guidelines (Managing Interference to Spectrum Licensed Receivers – 2.5 GHz Mid Band Gap) 2023*;
- the *Radiocommunications (Interpretation) Determination 2015 (Interpretation Determination)*, or any instrument replacing that determination;
- the *Radiocommunications (Australian Radio Quiet Zone Western Australia) Frequency Band Plan 2023 (ARQZWA Band Plan)*, or any instrument replacing that band plan.

The Receiver Advisory Guidelines also incorporate the ULOI Determination, as in force from time to time.

The ULOI Determination also incorporates the *Seas and Submerged Lands Act 1973*, as in force from time to time.

The ULOI Determination also incorporates the *Radiocommunications (Unacceptable Levels of Interference – 2.5 GHz Band) Determination 2012 (2012 ULOI Determination)*. The effect of the 2012 ULOI Determination is saved in relation to radiocommunications transmitters included in the Register before the commencement of the ULOI Determination, and is incorporated as in force at the time each such transmitter was included in the Register.

Each of the Transmitter Advisory Guidelines, Receiver Advisory Guidelines and ULOI Determination refers to the Act, the AIA and the LA, without incorporating them by reference.

Each of these Acts and legislative instruments is available, free of charge, from the Federal Register of Legislation (www.legislation.gov.au).

Consultation

Before the Transmitter Advisory Guidelines, Receiver Advisory Guidelines and ULOI Determination were made, the ACMA was satisfied that consultation was undertaken to the extent appropriate and reasonably practicable, in accordance with section 17 of the LA.

Under Part 4 of Chapter 3 of the LA, the 2012 Transmitter Advisory Guidelines, 2012 Receiver Advisory Guidelines and the 2012 ULOI Determination were due to ‘sunset’ on 1 April 2023. The ACMA analysed the instruments and identified that they were a necessary and useful part of the regulatory framework. The spectrum licences in the 2.5 GHz band are due to expire in 2029. Given this, the ACMA decided to remake the 2012 Transmitter Advisory Guidelines, the 2012 Receiver Advisory Guidelines and the 2012 ULOI Determination, to ensure the spectrum licence technical framework would be in place for the remainder of the spectrum licences’ duration. The ACMA proposed to remake the instruments with some changes.

The ACMA took technical framework reviews of nearby frequency bands into account when preparing the draft Transmitter Advisory Guidelines, draft Receiver Advisory Guidelines and draft ULOI Determination. A draft version of each instrument was released for public consultation on 4 November 2022, together with the consultation paper *Automatic sunset of legislative instruments: Proposal to remake instruments for the 700 MHz, 1800 MHz, 2.5 GHz and 2.5 GHz Mid-Band gap spectrum-licensed bands*. Consultation closed on 2 December 2022.

The ACMA received 5 responses. All 5 responses supported the 2.5 GHz draft instruments, with some comments which resulted in changes to the instruments. In particular, in paragraph 17(1)(a) of the Transmitter Advisory Guidelines, a correction was made to the number and title of ITU-R Recommendation M.1464.

Regulatory impact assessment

A preliminary assessment of the proposal to remake the 2012 Transmitter Advisory Guidelines, 2012 Receiver Advisory Guidelines and 2012 ULOI Determination was conducted by the Office of Impact Analysis (OIA) (formerly the Office of Best Practice Regulation (OBPR)), based on information provided by the ACMA, for the purposes of determining whether a Regulation Impact Statement (RIS) would be required. OIA advised that a RIS would not be required because the proposed regulatory change is minor or machinery in nature (OIA reference number OBPR22-03576).

Statement of compatibility with human rights

Subsection 9(1) of the *Human Rights (Parliamentary Scrutiny) Act 2011* requires the rule maker in relation to a legislative instrument to which section 42 of the LA applies (disallowance), to cause a statement of compatibility with human rights to be prepared in respect of that legislative instrument.

The statement of compatibility set out below has been prepared to meet that requirement.

Overview of the instruments

Section 262 of the Act permits the ACMA to make advisory guidelines about any aspect of radiocommunication or radio emissions. The purpose of the Transmitter Advisory Guidelines is to provide information and guidance to assist with the management of interference to radiocommunications receivers operating under apparatus, class and spectrum licences in or adjacent to the 2.5 GHz band caused by radiocommunications transmitters operating under spectrum licences issued in the 2.5 GHz band.

The purpose of the Receiver Advisory Guidelines is to provide information and guidance to assist with the management of interference to radiocommunications receivers operating under spectrum licences in the 2.5 GHz band caused by radiocommunications transmitters operating under other licences issued in or near the 2.5 GHz band.

Section 69 of the Act requires each spectrum licence to include a condition which specifies that a radiocommunications transmitter must not be operated under the licence unless the requirements of the ACMA under Part 3.5 of the Act for registration of transmitters have been met.

Under subsection 145(1) of the Act, the ACMA may, if it is satisfied that the operation of a radiocommunications transmitter could cause an unacceptable level of interference to other radiocommunications devices, refuse to register the transmitter. The ULOI Determination sets out what is meant by an ‘unacceptable level of interference’ in relation to a radiocommunications transmitter operated under a spectrum licence issued in the 2.5 GHz band. The ULOI Determination only applies in relation to 2.5 GHz band spectrum licensees.

Human rights implications

The ACMA has assessed whether the Transmitter Advisory Guidelines, Receiver Advisory Guidelines and ULOI Determination are compatible with human rights, being the rights and freedoms recognised or declared in the international instruments listed in subsection 3(1) of the *Human Rights (Parliamentary Scrutiny) Act 2011*.

Having considered the likely impact of the Transmitter Advisory Guidelines, Receiver Advisory Guidelines and ULOI Determination and the nature of the applicable rights and freedoms, the ACMA has formed the view that the Transmitter Advisory Guidelines, Receiver Advisory Guidelines and ULOI Determination do not engage any of those rights or freedoms.

Conclusion

Each of the Transmitter Advisory Guidelines, Receiver Advisory Guidelines and ULOI Determination is compatible with human rights as it does not raise any human rights issues.

Notes to the *Radiocommunications Advisory Guidelines (Managing Interference from Spectrum Licensed Transmitters – 2.5 GHz Band) 2023*

Part 1 – Preliminary

Section 1 Name

This section provides for the Transmitter Advisory Guidelines to be cited as the *Radiocommunications Advisory Guidelines (Managing Interference from Spectrum Licensed Transmitters – 2.5 GHz Band) 2023*.

Section 2 Commencement

This section provides for the Transmitter Advisory Guidelines to commence on the day after the day they are registered on the Federal Register of Legislation.

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

Section 3 Authority

This section identifies the provision of the Act that authorises the making of the Transmitter Advisory Guidelines, namely section 262 of the Act.

Section 4 Repeal of the *Radiocommunications Advisory Guidelines (Managing Interference from Transmitters – 2.5 GHz Band) 2012*

This section repeals the *Radiocommunications Advisory Guidelines (Managing Interference from Transmitters – 2.5 GHz Band) 2012* (F2012L02550).

Section 5 Definitions

This section defines a number of key terms used throughout the Transmitter Advisory Guidelines.

A number of other expressions used in the Transmitter Advisory Guidelines are defined in the Act.

This section also provides that unless the contrary intention appears, certain terms used in the Transmitter Advisory Guidelines that are defined in the spectrum plan have the same meaning as in that plan.

This section also provides that unless the contrary intention appears, certain terms used in the Transmitter Advisory Guidelines that are defined in the Interpretation Determination, or another instrument that replaces that determination, have the same meaning as in those instruments.

This section also provides that, in the Transmitter Advisory Guidelines, 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.

Section 6 References to other instruments

This section provides that in the Transmitter Advisory Guidelines, unless the contrary intention appears:

- a reference to another legislative instrument is a reference to that other legislative instrument as in force from time to time; and
- a reference to any other kind of instrument or writing is a reference to that other instrument or writing as in force or existing from time to time.

Part 2 – Overview

Section 7 Background

Subsection 7(1) provides basic information about spectrum licences and the modes of interference occurring across frequency boundaries and geographic areas of spectrum licences. It describes how interference is managed, and specifies the provisions of the Act relevant to interference management.

The Transmitter Advisory Guidelines have been made to provide guidance in the resolution of cases of interference occurring to licensed radiocommunications receivers, caused by radiocommunications transmitters operated under 2.5 GHz band spectrum licences.

Subsection 7(2) provides that the Transmitter Advisory Guidelines provide guidance for the management of interference to licensed radiocommunications receivers operating in relation to:

- spectrum licensed receivers operating in the part of the spectrum from 2570 MHz to 2620 MHz (**2.5 GHz mid-band gap**) (Part 3);
- certain apparatus licensed receivers used for fixed services (Part 4);
- certain apparatus licensed receivers used for space services (Part 5); and
- certain apparatus licensed receivers used for the aeronautical radionavigation service (**ARS**), for the radiolocation service (**RLS**) and by the Department of Defence (Part 7).

Subsection 7(3) provides that the Transmitter Advisory Guidelines provide advice (Part 6) for:

- the protection of radiocommunications receivers used for radio astronomy services; and
- the coordination with the Australian Radio Quiet Zone Western Australia (**ARQZWA**) (Part 8).

Subsection 7(4) advises that, when modelling propagation loss in the 2.5 GHz band, ITU-R Recommendation P.1144 provides a guide on the application of various propagation methods. These methods were developed internationally by the ITU-R. ITU-R Recommendation P.1144 advises users on the most appropriate propagation methods for particular applications, as well as the limits, required input information, and output for each of the methods. The subsection recommends that the most recent version of the propagation models defined by the ITU-R should be considered when modelling propagation in the 2.5 GHz band.

Subsection 7(5) states that the ACMA will take the Transmitter Advisory Guidelines into account in determining whether interference has occurred from a radiocommunications transmitter operating under a spectrum licence in the 2.5 GHz band to a radiocommunications receiver operating under another licence.

Subsection 7(6) notes that the Transmitter Advisory Guidelines do not prevent a licensee negotiating other protection arrangements with another licensee or other person.

Part 3 – Spectrum licensed receivers

Section 8 Background

Subsection 8(1) describes the general types of services operating in the two other spectrum licensed bands close to the 2.5 GHz band (including the 2.5 GHz mid-band gap). The subsection provides a general description of the television outside broadcast links used in electronic news gathering services, operating in the 2.5 GHz mid-band gap. More information about these links and services is available from ITU- R Recommendation F.1777.

Subsection 8(2) provides that the ACMA has typically not published guidance documents for coordination of devices operated under spectrum licences, beyond the relevant technical framework instruments that apply to particular bands (including instruments such as the Transmitter Advisory Guidelines and Receiver Advisory Guidelines).

Section 9 Protection requirements

Subsections 9(1) and 9(2) set out the protection requirements for fixed receivers operated under a spectrum licence in the 2.5 GHz mid-band gap that were included in the Register before the registration of fixed transmitters operated under 2.5 GHz band spectrum licences. These protection requirements mean that it is typically necessary for fixed outdoor transmitters operating under 2.5 GHz band spectrum licences, located within 1.5 kilometres of a receiver, to operate in coordination with the receiver.

Subsection 9(3) sets out protection requirements of receivers operated under a spectrum licence in the 2302 MHz to 2400 MHz frequency band (**2.3 GHz band**) that were included in the Register before the registration of fixed transmitters under 2.5 GHz band spectrum licences. These protection requirements mean that it is also typically necessary for fixed outdoor transmitters operating under 2.5 GHz band spectrum licences, located within 500 metres of a receiver, to operate in coordination with the receiver.

Part 4 – Fixed services

Section 10 Background

Section 10 describes the arrangements for point to point fixed service receivers that operate in and around the 2.5 GHz band, which may be affected by radiocommunications transmitters operated under spectrum licences in the 2.5 GHz band. The point to point fixed link bands are generally located, and operate, in accordance with criteria set out in RALI FX 3

Section 11 Protection requirements

Section 11 provides that, for point to point fixed service receivers, protection requirements are found in RALI FX 3.

Part 5 – Space services

Section 12 Background

Section 12 describes the space services provided in spectrum adjacent to the 2.5 GHz band.

Section 13 Protection requirements

Section 13 sets outlines protection requirements for earth stations used as part of the space services provided in spectrum adjacent to the 2.5 GHz band. The protection requirements are set out in ITU-R Recommendation SA.609 and Appendix 7 of the Radio Regulations.

Part 6 – Radio astronomy

Section 14 Background

Subsection 14(1) explains that Part 6 applies to the protection of sensitive radio astronomy service receivers operated in a number of bands in and adjacent to the 2.5 GHz band.

Radio astronomy receivers operate in the 2500 MHz to 2550 MHz frequency band on a fortuitous basis using frequencies in and adjacent to the 2.5 GHz band, subject to Australian footnote AUS87 in the spectrum plan.

The spectrum plan allocates the 2655 MHz to 2690 MHz frequency band on a ‘secondary service’ basis to the radio astronomy service.

The spectrum plan allocates the 2690 MHz to 2700 MHz frequency band on a ‘primary service’ basis to the radio astronomy service, and at several radio astronomy sites around Australia apparatus licences authorise the operation of devices in these bands.

Subsection 14(2) describes the site located in remote central Western Australia which has been established for radio astronomy use and has been protected by the establishment of the ARQZWA by the ARQZWA Band Plan. The ARQZWA has been established across the radio spectrum from 70 MHz through to 25.25 GHz. An area within 70 kilometres of the site has been excluded from the geographic area of the 2.5 GHz band spectrum licences.

Section 15 Protection requirements

Subsections 15(1) and (2) provide that, although the radio astronomy services operate on a fortuitous reception basis in the bands subject to footnote AUS 87 in the spectrum plan, the ACMA encourages spectrum licensees to liaise directly with radio astronomy station operators in order to minimise the potential for interference to occur. Licensees of 2.5 GHz spectrum licences should follow the notification arrangements specified for apparatus licensed radiocommunications devices set out in RALI MS 31.

Subsection 15(3) specifies that there are no protection requirements specified for radio astronomy receivers in the 2655 MHz to 2690 MHz frequency band.

Subsection 15(4) provides that the protection criteria set out in ITU-R Recommendation RA.769-2 apply to protect receivers in the 2690 MHz to 2700 MHz frequency band. Subsection 15(5) indicates that spectrum licensees in the 2.5 GHz band should coordinate against existing fixed receivers in the 2690 MHz to 2700 MHz frequency band when the licensees’ transmitters are within 100 kilometres of a fixed receiver that is included in the Register, though in some cases the transmitters may be as close as 20 kilometres.

Subsection 15(6) requires licensees in areas adjacent to the ARQZWA to coordinate proposed stations with reference to the methods and limits set out in RALI MS 32.

Part 7 – Radiodetermination service

Section 16 Background

Section 16 provides information about the types of apparatus licensed receivers operating as part of the ARS and the RLS in the band 2700 MHz to 2900 MHz frequency band, and those in that band operated by the Department of Defence for radiodetermination. These receivers are typically radar stations used for air traffic control or weather monitoring

Section 17 Protection requirements

Subsection 17(1) provides that spectrum licensees should have regard to the characteristics and protection criteria for the receivers referred to in subsection 16(1) set out in ITU-R Recommendations M.1461, M.1464 and M.1849.

Subsections 17(2) and (3) provide that spectrum licensees in the 2.5 GHz band should coordinate against existing ARS fixed receivers, when within 10 kilometres of such a receiver that is included in the Register with the station class 'AL'.

Subsection 17(4) provides that protection is afforded to Department of Defence radiodetermination receivers if the out-of-band emissions of a transmitter operated under a 2.5 GHz band spectrum licence do not exceed the specified maximum power flux density limit at the Defence site, at the antenna height for the receiver.

Subsection 17(5) notes that RALI MS 35 provides further information to assist coordination with radar stations in the 2700 MHz to 2900 MHz frequency band.

Subsections 17(6) and (7) provide that spectrum licensees in the 2.5 GHz band should coordinate against existing RLS fixed receivers, when within 20 kilometres of such a receiver that is included in the Register with the station class 'LR'.

Notes to the *Radiocommunications Advisory Guidelines (Managing Interference to Spectrum Licensed Receivers — 2.5 GHz Band) 2023*

Part 1 – Preliminary

Section 1 Name

This section provides for the Receiver Advisory Guidelines to be cited as the *Radiocommunications Advisory Guidelines (Managing Interference to Spectrum Licensed Receivers — 2.5 GHz Band) 2023*.

Section 2 Commencement

This section provides for the Receiver Advisory Guidelines to commence on the day after the day they are registered on the Federal Register of Legislation.

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

Section 3 Authority

This section identifies the provision of the Act that authorises the making of the Receiver Advisory Guidelines, namely section 262 of the Act.

Section 4 Repeal of the *Radiocommunications Advisory Guidelines (Managing Interference to Receivers – 2.5 GHz Band) 2012*

This section repeals the *Radiocommunications Advisory Guidelines (Managing Interference to Receivers — 2.5 GHz Band) 2012* (F2012L02549).

Section 5 Definitions

This section defines a number of key terms used throughout the Receiver Advisory Guidelines.

A number of other expressions used in the Receiver Advisory Guidelines are defined in the Act.

This section also provides that, in the Receiver Advisory Guidelines, 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.

Section 6 References to other instruments

This section provides that in the Receiver Advisory Guidelines, unless the contrary intention appears:

- a reference to another legislative instrument is a reference to that other legislative instrument as in force from time to time; and
- a reference to any other kind of instrument or writing is a reference to that other instrument or writing as in force or existing from time to time.

Part 2 – Overview

Section 7 Background

Subsections 7(1) and 7(2) provide basic information about spectrum licences and the modes of interference occurring across frequency boundaries and geographical areas of spectrum licences. They describe how interference is managed under the Act.

Subsection 7(3) outlines the purpose of the Receiver Advisory Guidelines. Their purpose include assisting in the management of in-band and out-of-band interference by providing compatibility requirements for registered fixed receivers operated under a spectrum licence issued for the 2.5 GHz band. They are also intended to provide protection to radiocommunications receivers operated under spectrum licences in the 2.5 GHz band from interference caused by radiocommunications transmitters operated under an apparatus, class or spectrum licence. The management of, and protection from, interference is facilitated by the minimum level of receiver performance requirements set out in the Receiver Advisory Guidelines.

Subsection 7(4) states that the Receiver Advisory Guidelines are intended to assist in the management of interference to a radiocommunications receiver operating under a spectrum licence in the 2.5 GHz band.

Subsection 7(5) provides that the Receiver Advisory Guidelines should be used by operators of spectrum and apparatus licensed services in planning their services or for the resolution of interference with radiocommunications under spectrum licences in the 2.5 GHz band.

Subsection 7(6) notes that the Receiver Advisory Guidelines do not prevent a person negotiating other protection arrangements with another person.

Part 3 – Managing interference from other services

Section 8 In-band interference

Subsection 8(1) explains the methods through which in-band interference to a radiocommunications receiver operated under a spectrum licence in the 2.5 GHz band, caused by spectrum licensed transmitters, is managed. If interference is from an adjacent spectrum licensed radiocommunications transmitter, it is managed through the core conditions of that licence and application of the device boundary criterion and deployment constraints specified in the ULOI Determination.

Subsection 8(2) explains the methods through which in-band interference to a radiocommunications receiver operated under a spectrum licence in the 2.5 GHz band, caused by apparatus-licensed transmitters, is managed. If interference is caused by an apparatus-licensed radiocommunications transmitter, it is managed as if the transmitter is operated under a spectrum licence. This means that the device boundary criterion that applies to spectrum-licensed radiocommunications transmitters is treated as though it applies to those apparatus licensed radiocommunications transmitters.

Subsection 8(3) explains that the device boundary criterion is used for in-band interference. The device boundary criterion also incorporates emission limits which provide reasonable protection to radiocommunications services within the geographic area of the spectrum licence. While emission limits are used to manage out-of-band interference, they cannot be used to provide protection to radiocommunications services along the geographic boundaries of a spectrum licence.

Subsection 8(4) provides that a radiocommunications receiver operated under a spectrum licence in the 2.5 GHz band (**2.5 GHz band receiver**) will not be afforded protection from in-band interference caused by a class-licensed radiocommunications transmitter, operating in accordance with the relevant conditions of the class licence.

Section 9 Out-of-band interference

Section 9 explains what constitutes out-of-band interference to a radiocommunications receiver operated under a spectrum licence, and how it can be managed through compatibility requirements for receivers.

Out-of-band interference can occur when radiocommunications transmitters are operated near each other, whether in frequency or distance. It may consist of intermodulation products, harmonic signals, parasitic signals or other spurious signals generated at site or arriving at the radiocommunications receiver.

Out-of-band interference may extend for significant frequency separations on either side of a spectrum licence and its severity may depend on the quality of the radiocommunications receiver. For these reasons, out-of-band interference is managed through interference management procedures based on a compatibility requirement in Part 5 for radiocommunications receivers. A minimum level of receiver performance is specified in Part 4, in conjunction with a compatibility requirement for co-ordination with other licensed services. The use of a performance standard for spectrum licensed radiocommunications receivers ensures that the burden of mitigating interference is not solely placed on the operator of the radiocommunications transmitter.

Section 10 Recording radiocommunications receiver details in the Register

Section 10 explains that a 2.5 GHz band receiver will not be afforded protection unless the details of the receiver are included in the Register. In order to meet the compatibility requirement in Part 5 of the Receiver Advisory Guidelines, a fixed receiver operated under a 2.5 GHz band spectrum licence must have its details included in the Register.

Section 11 Mobile devices

Section 11 explains that the compatibility requirement in Part 5 is not applicable to mobile radiocommunications receivers.

Part 4 – Minimum level of receiver performance

Section 12 Notional receiver performance level

Section 12 explains why a notional receiver performance level is needed. The level of interference experienced by a radiocommunications receiver is in part dependent on the quality of the receiver itself. Emissions from a radiocommunications transmitter should not have to be reduced below a point where the performance of the receiver is the main cause of the problem. As a result, it is necessary to establish a benchmark performance level for radiocommunications receivers.

The benchmark performance level is set out in Schedule 1 to the Receiver Advisory Guidelines.

This section also provides that a radiocommunications receiver will need to meet the notional receiver performance level to gain protection from interference from a radiocommunications transmitter.

Part 5 – Compatibility requirement

Section 13 Compatibility

Section 13 provides that in relation to a fixed receiver, the licensee of a fixed transmitter operated under an apparatus licence or registered under a spectrum licence must ensure that the transmitter meets the compatibility requirement set out in Schedule 2, for the receiver to have protection from interference under the Receiver Advisory Guidelines. For this section to apply in relation to a fixed receiver, the receiver must:

- be operated under a spectrum licence in the 2.5 GHz band; and
- have at least the notional level of receiver performance set out in Schedule 1; and
- be included in the Register:
 - for a fixed radiocommunications transmitter registered in relation to a spectrum licence – before the date of registration of the transmitter in relation to the spectrum licence; or
 - for a fixed radiocommunications transmitter operated under an apparatus licence – before the date of issue of the apparatus licence the transmitter is operated under;
- if the receiver is operated in the part of the 2.5 GHz band from 2500 MHz to 2570 MHz – the receiver has an effective antenna height (worked out in accordance with the ULOI Determination) of at least 20 metres;
- if the receiver is operated in the part of the 2.5 GHz band from 2620 MHz to 2690 MHz – the receiver has an effective antenna height (worked out in accordance with the ULOI Determination) of at least 10 metres.

Schedule 1 Notional receiver performance level

Schedule 1 provides spectrum licensees with information regarding the notional performance of 2.5 GHz receivers operating under a spectrum licence in the 2.5 GHz band. The Schedule provides information relating to:

- receiver adjacent channel selectivity;
- receiver intermodulation response rejection; and
- receiver blocking.

Spectrum-licensed radiocommunications receivers operating in the 2.5 GHz band should meet this performance level to minimise interference from radiocommunications transmitters operating under other spectrum licences or apparatus or class licences.

Schedule 2 Compatibility requirement

Schedule 2 outlines, for the purpose of assessing compatibility with other radiocommunications services, the maximum unwanted signal level that a radiocommunications service in the 2.5 GHz band should not exceed. It also provides that logarithmic scaling should be used to find a maximum unwanted signal level in alternative bandwidths.

Notes to the *Radiocommunications (Unacceptable Levels of Interference – 2.5 GHz Band) Determination 2023*

Section 1 Name

This section provides for the ULOI Determination to be cited as the *Radiocommunications (Unacceptable Levels of Interference – 2.5 GHz Band) Determination 2023*.

Section 2 Commencement

This section provides for the ULOI Determination to commence on the day after the day it is registered on the Federal Register of Legislation.

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

Section 3 Authority

This section identifies the provision of the Act that authorises the making of the ULOI Determination, namely section 145(4) of the Act.

Section 4 Repeal of the *Radiocommunications (Unacceptable Levels of Interference – 2.5 GHz Band) Determination 2012*

This section repeals the *Radiocommunications (Unacceptable Levels of Interference – 2.5 GHz Band) Determination 2012* (F2012L02545).

Section 5 Definitions

This section defines a number of key terms used throughout the ULOI Determination.

A number of other expressions used in the ULOI Determination are defined in the Act.

This section also provides that, in the ULOI Determination, 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.

Section 6 References to other instruments

This section provides that in the ULOI Determination, unless the contrary intention appears:

- a reference to another legislative instrument is a reference to that other legislative instrument as in force from time to time; and
- a reference to any other kind of instrument or writing is a reference to that other instrument or writing as in force or existing from time to time.

Section 7 Emission designator

Section 7 provides that the designation of a radiocommunications transmitter's emission is to be worked out using the methods set out in the Radio Regulations, made by the ITU. It also provides that, for the purposes of determining the emission designation of a radiocommunications transmitter using the Radio Regulations, a reference to 'necessary bandwidth' in those Regulations for a given class of emission is taken to be a reference to the occupied bandwidth of the transmitter. The designation of a radiocommunications transmitter's emission is relevant for the coordination and identification of radio emissions and is also used when determining whether two or more fixed transmitters are a group of radiocommunications transmitters under section 8 of the ULOI Determination.

Section 8 Group of radiocommunications transmitters

Section 8 defines what ‘a group of radiocommunications transmitters’ is for the purpose of the ULOI Determination. A group of radiocommunications transmitters consists of two or more fixed transmitters at a common site that have common features. Including radiocommunications transmitters within a group may make registration of transmitters easier for licensees.

Section 9 Group of radiocommunications receivers

Section 9 defines what ‘a group of radiocommunications receivers’ is for the purpose of the ULOI Determination. A group of radiocommunications receivers consists of two or more fixed receivers at a common site that have certain features in common. Inclusion of radiocommunications receivers within a group may make registration of receivers easier for licensees.

Section 10 Unacceptable level of interference

Section 10 provides the definition of what will be deemed unacceptable levels of interference for the purpose of interference management in the 2.5 GHz band. A radiocommunications transmitter producing emissions that are found to cause unacceptable levels of interference to other services will, in most circumstances, not be registered on the Register for operation under a spectrum licence in the band, in accordance with subsection 145(1) of the Act. Licensees who operate such transmitters without registration will be in breach of the condition included in their spectrum licence because of section 69 of the Act and may become subject to further compliance action under the Act. It is an offence, and subject to a civil penalty, to operate a radiocommunications device otherwise than as authorised by a spectrum licence (see Part 3.1 of the Act). The maximum penalty for the offence is 2 years imprisonment for an individual, or 1500 penalty units (\$412,500 on the current value of a penalty unit) where the radiocommunications device is a radiocommunications transmitter. The maximum civil penalty is 300 penalty units (\$82,500 on the current value of a penalty unit) where the radiocommunications device is a radiocommunications transmitter. Operation of a radiocommunications device is not authorised by a spectrum licence if it is not in accordance with the conditions of the licence (subsection 64(2) of the Act).

Under subsection 10(1), a radiocommunications transmitter operated under a spectrum licence is taken to be causing unacceptable interference if:

- the operation of the transmitter breaches the core conditions of the licence relating to the maximum permitted level of radio emissions from the transmitter outside the geographic and frequency boundaries of the licence; or
- subject to an exception identified below (in subsection 10(2)), any part of the ‘device boundary’ of the transmitter lies outside the geographic area of the licence. The ‘device boundary’ is a theoretical boundary calculated around the transmitter using the methodology set out in Schedules 1, 2 and 3 to the ULOI Determination; or
- the device boundary of the transmitter cannot be calculated in accordance with item 1 of Schedule 2 to the ULOI Determination.

Subsection 10(2) provides that a level of interference mentioned in paragraph 10(1)(b) is not unacceptable in relation to a part of the device boundary that lies outside the geographic area of the spectrum licence, where the part of the device boundary is connected to a radial that:

- is mentioned in item 1 of Schedule 2; and
- does not cross over land outside the geographic area of the licence that is permanently above the Australian territorial sea baseline.

In this case, the fact that the device boundary is located outside of the geographic area of the spectrum licence does not mean that the radiocommunications transmitter is taken to be causing unacceptable interference. (The transmitter may, however, be taken to be causing unacceptable interference for other reasons.)

Subsection 10(3) provides that a radiocommunications transmitter operated under a spectrum licence is taken to be causing unacceptable interference if the operation of the transmitter results in emissions above the horizontal plane greater than 45 dBm/30 kHz equivalent isotropically radiated power.

Subsection 10(4) provides that a radiocommunications transmitter operated under a spectrum licence is taken to be causing unacceptable interference if:

- the transmitter operates in the 2500 MHz to 2570 MHz frequency band; and
- has an effective antenna height greater than 10 metres.

Subsection 10(5) provides that section 10 does not apply in relation to a radiocommunications transmitter to which section 12 applies.

Section 11 Accuracy

Section 11 specifies that, unless otherwise specified, the value of a parameter in Schedules 2 and 3 must be estimated with a level of confidence not less than 95 percent that the true value of the parameter will always remain below the requirement specified in this instrument. That is to say, an estimate must have a likelihood of 95 percent or greater of being within the requirement for the parameter.

Section 12 Transitional – radiocommunications transmitter registered before commencement of this instrument

Section 12 applies to a radiocommunications transmitter included in the Register in relation to a spectrum licence in the 2.5 GHz band before the ULOI Determination commenced. For such a transmitter, the level of interference caused by the transmitter is unacceptable if it would have been unacceptable under the 2012 ULOI Determination, as in force at the time the relevant transmitter was included in the Register. This preserves the rights of spectrum licensees who have already had radiocommunications transmitters included in the Register.

Schedule 1 Location

This Schedule sets out how to work out the location of a radiocommunications transmitter (and the location of a group of radiocommunications transmitters), in terms of the location of the centre of the antenna or antennas specified in latitude and longitude.

Schedule 2 Device boundary and device boundary criterion

This Schedule sets out the technical procedure for calculating the device boundary of a radiocommunications transmitter or group of radiocommunications transmitters, for the purposes of section 10 of the ULOI Determination.

Item 1 of Schedule 2

Item 1 of the Schedule details the steps involved in calculating the device boundary. The calculation is an iterative process and involves testing whether the device boundary criterion specified in item 2 is met at increasing distances (of 100 metre increments) from the radiocommunications transmitter along radial lines spaced around the centre location of the transmitter (worked out in accordance with Schedule 1). The latitude and longitude of the first point on a radial where the device boundary criterion is less than or equal to zero is considered to be the furthest point of the device boundary on

this radial. There are 360 radials for each radiocommunications transmitter, meaning there are 360 points that form the device boundary.

If the end point of any radial in relation to a radiocommunications transmitter is outside the geographic area of the spectrum licence, then unless the specified exception applies, the transmitter will be taken to cause an unacceptable level of interference.

For a group of radiocommunications transmitters the device boundary is calculated as if for a single radiocommunications transmitter. However, the radiated power for a group of radiocommunications transmitters is taken to be equal for each bearing and to have a value that is equal to the maximum horizontally radiated power, in any direction, of any of the radiocommunications transmitters in the group.

Item 2 of Schedule 2

Item 2 provides the device boundary criterion, which is the mathematical expression used to calculate a device boundary in accordance with item 1 of Schedule 2. The mathematical expression consists of the horizontally radiated power of a radiocommunications transmitter minus the path loss function. The device boundary criterion has function dependencies which include the horizontally radiated power, the receiver level of protection and the propagation loss set out in item 3 of Schedule 2, for each segment along each radial.

Item 3 of Schedule 2

Item 3 provides the methodology for determining the propagation loss component for determining the device boundary criterion in item 2. This item uses the Modified Hata propagation model from ‘ERC Report 068’ published by the European Conference of Postal and Telecommunications Administrations (or CEPT) in 2000, and revised in 2002, which details the method and parameters to be used to calculate the propagation loss. CEPT reports are available, free of charge, at <https://docdb.cept.org/home>. This item also details how relevant parameters, which are used in the calculation of propagation loss, are to be determined.

Schedule 3 Effective antenna height and average ground height

Item 1 of Schedule 3

Item 1 of Schedule 3 specifies the procedure for calculating effective antenna height for the purpose of the ULOI Determination, taking account of average ground height above sea level and antenna height above ground. The effective antenna height of a spectrum-licensed radiocommunications transmitter is used to calculate the propagation loss component of the device boundary criterion. The device boundary criterion is set out in item 2 of Schedule 2. The device boundary criterion is the mathematical expression used to calculate a device boundary. The process for calculating a device boundary is set out in item 1 of Schedule 2.

Item 2 of Schedule 3

Item 2 of this Schedule sets out the procedure for calculating the average ground height of a point on any radial from the location of a radiocommunications transmitter. It does so by taking account of the height of the cell in the digital elevation model corresponding to that point, and the surrounding cells.

These heights are calculated with reference to a digital elevation model sourced from Geoscience Australia.

Item 3 of Schedule 3

Item 3 sets out Vincenty's Direct Formulae, which are used in the calculation of the coordinates (in latitude and longitude) of the points along the radials about the radiocommunications transmitter in item 1. These coordinates are used in item 2 to obtain the average ground height for that point for use in item 1. This simplification of Vincenty's Direct Formulae performs location calculations over the GRS80 ellipsoid as referenced by the GDA94 to a high degree of accuracy, using an iterative routine.