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 Mid Band Gap) 2023

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

Radiocommunications (Unacceptable Levels of Interference – 2.5 GHz Mid Band Gap) 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 Mid Band Gap) 2023* (**Transmitter Advisory Guidelines**); and
- *Radiocommunications Advisory Guidelines (Managing Interference to Spectrum Licensed Receivers — 2.5 GHz Mid Band Gap) 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 Mid Band Gap) 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

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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 part of the spectrum from 2570 MHz to 2620 MHz (**2.5 GHz Mid Band Gap**), 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 Mid-band Gap) 2012* (**2012 Transmitter Advisory Guidelines**); and
- the *Radiocommunications Advisory Guidelines (Managing Interference to Receivers — 2.5 GHz Mid-band Gap) 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 Mid Band Gap, 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 Mid Band Gap (**2.5 GHz Mid Band Gap transmitters**), where the 2.5 GHz Mid Band Gap 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 Mid Band Gap.

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 Mid Band Gap, 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 Mid Band Gap 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 Mid Band Gap.

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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 Mid Band Gap, 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 Mid Band Gap. 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 Mid Band Gap 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 Mid Band Gap. 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 sunsetting provisions in Part 4 of Chapter 3 of the LA.

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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:

- ITU-R Recommendation P.1144 *Guide to the application of the propagation methods of Radiocommunications Study Group* 3, published by the Radiocommunications Sector (**ITU-R**) of the International Telecommunication Union (**ITU**), and 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 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.

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;
- ITU-R Recommendation P.525-4 *Calculation of free-space attenuation* (**ITU-R Recommendation P.525-4**), published by the ITU-R, and available, free of charge, at www.itu.int;
- ITU-R Recommendation P.526-15 *Propagation by diffraction* (**ITU-R Recommendation P.526-15**), published by the ITU-R, and available, free of charge, at www.itu.int;
- ITU-R Recommendation P.2108-0 *Prediction of clutter loss* (**ITU-R Recommendation P.2108-0**), 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.

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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 (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**);
- the Receiver Advisory Guidelines.

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 Mid-Band Gap) 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 Mid Band Gap 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 spectrum licensed 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 sunsetting 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.

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The ACMA received 5 responses. All 5 responses supported the 2.5 GHz Mid Band Gap draft instruments with no proposed amendments.

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 Mid Band Gap caused by radiocommunications transmitters operating under spectrum licences issued in the 2.5 GHz Mid Band Gap.

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 Mid Band Gap caused by radiocommunications transmitters operating under other licences issued in or near the 2.5 GHz Mid Band Gap.

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 Mid Band Gap. The ULOI Determination only applies in relation to 2.5 GHz Mid Band Gap 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

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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.

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Attachment A

Notes to the *Radiocommunications Advisory Guidelines (Managing Interference from Spectrum Licensed Transmitters – 2.5 GHz Mid Band Gap) 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 Mid Band Gap) 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 Mid-band Gap) 2012*

This section repeals the *Radiocommunications Advisory Guidelines (Managing Interference from Transmitters – 2.5 GHz Mid-band Gap) 2012* (F2012L02555).

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, 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.

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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 Mid Band Gap 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 2500 MHz to 2570 MHz and 2620 MHz to 2690 MHz frequency bands (collectively, the **2.5 GHz band**) (Part 3);
- apparatus licensed receivers used for fixed services (Part 4).

Subsection 7(3) provides that the Transmitter Advisory Guidelines provide advice for coordination with the Australian Radio Quiet Zone Western Australia (**ARQZWA**) (Part 5).

Subsection 7(4) advises that, when modelling propagation loss in the 2.5 GHz Mid Band Gap, 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 Mid Band Gap.

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 Mid Band Gap to a radiocommunications receiver operating under another licence.

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

Part 3 – Spectrum licensed receivers

Section 8 Background

Section 8 describes the fixed receivers operating in spectrum licensed bands other than the 2.5 GHz Mid Band Gap. The Part is intended to apply to fixed receivers that operate on frequencies that are in close proximity to the 2.5 GHz Mid Band Gap, in particular those that operate in the 2.5 GHz band. Section 8 also provides a description of wireless access service (**WAS**) network stations that are likely to be operating in the 2.5 GHz band. The section provides that the necessary technical information can be found in the documents that make up the technical framework for spectrum licences in the 2.5 GHz band.

Section 9 Protection requirements

Subsection 9(1) sets out the protection requirements for fixed receivers operated under a spectrum licence in the 2.5 GHz band that exist prior to the registration of transmitters operated under spectrum licences in the 2.5 GHz Mid Band Gap. The protection requirements mean that it is typically

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necessary for fixed transmitters operating under spectrum licences in the 2.5 GHz Mid Band Gap to operate in coordination with nearby fixed receivers.

Subsection 9(2) provides that the Register of Radiocommunications Licences identifies the location and antenna information of fixed receivers that are registered, to facilitate this coordination. Coordination is typically required for transmitters located within 200 metres of the fixed receivers.

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 Mid Band Gap, which may be affected by radiocommunications transmitters operated under spectrum licences in the 2.5 GHz Mid Band Gap. The point-to-point fixed link bands are generally located and operated in accordance with criteria set out in RALI FX 3

Section 11 Protection requirements

Section 11 sets out the protection requirements for point to point fixed service receivers. For apparatus licensed point to point fixed links located in the 1900 MHz to 2300 MHz frequency band, protection requirements are found in RALI FX 3.

Part 5 – Radio Astronomy Services

Section 12 Background

Subsection 12(1) explains that Part 5 applies to the protection of sensitive radio astronomy service receivers operated in a number of bands in and adjacent to the 2.5 GHz Mid Band Gap.

Subsection 12(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 Mid Band Gap spectrum licences.

Section 13 Protection requirements

Section 13 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.

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Attachment B

Notes to the *Radiocommunications Advisory Guidelines (Managing Interference to Spectrum Licensed Receivers — 2.5 GHz Mid Band Gap) 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 Mid Band Gap) 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 Mid-band Gap) 2012*

This section repeals the *Radiocommunications Advisory Guidelines (Managing Interference to Receivers — 2.5 GHz Mid-band Gap) 2012* (F2012L02558).

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.

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Subsection 7(3) outlines the purpose of the Receiver Advisory Guidelines. Their purpose is to assist 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 Mid Band Gap. They are also intended to provide protection to radiocommunications receivers operated under spectrum licences in the 2.5 GHz Mid Band Gap 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 Mid Band Gap.

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 Mid Band Gap.

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 Mid Band Gap, 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 Mid Band Gap, 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 Mid Band Gap (**2.5 GHz Mid Band Gap 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.

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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 Mid Band Gap 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 Mid Band Gap 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.

Section 12 Frequency band

Section 12 explains that receivers will generally not be protected for the reception of radiocommunications signals outside the 2575 MHz to 2615 MHz frequency band.

Part 4 – Minimum level of receiver performance

Section 13 Notional receiver performance level

Section 13 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.

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Part 5 – Compatibility requirement

Section 14 Compatibility

Section 14 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 Mid Band Gap; 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.

Schedule 1 Notional receiver performance level

Schedule 1 provides spectrum licensees with information regarding the notional performance of 2.5 GHz Mid Band Gap receivers operating under a spectrum licence in the 2.5 GHz Mid Band Gap. 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 Mid Band Gap 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 Mid Band Gap should not exceed. It also provides that logarithmic scaling should be used to find a maximum unwanted signal level in alternative bandwidths.

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Attachment C

Notes to the *Radiocommunications (Unacceptable Levels of Interference – 2.5 GHz Mid Band Gap) 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 Mid Band Gap) 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 subsection 145(4) of the Act.

Section 4 Repeal of the *Radiocommunications (Unacceptable Levels of Interference – 2.5 GHz Mid-band Gap) Determination 2012*

This section repeals the *Radiocommunications (Unacceptable Levels of Interference – 2.5 GHz Mid-band Gap) Determination 2012* (F2012L02553).

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.

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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 technical definition of what will be deemed unacceptable levels of interference for the purpose of interference management in the 2.5 GHz Mid Band Gap. 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; and

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- does not cross over defined sections of the Gulf of St Vincent and Bass Strait. (This is because there is a strong risk of interference to and from services deployed in Adelaide and Yorke Peninsula, as well as, between Victoria and Tasmania, due to frequent and long periods of ducting.)

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 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 the ULOI Determination. 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 Mid Band Gap 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.

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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 specifies the propagation model to be used for determining the propagation loss component of the device boundary criterion set out in item 2 of Schedule 2. Propagation loss is calculated using the method and parameters defined in section 4.5.2 of ITU-R Recommendation P.525-4, for free space attenuation loss, and ITU-R Recommendation P.526-15, for diffraction attenuation loss. The dependencies in this propagation model include distance from the centre location of the radiocommunications transmitter to the point representing the radial/increment combination, the transmission frequency of the device, antenna heights (the height of the transmitter above ground is determined according to item 1 of Schedule 3, and the nominal receiver height above ground level is 5 metres) and a path profile. The path profile is to be developed by sampling the DEM-9S digital elevation model for terrain heights, and then calculating average ground height according to item 2 of Schedule 3.

For transmitters that are located at or below 6 metres above ground level, additional losses due to clutter (e.g. buildings and trees) can be calculated using ITU-R Recommendation P.2108-0.

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.

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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.

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