



Radiocommunications Advisory Guidelines (Managing Interference from Transmitters – 2.5 GHz Band) 2012

Radiocommunications Act 1992

THE AUSTRALIAN COMMUNICATIONS AND MEDIA AUTHORITY makes these Advisory Guidelines under section 262 of the *Radiocommunications Act 1992*.

Dated 19th December 2012

Chris Chapman
[signed]
Member

Richard Bean
[signed]
Member/~~General Manager~~

Australian Communications and Media Authority

Contents

Part 1	Preliminary	
	1.1 Name of Advisory Guidelines	3
	1.2 Commencement	3
	1.3 Purpose of these guidelines	3
	1.4 Interpretation	3
Part 2	Background	
	2.1 Background	6
Part 3	Other spectrum licence receivers	
	3.1 Background	7
	3.2 Electronic news gathering	7
	3.3 Protection requirements	8
Part 4	Fixed service receivers	
	4.1 Background	9
	4.2 Protection requirements	9
Part 5	Space services receivers	
	5.1 Background	10
	5.2 Space Services	10
	5.3 Protection requirements	10
Part 6	Radio astronomy service receivers	
	6.1 Background	11
	6.2 Radio astronomy sites and the Mid-West Radio Quiet Zone	11
	6.3 Protection requirements	12
Part 7	Radiodetermination services receivers	
	7.1 Background	14
	7.2 Protection requirements	14

Part 1 Preliminary

1.1 Name of Advisory Guidelines

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

1.2 Commencement

These Advisory Guidelines commence on the day after they are registered.

Note All legislative instruments and compilations are registered on the Federal Register of Legislative Instruments kept under the *Legislative Instruments Act 2003*. See <http://www.frli.gov.au>.

1.3 Purpose of these Advisory Guidelines

- (1) The purpose of these Advisory Guidelines is to manage interference from radiocommunications transmitters operated under a spectrum licence in the 2.5 GHz band by providing for the protection of radiocommunications receivers operating in or adjacent to the 2.5 GHz band.
- (2) The ACMA will take these Advisory Guidelines into account in determining whether a spectrum licensed radiocommunications transmitter is causing interference to a licensed radiocommunications receiver operating as set out in these Advisory Guidelines.
- (3) These Advisory Guidelines do not prevent a licensee negotiating other protection requirements with another licensee.

1.4 Interpretation

- (1) In these Advisory Guidelines, unless the contrary intention appears:
 - 2.1 GHz band** means the frequency band 1900 MHz to 2300 MHz.
 - 2.2 GHz band** means the frequency band 2025MHz to 2285 MHz.
 - 2.3 GHz band** means the frequency band 2302 MHz to 2400 MHz.
 - 2.5 GHz band** means the frequency bands:
 - (a) 2500 MHz to 2570 MHz (the **2.5 GHz lower band**); and
 - (b) 2620 MHz to 2690 MHz (the **2.5 GHz upper band**).
 - 2.5 GHz Mid-band Gap** means the frequency band 2570 MHz to 2620 MHz.
- Act* means the *Radiocommunications Act 1992*.
- ARS* means aeronautical radionavigation service.
- Australian Radiofrequency Spectrum Plan* means the *Australian Radiofrequency Spectrum Plan 2009*.

CSIRO means the Commonwealth Scientific and Industrial Research Organisation.

EES means earth exploration-satellite service.

ENG means electronic news gathering.

ITU means the International Telecommunication Union.

ITU-R means the International Telecommunication Union Radiocommunications Sector.

ITU-R Recommendation means a Recommendation made by the ITU Radiocommunications sector.

Marketing Plan means the *Radiocommunications Spectrum Marketing Plan (2.5 GHz Band) 2012*.

Mid-West Radio Quiet Zone means the area defined in the Schedule to the *Radiocommunications (Mid-West Radio Quiet Zone) Frequency Band Plan 2011*.

MSS means mobile satellite service.

RALI means Radiocommunications Assignment and Licensing Instruction.

RALI FX-03 means the Radiocommunications Assignment and Licensing Instruction No. FX-03 Microwave Fixed Services Frequency Coordination, published by the ACMA, as in force from time to time.

RALI MS-31 means the Radiocommunications Assignment and Licensing Instruction No. MS-31 Notification Zones for Apparatus Licensed Services Around Radio Astronomy Facilities, published by the ACMA, as in force from time to time.

RALI MS-32 means the Radiocommunications Assignment and Licensing Instruction No. MS-32 Coordination of Apparatus Licensed Services Within The Mid West Radio Quiet Zone, published by the ACMA, as in force from time to time.

RLS means radiolocation service.

RRS means radiodetermination satellite service.

section 145 determination means the *Radiocommunications (Unacceptable Levels of Interference 2.5 GHz Band) Determination 2012*.

SRS means space research service.

TDD means time division duplex.

WAS means wireless access services.

- (2) The following terms have the same meaning as in the section 145 determination:
- (a) fixed receiver;
 - (b) fixed transmitter;
 - (c) geographic area;
 - (d) mobile transmitter.

(3) The following terms have the same meaning as in the Australian Radiofrequency Spectrum Plan:

- (a) aeronautical radionavigation service;
- (b) earth exploration-satellite service;
- (c) fixed service;
- (d) mobile satellite service;
- (e) radio astronomy service;
- (f) radiodetermination satellite service;
- (g) radiodetermination service;
- (h) radionavigation service;
- (i) space research service.

Note A number of terms used in these Advisory Guidelines are defined in the Act and have the meanings given to them by the Act, including:

- apparatus licence
- class licence
- frequency band
- interference
- Register
- spectrum licence
- transmitter.

Part 2 Background

2.1 Background

- (1) Apparatus, class and spectrum licensed radiocommunications receivers operate in or adjacent to the 2.5 GHz band. These radiocommunications receivers could potentially suffer interference caused by radiocommunications transmitters operated under a spectrum licence in the 2.5 GHz band.
- (2) Existing licensed radiocommunications fixed receivers, the details of which were included in the Register prior to the inclusion of details of a fixed transmitter operated under a spectrum licence in the 2.5 GHz band, must be provided protection in accordance with these Advisory Guidelines.
- (3) These Advisory Guidelines have been made for the management of interference to radiocommunications receivers operating in and adjacent to the 2.5 GHz band including the following:
 - (a) spectrum licensed receivers operating under other spectrum licences in the 2.5 GHz Mid-band Gap, typically used for ENG;
 - (b) apparatus licensed receivers in the fixed service operating in and adjacent to the 2.5 GHz band;
 - (c) apparatus licensed receivers in the radio astronomy service operating in the 2690 to 2700 MHz band;
 - (d) apparatus licensed receivers in the aeronautical radionavigation service operating in the 2700 to 2900 MHz band;
 - (e) apparatus licensed receivers in the radiodetermination service operating in the 2700 to 2900 MHz band.
- (4) These Advisory Guidelines also provide advice regarding the notification of sites to assist in the protection of radio astronomy receivers operating in the 2200 to 2550 MHz and 2655 to 2690 MHz bands on an opportunistic basis and coordination with the Mid-West Radio Quiet Zone in Western Australia.
- (5) As radio waves propagate in different ways because of factors such as frequency, terrain, atmospheric conditions and path length, there are a number of ways to predict path loss. The ITU-R publishes Recommendation P.1144 “Guide to the application of the propagation methods of Radiocommunication Study Group 3” to assist in the choice and application of propagation prediction methods suitable for determining path loss for coordination. The use of other published models applicable to the band may also be suitable.

Part 3 Other spectrum licence receivers

3.1 Background

- (1) This Part applies to the protection of radiocommunications fixed receivers operating under spectrum licences other than in the 2.5 GHz band.
- (2) These include the radiocommunications receivers operating in the 2.5 GHz Mid-band Gap and used at this time to support ENG. The next closest relevant spectrum licensed band is the 2.3 GHz Band currently used primarily to support TDD WAS.
- (3) Typically, there are no RALIs setting out coordination requirements between radiocommunications devices licensed using spectrum licences. It is necessary to look at the relevant spectrum licence technical framework for each band to determine system characteristics and coordination requirements.

3.2 Electronic news gathering

- (1) ENG television outside broadcast links once occupied the whole of the band 2500 to 2690 MHz across Australia. The use of that spectrum was authorised by apparatus licences. ENG services in the band were, as part of the restructure of the band, restricted to the 2.5 GHz Mid-band Gap. The ENG apparatus licences in the 2.5 GHz Mid-band Gap were then converted to spectrum licenses.
- (2) ENG involves the use of a variety of link types including, low height short range wireless camera to news vehicle links, higher power directional links from nomadic news van stations to fixed radiocommunications receiver sites called collection stations and helicopter relay links.

Note For more information see ITU-R Recommendation F.1777 “System characteristics of television outside broadcast, electronic news gathering and electronic field production in the fixed service for use in sharing studies”.

- (3) The technical framework for the spectrum licenses under which ENG operates in the 2.5 GHz Mid-band Gap is based on that for 2.5 GHz band TDD WAS with additional features to facilitate the diversity of ENG link types.

3.3 Protection requirements

- (1) Protection requirements for ENG fixed receivers or collection stations operating under spectrum licences in the 2.5 GHz Mid-band Gap included in the Register prior to the registration of a fixed transmitter to be operated under a spectrum licence in the 2.5 GHz band can be found in the technical framework for those licences in the form of the compatibility requirement (a minimum wanted signal level of -104 dBm/MHz) and notional receiver characteristics.
- (2) The location and antenna details of ENG fixed receivers in the band can be found in the Register and coordination with these sites is typically necessary for fixed outdoor transmitters located within 1.5 kilometres of these sites.
- (3) Protection requirements for TDD WAS fixed receivers operating under spectrum licences in the 2.3 GHz band included in the Register prior to the registration of a fixed transmitter under a 2.5 GHz band spectrum licence can be found in the technical framework for those licences in the form of the level of protection for receivers and the notional receiver characteristics.
- (4) Location details and antenna details of fixed radiocommunications receivers can be found in the Register; however, the available frequency separation means that coordination is typically necessary within 500 metres of these locations.

Part 4 Fixed service receivers

4.1 Background

- (1) This Part applies to the protection of radiocommunications fixed receivers operating as part of the fixed service in spectrum in and adjacent to the 2.5 GHz band.
- (2) There are no formal channelling arrangements for apparatus licensed point-to-point fixed links operating in and immediately adjacent to the 2.5 GHz band, due to the small number and specialised nature of these links located in remote parts of Australia.

Note Technical details of these links can be found in the Register available on the ACMA website.

- (3) The closest point-to-point fixed link band currently open to new assignments is the 2.2 GHz band. That band overlays an older band now closed to new assignments; the 2.1 GHz band. Apparatus licensed point-to-point fixed links operate in accordance with requirements of RALI FX-03. RALI FX-03 is subject to continuous review in consultation with industry, to incorporate improved assignment techniques and changing technology requirements.
- (4) Revisions to RALI FX-03 seek to improve spectrum access opportunities, without undue detriment to current licensees. Users of the RALI should consult the current version when planning systems, to increase spectrum productivity.

Note The latest version of RALI FX-03 is available from the ACMA website.

4.2 Protection requirements

- (1) Protection requirements for apparatus licensed point-to-point fixed links not located in the 2.1 GHz and 2.2 GHz bands included in the Register prior to the registration of a fixed transmitter under a spectrum licence in the 2.5 GHz band can be found in relevant ITU Recommendations and RALI FX-03, where applicable.
- (2) Protection requirements for apparatus licensed point-to-point fixed links located in the 2.1 GHz and 2.2 GHz bands included in the Register prior to the registration of a fixed transmitter under a 2.5 GHz band spectrum licence are specified in RALI FX-03.
- (3) In planning for the operation of transmitters under a spectrum licence in the 2.5 GHz band, spectrum licensees must provide the same level of out-of-band and in-band protection to point-to-point fixed link receivers as must be provided by apparatus licensed fixed service transmitters whose frequencies are assigned in accordance with RALI FX-03.

Part 5 Space services receivers

5.1 Background

This Part applies to the protection of receivers in systems operating as part of a MSS, RSS, SRS and EES in spectrum adjacent to the 2.5 GHz band. Licensed receivers in these bands are protected in accordance with relevant ITU-R Recommendations.

5.2 Space Services

- (1) The 2690 to 2700 MHz band is allocated to the ESS for passive (receive only) use and SRS for passive use. The receivers in the ESS in this band are located on board satellites. The receivers in the SRS in this band are located at fixed earth stations.
- (2) The 2483.5 to 2500 MHz band is allocated to the MSS for transmissions in the space to Earth direction and RSS for transmissions in the space to Earth direction from satellites to licensed Earth station receivers. There are currently no licensed earth stations operating in these services in these bands. Should apparatus licenses be issued in the future, a first in time coordination requirement will apply.

5.3 Protection requirements

- (1) Spectrum licensees are required to protect licensed earth station receivers included in the Register prior to the registration of a fixed transmitter under the spectrum licence in accordance with the relevant ITU-R Recommendations. The ACMA encourages direct liaison between spectrum licensees and the earth station operators during the system planning phases of new systems.
- (2) The protection requirements for space services receivers included in the Register prior to the registration of a fixed transmitter under a 2.5 GHz band spectrum licence are set out in ITU-R Recommendation SA.609: “Protection criteria for telecommunications links for Manned and Unmanned near-Earth research satellites”.
- (3) Additional information regarding the calculation of appropriate coordination distances, propagation models and threshold coordination levels can be found in ITU Radio Regulations – Appendix 7 (Rev.WRC-03) “Methods for the determination of the coordination area around an earth station in the frequency bands between 100 MHz and 105 GHz”.
- (4) Existing earth station sites can be found in the Register available on the ACMA website.

Part 6 Radio astronomy service receivers

6.1 Background

- (1) This Part 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. The radio astronomy service operates in these bands under a number of different regulatory arrangements.
- (2) The 2500 to 2550 MHz band in the Australian Radiofrequency Spectrum Plan carries Australian footnote AUS87. Footnote AUS87 provides an opportunity for radio astronomy receivers to operate in this and a number of other bands on a fortuitous basis.
- (3) The 2655 to 2690 MHz band in the Australian Radiofrequency Spectrum Plan is allocated on a secondary service basis to the radio astronomy service. At the time of making these Advisory Guidelines, there were no assignments in this band.
- (4) The 2690 to 2700 MHz band in the Australian Radiofrequency Spectrum Plan is allocated on a primary service basis to the radio astronomy service. Several radio astronomy sites around Australia hold apparatus licences for the use of this band.
- (5) A site located in remote central Western Australia has been identified for future radio astronomy use and has been protected by the establishment of the Mid-West Radio Quiet Zone across the radio spectrum from 100 MHz through to 25 GHz.

6.2 Radio astronomy sites and the Mid-West Radio Quiet Zone

- (1) The site details of radio-astronomy facilities operating in bands to which Australian footnote AUS87 of the Australian Radiofrequency Spectrum Plan applies are listed in the footnote.
- (2) The footnote indicates that there are facilities operated by the CSIRO at:

Item	Observatory	Location	Latitude	Longitude
1	Paul Wild Observatory	Narrabri	30° 59' 52.084" S	149° 32' 56.327" E
2	Parkes Observatory	Parkes	32° 59' 59.8657" S	148° 15' 44.3591" E
3	Mopra Observatory	Coonabarabran	31° 16' 4.451" S	149° 5' 58.732" E

-
- (3) The footnote indicates that there are facilities operated by the University of Tasmania at:

Item	Observatory	Location	Latitude	Longitude
1	Mount Pleasant Observatory	Hobart	42° 48' 12.9207" S	147° 26' 25.854" E
2	Ceduna Observatory	Ceduna	31° 52' 8.8269" S	133° 48' 35.3748" E

- (4) The footnote indicates that there are facilities operated at the Deep Space Communication Complex in Canberra (latitude 35° 23' 54" S, longitude 148° 58' 40" E).

Note All coordinates above are with reference to AGD66.

- (5) Two of these facilities, the Paul Wild Observatory and the Parkes Observatory located in central New South Wales, also hold apparatus licences for the 2690 to 2700 MHz band.
- (6) The site located in remote central Western Australia identified for future radio astronomy use has been protected by the establishment of the Mid-West Radio Quiet Zone across the radio spectrum from 100 MHz through to 25 GHz. The location of the site and the definition of the Mid-West Radio Quiet Zone, can be found in the *Radiocommunications (Mid-West Radio Quiet Zone) Frequency Band Plan 2011*. An area within 70 km of the site has been excluded from the geographic area of the 2.5 GHz band spectrum licenses.

6.3 Protection requirements

- (1) Licensees should have regard to radio astronomy station receivers operating on frequencies in the 2.5 GHz band covered by footnote AUS87 in the Australian Radiofrequency Spectrum Plan.
- (2) Although these facilities operate on a fortuitous reception basis, the ACMA encourages the direct liaison of spectrum licensees with the radio-astronomy station operators, particularly during the system planning phases for new registered fixed transmitters in this band to minimise the potential interference impact on these stations. To this end, spectrum licensees planning new registered fixed transmitters in the band should follow the notification arrangements specified for apparatus licensed systems set out in RALI MS-31.
- (3) Licensees must meet the coordination requirements to protect the assignments in the 2690 to 2700 MHz band in the Register (Paul Wild Observatory and Parkes Observatory) from unwanted emissions falling in the 2690 to 2700 MHz band.

Note Site details for these facilities can be found in the Register or RALI MS-31. Protection criteria can be found in ITU Recommendation ITU-R RA.769-2 "Protection criteria used for radio astronomic measurements".

-
- (4) Studies carried out by the ACMA indicate that coordination is typically necessary for fixed outdoor base stations located within 100 kilometres of these sites but that it should be possible to establish fixed base stations taking into account appropriate antenna heights, antenna direction, terrain and power levels to distances within 20 kilometres of these sites.
 - (5) Licensees in areas adjacent to the Mid-West Radio Quiet Zone are required to coordinate proposed stations using the methods and limits set out for apparatus licensees in RALI MS-32.

Part 7 Radiodetermination services receivers

7.1 Background

- (1) This Part applies to the protection of apparatus licensed radiodetermination receivers operated in the 2700 to 2900 MHz band as part of the ARS and the RLS. Stations of each service can be identified in the Register by the station class field. Stations operating in the aeronautical radionavigation service in the 2700 to 2900 MHz band consist of radar systems.
- (2) These systems are used for air traffic control and interference has a potential impact on air safety. Many of these stations are located at major airports. Stations operating in the radiolocation service in the 2700 to 2900 MHz band consist of radar systems. These systems are mainly used for meteorological purposes such as weather radar.
- (3) Note that while the radiolocation service operates under secondary allocation in the 2700 to 2900 MHz band, international footnote 423 in the Australian Radiofrequency Spectrum Plan applies to the band, which allows ground base radars used for meteorological purposes to claim equality with the primary aeronautical radionavigation service.
- (4) Radiodetermination services receivers operated by the Department of Defence require protection in accordance with subsection 7.2(5).

7.2 Protection requirements

- (1) Characteristics for coordination with these ground based radar systems are in ITU-R Recommendation M.1464-1 “Characteristics of radiolocation radars and characteristics and protection criteria for sharing studies for the aeronautical radionavigation and meteorological radars in the radiodetermination service operating in the 2700-2900 MHz band”.
- (2) Information on procedures for coordination are in ITU-R Recommendation M.1461 “Procedures for determining the potential for interference between radars operating in the radiodetermination service and systems in other services“. Site details can be found in the Register available on the ACMA website.
- (3) Protection is required for all licensed aeronautical radionavigation service fixed receivers operating in the 2700 to 2900 MHz band included in the Register prior to the registration of a fixed transmitter under a 2.5 GHz band spectrum licence.
- (4) Coordination is typically required for all fixed outdoor base stations located within 10 kilometres of an ARS radar site listed in the Register with the station class AL. Currently there is no RALI describing coordination requirements with the aeronautical radionavigation service in the band 2700 to 2900 MHz but such a RALI could be developed in the future.

-
- (5) Protection is required for all radiodetermination services receivers operated by the Department of Defence in the 2700-2900 MHz band. The maximum power flux density limit at the radar site for out-of-band emissions from a station under a spectrum licence in the 2.5 GHz band is -125 dBm/MHz/m^2 at the antenna height, at the radar site. Currently there is no RALI describing coordination requirements with Defence radiodetermination services in the band 2700 to 2900 MHz but such a RALI could be developed in the future.
 - (6) Protection is required for all licensed radiolocation service fixed receivers recorded operating in the band 2700 to 2900 MHz included in the Register prior to the registration of a fixed transmitter under a 2.5 GHz band spectrum licence.
 - (7) Coordination is typically required for all fixed outdoor base stations located within 20 kilometres of an RLS radar site listed in the Register with the station class LR. Currently there is no RALI available describing coordination requirements with the Radiolocation Service in the band 2700 to 2900 MHz but such a RALI could be developed in the future.