
Radiocommunications Assignment and Licensing Instruction

**Frequency Coordination and Licensing Procedures
for Apparatus Licensed
Public Telecommunications Services
in the
1800 MHz Band**

RADIOCOMMUNICATIONS ASSIGNMENT AND LICENSING INSTRUCTIONS

DISCLAIMER

The Australian Communications and Media Authority (ACMA) advises that these instructions reflect the current policies of the ACMA.

Prospective applicants for licences should take whatever steps necessary to ensure that they have access to appropriate technical or other specialist advice independently of the ACMA concerning their applications, the operation of radiocommunications equipment and services, or any other matters relevant to the operation of transmitters and services under the licences in question.

The policies of the ACMA, and the laws of the Commonwealth, may change from time to time, and prospective licensees should ensure that they have informed themselves of the current policies of the ACMA and of any relevant legislation. Furthermore, prospective applicants for licences should not rely on statements made in these instructions about the policies that may be followed by other authorities, nor about the effect of legislation.

Radiocommunications Assignment and Licensing Instructions are subject to periodic review and are amended as necessary. To keep abreast of developments, it is important that users ensure that they are in possession of the latest edition.

No liability is or will be accepted by the Minister or the Department of Communications and the Arts, ACMA, the Commonwealth of Australia, or its officers, servants or agents for any loss suffered, whether arising directly or indirectly, due to reliance on the accuracy or contents of these instructions.

Suggestions for improvements to Radiocommunications Assignment and Licensing Instructions may be addressed to The Manager, Spectrum Planning Section, ACMA at PO Box 78, Belconnen, ACT, 2616, or by e-mail to freqplan@acma.gov.au. It would be appreciated if notification to ACMA of any inaccuracy or ambiguity found be made without delay in order that the matter may be investigated and appropriate action taken.

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Amendment History

Date of Effect	Comments
1/12/2011	Initial release
27/9/2014	<p>Inclusion of assignment priorities for remote areas.</p> <p>Requirement that PTS coordinated with fixed links that do not meet the protection criteria specified in this RALI cannot be licensed irrespective of the licensee(s) involved.</p> <p>Update to special conditions that apply in the band. This includes a condition to facilitate the use of portable stations and remove the femto cell special condition (as it is now included in the PTS Licence Condition Determination).</p>
11/8/2015	<p>Assignment priority order for Infrastructure/Rail/Other segment was changed to highest channel down.</p> <p>Reference to instruments remade as a result of sunsetting have been updated</p> <p>Advisory note BL was replaced with advisory note C12.</p> <p>Reference to f_{offset} in Attachment 4 is corrected to the -3dB point of the measurement filter.</p>
2/08/2019	Inclusion of provision for underground PTS and minor amendments to correct typographical errors and update references.
25/3/2024	Updates to special conditions to account for sunsetting and remaking of the PTS LCD. Inclusion of Special Condition C21.

Frequency coordination and licensing procedures for apparatus licensed PTS in the 1800 MHz band

Part 1 Introduction

1.1. Purpose

The purpose of this Radiocommunications Assignment and Licensing Instruction (RALI) is to provide information about, and describe the necessary steps for, the frequency coordination and licensing of public telecommunications services (PTS), specifically the Public Mobile Telecommunication Service Class B (PMTS Class B) option, in the paired, 1710-1785 / 1805-1880 MHz bands, referred to as the 1800 MHz band.

The information in this document reflects the ACMA's statement of current policy in relation to frequency coordination and apparatus licensing of PTS systems in the 1800 MHz band. In making decisions, both ACMA assigners and Accredited Persons should take all relevant matters into account and decide each case on its merits. Issues related to these procedures that appear to fall outside of the established policy should be brought to the attention of:

The Manager - Spectrum Planning Section
Spectrum Infrastructure Branch
Australian Communications and Media Authority
P.O. Box 78
Belconnen ACT 2616

A glossary of acronyms and abbreviations is provided at page 43

1.2. Basic Principles

The basic principles for coordination and operation of PTS systems in the 1800 MHz band are that:

- apparatus licences are able to be issued for PTS systems operating in the paired frequency ranges 1710-1785 / 1805-1880 MHz in regional and remote areas that are outside of those areas specified for allocation by spectrum licensing¹, outside the Australian radio quiet zone Western Australia (ARQZWA) exclusion area as defined in the *Radiocommunications (Australian Radio Quiet Zone Western Australia) Frequency Band Plan 2023* (the ARQZWA Band Plan) and outside embargoed areas defined by the ACMA²;

¹ At the time of release of this RALI the 1800 MHz band was not available for apparatus licensing in defined metropolitan and regional areas as defined in RALI SM 26.

² For a complete list of existing embargoes please refer to RALI MS03 which can be downloaded from the ACMA's website at: [Current and past spectrum embargoes | ACMA](#)

- PTS base station transmitters must comply with the emission limits set out in Attachment 4 of this RALI;
- the operation of apparatus licensed PTS systems must not cause unacceptable interference to previously licensed PTS systems or other licensed co-primary services as defined in the *Australian Radiofrequency Spectrum Plan* [1];
- an ACMA assigner or Accredited Person will conduct the frequency coordination of PTS systems in accordance with this RALI. To satisfy themselves of the feasibility of the proposed PTS system, applicants may undertake coordination studies in accordance with the procedures in this RALI prior to submitting the application. The results of such studies may be included with the licence application;
- Low powered ubiquitous transmitters such as femtocells and smart repeaters are authorised to operate within 15 km of a base station registered on the RRL provided:
 - they meet the conditions specified in **Special Conditions C21 and C2** (see section 5.4); and
 - they meet coordination criteria specified in part 4 of this RALI.
- Uncoordinated underground services are authorised under a PMTS Class B licence provided they meet the conditions specified in **Special Condition C23**
- successful applications will be issued with a PMTS Class B apparatus licence for their PTS system.

1.3. Scope

This RALI details the steps necessary for frequency coordination and licensing of proposed PTS systems. It covers frequency coordination between proposed PTS systems and other previously licensed PTS systems; and between proposed PTS systems and other radiocommunications services identified in Table 1 that share the same or adjacent frequency bands.

This RALI aims to manage interference between systems to within limits defined at Attachment 2.

The RALI provides instructions that may be used by ACMA assigners and Accredited Persons when assessing whether proposed PTS systems will cause (or receive) unacceptable interference to (or from):

- existing PTS systems;
- point-to-point fixed links (fixed links);
- spectrum licensed space;
- the Australian Radio Quiet Zone Western Australia (ARQZWA);
- meteorological services; and,
- Cordless Communications Devices (DECT)

This RALI also identifies other services for which no specific coordination criteria

have been developed due to the nature of the service and the potential for interference being low.

It is a requirement that coordination calculations should be performed to assess potential interference to and from PTS systems. In some cases the effect of PTS mobile stations will need to be considered. Interference protection and requirements to protect other services are based upon the assumption that mobile station deployments conform to the deployment model described at Attachment 3.

1.4. Overview of Coordination Procedures

This RALI requires that coordination calculations should be performed to assess potential interference mainly to and from the PTS base station. In some cases however, mobile stations will need to be considered in the coordination process.

Part 3 of this document describes a range of potential interference mechanisms that should be considered when making assessments of potential interference.

Part 4 provides details of a procedure for performing assessments of potential interference. Attachment 2 provides the applicable protection criteria to be used in performing the assessments.

A summary of potential interference scenarios and reference to the applicable coordination procedure in this document (or elsewhere) is given in Table 1 below.

Table 1: Summary of potential interference mechanisms

Interference mechanism	Coordination procedure
PTS → PTS (see section 3.1)	Part 4 of this RALI
PTS Tx → Point-to-point Rx (see section 3.2.1)	Part 4 of this RALI
Point-to-point Tx → PTS Rx (see section 3.2.2)	Part 4 of this RALI
PTS Tx → Spectrum licensed area (see section 3.3.1)	Part 4 of this RALI
Spectrum licensed area → PTS Rx (see section 3.3.2)	No procedure defined
PTS Tx → Adjacent spectrum licensed Rx (see section 3.3.3)	No procedure defined
Adjacent spectrum licensed Tx → PTS Rx (see section 3.3.3)	Part 4 of this RALI
PTS Tx → CCD (DECT) (see section 3.4)	No procedure defined
PTS MS Tx → MetSat Rx	Section 3.5 of this RALI

(see section 3.5)	
PTS Tx → Radio Astronomy (see section 3.6)	Part 3.6 of this RALI Procedure defined in RALI MS31
PTS Tx → ARQZWA (see section 3.7)	Part 3.7 of this RALI Procedure defined in RALI MS32

1.5. Licensing

PTS apparatus licences are used to authorise the operation of PTS systems that comprises two or more land stations. The *Radiocommunications (Cellular Mobile Telecommunications Devices) Class Licence 2024* [2] authorises mobile stations to communicate with land stations authorised under a PTS apparatus licence, under a ‘no interference no protection’ basis.

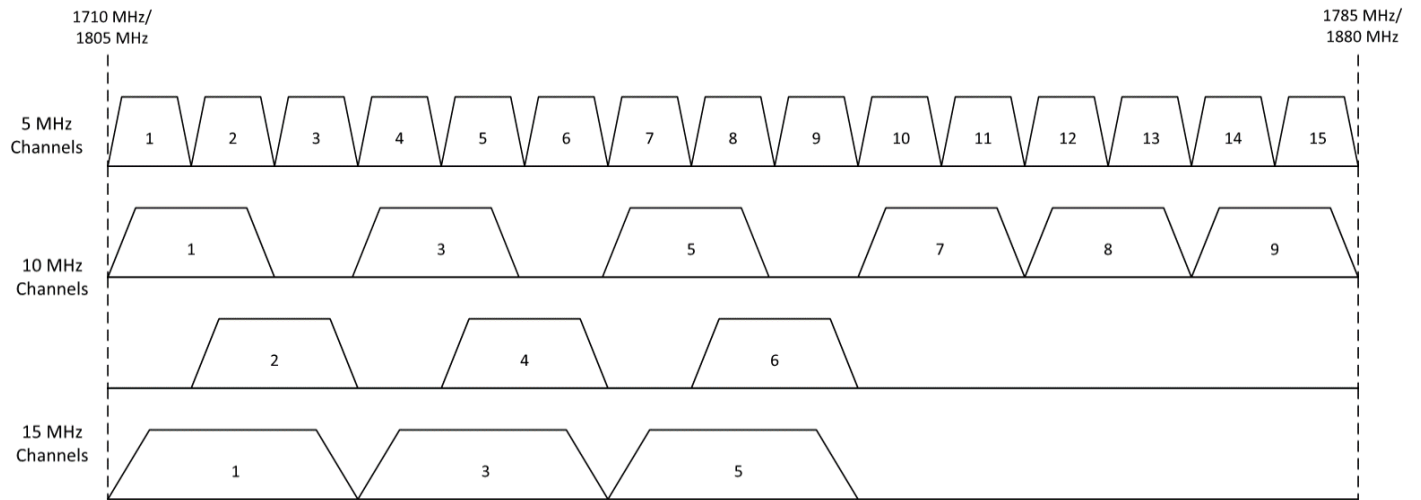
PTS licences will only be issued for PTS systems in the 1800 MHz bands in those areas of Australia that are outside the areas defined for allocation by spectrum licensing, relevant areas defined in the ARQZWA Band Plan and other relevant embargo areas contained in *Radiocommunications and Licensing Instruction MS03 - Spectrum Embargoes* [3].

It should be noted that:

- in the 1710-1785 / 1805-1880 MHz bands, channel allotment bandwidths of 5 MHz will apply.
- 5 MHz channels may be aggregated to form 10 or 15 MHz channels as defined in Figure 1 provided the assignment rules in section 4.14 are adhered to; and
- a maximum 50 dBm/30kHz EIRP density limit applies for all 1800 MHz band PTS licences;

Additional information about licensing arrangements is provided in Part 5 of this RALI.

Figure 1: Channelling arrangements for the 1800 MHz band



Part 2 Background

2.1. Legislative/administrative arrangements

The *Australian Radiofrequency Spectrum Plan* [1] allocates the 1800 MHz band for Fixed and Mobile services.

The band is subject to spectrum licensing in metropolitan and regional areas, as defined in RALI SM 26 [4].

Apparatus licensing arrangements for PTS systems in the 1800 MHz bands apply only in those areas that lie outside the areas specified in the Re-allocation Declarations and the embargoed areas defined in *Radiocommunications Assignment and Licensing Instruction (RALI) MS03: Spectrum Embargoes* [3]. A diagram of areas available for apparatus licensing, accurate as of the date of effect of this RALI, is provided at Attachment 1.

Apparatus licence in the 1800 MHz band is also subject to ARQZWA Band Plan. This band plan set out the purpose for which the frequency bands around the ARQZWA could be used.

PTS systems are subject to the Radiocommunications Licence conditions (PTS Licence) Determination 2024 [5], [Radiocommunications Licence Condition \(Apparatus Licence\) Determination 2015](#) [6] and Radiocommunications (Cellular Mobile Telecommunications Devices) Class Licence 2024 [2].

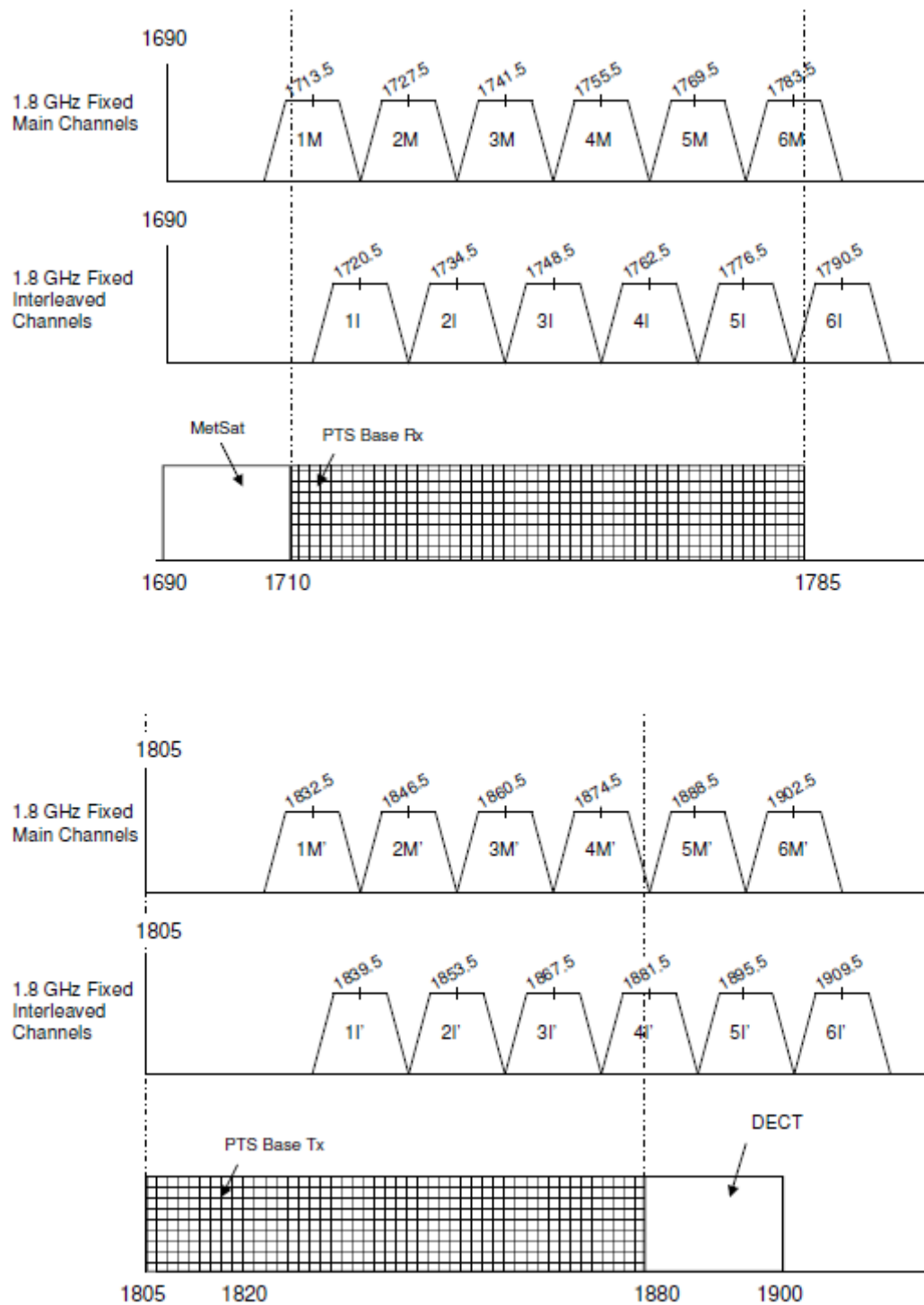
The 1800 MHz band has predominantly been used for fixed link services in regional and remote areas. The fixed link service band, detailed in the 1.8 GHz band channel arrangements of Appendix 1 of RALI FX-3, overlaps these frequency ranges. While the 2.1 GHz band is directly adjacent to the 1800 MHz band.

Arrangements are also in place to allow the use of mobile phones on board aircraft. These services are licensed under the PMTS C licence subtype. They are authorised to operate on a 'no interference and no protection' basis.

There are also a number of adjacent channel services in operation, these include:

- Meteorological Satellite Services (MetSat) in the 1670-1710 MHz band; and
- Cordless Communications Systems (in particular DECT) in the 1880-1900 MHz band;

Figure 2: Relationship between the 1710-1785 / 1805-1880 MHz band and other services



Part 3 Potential interference mechanisms

This Part describes a range of potential co-channel and adjacent channel interference mechanisms that should be considered when making assessments of potential interference. While this section discusses the various services that have been considered, only the services that require specific coordination procedures are defined in Part 4 – it is noted that in some cases interference from mobile stations attached to a PTS licence needs to be considered. These services are (see also Table 1):

- PTS to PTS
- PTS transmitter to Fixed link receiver
- Fixed link transmitter to PTS receiver
- PTS transmitter to Spectrum Licensed Space
- Spectrum Licensed Space to PTS Receiver
- PTS transmitter to Earth Station receiver (MetSat)
- PTS transmitter to the ARQZWA
- PTS transmitter into Radio Astronomy Receivers

3.1. PTS into PTS

3.1.1. Co-channel frequency coordination

Frequency coordination procedures for assessing whether a proposed PTS system will cause (or suffer) unacceptable interference to (or from) previously licensed PTS systems (PMTS Class B licences) are detailed in Part 4.7 of this document. These procedures only deal with the coordination of co-channel PTS systems.

The dominant interference mechanism is considered to be from the PTS base station transmitter to mobile receiver. This situation will be catered for via the coordination procedure in Part 4.7. The coordination procedure defined in Part 4.7 will generally account for the case of interference from a mobile transmitter to a PTS base station receiver.

In the case of mobile phones on board aircraft (licensed as PMTS Class C), coordination is not required. As detailed in the *Radiocommunications licence Conditions (PTS Licence) Determination 2024* [5], mobile phones on board aircraft operate under a ‘no interference no protection’ basis. These systems are also subject to other operating criteria detailed in special conditions attached to the licence as well as in the *Radiocommunications Licence Conditions (PTS Licence) Determination 2024* [5].

3.1.2. Adjacent channel considerations

The coordination of adjacent channel PTS base stations is not required for the assignment of new PTS base stations. Due to the type of equipment that is expected

to be deployed (as detailed at Attachment 3), paying particular attention to relevant standards, in addition to the expected area and type of deployment, adjacent channel operation will generally be possible without any specific coordination required. Therefore, no coordination details have been provided in Part 4 of this RALI.

In addition to this, no specific coordination requirements have been developed to protect against out-of-band interference³, since this form of interference can be extremely difficult to predict and accurately model due to the various factors controlling it.

In order to manage any circumstances where adjacent channel or out-of-band interference does occur, **Special Condition FZ**⁴ will be applied to all PTS licences in the 1800 MHz band. The intention is to encourage licensees to cooperate and, where necessary, compromise to resolve interference if and when it occurs. However, in the event a practical solution cannot be found the license issued first in time will be deemed to have priority.

ETSI documents EN 301908-1, EN 301908-13, EN 301908-14 and EN 301908-11 state that these systems can coexist when there is a frequency separation of 200 kHz between the LTE/WCDMA and GSM systems channel edges for neighbouring LTE/WCDMA and GSM networks. For the specific case where two adjacent PTS systems operate using LTE/WCDMA and GSM technologies, licensees deploying GSM technologies will be responsible for ensuring adequate frequency separation is provided within their licence holdings.

Consequently all GSM services must ensure they deploy a minimum 200 kHz guard band at frequency boundaries to enable coexistence.

3.2. Fixed Links

3.2.1. PTS transmitter into fixed link receiver

As a consequence of the shared nature of the bands, PTS transmitters have the potential to cause interference to incumbent fixed link receivers. PTS base station transmitters operating in the 1805-1880 MHz band will need to be coordinated with fixed links operating in or adjacent to these bands, while mobile transmitters operating in the 1710-1785 MHz band will need to be coordinated with fixed links operating in or adjacent to these bands.

Frequency coordination procedures outlined in Part 4.5 should be used for assessing whether:

- a proposed PTS transmitter (base stations and mobile) will cause

³ Out-of-band interference refers to a number of non-linear types of interference that may occur across the frequency boundaries of a licence, for example: receiver intermodulation, receiver blocking and spurious response.

⁴ For a full definition of this special condition please refer to section 5.4

unacceptable interference to previously licensed fixed link receivers; and

- a proposed fixed link receiver will receive unacceptable interference from a previously licensed PTS transmitter (base station and mobile).

3.2.2. Fixed link transmitter to PTS receiver

Interference from fixed link transmitters in the 1.8 GHz and 2.1 GHz band arrangements needs to be assessed against PTS base station receivers, operating in the 1710-1785 MHz band, and mobile receivers⁵, operating in the 1805-1880 MHz band.

Frequency coordination procedures outlined in Part 4.6 should be used for assessing whether:

- a proposed fixed link transmitter will cause unacceptable interference to a previously licensed PTS receiver; and
- a proposed PTS system will receive unacceptable interference from previously licensed fixed link transmitters.

3.3. Spectrum Licensed Space

3.3.1. PTS transmitter into Spectrum Licensed area

A PTS base station transmitter located near a spectrum licence area boundary with all or part of its emissions overlapping the frequency range covered by the spectrum licence, needs to coordinate with a “spectrum space”, as opposed to the traditional method of coordination with a radiocommunications devices at a specific location. In order to do this, spectrum licence coordination principles need to be applied. This means that the PTS transmitter should be treated as though it were a spectrum licence device.

Therefore, a proposed PTS transmitter will be considered to not interfere with the spectrum licence area if the device boundary (a polygon) of the PTS transmitter, as determined by procedure defined in the relevant section 145 determination does not intrude into the co-channel spectrum licensed area. The required coordination methodology is specified in section 4.8.

For PTS transmitters the device boundary criteria in *Radiocommunications (Unacceptable Levels of Interference — 1800 MHz Band) Determination 2023* [7] must be used.

Note that only coordination of a PTS base station with a spectrum licensed area is required. It is believed that this will also adequately satisfy coordination requirements for any associated mobile stations, due to the significant difference in EIRP's and antenna heights of the stations. However, it is noted that operation of

⁵ Although mobile receivers operate on a ‘no interference no protection’ basis, this coordination is performed to protect a notional coverage area of a PTS base station to provide some assurance of interference free operation.

mobile devices is on a 'no interference no protection' basis and any transmitter inside a spectrum licence space requires 3rd party authorisation from the licensee to operate.

3.3.2. Spectrum Licensed areas into PTS receiver

A PTS receiver located near a spectrum licence area boundary has the potential to receive interference from transmitters located within the spectrum licensed area. Similar to the case specified in section 3.3.1, coordination needs to be performed with the spectrum space to account for existing as well as potential future use of the spectrum by the licensee.

In many situations, there is likely to be a high level of reciprocity between the potential interference to a PTS receiver from transmitters located within the spectrum licensed area and the potential interference that a PTS transmitter may cause to receivers located within the spectrum licensed area. However, given the flexible nature of spectrum licences, evolution of technology over time and potential for new services to be deployed at any time, this cannot be guaranteed.

PTS licensees must accept any in-band interference caused by a registered spectrum licence device operating in accordance with the stated core conditions of the licence and the relevant section 145 determination in force for the spectrum licence at the time. The current section 145 determination in force is the *Radiocommunications (Unacceptable Levels of Interference — 1800 MHz Band) Determination 2023* [7].

Consequently, **Advisory Note FA** will also be applied to all PTS licences located within 100 km and operating co-channel to a spectrum licence space. This note informs licensees that if interference is caused by a registered spectrum licence device, the ACMA will consider that the spectrum licence device has priority over the PTS licence when settling the dispute, irrespective of the date the device was registered.

3.3.3. Adjacent Band Spectrum Licence Devices

A PTS system operating in frequency adjacent spectrum to a registered spectrum licence device has the potential to cause or receive in-band or out-of-band interference.

In regards to in-band interference:

- PTS licensees must accept any in-band interference caused by a registered spectrum licence device operating in accordance with the stated core conditions of the licence and the relevant section 145 determination in force for the spectrum licence at the time. The current section 145 determination in force is the *Radiocommunications (Unacceptable Levels of Interference — 1800 MHz Band) Determination 2023* [7] applies.
- Spectrum licensees are afforded the same level of in-band protection from adjacent band PTS licence transmitters as they are afforded from transmitters operated by an adjacent band spectrum licensee. Therefore, a registered spectrum licence device must accept any in-band interference caused by an adjacent band licensed PTS transmitter adhering to the emission limits

specified in Attachment 4 and operating in accordance with the requirements stated in this RALI.

In regards to out-of-band interference:

- Interference from apparatus licensed transmitters into devices operated under spectrum licences is managed by advisory guidelines. For the 1800 MHz spectrum licensed band the relevant guideline is specified on the spectrum licence. This guideline specifies compatibility requirements between spectrum licensed services and apparatus licensed services. The compatibility requirements are a model on the basis of which spectrum and apparatus licensees are expected to develop co-ordination procedures for the management of interference to each other's services, using good engineering practice. This guideline should also be consulted by prospective licensees when deploying systems in close vicinity to spectrum licensed devices (see also Part 4.11 of this RALI).
- Interference from devices registered for operation in a spectrum licensed space into apparatus licensed receivers is managed by advisory guidelines. For the 1800 MHz spectrum licensed band the relevant guideline is specified on the spectrum licence.

Due to the type of equipment that is expected to be deployed (as detailed at Attachment 3), paying particular attention to relevant standards, in addition to the expected area and type of deployment, it is anticipated that in most circumstances adjacent band operation will be possible without any specific coordination required. However, outside areas of high mobile use, as defined in the relevant section 145 determination in force for the spectrum licence at the time, the 1800 MHz spectrum licence technical framework relaxes deployment constraints to allow the use of high sited transmitters in the 1710-1785 MHz band. This has the potential to cause interference into PTS system receivers or receive interference from PTS transmitters. Coordination is therefore required with these systems (see Part 4.9 of this RALI).

In the event that in-band or out-of-band interference does occur between licensees the ACMA encourages licensees to cooperate and, where necessary, compromise to find a resolution. The ACMA is prepared to consider any interference management arrangements agreed to between spectrum licensees and apparatus licensees. For the case of out-of-band interference, if agreement cannot be reached between affected parties or the interference cannot practically be resolved, then the ACMA will consider the system licensed/registered first in time has priority.

Additionally, although the technical standards developed for FDD mobile telecommunications equipment in the 1800 MHz band provides an inherent level of protection from adjacent channel mobile devices, protection to registered spectrum licence receivers from harmful interference from PTS mobile transmitters cannot be guaranteed. In order to account for this, the *Radiocommunications (Cellular Mobile Telecommunications Devices) Class Licence 2024* requires that PTS mobile devices operate on a 'no interference no protection basis'. Therefore, if harmful interference does occur it is the responsibility of the PTS licensee to resolve the problem.

3.4. Cordless Communication Devices

Spectrum in the 1880-1900 MHz band is used by class licensed cordless communication devices (mainly DECT) that may operate in all parts of Australia.

Interference to adjacent band class licensed cordless telephone services (CTS) could potentially occur in situations where the CTS equipment and PTS operating in the 1800 MHz band are located in close proximity. However, in practice it is expected that the CTS technology will generally be capable of mitigating the potential interference risks. For example, the predominate CTS technology, DECT, incorporates a Dynamic Channel Assignment algorithm whereby when a DECT receiver senses interference above a threshold level on a particular channel the DECT system will seek an alternative less interference prone channel.

In the case of PTS base stations and the DECT handsets or DECT base ("land") stations the interference risk is expected to be low because the DECT equipment will generally be operated indoors and in the event that the DECT system detects an interfering signal the Dynamic Channel Assignment system will operate to move the system to an alternate channel.

In the case of PTS mobile stations and the DECT handsets or DECT base ("land") stations there is a higher level of potential interference because DECT equipment and PTS mobile stations could be located in close proximity inside buildings.

In general interference to and from PTS systems and CTS is minimised/managed by the following considerations:

- Dynamic Channel Assignment would in most situations mean that the DECT system would shift its operating frequency away from the potential interference;
- Because of the difficulty of controlling the proximity of DECT and PTS user equipment in domestic and office situations, PTS user terminal receivers will not be afforded protection in the event that interference is caused by DECT equipment. This issue is most significant for systems operating in the 1780-1785 / 1875-1880 MHz band. As a result Advisory Note **FR** (refer to 5.3 for details) will be attached on all assignments made in the 1780-1785 / 1875-1880 MHz band.
- A limit of 50 dBm/30kHz EIRP for PTS base stations that operate in the 1800 MHz band. This level will facilitate the deployment of macro base stations and also allow for reasonable protection of DECT systems in the immediate vicinity of a base station.

3.5. Meteorological Services

The *ARSP* allocates the 1670-1710 MHz band to Meteorological Satellite Services for downlink (space-to-Earth) communications. MetSat Earth stations use this band for the reception of data to assist in meteorological forecasting and other scientific purposes. The service uses both geo-stationary (GSO) and non geo-stationary (NGSO)

satellite transmitters. The bands 1698–1710 MHz are typically utilised for NGSO purposes, with GSO operating below 1698 MHz (see ITU-R Recommendation SA.1158-3). Apparatus licensed Earth stations of this service will require continuing protection from PTS in the 1800 MHz band, in particular from the frequency adjacent 1710-1725 MHz band.

There are two potential interference mechanisms:

- Adjacent channel interference from aggregations of PTS mobile transmitters in the 1710-1725 MHz band causing interference to MetSat Earth station receivers operating in the 1670-1710 MHz band; and,
- Adjacent channel interference from MetSat satellite transmitters into PTS base station receivers operating in the 1710-1725 MHz band.

A majority of these services operate in or near capital cities or regional areas of Australia adjacent to existing 1800 MHz spectrum licence spaces. Only a limited number of MetSat services operate in remote areas of Australia.

The potential for interference from MetSat satellite transmitters into PTS receivers is deemed low. As a result the ACMA does not intend to provide PTS licensees with protection from such interference. It will be the responsibility of applicants to assess the impact of this interference for themselves before deploying services.

Interference into MetSat Earth Station receivers does need to be considered. The protection requirements for Met-Sat service Earth station receivers operating in the band below 1710 MHz are set out in the following ITU Recommendations:

- ITU-R Recommendation SA.1026-4: Interference Criteria for Space-to-Earth Data Transmission Systems Operating in the Earth Exploration-Satellite and Meteorological-Satellite Services Using Satellites in Low-Earth Orbit.
- ITU-R Recommendation SA.1160-2: Interference Criteria for Data Dissemination and Direct Data Readout Systems in the Earth Exploration-Satellite and Meteorological-Satellite Services Using Satellites in the Geostationary Orbit.

Studies conducted by the CEPT and detailed in CEPT report 41 suggest the potential for interference from PTS to MetSat Earth stations is low. Considering this and due to the limited number of affected MetSat services and the inherent difficulty in coordinating and managing interference from mobile transmitters, the ACMA has developed an application referral zone around these sites as described in table 3.6.1. Requests for assignments within this zone are to be referred to the Manager, Spectrum Engineering, Spectrum Planning and Engineering Branch, Canberra for preliminary coordination consultation. This could involve negotiations with the affected MetSat licensee to determine the most appropriate way to deploy systems to manage any interference.

Operating Frequency (for PTS services)	Operating Frequency (for MetSat services)	Referral Zone*
1710-1725 MHz	1690-1710 MHz**	15 km

Table 3.6.1: Earth Station Referral Zone*

* The referral zone also applies to the site located at Latitude 12.593733° South and Longitude 131.305731° East (GDA94)

** All Earth stations on the RRL operating in this frequency range need to be considered.

In order to adequately protect MetSat Earth station receivers from interference, **Special Condition FA1** will be attached to all PTS licences issued in the 1800 MHz band that fall within the referral zones. This condition requires that transmitters operated under a PTS licence must not cause harmful interference to an Earth station receiver licensed first in time. Therefore if interference occurs it is the responsibility of the PTS licensee to rectify the issue. This may be best achieved through negotiations with the affected Earth station operator and appropriate planning of new systems.

The ACMA notes that the Bureau of Meteorology has identified a site to relocate its existing MetSat services in Darwin to. This site is located at Latitude 12.593733° South and Longitude 131.305731° East (GDA94). The ACMA supports the movement of such systems into areas of low population density. As a result the ACMA intends to protect the utility of this site for future MetSat services by applying the same referral zone as described in table 3.6.1.

3.6. Notification Zones around Radio Astronomy Facilities

RALI MS 31 has been developed to prescribe a process for notification to the Commonwealth Scientific and Industrial Research Organisation (CSIRO) of prospective frequency assignments to apparatus licensed services that might impede or degrade the operation of key radio astronomy facilities. Affected apparatus services are those that fall within defined zones around the radio astronomy facilities and within the frequency bands listed in Australian Radiofrequency Spectrum Plan (ARSP) Australian footnote AUS87. A full list of these sites and relevant notification zones is contained in RALI MS 31. In the 1800 MHz band the relevant frequency band to consider is the 1250-1780 MHz band.

Applicants with proposed assignment that fall within a notification zone are encouraged to work with the affected licensee and follow the notification procedure prescribed in RALI MS 31. The intention of this process is not to change the regulatory status of radio astronomy services in the band, but rather to encourage mutually acceptable technical solutions that would prevent avoidable interference to the radio astronomy service without imposing undue delay on non-radio astronomy services. The ACMA would not normally become involved in these negotiations.

3.7. ARQZWA

The ACMA established the Australia Radio Quiet Zone Western Australia (ARQZWA) on 11 April 2005. The ARQZWA aims to maintain the current “radio-quietness” of a site in remote Western Australia (near Boolardy Station, around 200 km East of Meekatharra) centred at latitude 26°42’15” South and longitude 116°39’32” East (GDA94). The area has very low levels of radiofrequency energy because of its low population and lack of industrial development. The ARQZWA is intended to facilitate the development and use of new radio astronomy technologies at that location, this includes the development and operation of the Square Kilometre Array (SKA).

Radiocommunications Assignment and Licensing Instruction, RALI MS32, details the coordination requirements for Apparatus Licences within the ARQZWA [8]. Proposed PTS assignments in the 1800 MHz band must conform to the requirements of RALI MS32.

3.8. Underground PTS

PTS networks in underground locations such as mines are increasingly being sought by industries. Due to the service being located underground, the potential for interference to services above ground is low. Thus, no formal coordination with these services is considered necessary provided **Special Condition C23** and advisory note BL are attached to any licence issued. There is no limit on how much of the 1800 MHz band can be used in an underground environment under these conditions. However, coordination among multiple underground PTS licensees is a site management issue and should be resolved by underground site manager. Moreover, the arrangements for underground PTS in this RALI do not apply in any 1.8 GHz spectrum licensed space. **Special Condition C23** limits the above ground emissions and requires that stations operate under a ‘no interference and no protection basis’. Advisory note BL indicates that the band is under review and that the licensed transmitter may be required to cease operation upon notice.

When applying for a licence, an above ground PTS transmitter position indicating the nominal location of the underground facility, must be used. Multiple underground devices may be operated under any licence issued, without the requirement of registration, provided the requirements of **Special Condition C23** are not exceeded.

Other parameters that should be used on any licence applications are:

- EIRP: 10 μ W
- Antenna ID: 80219
- Antenna height: 1.5 m
- Antenna azimuth: omni directional

For an existing PTS licence that does not support underground communications (ie no **Special Condition C23**), the licensee may apply to vary their existing licence to support underground transmitters using the procedure as above.

Part 4 PTS Coordination Procedure

4.1. Overview of Coordination Procedure

This part provides an overview of the coordination procedure to be followed.

To perform the coordination, access to licence data for existing assignments is required. This data is available on the ACMA's Register of Radiocommunications Licences (RRL).

The coordination procedure described here determines the compatibility of a proposed PTS with existing services operating in a particular frequency band in a given area. For typical coordination assessments the steps outlined below (or relevant parts thereof) need to be completed.

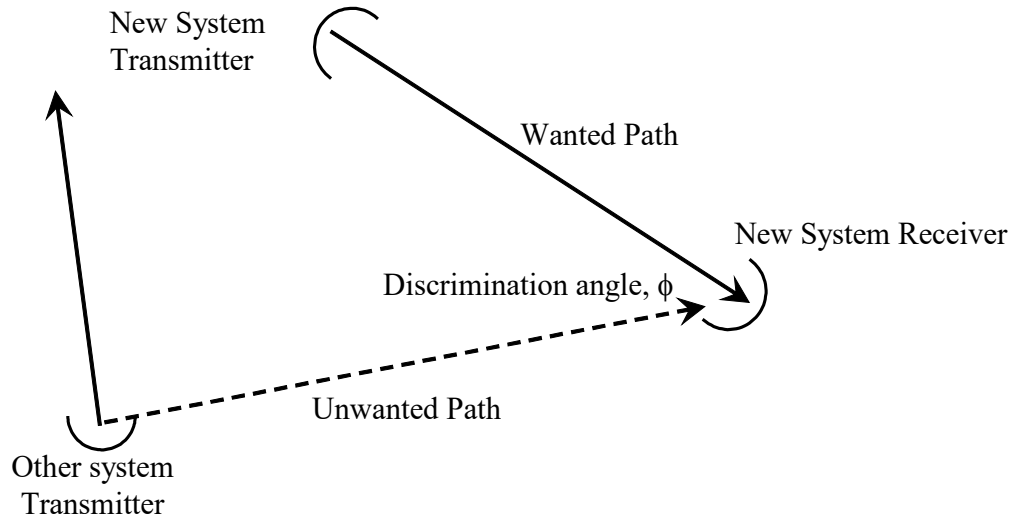
- Step 1. Identify potentially affected receivers;
- Step 2. Determine the wanted power at each receiver from its transmitter;
- Step 3. Determine the unwanted power at each receiver from the proposed transmitter.
- Step 4. Determine the required protection criteria for each identified victim receiver;
- Step 5. Compare the calculated unwanted level or wanted-to-unwanted ratio at each receiver against the applicable protection criteria.

4.2. Detailed description of Coordination Procedure

Step 1: Identify potentially affected receivers or interfering transmitters

The first step is to identify all receivers that may be affected by the operation of the proposed system. Only those receivers operating within a frequency cull range and located within a distance cull radius need to be considered. If no potential victim receivers are identified within the frequency and distance cull ranges then no further coordination calculations are required.

To assess the effects of other systems into a proposed system it is necessary to identify all transmitters falling within specified frequency and distance cull limits. Figure 3 illustrates a wanted system being interfered with from an unwanted signal.

Figure 3. Illustration of wanted and an unwanted signals

Step 2: Determine wanted signal power at each receiver from its associated transmitter

Step 2 of the coordination procedure is to calculate the level of wanted power at each receiver identified in step 1. Note that this step is only relevant in the case of interference into fixed link receivers.

Step 3: Determine the unwanted power at each receiver from the proposed transmitter

Step 3 of the coordination procedure is to calculate the level of unwanted power at each receiver identified in step 1.

Step 4: Determine the required protection criteria for each identified victim receiver

Step 4 of the coordination procedure is to determine the applicable protection criteria for each victim receiver identified in step 1. To protect receivers from unacceptable interference, the unwanted power levels at a victim receiver must not exceed the required protection criteria for that receiver.

In this RALI a maximum allowable unwanted level criterion is used for protection of PTS receivers and protection ratios are used for protection of fixed link receivers.

When applying protection ratios for protection of fixed link receivers, the protection ratios should be adjusted to take account of actual path length and geoclimatic zone. Protection ratio correction factor graphs are provided in Attachment 2c.

Example of Protection Ratio correction factor adjustment

An example calculation of the protection ratio for a digital fixed link receiver with the following parameters is shown below:

Input data:

Centre Frequency	=	1.8745 GHz
bandwidth	=	14 MHz
P _L	=	10
link path length	=	50 km

$$PR = \text{co-channel PR} + (\text{adjustment for } d=50 \text{ km and } P_L=10)^6$$

$$= 60 + (-7) \quad \text{dB}$$

$$= 53 \quad \text{dB}$$

Step 5: Comparison with protection criteria.

Step 5 of the coordination procedure compares the calculated levels from Step 2 and Step 3 with the protection values obtained from Step 4. Two cases are detailed below depending on which type of protection criteria is required.

Case one: Protection Ratio

The protection criterion is met for a particular victim receiver if the wanted-to-unwanted power ratio equals or exceeds the required protection ratio for that receiver. That is:

$$\text{Wanted Signal} - \text{Unwanted Signal} - \text{Protection ratio} \geq 0$$

If the wanted-to-unwanted power ratio equals or exceeds the protection ratio for each victim receiver then the protection criteria has been met and spectrum sharing is possible. However, if the wanted-to-unwanted power ratio is less than the protection ratio at any of the victim receivers then, for those receivers, the new transmitter is deemed to be causing unacceptable interference.

Case two: Maximum Unwanted Level

The unwanted signal level at the victim receiver is compared to a maximum unwanted level. This is generally expressed in dBm per bandwidth (e.g. dBm/5 MHz).

If the unwanted signal level exceeds the maximum unwanted level for any victim receiver then the transmitter is deemed to be causing unacceptable interference. However, if the unwanted signal level is equal or less than the maximum unwanted level for each victim receiver then the protection criteria has been met and spectrum sharing is possible.

Note: Where Protection ratios and Protection Criteria are required for frequency offset values other than those shown in the tables at Attachment 2 the value applying to the lesser offset case should be used.

⁶ see Attachment 2c

4.3. Propagation Models

Path losses between systems may arise through a range of propagation mechanisms, depending on the factors. Some of the main propagation mechanisms are: line of sight (free space loss), smooth Earth diffraction and diffraction over obstacles and irregular terrain (knife-edge diffraction).

Information on how to determine propagation losses due to diffraction over obstacles and irregular terrain can be found in ITU-R Recommendation P.526 [9], which also covers spherical Earth diffraction.

The interference protection criteria extracted from RALI FX-3 are applicable for interference levels exceeded for 20% of the time. Therefore, when drawing a path profile to calculate diffraction losses an Earth curvature factor of $k = 3$ should be used. This will give results corresponding to signal levels exceeded for 20% of the time.

In performing frequency assignment work, the ACMA recommends the use of the propagation models defined in ITU-R recommendation P.452 [10] under clear sky conditions for an annual time percentage of 20% or P.526 using a k-factor of 3. However, assigners are free to choose an alternative propagation model to be applied for a particular path, provided it is justifiable.

4.4. Further Options if Coordination is not successful

If the protection criteria are not met, then spectrum sharing is not possible unless further steps are taken by the applicant. If the proposal is to be pursued further, the applicant may consider the following options:

- modifying the configuration of the proposed system to meet the protection criteria (this may include modifying the equipment to limit operation to a smaller portion of the band, or changing the locations, antenna height, proposed EIRP, etc.);
- negotiating an agreement with the affected or affecting licensee(s) regarding changes to the system;
- applying for a licence to conduct test transmissions to assess the actual propagation loss.

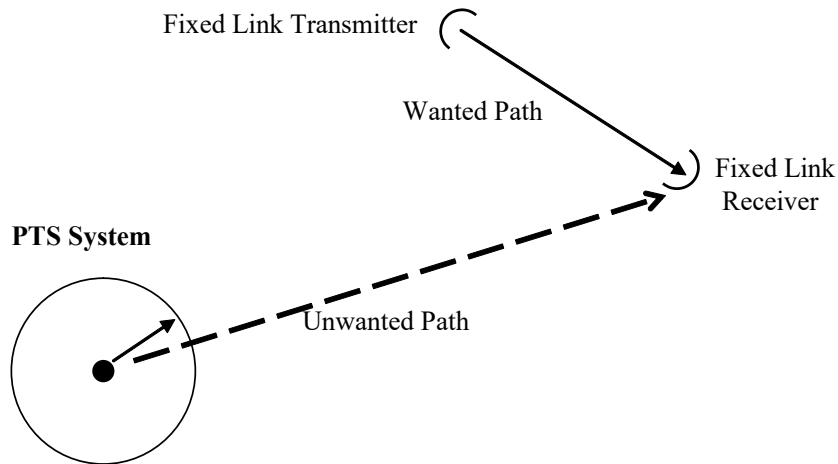
4.5. Assessing Interference: PTS into Fixed Links

Interference from a proposed PTS system transmitter into a fixed link receiver is assessed using the Steps described in section 4.2. Steps 1 to 5 in conjunction with the additional clarifications given below are to be followed. This procedure can also be used to assess potential interference into a proposed fixed link receiver from an existing PTS system transmitter.

The coordination process calculates a wanted-to-unwanted signal level ratio at the fixed link receiver input and compares it against the relevant protection ratio value(s) given in the tables at Attachment 2b.

Figure 4 illustrates the wanted and unwanted paths on the basis of the deployment model detailed at Attachment 3.

Figure 4. Interference scenario PTS into point-to-point fixed link



Note:

- **Agreements to reduce or accept lesser protection requirements detailed in this RALI are not allowed. Where coordination with an existing fixed link fails the frequency assignment criteria defined in this RALI a licence will not be granted, irrespective of who the licensee is.**
- **Numerous composite authorisations exist for fixed links operating in the 1.8 GHz band defined in RALI FX3. These can be identified where a fixed link assignment has a carrier frequency recorded on the RRL.**

When coordinating these assignments, assigners must:

- **use the carrier frequency as the centre frequency for emissions; and**
- **determine the bandwidth of the service from the emission designator rather than the licensed bandwidth.**

Details on composite authorisations can be found on the ACMA website.

Specific Step Clarification

Step 1: To identify potentially affected fixed link receivers, a minimum distance cull around the site of the proposed PTS base station transmitter of 200 km is required. Anything within this radius should be included in the following steps.

A frequency cull is then applied to further reduce the number of cases requiring more detailed coordination calculations. Noting that different situations apply with respect to sharing with other services in the two bands, the required frequency culls are:

PTS Band	Fixed Link Receiver Frequency Cull Range
1710-1785 MHz	1700-1790.5 MHz
1805-1880 MHz	1776.5-1951 MHz

Step 3: This step requires calculations to be made for all victim receivers identified in Step 1. This needs to take into account the appropriate interference scenarios for the frequency band being considered. Three separate cases exist:

Case 1 For the band 1805-1880 MHz (PTS base station transmit), calculate the unwanted power level on the basis of the licensed details (or application details) for the PTS base station transmitter using transmit power and antenna gain (with any discrimination taken into account), the licensed (or application) fixed point-to-point receiver gain (with any discrimination taken into account), and propagation loss from the appropriate propagation model.

Case 2 For the coordination of low powered ubiquitous transmitters⁷ in the band 1805-1880 MHz, if the ubiquitous transmitter occupies spectrum at or within the second adjacent channel of the fixed link receiver channel and the geographical location of the PTS base station (from case one) is within 15 km of the fixed link receiver, coordination is deemed to fail.

This case is only considered if low powered ubiquitous terminals are to be deployed.

Case 3 For the band 1710-1785 MHz (PTS mobile transmit), calculate the unwanted power level on the basis of the notional PTS mobile station details (provided at Attachment 3), the licensed (or applicant) fixed point-to-point receiver gain (with any discrimination taken into account), and propagation loss from the appropriate propagation model.

If the PTS mobile station occupies spectrum at or within the second adjacent channel of the fixed link receiver channel and the geographical

⁷ Low powered ubiquitous transmitters include devices such as femtocells and smart repeaters that adhere to **Special Condition C21** specified in section 5.4.

location of the PTS base station is within 15 km⁸ of the fixed link receiver, coordination is deemed to fail. Generally as a result a licence will not be granted unless it can be shown that the coverage area of the PTS system does not overlap the interference zone of the fixed link receiver where the interfering system has the notional PTS mobile transmitter characteristics defined in Attachment 3.

If the PTS mobile station occupies spectrum at or within the second adjacent channel of the fixed link receiver's channel and the geographical location of the PTS base station is greater than 15 km from the fixed link receiver, the notional PTS mobile station should be considered to be at the same coordinates and height as the PTS base station antenna.

Step 5: A comparison of the calculated wanted-to-unwanted ratios from Steps 2 and 3 with the relevant protection ratio value(s) in the tables at Attachment 2b will determine if the protection criteria at the victim fixed link receiver is achieved.

Note:

1. Case 1 and Case 3 coordination always needs to be performed for interference from both PTS base station transmitters in the 1805-1880 band and notional PTS mobile station transmitters in the 1710-1785 MHz band interfering into fixed link receivers.
2. Case 2 coordination need only be performed if low powered ubiquitous transmitters are to be deployed under the proposed assignment. If the frequency assignment criteria is met, then **Special Condition C21** (see section 5.4) must be attached to relevant spectrum accesses. If the assignment is within 15 km of the geographical boundary of a spectrum licence then **Special Condition C2** should also be attached.

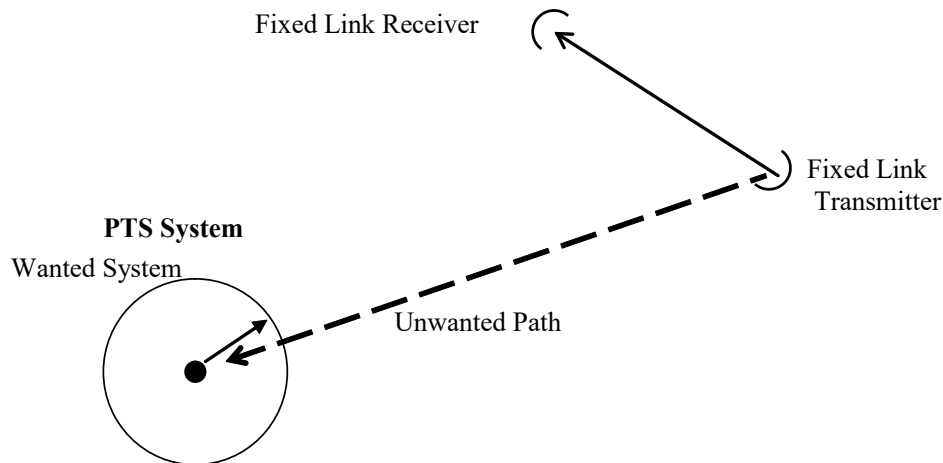
4.6. Assessing Interference: Fixed Links into PTS

Interference from an existing fixed link transmitter into a proposed PTS system receiver is assessed using the steps described in section 4.2. Steps 1 to 5 in conjunction with the additional clarifications given below are to be followed. This procedure can also be used to assess potential interference from a proposed fixed link transmitter into an existing PTS system.

The coordination process is to calculate the unwanted signal level at the PTS victim receiver and compare it against relevant protection criteria given in the tables at Attachment 2a.

Figure 5 illustrates the wanted and unwanted paths on the basis of the deployment model detailed at Attachment 3.

⁸ The notional coverage area has been estimated at 15 km (based on a mobile transmit EIRP of 30 dBm/5MHz, base station receive sensitivity of -102 dBm/5MHz and notional system characteristics contained in Attachment 3).

Figure 5. Interference scenario fixed link into PTS**Note:**

- **Agreements to reduce or accept lesser protection requirements detailed in this RALI are not allowed. So where coordination with an existing fixed link fails the frequency assignment criteria defined in this RALI a licence will not be granted, irrespective of who the licensee is.**
- **Numerous composite authorisations exist for fixed links operating in the 1.8 GHz band defined in RALI FX3. These can be identified where a fixed link assignment has a carrier frequency recorded on the RRL.**

When coordinating these assignments, assigners must:

- **use the carrier frequency as the centre frequency of emissions; and**
- **determine the bandwidth of the service from the emission designator rather than the licensed bandwidth.**

Details on composite authorisations can be found on the ACMA website.

Specific Step Clarification

Step 1: To identify potentially interfering fixed link transmitters, a minimum distance cull around the site of the proposed PTS base station receiver of 200 km is required. Anything within this radius should be included in the following steps.

A frequency cull is then applied to further reduce the number of cases requiring more detailed coordination calculations. The recommended frequency culls are:

PTS Band	Fixed Link Transmitter Frequency Cull Range
1710-1785 MHz	1700 – 1790.5 MHz
1805-1880 MHz	1783.5 – 1904.5 MHz

Step 3: This step requires calculations to be made for all victim receivers identified in Step 1. This needs to take into account the appropriate interference scenarios for the frequency band being considered. Two separate cases exist:

Case 1 For the band 1710-1785 MHz (PTS base station receive), calculate the unwanted power level at the PTS base station receiver, using the PTS base station licensed details (or application details) including antenna gain (with any discrimination taken into account), the fixed link transmitter power (EIRP) in the direction of the PTS base station receiver, and propagation loss from the appropriate propagation model.

Case 2 For the band of 1805-1880 MHz (PTS mobile receive), calculate the unwanted power level at a PTS mobile receiver using the notional PTS mobile receiver details (provided at Attachment 3), the fixed link transmitter power (EIRP) in the direction of the notional PTS mobile receiver, and propagation loss from the appropriate propagation model.

If a fixed link transmitter occupies spectrum at or within the first adjacent channel of the PTS mobile station receiver's channel and its geographical location is within 15 km⁹ of the PTS base station, coordination is deemed to fail and a licence will not be granted unless the licensee is willing to accept a higher level of interference.

If a fixed link transmitter occupies spectrum at or within the first adjacent channel of the PTS mobile station receiver's channel and its geographical location is greater than 15 km from the PTS base station, the notional PTS mobile station should be considered to be at the same coordinates and height as the PTS base station antenna.

Step 5: A comparison of the relevant values in the tables at Attachment 2a and the calculated unwanted signal levels from Step 3 will determine if the level of interference into the PTS receiver is acceptable.

Note that this needs to be performed for interference from fixed link transmitters into both PTS base station receivers in the 1710-1785 MHz band as well as notional PTS mobile station receivers in the 1805-1880 MHz band.

⁹ The notional coverage area has been estimated at 15 km (based on a mobile transmit EIRP of 30 dBm/5MHz, base station receive sensitivity of -102 dBm/5MHz and notional system characteristics contained in Attachment 3).

4.7. Assessing Interference: PTS into PTS

Note: This process is not required between stations operated by the same licensee, as it is expected that the licensees will manage interference between their own stations.

Interference from a proposed PTS system transmitter into each potential victim PTS system receiver is assessed using the steps described in section 4.2. Steps 1 to 5 in conjunction with the additional clarifications given below are to be followed.

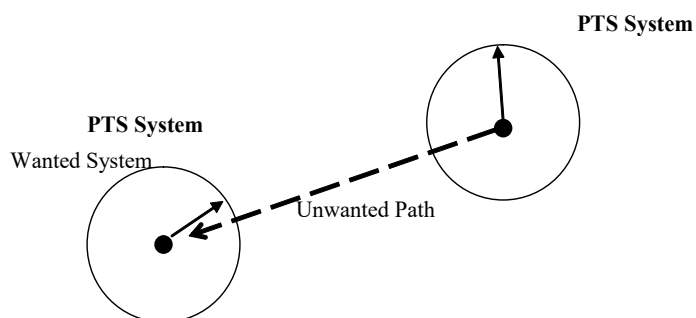
Two scenarios are considered together in this section:

- interference from a proposed PTS transmitter to a licensed PTS receiver
- interference from a licensed PTS transmitter to a proposed PTS receiver

The coordination process is to calculate the unwanted signal level at the PTS victim receiver and compare it against relevant protection criteria given in the tables at Attachment 2a.

Figure 6 illustrates the wanted and unwanted paths on the basis of the deployment model detailed at Attachment 3.

Figure 6. Interference scenario PTS into PTS



Specific Step Clarification

Step 1: To identify potentially affected PTS receivers, a minimum distance cull around the proposed PTS base station transmitter/receiver site of 100 km is required. Anything within this radius should be included in the following steps. A minimum co-channel reuse distance of 45 km will also be applied to PTS base stations operated by different licensees. Within the reuse distance of an existing PTS base station location, other co-channel PTS applications will not be considered. Beyond the reuse distance, co-channel coordination procedure detailed in the following steps should be followed.

A frequency cull is then applied to further reduce the number of cases requiring more detailed coordination calculations. Frequency culls are made at plus and minus half the desired channel bandwidth from the centre frequency of the proposed channel (i.e. only co-channel coordination is required). All PTS systems with emissions that overlap this frequency range need to be considered in the next steps.

Step 3: Calculate the unwanted power level on the basis of the proposed details for the PTS base station transmitter using antenna gains (with any discrimination taken into account) and transmitter power, notional PTS mobile station parameters

(provided at Attachment 3), and propagation loss from the appropriate propagation model.

A notional PTS mobile station is used as the victim receiver during coordination in this step. It should be considered to be at the same coordinates and height as the victim PTS base station antennas identified in step 1.

Step 5: A comparison of the values in the tables at Attachment 2a and the calculated unwanted signal levels from Step 3 will determine if the level of interference into the PTS victim receiver is acceptable.

4.8. Assessing Interference: Spectrum Licensed Area

To best ensure compatibility, coordination of PTS licenses with existing Spectrum Licences will be subject to the same requirements as if devices were deployed under the 1800 MHz spectrum licence technical framework.

This means that for all PTS base station transmitters located within 100 km and operating co-channel of a spectrum licence space, the 1800 MHz spectrum licence device boundary requirements need to be met.

The device boundary requirements, including device boundary criteria and propagation model, are detailed in the *Radiocommunications (Unacceptable Levels of Interference — 1800 MHz Band) Determination 2023* [7].

Prospective licensees should be aware that **Advisory note FA** (see section 5.3) will also be attached to all PTS licences located within 100 km and operating co-channel to a spectrum licence boundary. This note advises PTS licensees that within this distance, if interference into a PTS receiver occurs, the spectrum licensee has priority irrespective of date the spectrum licence device was first operated.

4.9. Assessing Interference: Spectrum Licensed Devices

Interference from an adjacent channel *high sited* spectrum licence transmitter operating in the 1710-1725 MHz band and a PTS Base Station Receiver is assessed using the following procedure:

Step 1: To identify potentially affected PTS Receivers, a minimum distance cull around the proposed Receiver of 100 km is required. Any *high sited* spectrum licence transmitter within this radius should be included in the following steps.

A frequency cull is then applied to further reduce the number of cases requiring more detailed coordination calculations. The recommended frequency culls are:

PTS Band	Spectrum Licence Transmitter
1725-1745 MHz	1710-1725 MHz

Note:

- Transmitters registered via a group registration and associated with a site on

the towns mobile list are not required to be coordinated with. These registrations are typically used to authorise the use of user terminals at unknown locations within an area.

Step 3: This step requires calculations to be made for all victim receivers identified in Step 1. Calculate the unwanted power level at the PTS base station receiver, using the PTS base station licensed details (or application details) including antenna gain (with any discrimination taken into account), the transmitters power (EIRP) in the direction of the PTS base station receiver, and propagation loss from the appropriate propagation model.

Step 5: A comparison of the relevant values in the tables at Attachment 2a and the calculated unwanted signal levels from Step 3 will determine if the level of interference into the PTS receiver is acceptable.

4.10. Assessing Interference: ARQZWA

All proposed PTS assignments in the 1800 MHz band need to be assessed against the ARQZWA. Details of the restricted and coordination zones for services in the 1800 MHz band are provided in RALI MS32. No new assignments are to be made within the restricted zones. If a proposed assignment lies within a coordination zone then the coordination procedures outlined in RALI MS32 must be followed.

4.11. Assessing Interference: MetSat

The ACMA has developed an application referral zone around MetSat Earth station sites as described in the table below. Requests for assignments within these zones are to be referred to the Manager, Spectrum Engineering, Spectrum Infrastructure Branch, Canberra for preliminary coordination consultation. This could involve negotiations with the affected MetSat licensee to determine the most appropriate way to deploy systems to manage any interference.

Operating Frequency (for PTS services)	Operating Frequency (for MetSat services)	Referral Zone
1710-1725 MHz	1690-1710 MHz	15 km

Note:

- All Earth stations on the RRL operating in this frequency range need to be considered.
- The referral zone also applies to the site located at Latitude 12.593733° South and Longitude 131.305731° East (GDA94) which is planned for future MetSat use.

4.12. Assessing Interference: Radio Astronomy

RALI MS 31 has been developed to prescribe a process for notification to the Commonwealth Scientific and Industrial Research Organisation (CSIRO) of prospective frequency assignments to apparatus licensed services that might impede or degrade the operation of key radio astronomy facilities. Affected apparatus services are those that fall within defined zones around the radio astronomy facilities and within the frequency bands listed in Australian Radiofrequency Spectrum Plan (ARSP) Australian footnote AUS87.

Applicants are encouraged to work with the affected licensee and follow the notification procedure prescribed in RALI MS 31.

4.13. Site Engineering Aspects

At shared sites, or sites in close proximity, a number of potential interference mechanisms other than co-channel or adjacent channel interference may occur. These include: intermodulation; transient and spurious emissions; receiver desensitisation; and, physical blocking. These mechanisms are caused by non-linear and often complex processes that are, usually, not readily predicted using information contained in the ACMA's RRL. Nevertheless, a number of "site engineering" methods can be applied to address these potential interference scenarios. These include, but are not limited to, RF filtering, site shielding, frequency separation, site locations and power reduction.

Most of the above mentioned methods require co-operation and co-ordination between licensees. This is most easily achieved where the two systems are owned by the same licensee. In reality however, neighbouring systems are seldom owned by the same licensee, and therefore formal discussions may be required.

In the case of co-siting with spectrum licensed devices, if the interference from the spectrum licensed device is not the result of operation of the radiocommunications device in a manner that does not comply with the respective conditions of the licence, then licensees must take reasonable steps to negotiate arrangements likely to reduce the interference to acceptable levels. To assist in such situations, operators are also referred to the relevant Radiocommunications Advisory Guideline (specified on the spectrum licence) which specifies a minimum spectrum licence notional receiver performance.

The ACMA expects that licensees (or their site managers) will work cooperatively and apply good site engineering practice to resolve problems¹⁰.

¹⁰ Refer to RALI FX-3 section 3.3 for further discussion.

4.14. Assignment Rules

Site Sense

PTS systems are required to observe site sense rules in the 1800 MHz band by deploying base station transmitters in the 1805-1880 MHz portions of the band and base station receivers in the 1710-1785 MHz portion of the band.

EIRP Limits

All PTS licences are subject to a 50 dBm/30kHz EIRP density limit in the 1800 MHz band.

Channel Plan

5 MHz channelling arrangements apply. Channel centre frequencies for the 5 MHz channelling arrangement are defined as:

- Lower band: $1712.5 + (n-1)*5$
- Upper band: $1807.5 + (n-1)*5$

Where n is the paired upper and lower band channel number defined as an integer from 1-15 (inclusive).

Provided the assignment priorities described in this section are adhered to, licensees can aggregate 5 MHz channels to form larger channels as described in Figure 1.

Definitions

Infrastructure sector

The ACMA's classification of the infrastructure sector encompasses both the Australian resources sector as defined by the Department of Industry, Innovation and Science,¹¹ and nationally significant infrastructure as defined in the [Infrastructure Australia Act 2008](#) [1]. The industries covered include:

- > minerals
- > oil
- > natural gas
- > transport
- > energy
- > water
- > rail

For the purposes of the priority assignments in the 1800 MHz band, the communications sector is covered by assignments to the three mobile carriers and

¹¹ The Australian resources sector is defined within Australian Government (2010) *Resourcing the Future*, National resources sector employment taskforce discussion paper, p1, available at <http://www.innovation.gov.au/Skills/National/Documents/NRSETReport.pdf>. ¹² It is noted that GSM systems using smaller bandwidths may also operate in this band, however, modelling has been predominantly based on wider bandwidth UTRA/E-UTRA systems.

would not therefore be included in the generic 'infrastructure' assignments.

Assignment Priority

General Rules

Assignments should be made following the assignment priorities defined in table 4.1. Prospective licensees must follow the assignment priorities defined. The terms 'infrastructure' in table 4.1 are the same as those defined previously for the *Infrastructure Sector*.

Prospective licensees will not be granted licences in those parts of the spectrum identified for access by another operator or industry/sector.

Once long term planning for the 1800 MHz band is further progressed, the ACMA will review these assignment priorities.

Table 4.1: Assignment priorities in the 1800 MHz band

Frequency	Channel (2 x 5 MHz)	Remote Australia	Regional Australia
<div>1710/1805 MHz</div> <div><div></div></div> <div>1785/1880 MHz</div>	1	Telstra (2 x 15 MHz)	Not Available
	2		
	3		
	4	VHA (2 x 15 MHz)	
	5		
	6		
	7	Optus (2 x 15 MHz)	
	8		
	9		
	10	Infrastructure*/ Other* (2 x 30 MHz)	
	11		
	12		
	13		
	14		
	15		

*Licensees in this segment of the band are subject to a 2 x 10 MHz spectrum acquisition limit in a given area. For the purpose of applying this rule, a given area is deemed to be a 45km radius around a particular PTS site.

The definition of regional areas are those defined for spectrum licensing in Embargo 26

for the 1800 MHz band. Indicative representations of these areas are provided at Attachment 1, they can also be viewed in Google Earth. Any areas that are not encompassed by Embargo 26 for the 1800 MHz band are considered to be remote areas.

'Infrastructure and Other' band segment

The segment of the band identified for use by the infrastructure sector and 'other' users encompasses any prospective licensee except Telstra, VHA and Optus.

In these segments licensees should be assigned:

- no more than 2x10 MHz of spectrum in a given area;
- contiguous channels unless none are available;
- channels from the highest channel down.

The exception to this rule is when a licensee already holds spectrum in the 1800 MHz band. In this instance, the licensee should be preferentially assigned the same spectrum in the surrounding area. This improves spectral efficiency and maximises spectrum availability for other prospective licensees.

Part 5 Licensing

5.1. Overview of Licensing

A Public Mobile Telecommunications Service Class B (PMTS Class B) apparatus licence for a PTS system may be issued to authorise the operation of a service that consists of 2 or more land stations. Devices used by consumers to communicate with the land stations would be authorised by the *Radiocommunications (Cellular Mobile Telecommunications Devices) Class Licence 2024* [2].

A PTS licence is defined in the *Radiocommunications (Interpretation) Determination 2015* [11] as:

PTS licence means an apparatus licence issued for a service that consists of 1 or more stations that are operated for the provision of a public mobile telecommunications service.

Under the PTS licence type, the PMTS Class B licensing option is available for service in the 1710 – 1785 / 1805 - 1880 MHz band.

PMTS Class B apparatus licences authorising operation in the 1800 MHz band will only be issued in geographic areas that are located outside the embargo areas defined in *Radiocommunications Assignment and Licensing Instruction (RALI) MS03: Spectrum Embargoes* [3]. This includes those frequencies and areas allocated for spectrum licensing.

5.2. Licence Conditions

The operation of radiocommunications equipment authorised by a PTS licence is subject to:

- conditions specified in the *Radiocommunications Act 1992* [12](the Act), including an obligation to comply with the Act;
- conditions specified in the *Radiocommunications Licence Conditions (Apparatus Licence) Determination 2024* [6], *Radiocommunications (Cellular Mobile Telecommunications Devices) Class Licence 2024* [2] and any other determinations made by the ACMA under section 110A(2) of the Act;
- the *Radiocommunications Licence Conditions (PTS Licence) Determination 2024* [5], includes conditions that allow the use of low-powered indoor devices (such as femtocells) under the following conditions:
 - *has an indoor fixed antenna and a radiated true mean power less than or equal to 24 dBm EIRP/occupied bandwidth;*
 - *is operated on a frequency specified in the licence for the operation of a radiocommunications transmitter that is, or is part of, another base station under the licence (the other base station); and*
 - *if the licence specifies an emission designator for emissions made by a*

radiocommunications transmitter that is, or is part of, the other base station – is operated in accordance with that emission designator; and

- *is not used to extend the coverage area within which radiocommunications made by the other base station may be received.*
- conditions specified in the licence; and
- any further conditions imposed by the ACMA under section 111 of the Act.

5.3. Advisory Notes

The following user selectable **Advisory Note FR** must be attached to all licences authorising PTS systems in the 1780-1785 / 1875-1880 MHz band:

The shared spectrum arrangements and uncoordinated nature of class licensed radiocommunications devices in the 1880-1900 MHz band:

- a) may result in interference from nearby class licensed radiocommunications devices that may reduce system performance; and*
- b) the likelihood of such interference is very low due to the dynamic channel allocation techniques inherent in cordless technologies used in the band; and*
- c) protection from such interference cannot be afforded.*

The following user selectable **Advisory Note FA** must be attached to all licences for PTS sites located within 100 km of a spectrum licence boundary with in-band emissions that overlap those of the spectrum licence space:

If in-band interference to a station operated under this licence is caused by a radiocommunications device that is authorised to operate under a spectrum licence, the ACMA will consider any dispute from the starting point that the spectrum licence has priority over this licence, irrespective of the date that the spectrum licensed device was first operated.

Until long term planning in the 1800 MHz band is finalised, **Advisory Note C12** will be attached to all PTS licences:

The 1800 MHz band will be subject to re-planning in the future. This may require licensees to retune radiocommunication devices at their own cost to facilitate larger contiguous channels for all licensees in an area.

Until long term planning in the 1800 MHz band is finalised, **Advisory Note BN** will be attached to all PTS licences:

ACMA will monitor and review the use of, and demand for, this radiofrequency spectrum. ACMA may recommend the re-allocation of these bands, including by price-based allocation, as provided for in the Radiocommunications Act 1992. In view of this, ACMA's policy is that licensing services in this spectrum for periods exceeding 12 months, is not appropriate at this stage.

The following user selectable **Advisory Note BL** must be attached to all licences for

PTS licences in the 1800 MHz band that will be deployed underground:

This frequency band is currently under review to accommodate changes in technology. This review may lead to a requirement to change frequency or to cease transmission.

5.4. Special Conditions

Conditions of operation, which apply to an individual licence, will be printed on the licence under the heading 'Special Conditions'.

Special Condition FZ will be applied to all PTS licences in the 1800 MHz band. The intention is to encourage licensees to cooperate and, where necessary, equally compromise to resolve adjacent channel interference.

The licensee must cooperate to the extent necessary to prevent its radiocommunications services from inhibiting the use of radiofrequency spectrum by other licensees operating under a public telecommunication service licence in the area surrounding the station location specified on this licence.

Special Condition FA1 will be applied to all PTS licences operating in any portion of the 1710-1725 MHz band that are within 15km of a MetSat Earth station operating in the 1690-1710 MHz band. The intention is to ensure that transmitters operating under a PTS licence do not cause harmful interference MetSat Earth station receivers operating in below 1710 MHz.

The operation of radiocommunications transmitters under this licence must not cause harmful interference to Earth receive apparatus licences issued before the date of approval of this licence.

Special Condition C2 must be applied to all spectrum accesses associated with PTS licences in the frequency range 1920 to 1980 MHz and 2110 to 2170 MHz that will deploy low powered ubiquitous transmitters within 15km of a spectrum licence geographical boundary. This prevents low powered ubiquitous terminals from being deployed within a spectrum licence space.

Special Condition C2

The licensee is not authorised to operate a station: (a) in the geographic areas; and (b) on the frequencies, where a spectrum licence is in force.

Special Condition C21 can be applied to spectrum accesses in the 1800 MHz band that will deploy low powered ubiquitous transmitters and meet the coordination criteria specified in this RALI. This allows transmitters that meet the criteria specified to be deployed without the need to record site specific information.

Special Condition C21

A person must not operate a:

- a) *radiocommunications transmitter that is, or is part of, a station other than a registration exempt station otherwise than in accordance with section 8 of the Radiocommunications Licence Conditions (PTS Licence) Determination 2024 (PTS LCD); or*
- b) *registration exempt station otherwise than in accordance with sections 9, 12 and 13 of the PTS LCD.*

In this condition, **registration exempt station** has the same meaning as in the PTS LCD and also means a station:

- a) *that is, or incorporates, one or more radiocommunications transmitters (a **relevant transmitter**); and*
- b) *for which each relevant transmitter:*
 - (i) *has a fixed indoor antenna; and*
 - (ii) *is operated with a radiated true mean power not greater than 24 dBm EIRP per occupied bandwidth; and*
 - (iii) *is operated on a frequency specified in this licence for the operation of a radiocommunications transmitter; and*
 - (iv) *if this licence specifies an emission designator for emissions made by a radiocommunications transmitter – is operated in accordance with that emission designator; and*
 - (v) *is located within 15 kilometres of another base station (other than a low power base station) operated under this licence; and*
- c) *if a radiocommunications receiver is part of the station – the receiver is operated on a frequency specified in this licence.*

Special Condition C22 can optionally be applied to spectrum accesses in the 1800 MHz band that are located outside a city or town and is in remote areas of Australia as defined in section 4.14. The intention is to allow the use of portable devices that can be used to improve coverage in black spots in the coverage of a base station authorised to operate under a PTS licence.

Special Condition C22

A person must not operate a:

- a) *radiocommunications transmitter that is, or is part of, a station other than a registration exempt station otherwise than in accordance with section 8 of the Radiocommunications Licence Conditions (PTS Licence) Determination 2024 (PTS LCD); or*
- b) *registration exempt station otherwise than in accordance with sections 9, 12 and 13 of the PTS LCD.*

In this condition, **registration exempt station** has the same meaning as in the PTS LCD and also means a station:

- a) that is, or incorporates, one or more radiocommunications transmitters (a **relevant transmitter**); and
- b) that is capable of being moved between places; and
- c) for which each relevant transmitter:
 - (i) is operated on a frequency specified in this licence for the operation of a radiocommunications transmitter; and
 - (ii) if this licence specifies an emission designator for emissions made by a radiocommunications transmitter – is operated in accordance with that emission designator; and
 - (iii) is only operated when located within 5 kilometres of another base station (other than a low power base station) operated under this licence; and
- d) if a radiocommunications receiver is part of the station – the receiver is operated on a frequency specified in this licence.

Special Condition C23 must be applied to all spectrum accesses associated with PTS licences in the frequency range 1710 to 1785 MHz and 1805 to 1880 MHz that will deploy devices underground.

Special Condition C23

A person must not operate a:

- a) radiocommunications transmitter that is, or is part of, a station other than a registration exempt station otherwise than in accordance with section 8 of the Radiocommunications Licence Conditions (PTS Licence) Determination 2024 (**PTS LCD**); or
- b) registration exempt station otherwise than in accordance with sections 9, 12 and 13 of the PTS LCD.

In this condition, **registration exempt station** has the same meaning as in the PTS LCD and also means a base station:

- a) that is, or incorporates, one or more radiocommunications transmitters (a **relevant transmitter**); and
- b) that is located in an underground space; and
- c) for which each relevant transmitter:
 - (i) is operated with a radiated true mean power not greater than 10 micro watts per occupied bandwidth, when measured at an opening above ground that connects to the underground space; and
 - (ii) is operated on a frequency specified in this licence for the operation of a radiocommunications transmitter; and

- (iii) *if this licence specifies an emission designator for emissions made by a radiocommunications transmitter – is operated in accordance with that emission designator; and*
- d) *if a radiocommunications receiver is part of the station – the receiver is operated on a frequency specified in this licence.*

5.5. Spectrum Access Records

Technical details relating to the PTS system's base station, including, but not limited to, the actual operating EIRP, location, antenna height, type and orientation and transmit/receive frequency band, should be recorded.

Notes:

- Where sectorised antennas are used, details of the antenna model, down-tilt, polarisation and azimuth should be recorded for each sector. However, where the sectorised antennas are combined to achieve an effectively omni-directional coverage (on a single channel) it is not necessary to specify the azimuth of each sector antenna. Sites registered as an omni-directional deployment should be coordinated assuming the maximum radiated power in all directions – irrespective of the actual configuration.
- Where steerable beam antennas are used, details of the highest gain achievable through antenna phasing should be recorded.
- The coordination process described in Part 4 requires that protection to and from PTS mobile stations be calculated on the basis of assumed notional “worst-case” parameters for the PTS mobile station located within the 15 km coverage area from the PTS base station location. However, it is not required that data for the assumed PTS mobile station location should be recorded in the RRL.

RALI Authorisation

Approved

21/03/2024

Andrew Stewart

A/g Section Manager

Spectrum Planning Section

Spectrum Planning and Engineering Branch

Australian Communications and Media Authority

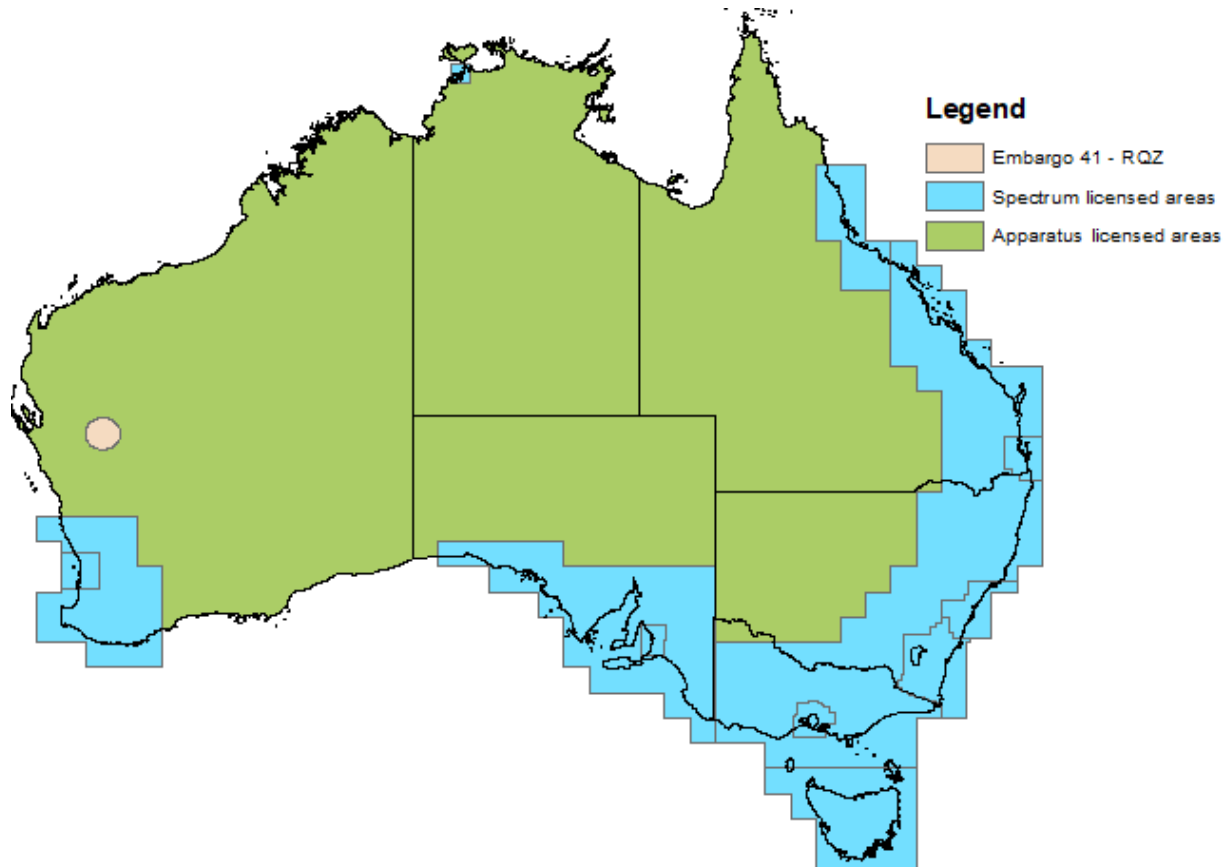
Glossary

ACMA	Australian Communications and Media Authority
AL	Apparatus Licensed
ARQZWA	Australian Radio Quiet Zone Western Australia
DECT	Digital Enhanced Cordless Telecommunications (previously known as Digital European Cordless Telecommunications)
EIRP	Equivalent Isotropically Radiated Power
FDD	Frequency Division Duplex
FWA	Fixed Wireless Access
ITU	International Telecommunication Union
LCD	Licence Conditions Determination
MetSat	Meteorological Satellite Service
MSS	Mobile Satellite Service
PR	Protection Ratio
PTS	Public Telecommunications System
RALI	Radiocommunications Assignment and Licensing Instructions
RPE	Radiation Pattern Envelope
RRL	Register of Radiocommunications Licences
Rx	Receiver
SL	Spectrum licensed
TDD	Time Division Duplex
Tx	Transmitter

REFERENCES

1. *Australian Radiofrequency Spectrum Plan 2021*, Australian Communications and Media Authority, 2021,
<http://www.legislation.gov.au/F2021L00617/asmade/text>
2. *Radiocommunications (Cellular Mobile Telecommunications Devices) Class Licence 2024* Australian Communications and Media Authority, 2024
<https://www.legislation.gov.au/F2024L00315/latest/text>
3. *Radiocommunications and Licensing Instruction MS03 - Spectrum Embargoes* Australian Communications Authority,
[Current and past spectrum embargoes | ACMA](#)
4. *Radiocommunications and Licensing Instruction SM26 - Restrictions on Apparatus Licensing in Spectrum Licensed Spaces*, Australian Communications Authority,
[RALI SM 26: Restrictions on Apparatus Licensing in Spectrum Licensed Spaces | ACMA](#)
5. *Radiocommunications Licence Conditions (PTS Licence) Determination 2024*, Australian Communications Authority, 2024
<https://www.legislation.gov.au/F2024L00316/latest/text>
6. *Radiocommunications Licence Conditions (Apparatus Licence) Determination 2015*, Australian Communications Authority, 2015,
<https://www.comlaw.gov.au/Details/F2015L00210>
7. *Radiocommunications (Unacceptable Levels of Interference- 1800 MHz Band) Determination 2023*, Australian Communications Authority, 2023,
<https://www.legislation.gov.au/F2023L00245/asmade/text>
8. *Coordination of Apparatus Licences within the Australian Radio Quiet Zone Western Australia (MS32)*, Australian Communications and Media Authority, 2007,
[RALI MS32: Australian Radio Quiet Zone Western Australia | ACMA](#)
9. *ITU-R Recommendation P.526, "Propagation by Diffraction"*, International Telecommunication Union
10. *ITU-R Recommendation P.452, "Prediction procedure for the evaluation of microwave interference between stations on the surface of the Earth at frequencies above about 0.7 GHz"*, International Telecommunication Union
11. *Radiocommunications (Interpretation) Determination 2015*, Australian Communications Authority, 2015,
<https://www.comlaw.gov.au/Details/F2015L00178>
12. *Radiocommunications Act 1992*, Commonwealth of Australia,
<https://www.legislation.gov.au/C2004A04465/latest>
13. *Compatibility study for LTE and WiMAX operating within the bands 880-915 MHz / 925-960 MHz and 1710-1785 MHz / 1805-1880 MHz (900/1800 MHz bands)*, European Conference of Postal and Telecommunications

- Administrations 2010,
<http://www.erodocdb.dk/docs/doc98/official/pdf/CEPTREP040.pdf>
14. *Radiocommunications Advisory Guidelines (Managing Interference into spectrum licensed receivers – 1800 MHz band)* 2023, Australian Communications and Media Authority, 2023
<https://www.legislation.gov.au/F2023L00242/asmade/text>
 15. *Radiocommunications Advisory Guidelines (Managing Interference from spectrum licensed transmitters - 1800 MHz Band)* 2023, Australian Communications and Media Authority, 2023
<https://www.legislation.gov.au/F2023L00274/asmade/text>

Attachment 1: Designated areas for PTS licensing in the 1800 MHz band as of 26th May 2015.

Apparatus licences for PTS systems may only be issued in the frequency ranges and areas shaded green in the figure above on a site coordinated basis. For precise definition of area boundaries refer to *Embargo 26* and *Radiocommunications and Licensing Instruction MS03* [3]. For the most current and complete list of embargoes that apply to the 1800 MHz band please refer to *Radiocommunications and Licensing Instruction MS03* [3].

Attachment 2a: Protection Criteria: PTS receivers**PROTECTION CRITERIA**

For the purposes of this attachment adjacent channels are defined with respect to the victim receiver's channel size. For example, in the case of an interference assessment for a point-to-point transmitter operating in a 14 MHz channel into a PTS receiver operating in a 5 MHz channel, the first adjacent channels refers to the 5 MHz channel either side of the victim receiver's occupied channel.

1. Victim PTS base station receiver and interfering fixed link transmitter or a high sited spectrum licence transmitter operating in the lower segment of the 1800 MHz band.

Frequency Offset (MHz)	PROTECTION CRITERIA Digital Interferer Tx → Digital Victim Rx
Co-channel	-102 (dBm per 5 MHz channel) -99 (dBm per 10 MHz channel) -97.2 (dBm per 15 MHz channel)
1 st Adjacent Channel	- 57 (dBm per 5 MHz channel) - 54 (dBm per 10 MHz channel) - 52.2 (dBm per 15 MHz channel)
2 nd Adjacent Channel	N/A

2. Victim PTS mobile receiver and interfering fixed link transmitter

Frequency Offset (MHz)	PROTECTION CRITERIA Digital Interferer Tx → Digital Victim Rx
Co-channel	-92 (dBm per 5 MHz channel) -89 (dBm per 10 MHz channel) -87.2 (dBm per 15 MHz channel)
1 st Adjacent Channel	-59 (dBm per 5 MHz channel) -56 (dBm per 10 MHz channel) -54.2 (dBm per 15 MHz channel)
2 nd Adjacent Channel	N/A

3. Victim PTS mobile receiver and Interfering PTS base station transmitter (Note a)

Frequency Offset (MHz)	PROTECTION CRITERIA Digital Interferer Tx → Digital Victim Rx
Co-channel	-92 (dBm per 5 MHz channel) -89 (dBm per 10 MHz channel) -87.2 (dBm per 15 MHz channel)
1 st Adjacent Channel	N/A

- a. This only applies for protection between stations of different licensees, where a minimum separation distance of 45 km between PTS base stations of different licensees is applicable. No minimum separation distance applies to different stations operated by the same licensee. In such cases, it is expected that the licensee would manage interference between such stations.

General Notes:

1. Separate protection criteria for analog system interferers have not been defined. Digital criteria shall be applied in such cases.

Attachment 2b: Protection Criteria: 1.8 GHz and 2.1 GHz fixed link receivers**PROTECTION RATIOS**

For the purposes of this attachment adjacent channels are defined as the maximum of the interfering transmitter and victim receivers channel size. For example, in the case of an interference assessment for a PTS transmitter operating in a 5 MHz channel interfering into a point-to-point receiver operating in a 14 MHz channel, the first adjacent channel refers to the 14 MHz channels either side of the victim receiver's occupied channel. The same logic is used to determine 2nd and 3rd adjacent channels.

1. Victim 1.8 GHz, 2.1 GHz or 2.2 GHz fixed link receiver and Interfering PTS transmitter

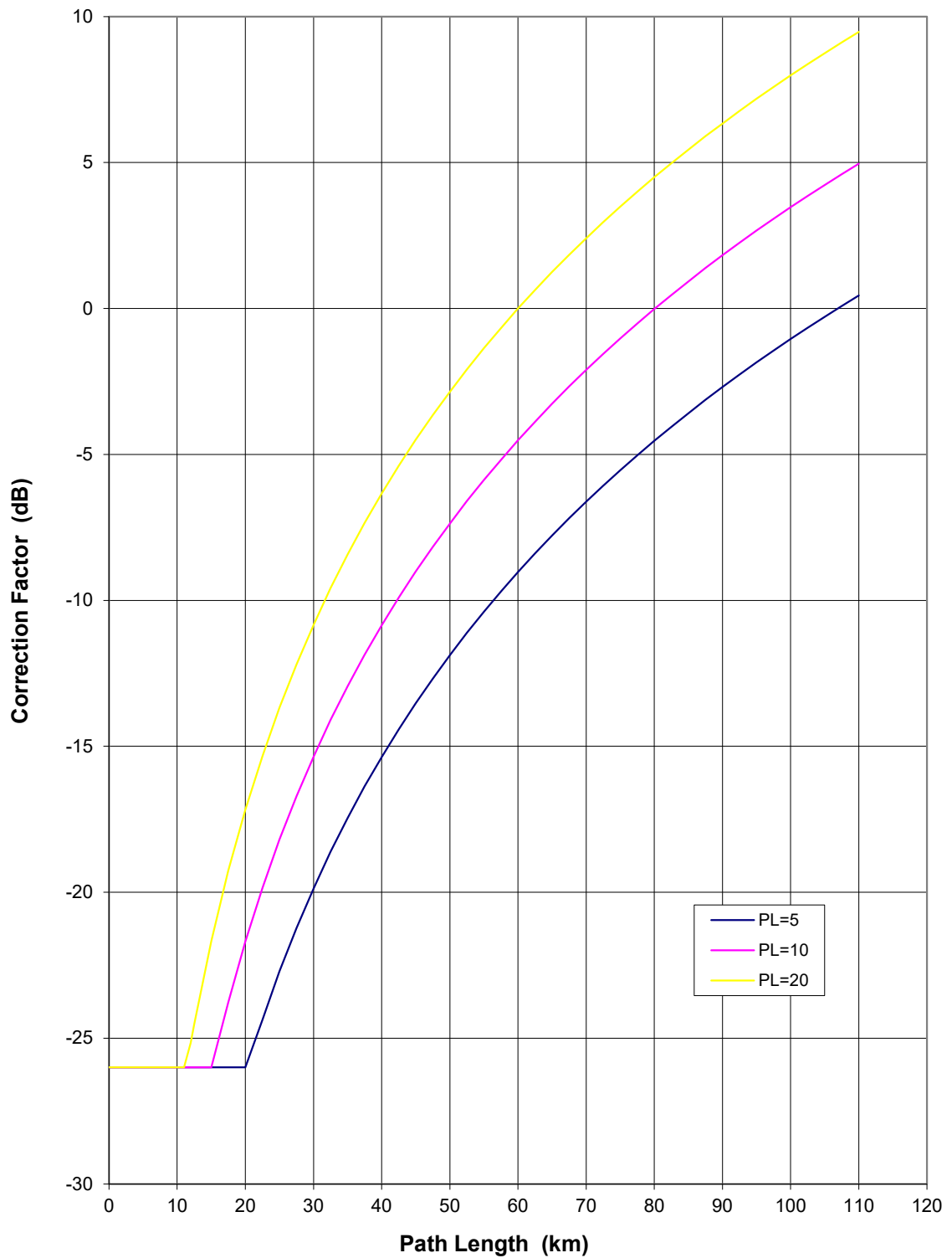
Frequency Offset (MHz)	REQUIRED PROTECTION RATIO (dB) Digital Interferer Tx → Digital Victim Rx
Co-channel	60
1 st Adjacent Channel	30
2 nd Adjacent Channel	0
3 rd Adjacent Channel	N/A

General Notes:

1. Protection ratios are based on a 60 km path length and P_L (Percentage of time that the average refractivity gradient in the lowest 100 m of the atmosphere is less than or equal to -100 N units/km) of 20. For other path lengths and P_L values refer to the correction factor graph at Attachment 2c.
2. Separate protection ratios for analog victims have not been defined. The above-mentioned protection ratios for digital systems shall be applied in such cases.
3. Provisionally, protection ratio values quoted here are identical to those included in RALI FX-3 for comparable cases. However, designers should be advised that in future these values (and the comparable values in RALI FX-3) may be revised downward to increase the density of spectrum usage in these bands.

Attachment 2c: Protection Ratio correction factors

MULTI PATH



P_L : Percentage of time that the average refractivity gradient in the lowest 100 m of the atmosphere is less than or equal to -100 N units/km.

For further details refer to Annex A to Appendix 1 of RALI FX-3.

Attachment 3: PTS system deployment model**Equipment types**

The equipment types and technologies considered in developing this RALI were:

- E-UTRA FDD (or LTE). Relevant standards are 3GPP TS 36.104 version 10.1.0 (base station) and 3GPP TS 36.101 version 10.1.1 (user equipment).
- GSM. Relevant standards are 3GPP TS 45.005 version 9.5.0 and 3GPP 05.05 version 8.20.0

Deployment model and general equipment characteristics

Deployment model values were chosen after considering typical PTS parameter values. The cell radius value (within which mobile stations will be protected under the constraints of the deployment model) was chosen to provide a reasonable protected deployment area but at the same time to promote opportunities for frequency re-use in other areas (by not protecting weak edge-of-coverage signals).

Base station Parameters	Deployment model Value	Range	Unit
Transmit Power	20	20-120	W
Feeder Loss	2	2	dB
Antenna Gain	19	11 - 19	dBi
F/B	28	0 - 30	dB
EIRP	60	52 – 70	dBm
Reference Bandwidth	5	0.2-20 ¹²	MHz
Rx Noise Floor	-102	-100 → -102	dBm
Antenna Height	30	variable	m
Maximum Cell Radius ¹³	15	up to 15	km
Adaptive Transmit Power Control	enabled	not specified	

Mobile station parameters	Deployment model Value	Range (Max)	Unit
EIRP (max)	30	20 - 38	dBm
Rx Bandwidth	5	0.2-20	MHz
Rx Noise Floor	-98	-96 → -98	dBm
Body and other Loss	6	0-8	dB
Antenna Height	1.5	1.5	m

¹² It is noted that GSM systems using smaller bandwidths may also operate in this band, however, modelling has been predominantly based on wider bandwidth UTRA/E-UTRA systems.

¹³ Cell radius for cases where the base station communicates with mobile stations with external antennas. While practical systems may in some cases achieve greater ranges, such operation is regarded as low probability and have not been catered for when developing planning models and protection criteria.

Notional Mobile Station

Maximum transmit power =	1 W (30 dBm/5 MHz)
Maximum antenna gain =	2.1 dBi (omni directional)
Height =	1.5 m
Maximum cell radius =	15 km

Emission Masks

Emission characteristics should conform to the relevant standard paying particular attention to co-existence requirements.

In addition to this, PTS base station transmitters are required to comply with the emission limits set out in Attachment 4 of this RALI. These emission limits are based on the same emission limits agreed to by the technical liaison group that reviewed the 1800 MHz technical framework in 2011.

Protection Criteria

Unlike fixed link protection ratios, which until now have been conservatively based and in many cases provide considerable excess fade margin, the PTS protection criteria in this RALI are deliberately biased towards permitting a high level of spectrum re-use while affording reasonable – though not excessive – levels of protection to the notional PTS service areas.

The maximum unwanted signal level for PTS receivers has been based on a level equivalent to the noise floor of the receiver (with an assumed receiver system noise figure of 5dB for the base station and 9 dB for the mobile). For a base station, within a nominal 5 MHz channel the level of -102 dBm has been specified. For a mobile station, within a nominal 5 MHz channel the level of -92 dBm has been specified, which takes into account estimated body and other losses of 6 dB.

Attachment 4: Out-of-band Emission Limits for PTS Operating in the 1.8 GHz Band

PTS base station transmitters are required to comply with the emission limits set out in this Attachment. These emission limits are based on the same emission limits implemented in the 1800 MHz spectrum licence technical framework.

The non spurious emission limits in Table 1 apply:

- (a) at frequencies outside the 1710-1785 MHz and 1805-1880 MHz frequency bands; and
- (b) offset from 1785 MHz, 1805 MHz and 1880 MHz;

where:

f_{offset} : is the frequency offset from the 1785 MHz, 1805 MHz and 1880 MHz band edges.

Note: The -3dB point of the specified bandwidth closest to the band edge being frequency offset from, is placed at f_{offset}

Table 1a: Radiated maximum true mean power non spurious emission limits

Frequency offset range	Radiated maximum true mean power (dBm EIRP)	Specified Bandwidth
$0 \text{ Hz} \leq f_{\text{offset}} < 200 \text{ kHz}$	2	30 kHz
$200 \text{ kHz} \leq f_{\text{offset}} < 900 \text{ kHz}$	$2 - 15 \times (f_{\text{offset}}(\text{MHz}) - 0.2)$	30 kHz
$900 \text{ kHz} \leq f_{\text{offset}} < 5.6 \text{ MHz}$	-8.5	30 kHz
$f_{\text{offset}} \geq 5.6 \text{ MHz}$	-18.5	30 kHz

Table 1b: Radiated peak power non spurious emission limits

Frequency offset range	Radiated peak power (dBm EIRP)	Specified Bandwidth
$0 \text{ Hz} \leq f_{\text{offset}} < 300 \text{ kHz}$	10	300 kHz

The non spurious emission limits in Table 2a and 2b apply:

- (a) at frequencies outside the 1710-1785 MHz frequency band; and
- (b) offset from 1710 MHz;

where:

f_{offset} : is the frequency offset from the 1710 MHz band edge.

Note: The -3dB point of the specified bandwidth closest to the band edge being frequency offset from, is placed at f_{offset}

Table 2a: Radiated maximum true mean power non spurious emission limits

Frequency offset Range	Radiated maximum true mean power (dBm EIRP)	Specified Bandwidth
$0 \text{ Hz} \leq f_{\text{offset}} < 500 \text{ kHz}$	-8.5	30 kHz
$f_{\text{offset}} \geq 500 \text{ kHz}$	-33.5	30 kHz

Table 2b: Radiated peak power non spurious emission limits

Frequency offset Range	Radiated peak power (dBm EIRP)	Specified Bandwidth
$0 \text{ Hz} \leq f_{\text{offset}} < 300 \text{ kHz}$	10	300 kHz

The non spurious emission limits in Table 3 apply:

- (a) at frequencies outside the upper or lower frequency limits set out in Part 2 of Licence Schedule 1; and
- (b) offset from the upper or lower frequency limits set out in Part 2 of Licence Schedule 1

where:

f_{offset} : is the frequency offset from the upper or lower frequency limits set out in Part 2 of Licence Schedule 1.

Note: The -3dB point of the specified bandwidth closest to the band edge being frequency offset from, is placed at f_{offset}

Table 3: Radiated maximum true mean power non spurious emission limits

Frequency offset range	Radiated maximum true mean power (dBm EIRP)	Specified Bandwidth
$0 \text{ Hz} \leq f_{\text{offset}} < 200 \text{ kHz}$	21.5	30 kHz
$200 \text{ kHz} \leq f_{\text{offset}} < 1 \text{ MHz}$	$2 - 13.125 \times (f_{\text{offset}}(\text{MHz}) - 0.2)$	30 kHz
$1 \text{ MHz} \leq f_{\text{offset}} < 5.8 \text{ MHz}$	-8.5	30 kHz
$f_{\text{offset}} \geq 5.8 \text{ MHz}$	-13	30 kHz