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Radiocommunications Assignment and Licensing Instruction

**Frequency Coordination and Licensing Procedures
for Apparatus Licensed
Public Telecommunications Services
in the
2 GHz Bands**

AUSTRALIAN COMMUNICATIONS AND MEDIA AUTHORITY
SPECTRUM PLANNING BRANCH
CANBERRA

RADIOCOMMUNICATIONS ASSIGNMENT AND LICENSING INSTRUCTIONS

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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.

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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.

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Suggestions for improvements may be addressed to:

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

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Amendment History

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Frequency coordination and licensing procedures for apparatus licensed PTS in the 2 GHz 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) in the paired, 1920-1980 MHz and 2110-2170 MHz (2GHz) 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 1920-1980 MHz and 2110-2170 MHz frequency ranges. 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 Engineering Section
Spectrum Planning Branch
Australian Communications and Media Authority
P.O. Box 78
Belconnen ACT 2616

A glossary of acronyms and abbreviations is provided at page 33

1.2. Basic Principles

The basic principles for coordination and operation of PTS systems in the 1920-1980 MHz and 2110-2170 MHz bands are that:

- apparatus licences are able to be issued for PTS systems operating in the paired frequency ranges 1920-1980 MHz and 2110-2170 MHz in regional and remote areas that are outside of those areas specified for allocation by spectrum licensing¹, outside the mid west radio quiet zone (RQZ) exclusion area² and outside the area defined by embargo 49³ (see diagram at Attachment 1);
- 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 2009*[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

¹ At the time of release of this RALI the 1920-1980 and 2110-2170 MHz band was subject to Embargo 26 of RALI MS3 and was not available for apparatus licensing in defined metropolitan and regional areas

² At the time of release of this RALI the 100 MHz-25.25 GHz band was subject to Embargo 41 of RALI MS03 and was not available for apparatus licensing within the defined area of the RQZ.

³ At the time of writing of this RALI the 2100-2130 MHz band was subject to Embargo 49 of RALI MS03 and was not available for apparatus licensing within 300 km of Yarragadee in Western Australia.

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.

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);
- point-to-multipoint (BWA) systems;
- spectrum licensed space;
- the Radio Quiet Zone (RQZ); and,
- space services.

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.

This RALI does not address the coordination of fixed link services with other fixed link services. RALI FX-3 [2] is normally used for that purpose.

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 co-channel and adjacent channel 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
spectrum licensed area → PTS Rx (see section 3.3.3)	No procedure defined
BWA Tx → PTS (see section 3.4.1)	Part 4 of this RALI
PTS → BWA Rx (see section 3.4.2)	No procedure defined
PTS Tx → MSS uplink (space Rx) (see section 3.5.1)	Case does not currently exist – no procedure defined
MSS uplink Tx → PTS Rx (see section 3.5.2)	Case does not currently exist – no procedure defined
PTS Tx → space services (see section 3.6.1)	Part 4 of this RALI
space services → PTS Rx (see section 3.6.2)	Part 4 of this RALI
PTS Tx → Mid West RQZ (see section 3.7)	Part 3.7 of this RALI Procedure defined in RALI MS32
Point-to-point Tx → Point-to-point Rx	Outside scope of this RALI see RALI FX-3

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 2002* authorises mobile stations to communicate with the land stations authorised under the PTS apparatus licence, under a ‘no interference no protection’ basis.

PTS licences will only be issued for PTS systems in the paired 1920-1980 MHz and 2110-2170 MHz frequency bands in those areas of Australia that are outside the areas defined for allocation by spectrum licensing and other relevant embargo areas contained in *Radiocommunications and Licensing Instruction MS03 - Spectrum Embargoes* [3].

It should be noted that:

- in the 1920-1980 MHz and 2110-2170 MHz bands, channel allotment bandwidths of 5 MHz will apply;
- no licensee may be assigned more than two 5 MHz channels in the same area⁴.

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

⁴ The same area is the frequency reuse area of 45 km around a PTS base station.

Part 2 Background

2.1. Legislative/administrative arrangements

The *Australian Radiofrequency Spectrum Plan* allocates the 1920-1980 MHz and 2110-2170 MHz frequency bands for Fixed and Mobile services.

In addition to this, these frequency bands were subject to the *Radiocommunications (Spectrum Re-allocation) Declaration No.2 of 2000* (the Declaration) [4]. The Declaration defined geographic areas (that included major metropolitan and regional areas) that were allocated via the issue of spectrum licences. Although the Declaration is no longer in force, spectrum licences issued as a result of the Declaration are subject to the conditions specified in the relevant technical framework.

Apparatus licensing arrangements for PTS systems in the 1920-1980 MHz and 2110-2170 MHz frequency bands apply only in those areas that lie outside the areas specified in the Declaration and the embargoed areas defined in *Radiocommunications Assignment and Licensing Instruction (RALI) MS03: Spectrum Embargoes*. A diagram of areas available for apparatus licensing is provided at Attachment 1.

The 1920 - 1980 MHz and 2110-2170 MHz spectrum has predominantly been used for fixed link services in regional and remote areas. The fixed link service band, detailed in the 2.1 GHz band channel arrangements of Appendix 1 of RALI FX-3, overlaps these frequency ranges.

The 1920-1980 MHz band overlaps the first three main and interleaved channels of the 2.1 GHz fixed link channel arrangements. These relationships are illustrated in Figure 1 below.

The 2110-2170 MHz band overlaps the first two main channels and first three interleaved channels of the 2.1 GHz fixed link channel arrangements. These relationships are illustrated in Figure 2 below.

Figure 1: Relationship between the 1920-1980 MHz band and other services

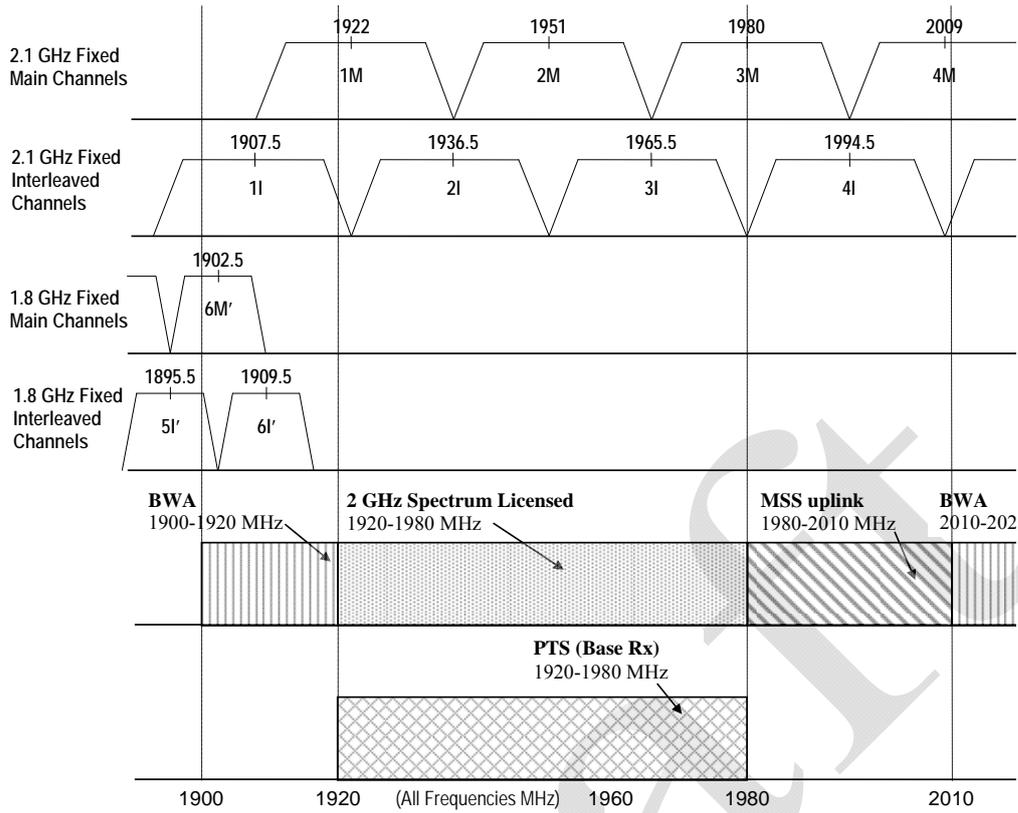
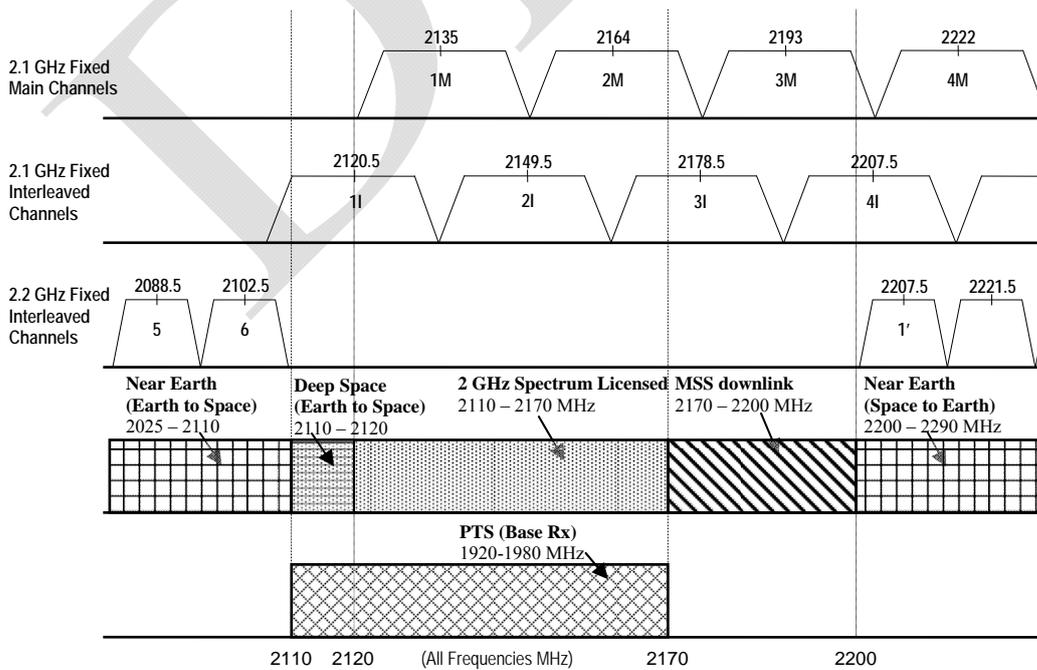


Figure 2: Relationship between the 2110-2170 MHz band and other services



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. These services are (see also Table 1):

- PTS to PTS
- PTS transmitter to Fixed link receiver
- Fixed link transmitter to PTS receiver
- BWA transmitter to PTS receiver
- PTS transmitter to Spectrum Licensed Space
- Space Service Transmitter to PTS Receiver
- PTS transmitter to Space Service receiver
- PTS transmitter to the mid west RQZ

3.1. PTS into PTS

3.1.1. Co-channel frequency coordination

Frequency coordination procedures for assessing whether a proposed new PTS system will cause (or suffer) unacceptable interference to (or from) previously licensed PTS systems 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 the PTS base station transmitter to mobile receiver. This situation will be catered for via the coordination procedure in Part 4.7. It is also believed that the coordination procedure defined in Part 4.7 will adequately account for the case of interference from a mobile transmitter to a PTS base station receiver.

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, it is anticipated that adjacent channel operation should be possible without any specific coordination required. Therefore, no coordination details have been provided in Part 4 of this RALI.

However, **Special Condition FW** will be applied to all PTS licences in the frequency range 1920 to 1980 MHz and 2110 to 2170 MHz. The intention is to encourage licensees to cooperate and, where necessary, compromise to resolve adjacent channel interference if and when it occurs.

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 will be the dominant interferer into fixed link receivers operating in or adjacent to the 2110 – 2170 MHz band, while mobile transmitters will be the dominant interferer into fixed link receivers operating in or adjacent to the 1920 – 1980 MHz band.

For both the 1920 – 1980 MHz and 2110 - 2170 MHz bands, interference between PTS transmitters and fixed link receivers in the 1.8 GHz, 2.1 GHz and 2.2 GHz band arrangements should be assessed.

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

- a proposed PTS transmitter will cause unacceptable interference to previously licensed fixed link receivers; and
- a proposed fixed link receiver will expect unacceptable interference from a previously licensed PTS transmitter.

In the event that calculations indicate that interference may occur, unless an agreement or other arrangements can be made between the applicant and the existing licensee, a licence will not be granted.

Note that any agreement or arrangements that are made may require one or both of the PTS or fixed link to be reassessed against the relevant coordination criteria.

3.2.2. Fixed link transmitter to PTS receiver

Interference from fixed link transmitters in the 1.8 GHz, 2.1 GHz and 2.2 GHz band arrangements needs to be assessed against both PTS base station receivers, in the 1920 - 1980 MHz band, and mobile receivers, in the 2110 - 2170 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.

In the event that calculations indicate that interference may occur, unless an agreement or other arrangements can be made between the applicant and the existing licensee, a licence will not be granted.

Note that any agreement or arrangements that are made may require one or both of the PTS or fixed link to be reassessed against the relevant coordination criteria.

3.3. Spectrum Licensed Areas

3.3.1. PTS transmitter into Spectrum Licensed area

A PTS base station transmitter located near a spectrum licence area boundary 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 license 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 *Radiocommunications (Unacceptable Levels of Interference – 2 GHz Band) Determination 2000* [9], does not intrude into the co-channel spectrum licensed area. The required coordination methodology is specified in section 4.8.

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.

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. In most situations however, there will 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. There are expected to be very few situations where a PTS transmitter could be licensed where the associated PTS receiver would suffer interference.

For this reason it is considered sufficient to formally assess potential interference from a PTS base station transmitter into the spectrum licensed area. Prospective licensees are of course be free to undertake their own assessment of potential interference risk to PTS receivers.

Advisory Note FA will also be applied to all PTS licences located within 100 km of a spectrum licence boundary in the event interference does occur. This note informs licensees that if interference is caused to a registered spectrum licence device, the ACMA will consider that the spectrum licence device has priority over the PTS licence when settling the dispute.

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 interference. Priority in assessing interference is given on a first-in-time registration/licensing basis.

Interference from apparatus licensed transmitters into devices operated under spectrum licences is managed by advisory guidelines. For the 2 GHz spectrum licensed band the relevant guideline is the *Radiocommunications Advisory Guidelines*

(Managing Interference from Apparatus-licensed and Class-licensed Transmitters - 2 GHz Band) 2000 [20]. 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 be consulted by prospective licensees when co-siting systems with spectrum licensed devices (see also Part 4.12 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 2 GHz spectrum licensed band the relevant guideline is the *Radiocommunications Advisory Guidelines (Protection of Apparatus-licensed and Class-licensed Receivers - 2 GHz Band) 2000* [11].

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 channel operation should be possible without any specific coordination required. Therefore, no coordination details have been provided in Part 4 of this RALI.

Additionally, although the technical standard developed for FDD equipment in the 2 GHz 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 2002* 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.

However, in the event that interference does occur 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.

3.4. BWA Services

3.4.1. BWA transmitter into PTS receiver

The *1900 - 1920 and 2010 - 2025 MHz Bands Frequency Band Plan* [5] supports the provision of broadband wireless access (BWA) services, using Time Division Duplex (TDD) technologies, in defined regional and remote areas of Australia.

A BWA base station transmitters operating in the 1900-1920 MHz band has the potential to cause interference to an adjacent channel PTS base station receiver operating in the 1920-1980 MHz band. This is due to the different duplex schemes utilised. Frequency coordination procedures for assessing whether a BWA base station transmitter will cause unacceptable interference to a PTS base station receiver are detailed in Part 4.8 of this document.

Other interference mechanisms related to BWA remote station transmitters and receivers as well as PTS mobile station transmitters are largely covered by the

coordination of BWA and PTS base stations and the respective assignment planning models.

However, in the event that interference does occur the ACMA encourages licensees to cooperate and, where necessary, compromise to find a resolution. If the matter cannot be resolved between affected parties, it is noted that BWA remote stations and PTS mobile stations operate on a 'no interference no protection' basis. The BWA licensee will therefore be required to rectify any interference issues into PTS bases station receivers caused by these devices.

BWA base station transmitters operating in the 2010–2025 MHz band have a minimum 30 MHz separation to the adjacent band PTS base station receivers operating in the 1920–1980 MHz band. ACMA analysis has indicated that the probability of interference between these services is negligible, in addition to this embargo 38 currently prevents any BWA assignments to be made in the band Australia-wide. Accordingly, no frequency coordination requirements are included in this RALI at this stage.

3.4.2. PTS transmitter in BWA receiver

The *1900 - 1920 and 2010 - 2025 MHz Bands Frequency Band Plan* [5] supports the provision of broadband wireless access (BWA) services, using Time Division Duplex (TDD) technologies, in defined regional and remote areas of Australia.

A PTS mobile station transmitter operating in the 1920-1980 MHz band has the potential to cause interference to an adjacent channel BWA base station receiver. However, in most situations it is believed that this scenario will be adequately addressed through the coordination of the BWA base station transmitter and PTS base station receiver. Therefore, no coordination details have been provided in Part 4 of this RALI.

However, in the event that interference does occur the ACMA encourages licensees to cooperate and, where necessary, compromise to find a resolution. If the matter cannot be resolved between affected parties, it is noted that PTS mobile stations operate on a 'no interference no protection' basis. The PTS licensee will therefore be required to rectify any interference issues into BWA bases station receivers caused by these devices

BWA base station receivers operating in the 2010 – 2025 MHz band have a minimum 30 MHz separation to the adjacent band PTS mobile transmitters operating in the 1920 – 1980 MHz band. ACMA analysis has indicated that the probability of interference between these services is negligible, in addition to this embargo 38 currently prevents any BWA assignments to be made in the band Australia-wide. . Accordingly, no frequency coordination requirements are included in this RALI at this stage.

3.5. MSS services

3.5.1. 1980-2010 MHz band MSS uplink services

The *Mobile-Satellite Service (2 GHz) Frequency Band Plan 2002* [6] supports Mobile Satellite Service (MSS) uplink transmitters in the 1980-2010 MHz band. This band is frequency adjacent to the 1920-1980 MHz band.

There are two potential interference mechanisms:

- Adjacent channel interference from aggregations of PTS mobile transmitters in the 1920-1980 MHz band causing interference to satellite-borne MSS receivers operating in the 1980-2010 MHz band; and,
- Adjacent channel interference from ground-based MSS uplink equipment operating in the 1980 - 2010 MHz band to PTS base station receivers operating in the 1920-1980 MHz band.

At the time of writing no MSS services were operating in the 1980-2010 MHz band. However, when MSS systems begin to operate in the 1980-2010 MHz band, they are likely to be used in remote parts of Australia – the same area as the intended apparatus licensed PTS services.

The ACMA will continue to monitor international developments for MSS in the 1980-2010 MHz band. However, at this stage, no co-ordination procedure has been defined as insufficient information is available concerning the characteristics of MSS systems that may operate in the 1980-2010 MHz band.

3.5.2. 2170-2200 MHz band MSS downlink services

The *Mobile-Satellite Service (2 GHz) Frequency Band Plan 2002* [6] supports Mobile Satellite Service (MSS) downlink transmitters in the 2170-2200 MHz band. This band is frequency adjacent to the 2110-2170 MHz band.

There are two potential interference mechanisms:

- Adjacent channel interference from aggregations of PTS base station transmitters in the 2110-2170 MHz band causing interference to ground-borne MSS receivers operating in the 2170-2200 MHz band; and,
- Adjacent channel interference from satellite-based MSS subscriber downlink equipment operating in the 2170-2200 MHz band to PTS mobile receivers operating in the 2110-2170 MHz band.

At the time of writing no MSS services were operating in the 2170-2200 MHz band. However, when MSS systems begin to operate in the 2170-2200 MHz band, they are likely to be used in remote parts of Australia – the same area as the intended apparatus licensed PTS services.

The ACMA will continue to monitor international developments for MSS in the 2170 - 2200 MHz band. However, at this stage, no co-ordination procedure has been defined as insufficient information is available concerning the characteristics of MSS systems that may actually become operational in the 2170 - 2200 MHz band.

3.6. Space Services

3.6.1. 2025-2120 MHz band Space Services uplink

The 2025-2110 MHz band has allocations to the Space Research Service (Earth-to-space) and Space Operation Service. Currently, there are several space research or space operation facilities using these allocations across Australia⁵.

The 2110-2120 MHz band has an allocation to the Space Research Service (deep space, Earth-to-space). Currently there are few deep space research facilities using this allocation in Australia⁶.

There are four potential interference mechanisms between PTS systems and Space Service operating in the 2025-2120 MHz band:

- Adjacent channel interference from aggregations of PTS mobile transmitters in the 1920-1980 MHz band causing interference to space station receivers operating in the 2025-2110 MHz band;
- Adjacent channel interference from aggregations of PTS base station transmitters in the 2110-2170 MHz band causing interference to space station receivers operating in the 2025-2110 MHz band;
- Adjacent channel interference from ground-based near Earth transmitters operating in the 2025-2110 MHz band to PTS base station receivers operating in the 1920 - 1980 MHz band; and
- Adjacent channel interference from ground-based deep space transmitters operating in the 2110-2120 MHz band to PTS mobile receivers operating in the 2110 - 2170 MHz band.

Space station receivers are protected in accordance with relevant ITU-R Recommendations and the ITU-R Radio Regulations. The ACMA has taken account of interference studies into these space services from PTS systems. Based on these studies, the risk of interference to these space services is low, and as such no coordination criteria has been developed.

PTS base station receivers operating in the 1920 – 1980 MHz band have a minimum 45 MHz separation from ground-based near Earth transmitters. Based on this frequency separation, the risk of interference to PTS base station receivers is considered to be low, as such no coordination criteria has been developed.

Furthermore, the ACMA will not protect PTS base station receivers from out-of-band interference from ground-based near Earth station transmitters. It is expected that PTS licensees will use techniques such as filtering to manage such interference.

Transmitters used for the Space Research Service (deep space, Earth-to-space) are extremely high powered and have the potential to cause interference into both co-channel and adjacent channel services, in particular PTS mobile receivers. The relevant frequency coordination procedure for assessing the potential for interference

⁵ As of the 1st August 2009 established space research or operations facilities in the 2025-2120 MHz band include the following locations: Mingenew, New Norcia, Tidbinbilla, Mount Stromlo, Alice Springs, HMAS Cerberus and Gnaragarra.

⁶ As of the 1st August 2009 established deep space research facility in the 2110-2120 MHz band include the following locations: Tidbinbilla and New Norcia

between these services is specified in section 4.10. It is recommended that coordination be conducted in liaison with Earth station operators.

It should also be noted that, outside the coordination procedure specified in section 4.10, the ACMA will not protect PTS mobile receivers from interference caused by deep space Earth station transmitters. The relevant frequency coordination procedure for this scenario is specified in section 4.10.2.

PTS mobile receivers in the 2110 – 2170 MHz band operate in the adjacent band to the near-Earth Earth station transmitters in the 2025 – 2110 MHz band. While, there is the potential for PTS mobile receivers to receive interference within a few kilometres of a Near-Earth Earth station, The ACMA will not protect PTS mobile receivers from out-of-band interference from Near-Earth Earth station transmitters.

3.6.2. 2200-2300 MHz band Space Services downlink

The 2200-2290 MHz band has allocations to the Space Research Service (space-to-Earth, space-to-space) and Space Operation Service (space-to-Earth, space-to-space). There are several space research or space operation facilities using these allocations across Australia⁷.

The 2290-2300 MHz band has an allocation to the Space Research Service (deep space, space-to-Earth). Currently there are few deep space research facilities using this allocation in Australia⁸.

There are two potential interference mechanisms:

- Adjacent channel interference from aggregations of PTS base station transmitters in the 2110-2170 MHz band causing interference to ground-borne receivers operating in the 2200-2290 MHz and 2290-2300 MHz bands;
- Adjacent channel interference from space transmitters operating in the 2200-2290 MHz band to PTS mobile receivers operating in the 2110 - 2170 MHz band.

PTS base station transmitters operating in the 2110-2170 MHz band have a minimum 30 MHz separation from near-Earth Earth station receivers in the 2200 – 2290 MHz band. While PTS licensees are required to protect these Earth station receivers in accordance with ITU-R Recommendations, based on the minimum 30 MHz of frequency separation, the risk of interference to Earth station receivers is considered to be low.

In order to adequately protect Earth station receivers (including deep space receivers) from interference, **Special Condition FX** will be attached to all PTS licences issued in the 2 GHz band. This condition requires that transmitters operated under a PTS licence must not cause harmful interference to an Earth station receiver. Therefore if interference occurs it is the responsibility of the PTS licensee to rectify the issue.

The 2290-2300 MHz band has an allocation to the Space Research Service (deep space, space-to-Earth). While PTS licensees are required to protect these Earth station

⁷ As of the 1st August 2009 established space research or operations facilities in the 2200-2300 MHz band include, Mingenew, New Norcia, Tidbinbilla, Battery Point, Alice Springs and Gngangara

⁸ As of the 1st August 2009 established deep space research facility in the 2290-2300 MHz band include the following locations: Tidbinbilla, Gngangara and New Norcia

receivers in accordance with ITU-R Recommendations, based on the minimum 120 MHz of frequency separation, the risk of interference to Earth station receivers is considered to be low. The relevant coordination methodology is specified in section 4.11.

PTS mobile receivers operating in the 2110 – 2170 MHz band have a minimum 30 MHz separation from space station transmitters. Based on the minimum 30 MHz of frequency separation,, the risk of interference to PTS mobile receivers is considered low. In addition to this, PTS mobile receivers operate in the band under a ‘no interference no protection basis’, as such no coordination criteria have been developed.

3.7. Mid West RQZ

The ACMA established Australia’s first Radio Quiet Zone (RQZ) on 11 April 2005. The RQZ aims to maintain the current “radio-quietness” of a site in remote Western Australia (near Boolardy Station, around 200 km East of Meekatharra). The area has very low levels of radiofrequency energy because of its low population and lack of industrial development. The RQZ is intended to facilitate the development and use of new radio astronomy technologies at that location, and support Australia’s bid to host the Square Kilometre Array (SKA).

On 24 September 2006, the ACMA released a Radiocommunications Assignment and Licensing Instruction (RALI), *Coordination of Apparatus Licences within the Midwest Radio Quiet Zone (MS32)* [7]. The RALI defines the RQZ as inner restricted zones where new frequency assignments are not usually permitted (with exceptions assessed on a case by case basis), and outer coordination zones within which new frequency assignments require coordination. The frequency span of the RQZ is 100 MHz to 25.25 GHz. RALI MS32 contains the relevant procedures and criteria required in order to coordinate with the RQZ.

A summary of the restricted and coordination zones for the frequency bands 1920-1980 MHz, 2110-2170 MHz is given table 2. 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.

Frequency Range (MHz)	Restricted Zone Radius (km)	Coordination Zone Radius (km)
1920-1980	100	140
2110-2170	100	140

Table 2: RQZ Coordination and Exclusion zone radii. The RQZ is centred at latitude 26°42’15” South and longitude 116°39’32” East (GDA94 Datum).

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 Radiocommunication Licences (RRL) that is available for purchase on CD-ROM.

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.

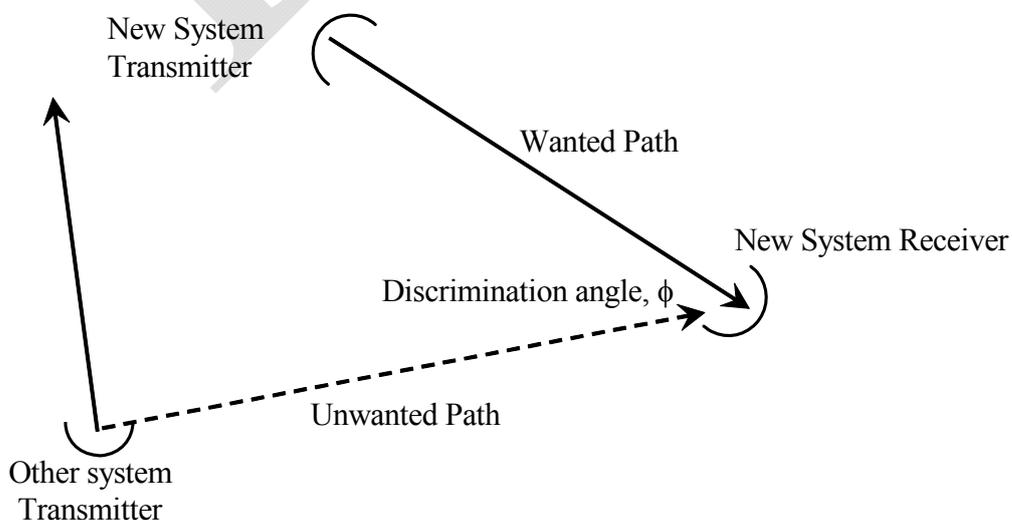
4.2. Detailed description of Coordination Procedure

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 see 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	=	1.98 GHz
bandwidth	=	29 MHz
P _L	=	10
link path length	=	50 km

$$PR = \text{co-channel PR} + (\text{adjustment for } d=50 \text{ km and } P_L=10)^9$$

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

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

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

⁹ see Attachment 2c

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/5MHz).

If the unwanted signal level exceeds the maximum unwanted level for each 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.

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 526-7 [8], which also covers spherical Earth diffraction.

The interference protection criteria specified in 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 used¹⁰. This will give results corresponding to signal levels exceeded for 20% of the time. There is no need to apply a correction factor for location variability as the method yields results only appropriate to the one receiver location.

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.

¹⁰For PTS to PTS ordination, a K-factor of $k = 4/3$ should be used.

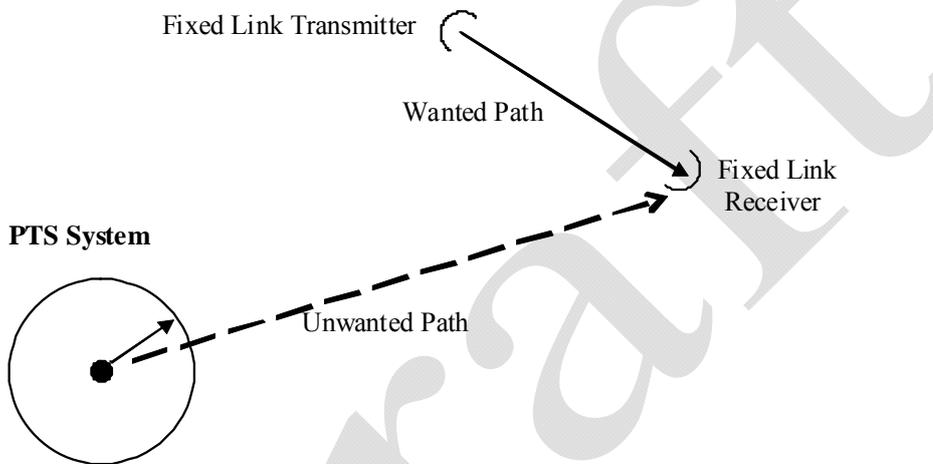
4.5. Assessing Interference: PTS into Fixed Links

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



Specific Step Clarification

Step 1: To identify potentially affected fixed link receivers, a recommended 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
1920 – 1980 MHz	1888.5– 2038 MHz
2110 – 2170 MHz	2088.5 – 2236.5 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 2110 – 2170 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 band 1920 – 1980 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 fixed link receiver is within the PTS base station coverage area of 15 km¹¹, coordination is deemed to fail and a licence will not be granted.

If the fixed link receiver is outside the PTS coverage area of 15 km, 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 that this needs to be performed for interference from both PTS base station transmitters in the 2110-2170 MHz band and notional PTS mobile station transmitters in the 1920-1980 MHz band interfering into fixed link receivers.

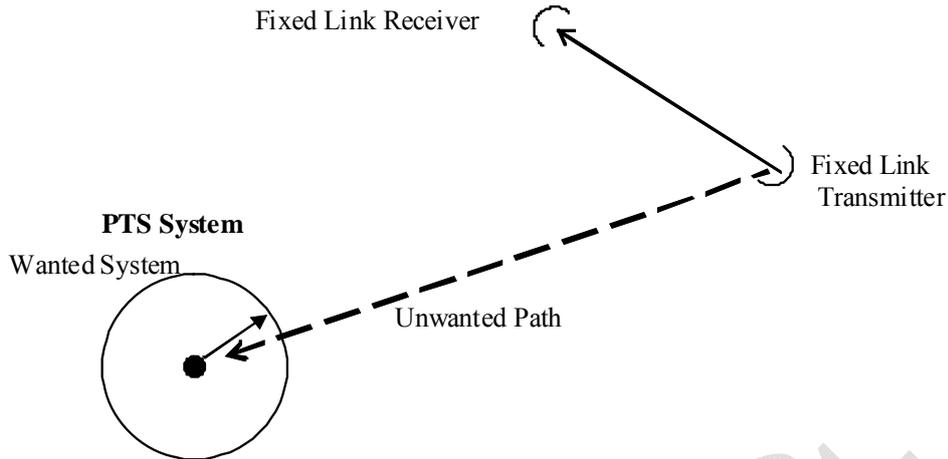
4.6. Assessing Interference: Fixed Links into PTS

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.

¹¹ 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**Specific Step Clarification**

Step 1: To identify potentially interfering fixed link transmitters, a recommended 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
1920 - 1980 MHz	1907.5 - 1994.5 MHz
2110 – 2170 MHz	2102.5 – 2178.5 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 of 1920 – 1980 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 2110 – 2170 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 the fixed link transmitter is within the PTS base station coverage area

of 15 km¹², coordination is deemed to fail and a licence will not be granted.

If the fixed link transmitter is outside the PTS coverage area 15 km, 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 (dBm/5 MHz) 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 both PTS base station receivers in the 1920-1980 MHz band and notional PTS mobile station receivers in the 2110-2170 MHz band being interfered with from fixed link transmitters.

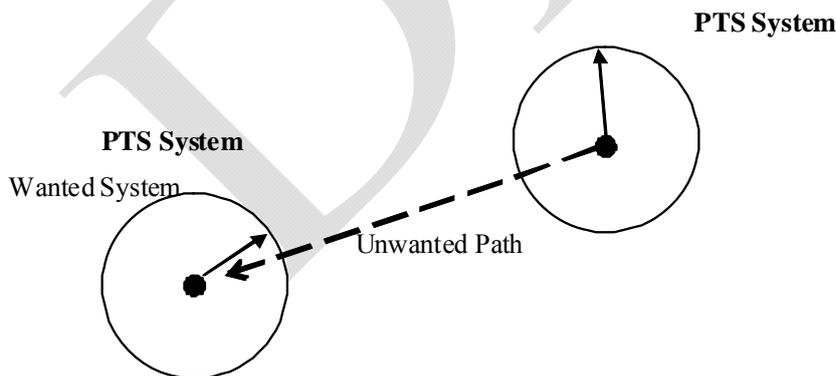
4.7. Assessing Interference: PTS into PTS

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.

The coordination process is to calculate the unwanted signal level at the potential 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 recommended minimum distance cull around the proposed PTS base station transmitter site of 100 km is required. Anything within this radius should be included in the following steps. A

¹² The notional coverage area has been estimated at 15 km (based on a mobile transmit EIRP of 30 dBm/5MHz, base receive sensitivity of -102 dBm/5MHz and notional system characteristics contained in Attachment 3).

minimum cochannel reuse distance of 45 km will be applied to PTS base stations operated by different licensees. Within the reuse distance of an existing PTS base station location, other cochannel PTS applications will not be considered. Beyond the reuse distance, cochannel 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. Given that, in this case, the wanted and unwanted systems have the same bandwidth the frequency culls are made at ± 2.5 MHz from the centre frequency of the proposed channel (i.e. only co-channel coordination is required).

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 (dBm/5 MHz) from Step 3 will determine if the level of interference into the PTS victim receiver is acceptable.

4.8. Assessing Interference: Spectrum Licensed Services

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 2 GHz spectrum licence technical framework.

This means that for all PTS base station transmitters located within 100 km of a spectrum licence boundary in the frequency range 2110-2170 MHz, device boundary coordination needs to be completed. The device boundary requirements, including device boundary criteria and propagation model, are detailed in the *Radiocommunications (Unacceptable Levels of Interference- 2 GHz Band) Determination 2000* [9].

The device boundary criteria specified in the *Radiocommunications (Unacceptable Levels of Interference- 2 GHz Band) Determination 2000* [9] should be used wherever possible. However, in circumstances where the necessary tools are not available to conduct the more detailed device boundary criteria calculation, the alternate device boundary criteria in Appendix 4 can be used.

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 of a spectrum licence boundary. This note advises PTS licensees that within this distance, if interference occurs, the spectrum licensee has priority irrespective of date the spectrum licence device was first operated.

4.9. Assessing Interference: BWA into PTS

Interference from an existing adjacent channel BWA transmitter operating in the 1900-1920 MHz band into a PTS base station 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 BWA transmitter in the 1900 -1920 MHz band into an existing PTS base station 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.

Specific Step Clarification

Step 1: To identify potentially interfering BWA base station transmitters, a recommended minimum distance cull around the site of the proposed PTS base station receiver of 50 km is required. Anything within this radius should be considered.

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

PTS Band	BWA Transmitter Frequency Cull Range
1920 - 1930 MHz	1910 - 1920 MHz

Step 3: Calculate the unwanted power level at the PTS base station receiver, using the PTS base station application details (or licensed details) including antenna gain (with any discrimination taken into account), the BWA base station transmitter power (EIRP) in the direction of the PTS base station receiver, and propagation loss from the appropriate propagation model.

Any PTS receiver that is within 20 km of a BWA base station operating in the 1910-1920 MHz band will be deemed to receive unacceptable interference. Therefore, a licence will not be granted.

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

4.10. Assessing Interference: Space Services into PTS

4.10.1. Near-Earth Earth Stations (2025-2110 MHz)

Interference from a Near-Earth Earth Station transmitter operating in the 2025-2110 MHz band (Earth station uplink band) into a PTS mobile receiver operating in the 2110-2170 MHz band is assessed using the methodology described in this section.

The coordination process is to determine whether a proposed PTS system is outside the specified minimum required separation distance. If this criterion is met then coordination is deemed to be successful.

Specific Step Clarification

Step 1: To identify potentially affected PTS system receivers, a minimum separation distance between a PTS system and a Near-Earth Earth Station transmitter operating in

the 2025-2110 MHz band is employed. The required separation distance with respect to the operating frequency of a BWA system is given in the table below.

Any PTS systems located within these minimum separation distances will be deemed to receive unacceptable interference. Therefore, a licence will not be granted.

Operating Frequency (for PTS services)	Minimum required separation distance
2110-2115 MHz	20 km
2115-2170 MHz	N/A

4.10.2. Deep Space Earth Stations (2110-2120 MHz)

Interference from an Earth Station transmitter operating in the 2110-2120 MHz band (Deep Space Earth station uplink band) into a PTS mobile receiver operating in the 2110-2170 MHz band is assessed using the methodology described in this section.

The coordination process is to determine whether a proposed PTS system is outside the specified minimum required separation distance. If this criterion is met then coordination is deemed to be successful.

Specific Step Clarification

Step 1: To identify potentially affected PTS system receivers, a minimum separation distance between a PTS system and a deep space Earth station transmitter operating in the 2110-2120 MHz band is employed. The required separation distance with respect to the operating frequency of a BWA system is given in the table below.

Any PTS systems located within these minimum separation distances will be deemed to receive unacceptable interference. Therefore, the proposed service will not be registered.

Operating Frequency (for PTS services)	Minimum required separation distance
2110-2125 MHz	75 km
2125-2170 MHz	20 km

4.11. Assessing Interference: PTS into Space Services

Interference from a proposed PTS system transmitter into each potential victim Earth Station receiver operating in the 2290 – 2300 MHz band (Deep Space Earth station downlink band), is assessed using the methodology described in this section.

Space Service protection requirements provided in this RALI have been determined from the protection requirements for Space Service station receivers operating in the band 2200-2290 MHz as set out in the following ITU-R publications:

- ITU-R Recommendation SA.1157: Protection criteria for deep-space research [10]
- ITU-R Recommendation SA.363-5: Space operation systems frequencies, bandwidths and protection criteria.[12]
- ITU-R Radio Regulations – Appendix 7: Methods for the determination of the coordination area around an earth station in frequency bands between 100 MHz and 105 GHz.[13]

The coordination process is to determine whether a proposed PTS system is outside the specified minimum required separation distance. If this criterion is met then coordination is deemed to be successful.

Specific Step Clarification

Step 1: Any proposed PTS base station transmitter that is within 20 km of a deep space Earth station receiver will be deemed to cause unacceptable interference. Therefore, the proposed service will not be registered.

Any proposed PTS base station transmitter that is equal to or greater than 20 km from a deep space Earth station receiver will be deemed to not cause unacceptable interference.

4.12. 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 that 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 document *Radiocommunications Advisory Guidelines (Managing Interference from Apparatus-licensed and Class-licensed Transmitters - 2 GHz Band) 2000* [20] 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 problems¹³.

4.13. Assignment Priority Order

As a general rule, assignments should be made from the highest channel down. However, the following exceptions can be applied:

1. Rules relating to applications for two 5 MHz channels¹⁴

As described in Part 5 of this RALI, in any given area¹⁵ applicants may not be assigned more than two 5 MHz channels. Wherever possible, applicants should be assigned contiguous spectrum lots. Preferentially applicants seeking two channels in the same area should be assigned the highest frequency 10 MHz channel pairs. Licensees in this situation will be expected to manage their frequency reuse arrangements within this constraint.

2. Applications within 100km of a 2 GHz band spectrum licence boundary

Where an applicant owns spectrum in an adjacent 2 GHz band spectrum licence area and applies for a licence within 100 km of the area boundary, wherever possible, the same spectrum as held in the 2 GHz spectrum licence space should be assigned to that applicant. This facilitates the most efficient use of 2 GHz spectrum close to spectrum licence boundaries by enabling the spectrum licensee, on a case-by-case basis, to allow their own PTS apparatus licence applications to exceed device boundary criteria.

3. Rules relating to applications in an adjacent area

Where an applicant already has assigned channels in an adjacent area¹⁶, that applicant should wherever possible be assigned the same channels. This measure is intended to promote efficient spectrum use by requiring self-management of co-channel, adjacent area interference to the greatest extent practical.

¹³ Refer to RALI FX-3 section 3.3 for further discussion.

¹⁴ In the event that an applicant with an initial 5 MHz assignment applies for a second 5 MHz assignment in the same area, the rules relating to applications for two 5 MHz channels shall apply to the second application.

¹⁵ For the purpose of applying this rule a given area is the frequency reuse area of 45 km.

¹⁶ For the purpose of applying this rule an adjacent area is the area outside the frequency reuse distance of 45 km from the base station.

Part 5 Licensing

5.1. Overview of Licensing

A Public Mobile Telecommunications Service Class B (PMTS 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 2002* [18].

A PTS licence is defined in the *Radiocommunications (Interpretation) Determination 2000* [14] 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 B licensing option is available for service in the 1920 – 1980 MHz and 2110 – 2170 MHz.

PMTS B apparatus licences authorising operation in the 1920-1980 MHz and 2110-2170 MHz bands 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] for the 1920-1980 MHz and 2110 – 2170 MHz bands.

In the 1920-1980 MHz and 2110-2170 MHz bands, 5 MHz wide channelling will apply. No licensee may be assigned more than two 5 MHz channels in the same area.

5.2. Licence Conditions

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

- conditions specified in the *Radiocommunications Act 1992* [15](the Act), including an obligation to comply with the Act;
- conditions specified in the *Radiocommunications Licence Conditions (Apparatus Licence) Determination 2003*[16], the *Radiocommunications Licence Conditions (PTS Licence) Determination 1997*[17] , *Radiocommunications (Cellular Mobile Telecommunications Devices) Class Licence 2002* [18] and any other determinations made by the ACMA under section 107(1)(f) of the Act;
- 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 FS** must be attached to all licences authorising PTS systems in the 1920 - 1980 MHz band:

The shared spectrum arrangements and uncoordinated nature of mobile-

satellite service transmitters operated under class licences in the 1980-2010 MHz band:

- a. may result in interference from nearby class licensed radiocommunications devices and may reduce system performance; and*
- b. 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:

If interference to a station operated under this licence is caused by a radiocommunications device that is authorised to operate under a spectrum licence, the ACA 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.

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 FW will be applied to all PTS licences in the frequency range 1920 to 1980 MHz and 2110 to 2170 MHz. The intention is to encourage licensees to cooperate and, where necessary, equally compromise to resolve adjacent channel interference.

Whenever frequency adjacent interference occurs, the licensee shall take all steps 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 FX will be applied to all PTS licences in the frequency range 1920 to 1980 MHz and 2110 to 2170 MHz. The intention is to ensure that transmitters operating under a PTS licence do not cause harmful interference Earth station receivers operating in the 2200-2300 MHz band.

The operation of radiocommunications transmitters under this licence must not cause harmful interference to earth receive apparatus licensed services.

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 sectorized antennas are used, details of the antenna model, down-tilt,

polarisation and azimuth¹⁷ should be recorded for each sector.

- 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.

¹⁷ Where the sectored 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.

Glossary

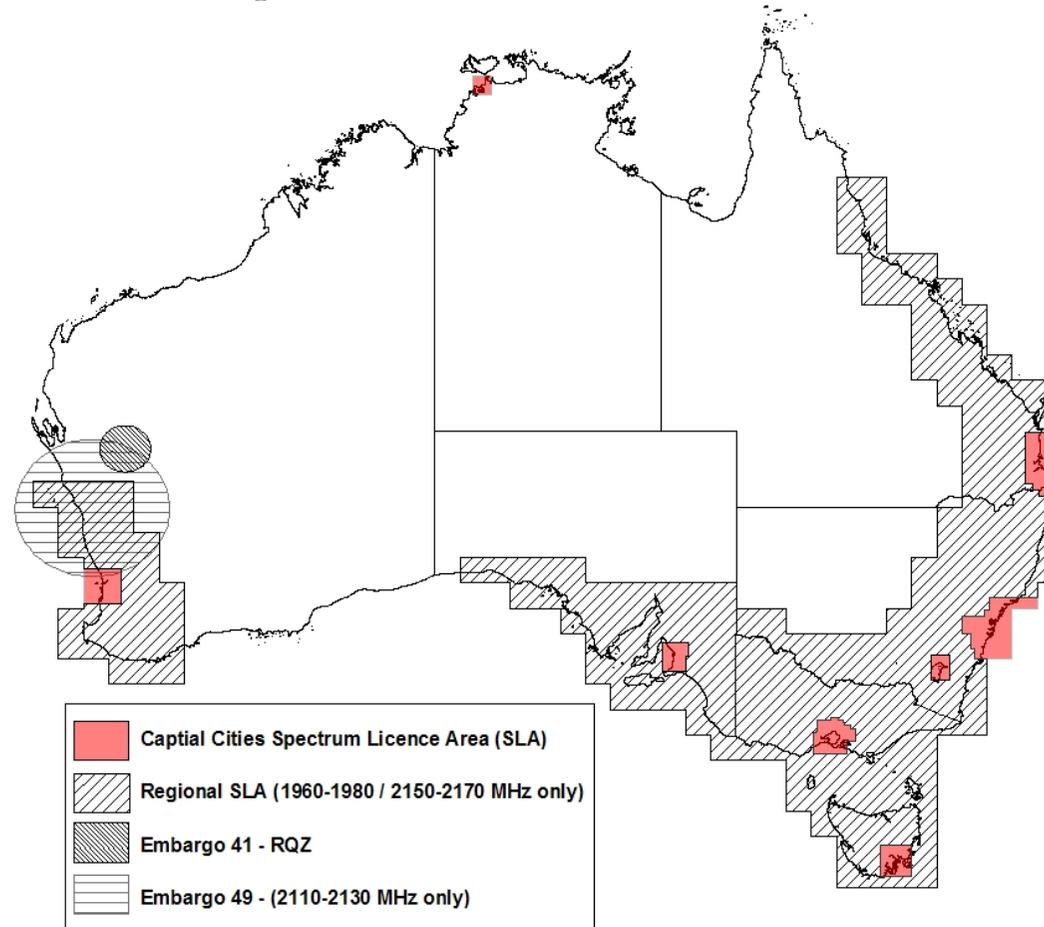
ACMA	Australian Communications and Media Authority
AL	Apparatus Licensed
BWA	Broadband Wireless Access
DECT	Digital Enhanced Cordless Telecommunications (previously known as Digital European Cordless Telecommunications)
EIRP	Equivalent Isotropically Radiated Power
FDD	Frequency Division Duplex
FWA	Fixed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

REFERENCES

1. *Australian Radiofrequency Spectrum Plan*, Australian Communications and Media Authority, 2009,
http://www.acma.gov.au/WEB/STANDARD/1001/pc=PC_2713
2. *Microwave Fixed Services Frequency Co-ordination (RALI FX-3)*, Australian Communications Authority, 1998,
http://internet.aca.gov.au/ACAINTER.1442104:STANDARD:1098039990:pp=DIR4_10,pc=PC_2599
3. *Radiocommunications and Licensing Instruction MS03 - Spectrum Embargoes* Australian Communications Authority, 1994,
http://www.acma.gov.au/webwr/radcomm/frequency_planning/spectrum_embargoes/ms03.pdf
4. *Radiocommunications (Spectrum Re-allocation Declaration) No. 2 of 2000*, Australian Communications Authority, 2000,
http://www.acma.gov.au/webwr/aca_home/legislation/radcomm/spectrum_licensing/2ghz/reallocation%20declaration%202%20ghz.pdf
5. *1900 - 1920 and 2010 - 2025 MHz Bands Frequency Band Plan*, Australian Communications Authority, 2004,
http://www.acma.gov.au/WEB/STANDARD/pc=PC_2574
6. *Mobile-Satellite Service (2 GHz) Frequency Band Plan 2002*, Australian Communications Authority, 2002,
<http://www.comlaw.gov.au/comlaw/Legislation/LegislativeInstrument1.nsf/0/6ADE68CF2C086C97CA256F8700115BF3?OpenDocument>
7. *Coordination of Apparatus Licences within the Midwest Radio Quiet Zone (MS32)*, Australian Communications and Media Authority, 2007,
http://www.acma.gov.au/webwr/radcomm/frequency_planning/frequency_assignment/docs/ms32.pdf
8. *ITU-R Recommendation P.526-9, "Propagation by Diffraction"*, International Telecommunications Union, 2005
9. *Radiocommunications (Unacceptable Levels of Interference- 2 GHz Band) Determination 2000*, Australian Communications Authority, 2000,
<http://www.comlaw.gov.au/ComLaw/Legislation/LegislativeInstrumentCompilation1.nsf/all/search/FE36E2971172E54ACA2570C700202356>
10. ITU-R Recommendation SA.1157, *"Protection criteria for deep-space research"*, International Telecommunications Union, 1995
11. *Radiocommunications Advisory Guidelines (Protection of Apparatus-licensed and Class-licensed Receivers - 2 GHz Band) 2000* Australian Communications and Media Authority, 2000
<http://www.comlaw.gov.au/ComLaw/legislation/LegislativeInstrument1.nsf/0/554D38F159CC2CB4CA256F8E000FF63F?OpenDocument>
12. ITU-R Recommendation SA.363-5, *"Space operation systems frequencies, bandwidths and protection criteria"*, International Telecommunications Union, 1994
13. ITU, *"Radio Regulations"*, 2008

14. *Radiocommunications (Interpretation) Determination 2000*, Australian Communications Authority, 2000,
<http://www.comlaw.gov.au/comlaw/management.nsf/lookupindexpagesbyid/IP200506692?OpenDocument>
15. *Radiocommunications ACT 1992*, Commonwealth of Australia,
<http://www.comlaw.gov.au/ComLaw/Legislation/Act1.nsf/0/6A63C4E89F280822CA256F720017E0ED?OpenDocument>
16. *Radiocommunications Licence Conditions (Apparatus Licence) Determination 2003*, Australian Communications Authority, 2003,
<http://www.comlaw.gov.au/ComLaw/Legislation/LegislativeInstrument1.nsf/0/BCDCEDE18FF8C3C5CA256F8D001F8842?OpenDocument>
17. *Radiocommunications Licence Conditions (PTS Licence) Determination 1997*, Australian Communications Authority, 2005,
<http://scaleplus.law.gov.au/ComLaw/Legislation/LegislativeInstrumentCompilation1.nsf/superseded%5Cbytitle/AD717D52FACD469ECA256FF200190270?OpenDocument&mostrecent=1>
18. *Radiocommunications (Cellular Mobile Telecommunications Devices) Class Licence 2002* Australian Communications and Media Authority, 2009
<http://www.comlaw.gov.au/ComLaw/Legislation/LegislativeInstrumentCompilation1.nsf/current/bytitle/AF1A26009D29F3AFCA25755B000794F2?OpenDocument&mostrecent=1>
19. ERC report 68, *Monte-Carlo Simulation Methodology For The Use In Sharing And Compatibility Studies Between Different Radio Services Or Systems*, European Conference of Postal and Telecommunications Administrations (CEPT), February 2000,
<http://www.erodocdb.dk/Docs/doc98/official/pdf/REP068.PDF>
20. *Radiocommunications Advisory Guidelines (Managing Interference from Apparatus-licensed and Class-licensed Transmitters - 2 GHz Band) 2000*, Australian Communications and Media Authority, 2000
<http://www.comlaw.gov.au/ComLaw/legislation/LegislativeInstrument1.nsf/0/0AA28F23CBE2A655CA256F8E000FB16F?OpenDocument>

Attachment 1: Designated areas for PTS licensing in the 2 GHz band.



Apparatus licences for PTS systems may only be issued in the areas outside the shaded areas on a site coordinated basis. For precise definition of area boundaries refer to *Radiocommunications (Spectrum Re-allocation) Declaration No. 2 of 2000* and *Radiocommunications and Licensing Instruction MS03*. Note that the areas defined by the Regional SLA and Embargo 49 do not extend across the entire 2 GHz band.

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

1. Victim PTS base station receiver and interfering 1.8 GHz fixed link transmitter

Frequency Offset (MHz)	PROTECTION CRITERIA Digital Interferer Tx → Digital Victim Rx 14 MHz → 5 MHz
0	-102 (dBm per 5 MHz channel)
9.5	- 57 (dBm per 5 MHz channel)
14.5	

2. Victim PTS base station receiver and interfering 2.1 GHz fixed link transmitter

Frequency Offset (MHz)	PROTECTION CRITERIA Digital Interferer Tx → Digital Victim Rx 29 MHz → 5 MHz
0	-102 (dBm per 5 MHz channel)
17	- 57 (dBm per 5 MHz channel)
22	

3. Victim PTS mobile receiver and interfering 2.1 GHz fixed link transmitter

Frequency Offset (MHz)	PROTECTION CRITERIA Digital Interferer Tx → Digital Victim Rx 29 MHz → 5 MHz
0	-90 (dBm per 5 MHz channel)
17	- 57 (dBm per 5 MHz channel)
22	

4. Victim PTS mobile receiver and interfering 2.2 GHz fixed link transmitter

Frequency Offset (MHz)	PROTECTION CRITERIA Digital Interferer Tx → Digital Victim Rx 14 MHz → 5 MHz
0	-90 (dBm per 5 MHz channel)
9.5	- 57 (dBm per 5 MHz channel)
14.5	

5. Victim PTS base station receiver and interfering BWA base station transmitter

Frequency Offset (MHz)	PROTECTION CRITERIA Digital Interferer Tx → Digital Victim Rx 5 MHz → 5 MHz
0	-102 (dBm per 5 MHz channel)
5 – 15	- 57 (dBm per 5 MHz channel)
20	

Frequency Offset (MHz)	PROTECTION CRITERIA Digital Interferer Tx → Digital Victim Rx 10 MHz → 5 MHz
0	-102 (dBm per 5 MHz channel)
7.5 – 12.5	- 57 (dBm per 5 MHz channel)
17.5	

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

Frequency Offset (MHz)	PROTECTION CRITERIA Digital Interferer Tx → Digital Victim Rx 5 MHz → 5 MHz
0	-90 (dBm per 5 MHz channel)
5	

- 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, 2.1 GHz and 2.2 GHz fixed link receivers**PROTECTION RATIOS**

1. Victim 1.8 GHz fixed link receiver and Interfering PTS transmitter

Frequency Offset (MHz)	REQUIRED PROTECTION RATIO (dB) Digital Interferer Tx → Digital Victim Rx 5 MHz → 14 MHz
0	60
9.5	30
23.5	0
37.5	

2. Victim 2.1 GHz fixed link receiver and Interfering PTS transmitter

Frequency Offset (MHz)	REQUIRED PROTECTION RATIO (dB) Digital Interferer Tx → Digital Victim Rx 5 MHz → 29 MHz
0	60
17	30
46	0
75	

3. Victim 2.2 GHz fixed link receiver and Interfering BWA

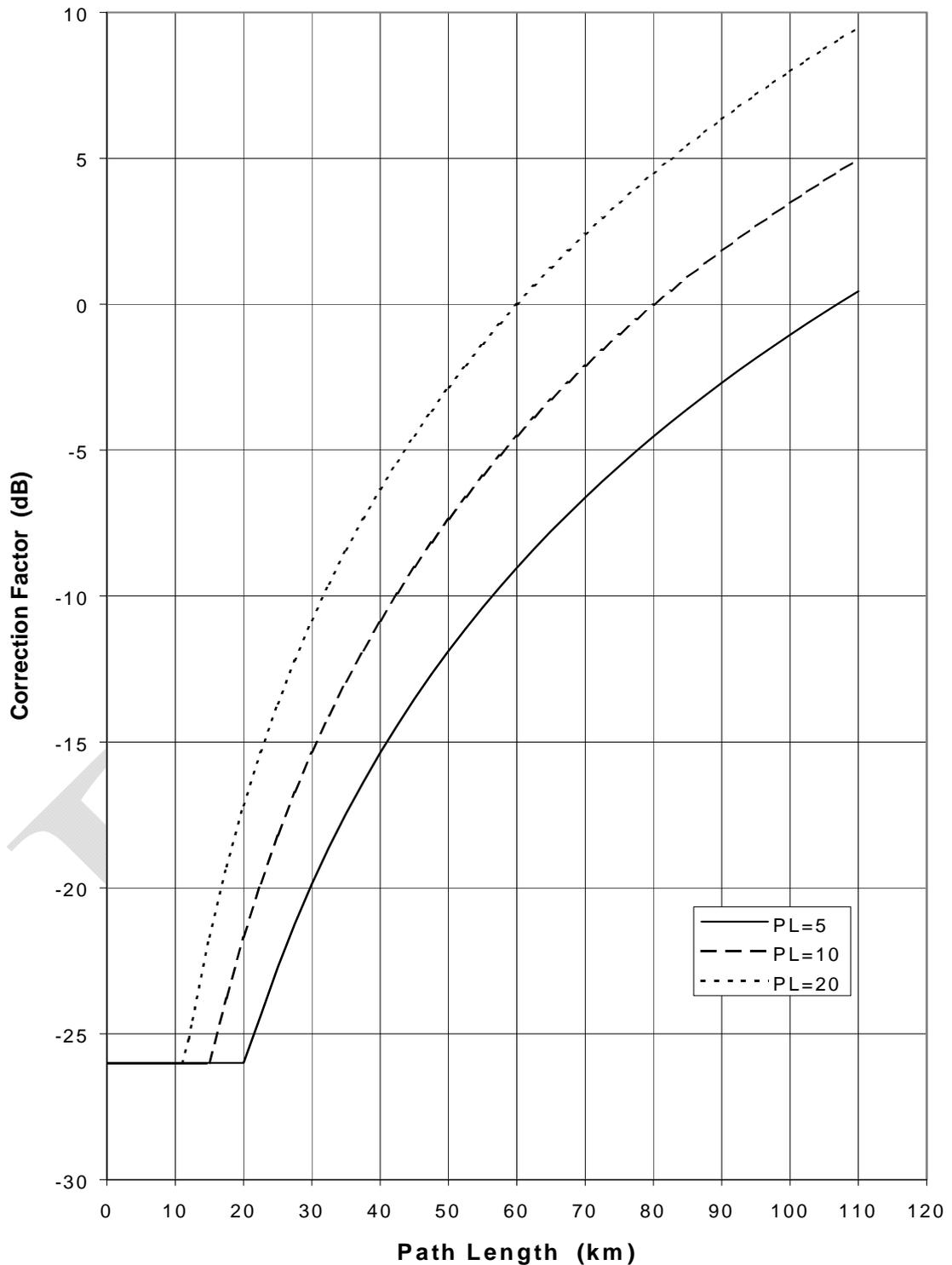
Frequency Offset (MHz)	REQUIRED PROTECTION RATIO (dB) Digital Interferer Tx → Digital Victim Rx 5 MHz → 14 MHz
0	60
9.5	30
23.5	0
37.5	

General Notes:

- 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.
- Separate protection ratios for analog victims have not been defined. The above-mentioned protection ratios for digital systems shall be applied in such cases.
- 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:

- UMTS UTRA FDD (or WCDMA). A FDD CDMA system supported in the 2 GHz spectrum auctions for IMT2000/3G. Relevant standards are ETSI TS 125 104 (base station) and ETSI TS 125 101 (user equipment).

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	50	25 - 120	W
Feeder Loss	2	2	dB
Antenna Gain	19	11 - 19	dBi
F/B	28	0 - 30	dB
EIRP	67	56 – 71	dBm
Spurious EIRP > 30 MHz offset	-14	-14	dBm
Reference Bandwidth	5	5	MHz
Rx Noise Floor	-102	-100 → -102	dBm
Antenna Height	30	variable	m
Maximum Cell Radius ¹⁸	15	from 11 - 15	km
Adaptive Transmit Power Control	enabled	not specified	

Mobile station parameters	Deployment model Value	Range	Unit
EIRP	32	25 - 40	dBm
Rx Bandwidth	5	5	MHz
Rx Noise Floor	-98	-96 → -98	dBm
Body Loss	8	8	dB
Antenna Height	1.5	1.5	m

Notional Mobile Station

Maximum transmit power = 1 W (30 dBm/5 MHz)

Maximum antenna gain = 0 dBi

Height = 1.5 m

Maximum cell radius = 15 km

¹⁸ 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 fortuitous and will not be afforded protection. Similarly such operation will be subject to a “no interference” condition in respect of interference to other licensed services.

Deployment scenarios

It is expected that, in most cases, base stations will be deployed in a manner that provides 360° coverage around the base station site. This could be achieved using an omni-directional antenna or a combination of sectored antennas. In the 2110 – 2170 MHz band, the base station transmitter is the interfering element to other services and the mobile receiver is the element being interfered from other services. In the 1920 – 1980 MHz band, the mobile station transmitter is the interfering element to other services and the base station receiver is the element being interfered from other services. All elements must be considered in the interference analysis.

Emission Masks

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

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 -90 dBm has been specified, which takes into account an estimated body loss of 8 dB. Both of these protection criteria provide an interference-to-noise ratio of 0 dB (i.e. I/N = 0 dB).

Attachment 4: Co-channel – PTS base station transmitter within 200 km of a spectrum licence boundary¹⁹

This coordination procedure deals with an apparatus licensed PTS base station transmitter at a high site potentially interfering with a spectrum licensed receiver located at a low site.

To determine whether coordination is required a coordination threshold distance is used. The coordination threshold distance for a PTS base station transmitter in this RALI is 100 km; that is if the proposed PTS base station transmitter is located within 100 km of a spectrum licence boundary then coordination is required. This condition could occur if 2110 - 2170 MHz band PTS base station systems are located within 100 km of a spectrum licence boundary. Proposed PTS base station transmitters or receivers outside this distance should not require coordination with spectrum licences.

The device boundary requirement follows a method very similar to that detailed in the *Radiocommunications (Unacceptable Levels of Interference- 2 GHz Band) Determination 2000* with a replaced device boundary criteria. For more information on spectrum licensing see the ACMA website www.acma.gov.au.

The device boundary is calculated according to the distance that is necessary to satisfy the following device boundary criterion. This distance is measured along radials of a maximum length of 55 minutes (measured by reference to the Australian National Spheroid) at every 2.5 degrees of arc (beginning at 1.25 degrees from True North) and centred on the transmitter location. However, this criterion does not have to be satisfied if the licensee has an agreement with the licensee(s) of a spectrum licence whose geographic area is intersected by the radials and whose frequency band contains the effective occupied bandwidth of the transmitter, to operate transmitters that do not comply with this device boundary criterion.

The device boundary criterion is:

$$(\text{HRP} - \text{Lb} - \text{CR}) \leq 0;$$

where HRP = Horizontally Radiated Power; and

Lb = Propagation Loss; and

CR = Compatibility Requirement for a notional receiver.

Calculation of Horizontally Radiated Power (HRP)

HRP (dBm EIRP per 30 kHz) is the horizontally radiated power for each radial. Note that there is a cap on HRP of 55 dBm EIRP per 30 kHz for transmitters operating under spectrum licences in the 2110 - 2170 MHz band

High Site-Low Site Propagation Model (Lb)

The propagation loss for a high site-low site transmit-receive path (Lb) may be worked out in accordance with an appropriate propagation model using a path profile derived from the ACMA's digital elevation model (RadDEM terrain data). For

¹⁹ These coordination procedures have been adapted from section 6 of Appendix 7 to RALI FX-3 that deals with similar high site to high site interference scenarios.

example, the *Radiocommunications (Unacceptable Levels of Interference- 2 GHz Band) Determination 2000* [9] device boundary criteria is based on the extended Hata/COST-231 Suburban propagation model, as detailed in ERC Report 68 (Feb 2000) Annex B.a.1 [19], using RadDEM terrain data and an effective earth radius factor of $4/3$.

The path profile may be obtained by calculating equi-spaced (in degrees) locations every 9 seconds along the radial from the transmitter site, reading the elevation of the RadDEM cell in which each calculated location occurs.

Note: Path profiles may also be obtained by bi-linear interpolation.

The notional receiver antenna height above ground is 1.5 metres.

Licensees should exercise care when establishing whether a particular service might meet the compatibility requirements under these guidelines. Licensees would be well advised to confirm results calculated under the guidelines before taking any decisions in relation to proposed services.

Compatibility Requirement

The compatibility requirement (also know as the level of protection) for notional mobile receivers in the 2110 -2170 MHz band is -112 dBm/30 kHz, which takes into account an estimated body loss of 8 dB and antenna gain of 2.1 dBi.