Frequency assignment requirements for the fixed service in the 800 MHz band

Radiocommunications Assignment and Licensing Instruction

**rali: FX 22**

**date of effect: [insert date when released]**

Amendment history

| Date | Comments |
| --- | --- |
| July 2019 | New RALI. Initial version covering the assignment of single frequency fixed links in the band 845–849 MHz.  |
| February 2018 | Updated to include:* the assignment of two frequency fixed links in the 804–805.5/849–850.5 MHz segment, and
* enhanced co-existence arrangements with adjacent band spectrum licensed services.
 |
| July 2020 | Update to include provisions for sound outside broadcast links in 845–846.5 MHz. These provisions have been transferred from the now-suppressed RALI FX 11. See [IFC 12/2020](https://www.acma.gov.au/consultations/2020-05/803-960-mhz-band-implementation-arrangements-support-milestone-3-consultation-122020). |
| [Insert date when published] | Update to include changes arising from the [review of the spectrum licence technical frameworks](https://www.acma.gov.au/sites/default/files/2021-05/850-900%20MHz.zip) for the 850 and 900 MHz spectrum licensed bands. In particular:* updating Chapter 3 to reference the new Radiocommunications Advisory Guidelines for the 850/900 MHz spectrum licensed bands; and
* updating Appendix E to incorporate the new notional receiver parameters detailed in the [Radiocommunications Advisory Guidelines (Managing Interference to Spectrum Licensed Receivers – 850-900 MHz Bands) 2021](https://www.legislation.gov.au/Series/F2021L01149).
 |

Suggestions for improvements to Radiocommunications Assignment and Licensing Instruction FX 22 may be addressed to:

The Manager, Spectrum Planning Section
Australian Communications and Media Authority
PO Box 78
Belconnen ACT 2616

or by email to: freqplan@acma.gov.au.

Please notify the ACMA of any inaccuracy or ambiguity found in this RALI, so that it can be investigated and appropriate action taken.

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# Introduction

## Purpose

The purpose of this Radiocommunications Assignment and Licensing Instruction (RALI) is to provide instruction on frequency assignment policy and coordination procedures for point-to-point systems operating in the Fixed Service in the 800 MHz band. This RALI applies to:

* single frequency fixed links[[1]](#footnote-2) (SFFL) operating in the 845-849 MHz segment (including links licenced as studio-to-transmitter links (STLs) and excluding sound outside broadcast (SOB) links which continue to be assigned using FX 11).

two frequency fixed links[[2]](#footnote-3) (TFFL) operating in the 804-805.5/849-850.5 paired segment.

This is the second iteration of this RALI and additional Fixed Service types will be included in future updates in accordance with the implementation of outcomes of the review of the 803-960 MHz band – see section 1.2 for further details.

The information in this document reflects the ACMA’s statement of current policy in relation to radiocommunication systems operating in the Fixed Service in the 845-849 MHz SFFL and 804-805.5/849-850.5 MHz TFFL segments. In making decisions, accredited frequency assigners and the ACMA’s officers should take all relevant factors into account and decide each case on its merits. Issues relating to this document that appear to fall outside the enunciated policy should be referred to:

The Manager, Spectrum Planning Section
Australian Communications and Media Authority
PO Box 78
Belconnen ACT 2616

or by email to: freqplan@acma.gov.au.

## Review of the 803-960 MHz band

In November 2015, the ACMA completed its review of arrangements in the 803-960 MHz band (the Review) and released the decision paper: [the ACMA’s long-term strategy for the 803–960 MHz band](https://www.acma.gov.au/publications/2015-12/report/acmas-long-term-strategy-803-960-mhz-band-decision-paper) (the Decision paper). The Decision paper outlines the implementation of new arrangements in the band which will be completed by June 2024. The implementation phase of the review will include the transition of the Fixed Service allocations to new arrangements over a number of milestones – milestone dates are available in the Decision paper and in Appendix D.

The Decision paper also highlighted two measures to simplify the planning for fixed services in the 803-960 MHz band to improve efficiency, these being:

* Rationalisation of the various fixed service sub-types into either ‘single frequency’ or ‘two frequency’ categories – see section 1.2.1; and

Collation of the majority of frequency assignment and licensing arrangements applicable for Fixed Services in the 803-960 MHz band – which historically have been contained in separate RALIs and planning documents – into a new dedicated RALI.

Consistent with these simplification measures, frequency assignment criteria has been incrementally transferred to this RALI (and updated where necessary) to facilitate the implementation of the new arrangements detailed in the Decision paper.

### Amalgamation of historic service sub-types

As indicated in section 1.2, the Review sought to rationalise fixed service sub-types. Table 1 details the amalgamation of the following historic sub-types[[3]](#footnote-4):

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Historic service sub-type** | **Historic RALI** | **Historic frequency allocation** | **Amalgamated service sub-type** | **New frequency allocation** |
| Single frequency (single channel) | FX 17SPP 4/93\* | 857-861 MHz | Single frequency fixed link (SFFL) | 845-849 MHz[[4]](#footnote-5), [[5]](#footnote-6) |
| Single frequency (low capacity) | FX 11 | 845-852 MHz |
| Studio-to-transmitter links (STLs) | FX 11 | 845-852 MHz |
| Two frequency (single channel)  | FX 17FX 16\*\* | 852-854/928-930 MHz | Two frequency fixed link (TFFL) | 804-805.5/849-850.5 MHz[[6]](#footnote-7) |
| Two frequency (low capacity) | SPP 6/93 | 854-857/930-933 MHz |

\* SPP 4/93 primarily deals with coordination between fixed services and cordless telephone services (CTS), and between different CTS systems. CTS systems are required to cease operating by 30 June 2024 (see Appendix D) and SPP 4/93 is earmarked to be suppressed by 30 June 2023.

\*\* Licensing and assignment guidance for point-to-multipoint services, historically operated under the two-frequency (single channel) sub-type.

### Existing licensed services

Services which are not required to change frequency as part of the Review are permitted to continue to operate under their current licence conditions.

### The 850/900 MHz band spectrum licence technical framework

In August 2021, the ACMA finalised updates to the [850/900 MHz band spectrum licence technical framework (SLTF).](https://www.acma.gov.au/consultations/2021-04/draft-instruments-850900-mhz-band-auction-consultation-162021) These updates included amendments to coexistence arrangements between spectrum licensed services and frequency-adjacent apparatus-licensed services.

One of the key components of the SLTF is the [Radiocommunications Advisory Guidelines (RAGs)](https://www.acma.gov.au/850900-mhz-technical-framework) for 850/900 MHz band spectrum licensed transmitters and receivers. The updated RAGs include arrangements for coexistence with point to point fixed services in the 800 MHz band. This RALI has been revised to reflect these updated coexistence arrangments – see chapter 3 and Appendix E.

## Related RALIs

General information about Fixed services is contained in the RALI entitled ‘Microwave Fixed Services: Frequency Co-ordination’ (FX 3). Other related RALIs and planning documents that will be periodically amended or supressed as the implementation of the outcomes of the 803–960 MHz Review progresses include:

SP 4/93: Coordination procedures for the licensing of services sharing the 857–861 MHz band (earmarked to be suppressed by 30 June 2023).

RALI MS 40 contains the frequency plan for services in the 800 MHz band (803–890 MHz).

# Licence structure

In order to facilitate the development and implementation of appropriate licensing procedures, including the application of licence conditions and fees, different radiocommunications applications are separately identified within the various licence types as individual licensing options; usually related to type of service, station or use.

## Fixed licence type

Services within the scope of this RALI are licensed under a Fixed licence type as defined in the *Radiocommunications (Interpretations) Determination 2015.* Within the Fixed licence type are various licensing options available to authorise services that fall into the overarching fixed licence category, including point-to-point, studio-to-transmitter links (STLs), point-to-multipoint[[7]](#footnote-9) and sound outside broadcast (SOB) links.

## Fixed licence conditions

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

* conditions specified in the *Radiocommunications Act 1992* (the Act), including an obligation to comply with the Act;
* a condition that any radiocommunication device operated under the licence must comply with all the standards applicable to it;
* conditions specified in the *Radiocommunications Licence Conditions (Apparatus Licence) Determination 2015* and any other determinations made by the ACMA under paragraph 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.

## Licence Conditions Determination

Under paragraph 107(1)(f) of the Act, the ACMA may determine, by written instrument, conditions relating to a particular type of apparatus licence. These conditions are known as Licence Conditions Determinations (LCDs). LCDs contain the generic conditions particular to radiocommunications licence types and licensing options, including detail of assigned frequencies, or frequency bands, and permitted power levels.

The *Radiocommunications Licence Conditions (Apparatus Licence) Determination 2015* contains licence conditions that are common to all apparatus licences.

The *Radiocommunications Licence Conditions (Fixed Licence) Determination 2015* (the Fixed LCD) currently contains the conditions applicable to a range of licensing options, including point-to-point and sound outside broadcast stations.

## Special conditions

Any other conditions of operation which apply to an individual licence but are not included in the LCD, will be printed on the licence under the heading ‘Special Conditions’. A special condition that is inconsistent with an LCD may only be applied after consultation with the ACMA.

An accredited frequency assigner may ask the ACMA to impose one or more special condition on the licence.

## Inter-service coordination

This RALI provides guidance on inter-service coordination for particular scenarios – i.e. with spectrum licensed services (see section 3) and between SFFL and TFFL services (see sections 4 and 6). For other inter-service scenarios, coordination should be performed in accordance with good engineering practice based on fundamental interference mitigation principles.

# Operation of Fixed Services in Spectrum Adjacent to Spectrum Licences

The fixed service band edge at 845 MHz is directly (upper) adjacent to frequencies that are spectrum licensed.

The ‘*[Radiocommunications Advisory Guidelines (Managing Interference from Spectrum Licensed Transmitters – 850/900 MHz Bands) 2021](https://www.legislation.gov.au/Series/F2021L01148)’* sets out protection requirements for services operating frequency adjacent to spectrum licensed transmitters. In summary, these protection requirements are:

* Protection of SFFL/TFFL radiocommunications receivers from spectrum licensed radiocommunications transmitters is on a first-in-time basis.

Any existing SFFL/TFFL apparatus licensed receiver licensed prior to the registration of a spectrum licensed transmitter in the Register[[8]](#footnote-10) is to be provided protection to the level specified in this RALI (protection ratios are provided in section 4.2.2 and 6.2.2).

Out of band protection requirements for interference from SFFLs and TFFLs operating in bands adjacent to spectrum-licensed services are set out in Appendix E, which are based on the ‘*[Radiocommunications Advisory Guidelines (Managing Interference to Spectrum Licensed Receivers – 850/900 MHz Bands) 2021’](https://www.legislation.gov.au/Series/F2021L01149).*

These guidelines are available from the Federal Register of Legislation website[[9]](#footnote-11).

# Single frequency fixed links

## Introduction

This section of the RALI applies to the assignment of Single Frequency Fixed Links (SFFL) within the 845-849 MHz frequency segment.[[10]](#footnote-12) This includes studio-to-transmitter links (STLs) and all parameters and conditions set out in this section are common to both SFFLs and STL, other than those specified in 4.2.4 *Notional* *Antenna Parameters* and 4.2.7 *Fixed Path Length*.

### Purpose

The purpose of this subsection of the RALI is to provide licensing procedures for SFFLs allocated in the 845-849 MHz frequency segment of the 800 MHz Band Plan (RALI MS 40)[[11]](#footnote-13).

To cater for the transition of services from the 857–861 MHz segment into the 845-849 MHz segment, this RALI retains a similar level of coexistence provisions as the previous arrangements detailed in RALI FX 17. Note that there are some differences between existing and new coordination requirements that enable the amalgamation of different fixed link types in the 845-849 MHz segment and increased channel bandwidth flexibility.

### Background

An outcome of the review of the 803–960 MHz band was the rationalisation and reorganisation of fixed services spectrum[[12]](#footnote-14), including a reduction in total spectrum for SFFLs from 11 MHz to 4 MHz resulting in a total SFFL allocation of 845–849 MHz[[13]](#footnote-15). In addition, the current SFFL allocation in the 857–861 MHz segment will be removed at a later date[[14]](#footnote-16).

## Frequency assignment for SFFLs

SFFLs in the 845–849 MHz segment are to be assigned in accordance with this RALI. The coordination requirements set out in this RALI aim to enable coexistence of services in most situations, however given the scope for highly variable bandwidths, it is not possible to provide explicit procedures for all possible permutations. Where scenarios are not explicitly covered in this RALI, coordination should be carried out in accordance with good engineering practice based on fundamental interference mitigation principles, using relevant components of this RALI as a guide where possible.

### Channelling arrangements

Channelling arrangements for SFFLs in the 845–849 MHz segment provide for a total of 320 x 12.5 kHz channels. In the 12.5 kHz-based channel raster, channel centre frequencies are calculated using the following formula:

Channel Centre Frequency = [844.99375 + n(0.0125)] MHz

Where:

n = Channel Number (Integer range is between 1 to 320)

SFFL channel bandwidths may be multiples of 12.5 kHz, up to a maximum of 400 kHz. The centre frequency of an aggregated channel is as follows:

Aggregated Channel Centre Frequency = [(Fhigh – Flow)/2 + Flow]

Where:

Fhigh= The centre frequency of the highest channel included in the aggregation.

Flow = The centre frequency of the lowest channel included in the aggregation.

Note that the entire emission bandwidth must remain within the 845-849 MHz segment at all times.

### Frequency coordination procedure

Frequency coordination involves calculating the wanted to unwanted (W/U) signal level ratio for the proposed assignment and each existing assignment in the coordination area. The calculated W/U ratios are compared with the required protection ratios for the services involved (protection ratios are detailed in section 4.2.2.1). Refer to the RALI FX 3 ‘Microwave Fixed Services: Frequency Co-ordination’ for a more detailed explanation of the fixed link coordination procedures.

To allow more efficient use of spectrum, the coordination process is to refer to the most accurate radiation pattern envelope (RPE) data available for antennas used in proposed and existing fixed links[[15]](#footnote-17). Where RPE data is not available, values for maximum gain, beamwidth and front-to-back ratio (from the ACMA or antenna manufactures website) can be used.

A spatial cull for fixed links should include all stations within a radius of 200 km around the centre point of the proposed new link. Where necessary, this range may be extended to take account of special circumstances, such as stations on very high sites.

#### Protection ratios

Protection ratios may be derived using one of two methods:

* Use of sound engineering judgement to calculate the frequency-dependent rejection (FDR) ratio. This involves the application of equipment-specific transmitter and receiver characteristics (i.e. emission and selectivity masks) and the FDR calculation procedure[[16]](#footnote-18); or

Applying the method set out below. Protection ratios derived using the below methodology address the requirements of a broad range of fixed service systems and in some situations may be more conservative than those obtained using the FDR-based method. Where possible, it is preferable for the FDR method be used, however the below method is sufficient for determining protection ratios if the relevant technical information or expertise is not available.

Under this method, the protection ratio values for SFFLs have been based on those set out in previously applicable RALIs, FX 11 and FX 17. Additional requirements have also been included in this RALI to cater for the new 12.5 kHz-based channel raster and the ability to aggregate multiple 12.5 kHz channels (see section 4.2.1 for more information about channel aggregation). In addition, some protection ratios have been reduced for certain situations where previous protection levels were considered excessive (see section 4.2.2.1.2).

For co-channel[[17]](#footnote-19) coordination, logarithmic scaling should be used to adjust the interference power level when the transmit bandwidth is larger than the receive bandwidth. Scaling is not required for adjacent channel coordination as bandwidth adjustment is incorporated into the protection ratios detailed in Table 4.

Given the large number of potential bandwidth permutations which will be used in this frequency segment, protection ratios are split into two categories based on the receiver bandwidth:

* Section 4.2.2.1.1 for receivers with a bandwidth of <75 kHz

Section 4.2.2.1.2 for receivers with a bandwidth of ≥75 kHz

##### Protection requirements for receivers with a bandwidth of <75 kHz

Protection ratios for receivers operating with a bandwidth of less than 75 kHz are provided in Table 2. Due to the high level of adjacent channel isolation that is inherent in narrowband fixed services no adjacent channel protection requirements are specified in this RALI. These requirements are identical to those previously provided in RALI FX 17.

|  |  |
| --- | --- |
| **Wanted level (WL)** | **Co-channel protection ratio** |
| WL ≥ -99 dBm | 30 dB |
| -99 dBm > WL > -129 dBm | = 30 – (-99 – WL) |
| WL ≤ -129 dBm | No protection |

##### Protection requirements for receivers with a bandwidth of ≥75 kHz

Protection ratios for receivers operating with a bandwidth of greater than or equal to 75 kHz are provided in Table 3 (for co-channel) and Table 4 (for adjacent channel).

Co-channel protection requirements

The co-channel protection ratios are the same as previously provided in RALI FX 11, however new requirements have been introduced which reduce the level of protection for services with a low wanted level to ensure excessive protection is not provided, in order to improve assignment efficiency.[[18]](#footnote-20)

|  |  |
| --- | --- |
| **Wanted level (WL)** | **Co-channel protection ratio** |
| WL ≥ -72 dBm | 50 dB |
| -72 dBm > WL > -92 dBm | = 50 – (-72 – WL) dB |
| WL < -92 dBm | 30 dB |

Adjacent channel protection requirements

The shift to a 12.5 kHz channel raster will allow services to be assigned with a smaller frequency separations from existing services than was possible under the previous arrangements. To ensure adequate protection between services operating in the 845-849 MHz frequency segment, a ‘frequency offset-dependent’ protection ratio has been included for adjacent channel coordination – see Table 4. These protection ratios represent a compromise of the various possible permutations of channel bandwidth combinations. Specified protection ratios vary depending on the combined channel bandwidths of the transmitter and receiver being coordinated.

In order to determine the applicable protection ratios from Table 4, it is first necessary to calculate (RXBW + TXBW)/2, where RXBW = licensed channel width of the receiver; and TXBW = licensed channel width of the transmitter.

The protection ratios shown in Table 4 are intended to provide an adequate level of coexistence for services sharing the 845-849 MHz band. However, given the wide range of service types and bandwidths, there may be some scenarios where additional protection is required. Supplementary measures, such as aggregation of additional 12.5 kHz segments to create a guardband within the licensed bandwidth, may be needed – sound engineering judgement (which may include the use of FDR calculations) should be exercised in making such decisions.

The SFFL and TFFL segments share a frequency boundary at 849 MHz. The protection ratios in Table 4 also apply for coordination of SFFL receivers with TFFL transmitters.

|  | **Adjacent channel protection ratio (dB)** |
| --- | --- |
| **Channel edge offset[[19]](#footnote-21) (kHz)** |  |  |  |  |
| 0 | 30 | 35 | 35 | 24 |
| 12.5 | 20 | 30 | 32 | 22 |
| 25 | 16 | 25 | 28 | 21 |
| 37.5 | 12 | 21 | 24 | 20 |
| 50 | 8 | 19 | 21 | 20 |
| 62.5 | 5 | 18 | 19 | 19 |
| 75 | 3 | 17 | 19 | 18 |
| 87.5 | 1 | 15 | 18 | 17 |
| 100 | 0 | 14 | 17 | 17 |
| 112.5 | - | 12 | 16 | 15 |
| 125 | - | 11 | 15 | 14 |
| 137.5 | - | 9 | 14 | 13 |
| 150 | - | 8 | 13 | 12 |
| 162.5 | - | 6 | 11 | 11 |
| 175 | - | 4 | 10 | 10 |
| 187.5 | - | 2 | 9 | 9 |
| 200 | - | 0 | 8 | 8 |
| 212.5 | - | - | 7 | 7 |
| 225 | - | - | 6 | 6 |
| 237.5 | - | - | 5 | 5 |
| 250 | - | - | 4 | 4 |
| 262.5 | - | - | 3 | 4 |
| 275 | - | - | 2 | 3 |
| 287.5 | - | - | 1 | 3 |
| 300 | - | - | 0 | 2 |
| 312.5 | - | - | - | 2 |
| 325 | - | - | - | 1 |
| 337.5 | - | - | - | 1 |
| 350 | - | - | - | 1 |
| 362.5 | - | - | - | 1 |
| 375 | - | - | - | 0 |
| 387.5 | - | - | - | 0 |
| 400 | - | - | - | 0 |

### Assignment priority

A three stage vertical channel loading strategy is to be applied to the assignment of channels. In order to optimise the scope for sharing between SFFLs and SOB links, and coexistence of these services with Spectrum Licensed services in the lower-adjacent segment, it is advised to assign SFFLs on channels outside the 845 – 846.5 MHz segment whenever possible. In addition, to help manage coexistence with two-frequency fixed links (TFFLs) in the upper-adjacent frequency segment (849-851 MHz) assignment in the upper 400 kHz of the segment (848.6-849 MHz) should be avoided unless there are no other suitable frequencies available.

To put into effect the above priority requirements, Table 5 describes the three stage process for the prioritisation of channel assignments within three frequency sub-segments. When searching for available channels, Stage 1 should be exhausted prior to moving onto Stage 2, and so on.

|  |  |  |
| --- | --- | --- |
| **Stage** | **Frequency range (MHz)[[20]](#footnote-22)** | **Channel Assignment direction** |
| 1 | 846.5 - 848.6 | Ascending order |
| 2 | 845 - 846.5 | Descending order |
| 3 | 848.6 - 849 | Ascending order |

### Notional antenna parameters

Stations operating under the SFFL licence type must employ an antenna with performance characteristics equivalent to or better than:

* In high and medium density areas – a directional antenna with a mid-band gain of at least 16 dBi, a minimum front-to-back ratio of 20 dB and a maximum beam width (in E-plane) of 30°.

Outside high and medium density area – a directional antenna with a mid-band gain of at least 9 dBi, a minimum front-to-back ratio of 15 dB and a maximum beam width (in E-plane) of 45°.

Stations operating under the STL licence type must employ an antenna with performance characteristics equivalent to or better than:

* In high and medium density areas – a directional antenna with a mid-band gain of at least 22 dBi, a minimum front-to-back ratio of 24 dB and a maximum beam width (in E-plane) of 13°.

Outside high and medium density areas – a directional antenna with a mid-band gain of at least 9 dBi, a minimum front-to-back ratio of 15 dB and a maximum beam width (in E-plane) of 45°.

Note: the minimum performance characteristics listed also apply to vertically polarised links (with maximum beamwidth measured in H-plane)

Exemptions to this policy may be made on a case-by-case basis – refer to section 4.2.4.1 for a description of the advisory note to be applied under such circumstances.

Licensees who were required to change frequency as part of the implementation of the new arrangements in the 800 MHz band[[21]](#footnote-23), may be required to upgrade their antenna systems to the above antenna specifications if:

* their use of a lower performance antenna prevents an assignment being made that would have been possible if the notional antenna was in use; or

there is a possibility of interference to or from other services.

The assigner is free to select the antenna polarisation (either horizontal or vertical) that provides the best coordination results. However, horizontal polarisation is preferred as it provides for additional onsite isolation with respect to near-frequency or frequency-adjacent vertically polarised land mobile services.

#### Advisory Note – SFFL Antenna Use

Advisory note AW must be applied to all fixed licences in high and medium density areas where the proposed antenna performance specifications are below those specified in 4.2.4.

The wording of advisory note AW is as follows:

The licensee may be required to replace the antenna with another having a higher performance in order to facilitate efficient spectrum usage.

### Transmitter parameters

For SFFLs that employ a bandwidth of less than or equal to 75 kHz, the maximum transmitter output power (into the antenna) will be limited to 1W.

### Fixed link path length

SFFL assignments in this band are limited to links of a minimum 20km path length. Fixed services that operate under a 900 MHz Studio-to-Transmitter Link (STLs) licence are exempt from this requirement.

#  Sound outside Broadcast (SOB) links

This section of the RALI covers licensing of SOB links in the segment 845–846.5 MHz, allocated to SOB links and SFFLs on a co-primary basis. The assignment priority for SFFLs that is referred to in section 4.2.3 of this RALI has been formulated to allow maximum scope for SOB link use in this shared segment.

Note: The segment 846.5–851 MHz is allocated for SOB links use on a secondary basis. The arrangements for SOB use in this segment have not been prescribed. Applications for SOB operation in this segment are to be referred to Manager, Spectrum Planning Section for consideration.

Spectrum arrangements for SOB links are summarised at Appendix B of this RALI.

SOB links are effectively ‘temporary fixed links’ used for relatively short periods within an area defined on the licence. The licensing arrangements are different from those applicable to fixed point-to-point stations.

SOB links are a non-assigned licence category and a group of frequencies is assigned for use in a given area. These frequencies must be shared by all SOB users in the area. The number of channels provided for SOB use in an area will depend on industry requirements for SOB channels.

## SOB Conditions Contained in the Fixed LCD

The technical licence conditions that apply to all fixed licences authorising SOB stations are incorporated into the Fixed LCD. These conditions apply to the operation of a temporary radio link relaying program material to a fixed receiver normally located at the licensee’s studio or transmitter site.

## Frequency assignment for SOB links

### Frequency coordination

Fixed licences authorising SOB stations will be issued to any applicant subject to spectrum availability; i.e. SOB bands are available on a fully shared basis to all users in an area, on a no‑protection from interference by other SOB users basis. The only frequency coordination to be conducted will be to determine if SOB spectrum is not available due to the use of the bands by SFFLs and in accordance with limitations detailed at section 5.2.2 of this RALI. This will necessitate a user defined special condition being applied to the licence (refer to section 5.3.1 of this RALI). This arrangement is consistent with the pseudo-assigned, low-fee licence structure applicable to SOB links.

SOB licensees are encouraged to coordinate the use of the SOB bands on an industry consultation basis, in order to optimise the use of the frequencies and to minimise the risk of interference.

### Frequencies

SOB links may be authorised to operate on any suitable frequencies within the SOB frequency range specified on the licence (subject to availability of specified frequencies).

It is recommended that on each licence:

* a minimum of two SOB frequencies should be assigned in low spectrum demand areas; and

the number of frequencies assigned to SOB links in high spectrum demand areas be in accordance with the usage pattern for SOB links, and in line with spectrum availability (paying regard to assignment issues at section 5.2.7 of this RALI). The assignment of multiple frequencies in high spectrum demand areas allows licensees greater choice, as particular frequencies may not be usable in parts of the licensed area due to the presence of other services such as SFFLs and restrictions imposed through operation adjacent to a spectrum licensed band.

The frequencies available for selection in line with section 5.2.7 of this RALI are listed in Table 6.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Main Pattern** | 845.4 | 845.8 | 846.2 | - |
| **Interleave Pattern** | 845.2 \*\* | 845.6 | 846.0 | 846.4\* |

\* This frequency is not normally available for assignments with emissions greater than 200 kHz.

\*\* This frequency is not available for assignments with emissions greater than 200 kHz.

The frequencies will be stated on the licence by a user-defined special condition—see section 5.3.1 of this RALI.

This approach is recommended for equipment that is based on STL parameters. Alternative frequency proposals for SOB equipment with narrower spacings or other frequencies should be referred to the Manager, Spectrum Planning Section.

### Transmit power

The maximum transmitter power is to be limited to 5 watts into the antenna. See section 5.3.1 of this RALI for the user-defined special condition.

### Emission limits of SOB links

SOB links may employ an emission bandwidth greater than 25 kHz to a maximum of up to 400 kHz. As the assignment of narrow bandwidth services may be made on the interleave channels, the emission bandwidth needs to be referred to on the licence by a user-defined special condition for coordination purposes—see section 5.3.1 of this RALI.

### SOB antennas

It is recognised that, for outside broadcasting, it may be more convenient to use a Yagi antenna than the two-metre grid parabolic specified as the notional antenna for STLs (refer to section 4.2.4 of this RALI). However, the poorer side lobe performance of a Yagi antenna presents a higher risk of mutual interference with other services, particularly in the same geographic location. Therefore, it is recommended that a two-metre grid parabolic should be used whenever practicable (for example, for SOB links established on a semi-permanent basis).

### Service area

Although fixed licences authorising SOB stations are non-assigned, the service area is restricted to enable coordination with SFFLs. Usually this area will be defined as being within 50 km of a central coordinate for all SOB licences in a particular area (for example, the GPO of a capital city)—see section 5.3.1 of this RALI for the user-defined special condition.

Applications to operate SOB links in regions of larger radius than 50 km, for example, for state-wide networks, are to be referred to the Manager, Spectrum Planning Section, for consideration.

### Band edge considerations for SOB links

The SOB segment is directly upper-adjacent to the 845 MHz boundary with the base-receive segment of 850 MHz spectrum licensed services. In order to avoid interference to these services, SOB links should not normally be assigned frequencies within 400 kHz of the upper frequency edge of registered spectrum-licensed services operating within the SOB coordination area.

Out-of-band protection for fixed service receivers operating in bands adjacent to a spectrum licensed band is set out in the ‘*Radiocommunications Advisory Guidelines (Managing Interference from Spectrum Licensed Transmitters – 850/900 MHz Bands) 2021’*. A copy of this guideline is available from the Federal Register of Legislation website.[[22]](#footnote-24) As detailed in the guideline, SOB links operate on a no protection basis, although some protection may be afforded fortuitously through the protection of fixed link receivers.

## Special conditions

### User defined

Fixed licences authorising SOB stations are a non-assigned licence, meaning that no technical coordination is undertaken. Station records for each assigned frequency are recorded on the licence to aid assigners in establishing the most appropriate frequencies for future assignments. Stations recorded on an SOB licence only record the receiver characteristics as this is often the only known location. Transmitters typically operate in a mobile configuration and the technical characteristics of the transmitter are specified by way of a user defined special condition attached to the station record.

The wording should be:

This licence authorises the licensee to operate: on the frequency channel with a centre frequency of XXX.X MHz; with a maximum bandwidth of XXX kHz; a maximum transmitter power of 5 watts; and within XX kilometres of the site specified on the licence.

The distance specified within this condition will normally not exceed 50 km.

# Two frequency fixed links

## Introduction

This section of the RALI applies to the assignment of Two Frequency Fixed Links (TFFL) within the 804-805.5/849-850.5 MHz paired frequency segment.

### Purpose

The purpose of this subsection of the RALI is to provide licensing procedures for TFFLs allocated in the 804-805.5/849-850.5 MHz paired frequency segment (RALI MS 40)[[23]](#footnote-26).

To cater for the transition of services from the 852-853.5/928-929.5 MHz and 854-857/930-933 MHz segments into the 804-805.5/849-850.5 MHz segment, this RALI retains a similar level coexistence provisions as the previous arrangements detailed in RALI FX 17 and planning document SP 6/93. Note that there are some differences between existing and new coordination requirements that enable the amalgamation of different fixed link types in the 804-805.5/849-850.5 MHz segment and increased channel bandwidth flexibility.

### Background

An outcome of the review of the 803 – 960 MHz band was a rationalisation and reorganisation of fixed services spectrum[[24]](#footnote-27), including a reduction in total spectrum from 5 MHz to 2 MHz (paired) for TFFLs in the 800 MHz band. The previously-allocated 852-853.5/928-929.5 MHz and 854-857/930-933 MHz TFFL segments have been replaced with the new TFFL allocation in 804-805.5/849-850.5 MHz.[[25]](#footnote-28)

As described in the 803-960 MHz review decision paper, arrangements may be introduced to allow TFFLs to access spectrum in the adjacent TLMS segment (806-809/851-854 MHz) on a secondary basis as a means of alleviating potential congestion in the future (see section 3.2.3.1 of the Decision paper). The ACMA will consider introduction of these arrangements at a future date if congestion issues arise.

## Frequency assignment for TFFLs

TFFLs in the 804-805.5/849-850.5 MHz segment are to be assigned in accordance with this RALI. The coordination requirements set out in this RALI aim to enable coexistence of services in most situations, however given the scope for highly variable bandwidths, it is not possible to provide explicit procedures for all possible permutations. Where scenarios are not explicitly covered in this RALI, coordination should be carried out in accordance with good engineering practice based on fundamental interference mitigation principles, using relevant components of this RALI as a guide where possible.

### Channelling arrangements

Channelling arrangements for TFFLs in the 804-805.5/849-850.5 MHz segment provide for a total of 120 x 12.5 kHz channels. In the 12.5 kHz-based channel raster, channel centre frequencies are calculated using the following formula:

Lower channel centre frequency = [803.99375 + n(0.0125)]

Upper channel centre frequency = [848.99375 + n(0.0125)]

Where:

 n = Channel Number (Integer range is between 1 to 120)

TFFL channel bandwidths may be multiples of 12.5 kHz, up to a maximum of 200 kHz. The centre frequency of an aggregated channel is as follows:

Aggregated Channel Centre Frequency = [(Fhigh – Flow)/2 + Flow]

Where:

Fhigh= The centre frequency of the highest channel included in the aggregation.

Flow = The centre frequency of the lowest channel included in the aggregation.

Note that the entire emission bandwidth must remain within the 804-805.5/849-850.5 MHz segments at all times.

### Frequency coordination procedure

Frequency coordination involves calculating the wanted to unwanted (W/U) signal level ratio for the proposed assignment and each existing assignment in the coordination area. The calculated W/U ratios are compared with the required protection ratios for the services involved (protection rations are detailed in section 6.2.2.1). Refer to the RALI FX 3 ‘Microwave Fixed Services: Frequency Co-ordination’ for a more detailed explanation of fixed link coordination procedures.

Assigners should endeavour to follow established transmitter site sense wherever possible. This not only improves the availability of channels later on but also helps to optimise the productivity of prime sites. Further guidance on site sense is contained in section 3.3.3 of RALI FX 3.

To allow more efficient use of spectrum, the coordination process is to refer to the most accurate radiation pattern envelope (RPE) data available for antennas used in proposed and existing fixed links.[[26]](#footnote-29) Where RPE data is not available, values for maximum gain, beamwidth and front-to-back ratio (from the ACMA or antenna manufactures website) can be used.

A spatial cull for fixed links should include all stations within a radius of 200 km around the centre point of the proposed new link. Where necessary, this range may be extended to take account of special circumstances, such as stations on very high sites.

#### Protection ratios

Protection ratios may be derived using one of two methods:

* Use of sound engineering judgement to calculate the frequency-dependent rejection (FDR) ratio. This involves the application of equipment-specific transmitter and receiver characteristics (ie. emission and selectivity masks) and the FDR calculation procedure[[27]](#footnote-30); or

Applying the method set out below. Protection ratios derived using the below methodology address the requirements of a broad range of fixed service systems and in some situations may be more conservative than those obtained using the FDR-based method. Where possible, it is preferable for the FDR method to be used, however the below method is sufficient for determining protection ratios if the relevant technical information or expertise is not available.

Under this method, protection ratio values for TFFLs have been based on those set out in previously applicable planning documents, FX 17 and SP 6/93. Additional requirements have also been included to cater for the new 12.5 kHz-based channel raster and the ability to aggregate multiple 12.5 kHz channels (see section 6.2.1 for more information about channel aggregation). In addition, some protection ratios have been reduced for certain situations where previous protection levels were considered excessive (see section 6.2.2.1.2).

For co-channel[[28]](#footnote-31) coordination, logarithmic scaling should be used to adjust the interference power level when the transmit bandwidth is larger than the receive bandwidth. Scaling is not required for adjacent channel coordination as bandwidth adjustment is incorporated into the protection ratios detailed in Table 9.

Given the large number of potential bandwidth permutations which will be used in this frequency segment, protection ratios are split into two categories based on the receiver bandwidth:

* Section 6.2.2.1.1 for receivers with a bandwidth of ≤100 kHz

Section 6.2.2.1.2 for receivers with a bandwidth of >100 kHz

##### Protection requirements for receivers with a bandwidth of ≤100 kHz

Protection ratios for receivers operating with a bandwidth of less than or equal to 100 kHz are provided in Table 7. Due to the high level of adjacent channel isolation that is inherent in narrowband fixed services no adjacent channel protection requirements are specified in this RALI. These requirements are identical to those previously provided in RALI FX 17, and are consistent with requirements detailed in SP 6/93[[29]](#footnote-32).

|  |  |
| --- | --- |
| **Wanted level (WL)** | **Co-channel protection ratio** |
| WL ≥ -99 dBm | 30 dB |
| -99 dBm > WL > -129 dBm | = 30 – (-99 – WL) |
| WL ≤ -129 dBm | No protection |

##### Protection requirements for receivers with a bandwidth of >100 kHz

Protection ratios for receivers operating with a bandwidth of greater than 100 kHz are provided in Table 8 (for co-channel) and Table 9 (for adjacent channel).

Co-channel protection requirements

The co-channel protection ratios are the same as previously provided in SP 6/93, however new requirements have been introduced which reduce the level of protection for services with a low wanted level to ensure excessive protection is not provided, in order to improve assignment efficiency.[[30]](#footnote-33)

|  |  |
| --- | --- |
| **Wanted level (WL)** | **Co-channel protection ratio** |
| WL ≥ -72 dBm | 50 dB |
| -72 dBm > WL > -92 dBm | = 50 – (-72 – WL) dB |
| WL < -92 dBm | 30 dB |

Adjacent channel protection requirements

The shift to a 12.5 kHz channel raster will allow services to be assigned with smaller frequency separations from existing services than was possible under the previous arrangements. To ensure adequate protection between services operating in the 804-805.5/849-850.5 MHz frequency segment, a ‘frequency offset-dependent’ protection ratio has been included for adjacent channel coordination – see Table 9. These protection ratios represent a compromise of the various possible permutations of channel bandwidth combinations. Specified protection ratios vary depending on the combined channel bandwidths of the transmitter and receiver being coordinated.

In order to determine the applicable protection ratios from Table 9, it is first necessary to calculate (RXBW + TXBW)/2, where RXBW = licenced channel width of the receiver; and TXBW = licenced channel width of the transmitter.

The protection ratios shown in Table 9 are intended to provide an adequate level of coexistence for services sharing the 804-805.5/849-850.5 MHz band. However, given the wide range of service types and bandwidths, there may be some scenarios where additional protection is required. Supplementary measures, such as aggregation of additional 12.5 kHz segments to create a guardband within the licensed bandwidth, may be needed – sound engineering judgement (which may include the use of FDR calculations) should be exercised in making such decisions.

The SFFL and TFFL segments share a frequency boundary at 849 MHz. For coordination of TFFL receivers with SFFL transmitters, the protection ratios in Table 4 should be used when (RXBW + TXBW)/2 > 100 kHz. Table 9 should be used when (RXBW + TXBW)/2 ≤ 100 kHz

|  | **Adjacent channel protection ratio (dB)** |
| --- | --- |
| **Channel edge offset[[31]](#footnote-35) (kHz)** |  |  |
| 0 |  |  |
| 12.5 |  |  |
| 25 | 16 | 20 |
| 37.5 | 12 | 19 |
| 50 | 11 | 17 |
| 62.5 | 11 | 15 |
| 75 | 11 | 13 |
| 87.5 | 9 | 10 |
| 100 | 7 | 8 |
| 112.5 | 5 | 7 |
| 125 | 3 | 7 |
| 137.5 | 1 | 7 |
| 150 | - | 7 |
| 162.5 | - | 6 |
| 175 | - | 4 |
| 187.5 | - | 2 |
| 200 | - | - |

### Assignment priority

A two stage vertical channel loading strategy is to be applied to the assignment of channels. This strategy aims to optimise the scope for sharing between TFFLs and adjacent band services by loading channels in the centre of the TFFL segment first and avoiding the assignment of TFFL services in the upper and lower 400 kHz unless there are no other suitable frequencies available.

To put into effect the above priority requirements, Table 10 describes the two stage process for the prioritisation of channel assignments within two frequency sub-segments. When searching for available channels, Stage 1 should be exhausted prior to moving onto Stage 2.

1. Assignment priority in the 804-805.5/849-850.5 MHz segment

|  |  |  |  |
| --- | --- | --- | --- |
| **Stage** | **Lower frequency range (MHz)[[32]](#footnote-36)** | **Upper frequency range (MHz)[[33]](#footnote-37)** | **Channel Assignment direction** |
| 1 | 804.4 - 805.5 | 849.4 – 850.5 | Ascending order |
| 2 | 804 - 804.4 | 849 – 849.4 | Descending order |

### Notional antenna parameters

TFFL stations operating in high and medium density areas must employ an antenna with performance characteristics equivalent to or better than:

* For stations with a licence bandwidth of greater than 25 kHz – a directional antenna with a mid-band gain of at least 22 dBi, a minimum front-to-back ratio of 24 dB and a maximum beam width (in E-plane) of 13°.

For stations with a licence bandwidth of less than or equal to 25 kHz – a directional antenna with a mid-band gain of at least 16 dBi, a minimum front-to-back ratio of 20 dB and a maximum beam width (in E-plane) of 30°.

TFFL stations operating outside high and medium density areas must employ an antenna with performance characteristics equivalent to or better than:

* a directional antenna with a mid-band gain of at least 9 dBi, a minimum front-to-back ratio of 15 dB and a maximum beam width (in E-plane) of 45°.

Note: the minimum performance characteristics listed also apply to vertically polarised links (with maximum beamwidth measured in H-plane)

Exemptions to this policy may be made on a case-by-case basis – refer to section 6.2.4.1 for a description of advisory notes to be applied under such circumstances.

Licensees who were required to change frequency as part of the implementation of the new arrangements in the 800 MHz band[[34]](#footnote-38), may be required to upgrade their antenna systems to the above antenna specifications if:

* their use of a lower performance antenna prevents an assignment being made that would have been possible if the notional antenna was in use; or

there is a possibility of interference to or from other services.

The assigner is free to select the antenna polarisation (either horizontal or vertical) that provides the best coordination results. However, horizontal polarisation is preferred as it provides for additional onsite isolation with respect to near-frequency or frequency-adjacent vertically polarised land mobile services.

#### Advisory note ­– TFFL antenna use

Advisory note AW must be applied to all fixed licences in high and medium density areas where the proposed antenna performance specifications are below those specified in 6.2.4.

The wording of advisory note AW is as follows:

The licensee may be required to replace the antenna with another having a higher performance in order to facilitate efficient spectrum usage.

### Transmitter parameters

For TFFLs that employ a bandwidth of less than or equal to 25 kHz, the maximum transmitter output power (into the antenna) will be limited to 1W.

### Fixed link path length

TFFL assignments in this band are limited to links of a minimum 20km path length.

# Exceptions

Exceptions to the requirements of this RALI for prospective assignments require case-by-case consideration by the Manager, Spectrum Planning Section.

A request for exemption from the requirements of this RALI would need to be accompanied by evidence to support the request.

All requests for exemptions should be submitted to freqplan@acma.gov.au.

# RALI Authorisation

Not approved [Insert date when approved]

Chris Worley
Manager
Spectrum Planning Section
Spectrum Planning and Engineering Branch

Communications Infrastructure Division
Australian Communications and Media Authority

# Appendix A: Channelling arrangements for the Single Frequency Fixed Service (845–849 MHz)

A total of 320 channels are available for SFFLs in this band segment, in a 12.5 kHz channel raster, with centre frequencies given using the formulas below:

Channel Centre Frequency = [844.99375 + n(0.0125)]

Where:

n = Channel Number (Integer range is between 1 to 320)

SFFLs may utilise a variety of channel bandwidths greater than 12.5 kHz, to a maximum of 400 kHz by way of aggregating multiples of a single 12.5 kHz channel. For the aggregation of channels the centre frequency of the aggregated channel is as follows:

Aggregated Channel Centre Frequency = [(Fhigh – Flow)/2 + Flow]

Where:

 Fhigh = The centre frequency of the highest channel included in the aggregation.

 Flow = The centre frequency of the lowest channel included in the aggregation.

Noting that the entire emission bandwidth must remain within the 845-849 MHz segment at all times.

NOTES:

1. This segment is allocated to SFFLs.
2. Notional Antenna: refer to section 4.2.4 of this RALI
3. Channel Bandwidth: greater than 12.5kHz to a maximum of 400 kHz
4. Minimum Path Length: 20km, not applicable to STLs

 (Refer to section 4.2.6 of the RALI)

1. In order to optimise the scope of sharing between SFFLs and SOB services, assignment of SFFLs should avoid the 845 – 846.5 MHz segment in the first instance where possible.
2. In order to manage co-existence with future two frequency fixed services in the upper adjacent band (849-851 MHz), assignments in the top 400 kHz of the segment (848.6-849 MHz) should be avoided in the first instance where possible.
3. The table below describes the three stage process in terms of the frequency range they will be applied in and the channel assignment direction that assigners should take. In searching for appropriate channels, each stage should be exhausted before moving onto the next stage.

|  |  |  |
| --- | --- | --- |
|  | Frequency range (MHz) | Channel Assignment direction |
| 1 | 846.5 - 848.6 | Ascending order |
| 2 | 845 - 846.5 | Descending order |
| 3 | 848.6 - 849 | Ascending order |

# Appendix B: Spectrum Arrangements for SOB links (845–851 MHz)



Notes:

1. SOB links operate on assigned channels on a shared basis by all users in an area. SOB links must not cause interference to other primary services and are not able to be afforded protection from such services.
2. The channel plan in section 5.2.2 may be used for SOB links
3. Antenna: Yagi antennas may be used. However, it is recommended that a two-metre grid parabolic be used whenever practicable.
4. Emission bandwidth: greater than 25 kHz to a maximum of 400 kHz
5. Minimum path length: none specified
6. A SOB link is authorised to operate within an agreed distance of a designated coordinate, usually within 50 km of a specified post office.
7. Typical Uses: digital SOB of 250 kHz bandwidth analogue SOB of bandwidths ranging from 60 kHz to 400 kHz
8. Channel assignment restrictions:

(a) Use of frequencies within 400 kHz of the adjacent band below 845 MHz should be avoided where there are adjacent-frequency registered spectrum-licensed devices operating within the SOB coordination area (potentially restricting assignments in the range 845–845.4 MHz).

# Appendix C: Channelling arrangements for the Two Frequency Fixed Service (804–805.5/849–850.5 MHz)

A total of 120 channels are available for TFFLs in this band segment, in a 12.5 kHz channel raster, with centre frequencies given using the formulas below:

Lower channel centre frequency = [803.99375 + n(0.0125)]

Upper channel centre frequency = [848.99375 + n(0.0125)]

Where:

 n = Channel Number (Integer range is between 1 to 120)

TFFLs may utilise a variety of channel bandwidths greater than 12.5 kHz, to a maximum of 200 kHz by way of aggregating multiples of a single 12.5 kHz channel. For the aggregation of channels the centre frequency of the aggregated channel is as follows:

Aggregated Channel Centre Frequency = [(Fhigh – Flow)/2 + Flow]

Where:

 Fhigh = The centre frequency of the highest channel included in the aggregation.

 Flow = The centre frequency of the lowest channel included in the aggregation.

Noting that the entire emission bandwidth must remain within the 804-805.5/849-850.5 MHz segments at all times.

NOTES:

1. This segment is allocated to TFFLs.
2. Notional Antenna: refer to section 6.2.4 of this RALI.
3. Channel Bandwidth: greater than 12.5kHz to a maximum of 200 kHz
4. Minimum Path Length: 20km

In order to manage co-existence with adjacent band services, a two stage assignment priority is specified (see below table). The two stage process consists of the frequency range and the channel assignment direction that assigners should take. In searching for appropriate channels, stage 1 should be exhausted before moving onto stage 2.

|  |  |  |  |
| --- | --- | --- | --- |
| Stage | Lower frequency range (MHz) | Upper frequency range (MHz) | Channel Assignment direction |
| 1 | 804.4 – 805.5 | 849.4 – 850.5 | Ascending order |
| 2 | 804 – 804.4 | 849 – 849.4 | Descending order |

# Appendix D: 803–960 MHz review outcomes implementation plan



# Appendix E: Out of band protection requirements for adjacent band spectrum licensed receivers

Arrangements to protect spectrum licensed receivers from out of band interference from apparatus licensed services in adjacent bands are set out in *[Radiocommunications Advisory Guidelines (Managing Interference to Spectrum Licensed Receivers – 850/900 MHz Bands) 2021](https://www.legislation.gov.au/Series/F2021L01149)*. This appendix replicates parameters from these guidelines for ease of reference.

Coordination is to be made on a ‘first-in-time’ basis, where a new service is coordinated against existing registered services. Additional filtering on the fixed link transmitter may be required to meet these requirements.

The spectrum licensed receiver compatibility requirement, antenna gain and RF filtering characteristics are detailed in Table E1.

The maximum interfering power level transmitted within the occupied channel of the transmitter (measured at the input of the registered spectrum licenced receiver) are:

* detailed in Table E2 for registered recevers operating in the range 814-845 MHz;
* -15 dBm mean power for registered receivers operating in the frequency range 890-915 MHz.

**Table E1: Spectrum licence receiver parameters, where FreqOffset is the band edge frequency separation (in MHz) between the spectrum licensed receiver and the fixed link transmitter**

|  |  |  |
| --- | --- | --- |
| **Parameter** | **Value** | **Comments** |
| Compatibility requirement – maximum unwanted signal level within the occupied bandwidth of the receiver | -108 dBm/5MHz | Measured at the receiver input, (not exceeded for more than 5% of any 1 hour period). Logarithmic scaling should be used to find the appropriate level for alternative bandwidths |
| Receiver antenna gain | Use antenna gain from the RRL | If no antenna gain is available in the RRL, use 13 dBi in all directions (including losses) |
| Receive RF filtering loss | 2 + 60 x log10[1+(2 x FreqOffset/5)1.5] dB | For FreqOffset ≤ 2.5 MHz |
| 2 + 60 x log10[1+(2 x FreqOffset/5)2] dB | For 2.5 < FreqOffset ≤ 9 MHz |
| 70 dB | For FreqOffset > 9 MHz |

|  |
| --- |
|  |
|  |
|  |
|  |  |
|  |  |

**Table E2: . Maximum interfering power levels for the protection of spectrum licensed receivers operating in the range 814-845 MHz.**

|  |  |  |
| --- | --- | --- |
| **Receiver Occupied Bandwidth**  | **Frequency offsets from the upper and lower frequency limit of the spectrum licence receiver** | **Total interference power limit (at receiver input)** |
| < 20 MHz | ≤ 5 MHz | -52 dBm |
| > 5 MHz | -43 dBm |
| ≥ 20 MHz | ≤ 20 MHz | -52 dBm |
| > 20 MHz | -43 dBm |

1. See section 1.2.1 for more information on the types of services included in the ‘single frequency fixed link’ category [↑](#footnote-ref-2)
2. See section 1.2.1 for more information on the types of services included in the ‘two frequency fixed link’ category [↑](#footnote-ref-3)
3. SOB is not included in Table 1 as this link type has not been amalgamated and remains a separate link type. [↑](#footnote-ref-4)
4. RALI MS 40 may impose additional assignment restrictions in the frequency segment 845–849 MHz. [↑](#footnote-ref-5)
5. SOB links also share this allocation, see RALI MS 40 (Frequency Plan for Services in the 800 MHz band (803–890 MHz band)). [↑](#footnote-ref-6)
6. RALI MS 40 may impose additional assignment restrictions in the frequency segment 804–805.5/849–850.5 MHz. [↑](#footnote-ref-7)
7. Point-to-multipoint service in the 800 MHz band are coordinated in accordance with RALI FX 16. [↑](#footnote-ref-9)
8. Register has the same meaning as in the *Radiocommunications Act 1992*. [↑](#footnote-ref-10)
9. [*legislation.gov.au*](http://www.legislation.gov.au)*.*  [↑](#footnote-ref-11)
10. Arrangements for SOB links are detailed in chapter 5 of this RALI. [↑](#footnote-ref-12)
11. A copy of the *800 MHz Band Plan* is available on the ACMA [website](https://www.acma.gov.au/publications/2019-11/guide/rali-ms-40-800-mhz-band-plan)*.* [↑](#footnote-ref-13)
12. For further information on a complete list of changes, refer to *The ACMA’s long-term strategy for the 803–960 MHz band* paper. [↑](#footnote-ref-14)
13. The previous allocation of 845–852 MHz has been reduced by 3 MHz with SFFL within this 3 MHz segment (849–852 MHz) required to cease operation by 30 June 2019. [↑](#footnote-ref-15)
14. SFFLs in the 857–861 MHz segment will be required to cease operation by 30 June 2024. Services in this segment have the opportunity to move to the 845–849 MHz segment prior to this cessation date. [↑](#footnote-ref-16)
15. The business operating procedure ‘Submission of antenna radiation pattern envelope data to the ACMA’ contains more information on supplying RPE data to the ACMA. [↑](#footnote-ref-17)
16. A methodology for calculating FDR is contained in Recommendation ITU-R SM.337 (<https://www.itu.int/rec/R-REC-SM.337-6-200810-I/en>). In the first instance, actual transmitter emission and receiver selectivity characteristics should be used. In the absence of these the emission criteria detailed in Appendix 3 of RALI FX 3 may be used. There are a number of methods to derive a receiver selectivity response from an emission mask, such as that contained in ETSI TR 101 854 (<http://www.etsi.org/deliver/etsi_tr/101800_101899/101854/01.03.01_60/tr_101854v010301p.pdf>). [↑](#footnote-ref-18)
17. Overlapping licensed channels are considered as co-channel [↑](#footnote-ref-19)
18. This reduction in protection level aims to ensure that the calculated unwanted level will not be required to be less than approximately 6 dB below the receiver noise floor. [↑](#footnote-ref-20)
19. Channel edge offset is the frequency separation between the outer edges of the licensed transmit and receive channels [↑](#footnote-ref-21)
20. The entire emission bandwidth of the assignment should be contained within the frequency range limits mentioned in this column. [↑](#footnote-ref-22)
21. Refer to RALI MS40: Frequency Plan for Services in the 800MHz Band (803 to 890MHz) for more details [↑](#footnote-ref-23)
22. [*legislation.gov.au*](http://www.legislation.gov.au)*.*  [↑](#footnote-ref-24)
23. A copy of the *800 MHz Band Plan* is available on the ACMA [website](http://acma.gov.au/Industry/Spectrum/Spectrum-planning/About-spectrum-planning/band-plans-spectrum-planning-acma)*.* [↑](#footnote-ref-26)
24. For further information on a complete list of changes, refer to *The ACMA’s long-term strategy for the 803–960 MHz band* paper. [↑](#footnote-ref-27)
25. TFFL services in the segments 852-853.5/928-929.5 MHz and 854-857/930-933 MHz ceased operation by 30th June 2021. [↑](#footnote-ref-28)
26. The business operating procedure ‘Submission of antenna radiation pattern envelope data to the ACMA’ contains more information on supplying RPE data to the ACMA. [↑](#footnote-ref-29)
27. A methodology for calculating FDR is contained in Recommendation ITU-R SM.337 (<https://www.itu.int/rec/R-REC-SM.337-6-200810-I/en>). In the first instance, actual transmitter emission and receiver selectivity characteristics should be used. In the absence of these the emission criteria detailed in Appendix 3 of RALI FX 3 may be used. There are a number of methods to derive a receiver selectivity response from an emission mask, such as that contained in ETSI TR 101 854 (<http://www.etsi.org/deliver/etsi_tr/101800_101899/101854/01.03.01_60/tr_101854v010301p.pdf>). [↑](#footnote-ref-30)
28. Overlapping licensed channels are considered as co-channel [↑](#footnote-ref-31)
29. SP 6/93 indicated that receivers with bandwidths of 50 or 100 kHz would normally require less protection than 200 kHz services, tending towards protection ratios for narrowband (≤25 kHz) services. [↑](#footnote-ref-32)
30. This reduction in protection level aims to ensure that the calculated unwanted level will not be required to be less than approximately 6 dB below the receiver noise floor. [↑](#footnote-ref-33)
31. Channel edge offset is the frequency separation between the outer edges of the licensed transmit and receive channels [↑](#footnote-ref-35)
32. The entire emission bandwidth of the assignment should be contained within the frequency range limits mentioned in this column. [↑](#footnote-ref-36)
33. The entire emission bandwidth of the assignment should be contained within the frequency range limits mentioned in this column. [↑](#footnote-ref-37)
34. Refer to the Decision Paper for more details [↑](#footnote-ref-38)