

RALI : FX 11

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Radiocommunications Assignment and Licensing Instruction

**STUDIO TO TRANSMITTER LINKS AND
SOUND OUTSIDE BROADCASTING LINKS
IN THE 800 MHz BAND**

**AUSTRALIAN COMMUNICATIONS AND MEDIA AUTHORITY
SPECTRUM PLANNING AND ENGINEERING BRANCH**

RADIOCOMMUNICATIONS ASSIGNMENT AND LICENSING INSTRUCTIONS

DISCLAIMER

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

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

The policies of ACMA and the laws of the Commonwealth may change from time to time, and prospective licensees should ensure that they have informed themselves of the current policies of ACMA and of any relevant legislation (including subordinate instruments). Prospective applicants for licences should not rely on statements made in these instructions about the policies that may be followed by other government authorities or entities, nor about the effect of legislation. These instructions are not a substitute for independent advice (legal or otherwise) tailored to the circumstances of individual applicants.

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

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

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

Amendment History

| Date | Comments |
|-------------|---|
| July 2016 | Updated to remove licensing arrangements in the frequency band 845-849 MHz as a result of the 803-960 MHz band review . |
| August 2018 | Updated to reflect that as of 6 August 2018, Sound Outside Broadcasting links are secondary in the frequency range 846.5-852 MHz. This is the result of the 803-960 MHz band review . |
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Studio to Transmitter Links and Sound Outside Broadcasting links in the 800 MHz Band

1 Introduction

This Radiocommunications Assignment and Licensing Instruction (RALI) replaces FX 11, dated 21 July 2016.

1.1 Purpose

The purpose of this RALI is to provide licensing procedures for:

- Single frequency fixed links, used mainly by broadcast services for studio to transmitter links (STLs), allocated in the segment 849-852 MHz; and
- sound outside broadcast links (SOBs) allocated in the segment 845-852 MHz;

of the *Frequency Plan for services in the 800 MHz Band 803 - 890 MHz*¹ (referred to in the remainder of this RALI as the Band Plan).

Note: assignment instructions for STLs in the frequency range 845-849 MHz will now be covered under the more generic provisions for single frequency fixed links (SFFLs) in RALI FX 22 and have therefore been excised from the scope of this RALI. The provisions for STLs in the frequency range 849-852 MHz have been retained in this RALI but will be removed no later than June 2019 in accordance with the implementation timeframe for the outcomes of the 803-960 MHz review.²

The information in this document reflects the Australian Communications and Media Authority's statement of current policy in relation to licensing and frequency coordination for STLs and SOBs in the 800 MHz band. In making decisions, ACMA officers and accredited persons should take all relevant matters into account and decide each case on its merits. If an issue related to this document appears to fall outside the enunciated policy, please consult the Manager, Spectrum Engineering Section, PO Box 78, Belconnen, ACT, 2616, or by e-mail to freqplan@acma.gov.au.

1.2 Related RALIs

Assignment instructions for fixed links in the 800 MHz band are contained in the RALI entitled 'Frequency assignment requirements for the fixed service in the 800 MHz band' (FX 22). General information about Fixed services is contained in the RALI entitled 'Microwave Fixed Services: Frequency Co-ordination' (FX 3).

1.3 Background

The Band Plan supports a primary allocation to the fixed service (single frequency links), including STLs, within the segment 845-852 MHz.

¹ The *Frequency Plan for services in the 800 MHz Band 803 - 890 MHz* is available on the ACMA [website](#).

² For more information see the [ACMA's long-term strategy for the 803-960 MHz band](#)

SOBs are allocated on a shared primary basis with STLs in the segment 845-846.5 MHz. Secondary allocations are made to SOBs in the segment 846.5-852 MHz³ and to radiolocation services in the segment 850-852 MHz⁴.

A diagram of the 800 MHz Band Plan is included at Attachment A.

2.0 Licence Structure

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

2.1 Fixed Licence Type

The Fixed licence type is defined in the *Radiocommunications (Interpretation) Determination 2015*.

A Fixed licence means a licence issued for one or more stations that:

- (a) are located principally:
 - (i) at fixed points specified in the transmitter licence that relates to the station; or
 - (ii) in an area specified in the licence; and
- (b) are operated principally for communications with stations located:
 - (i) at 1 or more other fixed points specified in the transmitter licence; or
 - (ii) in an area specified in the licence; and
- (c) if permitted by the transmitter licence that relates to the station, may communicate with:
 - (i) an aircraft station, but not on an aeronautical frequency; and
 - (ii) a maritime ship station, but not on a maritime frequency; and
 - (iii) a land mobile station, but not on a land mobile frequency.

There are ten licensing options within the Fixed licence type.⁵ STLs are licensed under a Fixed licence authorising a Point to Point station. SOBs are licensed under a Fixed licence authorising a Sound Outside Broadcast station.

A Point to Point station is defined in the *Radiocommunications (Interpretation) Determination 2015*.

A Point to Point station means a station that:

- (a) is operated under a fixed licence; and
- (b) is operated principally for communication with 1 other fixed station; and
- (c) is operated on frequencies specified in the transmitter licence that relates to the

³ SOB links will be required to cease operation above 851 MHz by 30 June 2019

⁴ This is part of an overall radiolocation allocation in the segment 850-942 MHz of the 800 MHz Band Plan, normally restricted to Defence usage only.

⁵ A list of all licensing options is available on the [ACMA website](#)

station.

A SOB station is defined in the *Radiocommunications (Interpretation) Determination 2015*.

A sound outside broadcast station means a fixed station that:

- (a) is operated under a fixed licence; and
- (b) is established for the purpose of providing a temporary broadcasting coverage of an event.

3.0 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.

3.1 Licence Conditions Determinations

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), contains the conditions applicable fixed licences, including the Point to Point and SOB station licensing options.

3.2 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(s) on the licence according to the circumstances in which the frequency assignment for the licence are made.

4 Studio to Transmitter Links

STL licensing arrangements are based on Spectrum Planning Report SP 29/91: 'Frequency Assignment Rules for STL Services Operating in the Segment 845-852 MHz (Part One)', issued December 1991.⁶

A 'Studio to Transmitter Link' is defined as:

'a point to point station that:

- (a) is operated within a frequency range greater than 820 MHz and less than or equal to 960 MHz; and
- (b) transmits sound broadcasting program material from a broadcasting studio to a broadcasting transmitter.'

4.1 STL Conditions Contained in the Fixed LCD

Part 2 of the Fixed LCD contains technical licence conditions that apply to all Fixed licences authorising Point to Point stations. These conditions facilitate communications between two fixed stations.

4.2 Frequency Assignment for STLs

4.2.1 Channelling Arrangements

Channelling arrangements for STLs provide 7 main channels spaced 400 kHz apart with the centre frequency of the first channel at 849.4 MHz and 7 interleaved channels offset by 200 kHz, i.e., spaced 400 kHz apart beginning at 849.2 MHz. A diagram of the channelling arrangements is provided at Attachment B.

STLs may utilise a variety of channel bandwidths greater than 25 kHz, to a maximum of 400 kHz, depending on the application, the mode of operation and the number of control or program subcarriers used. Typical STL channel bandwidths are 250 kHz for equipment using digital modulation and range from 60 kHz to 400 kHz for analogue equipment.

4.2.2 Frequency Coordination Procedure

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

Discussed below are those aspects of the frequency coordination procedure specific to STLs including spatial cull range, and protection ratios.

4.2.2.1 Spatial Cull

The spatial cull for STLs 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.

⁶ Noting that assignments in the 845 – 849 MHz segment should refer to RALI FX 22 for licensing instructions in this segment.

4.2.2.2 Protection Ratios

The protection ratio values required to protect an STL from unacceptable interference from another STL, SOB and other links are based on criteria developed in other countries and consultations with the broadcast industry. They are listed in Table 1.

Table 1: Protection Ratios

| Relationship | Protection Ratio ⁷ |
|---------------------|-------------------------------|
| Co-channel * | 50 dB |
| Adjacent channel ** | 0 dB |

* Overlapping emissions are considered as co-channel.

** Two systems are deemed to be adjacent if their emissions do not overlap. For example, two 330 kHz systems assigned channels 400 kHz apart would be considered as adjacent. Similarly, two 150 kHz systems assigned channels 200 kHz apart would also be considered as adjacent.

Methods that may be considered for achieving the required W/U signal level ratio include:

- adjustments to antenna polarisation and directivity;
- geographical separation and terrain features; and
- the use of filters.

4.2.4 Assignment Priority

Channels from the main pattern (refer to Attachment B) should be used for larger bandwidth systems. Channels should be assigned to STLs according to the priority from the lowest channel number to the highest channel number in order to optimise the scope for sharing between STLs and SOBs that operate in the 850.5 – 852 MHz segment.

Channels from the ‘interleaved’ pattern may be used where appropriate, for example, for smaller bandwidth systems including mono and ‘dual mono’⁸ systems. Interleaved channels 5-7 should not be assigned to an STL unless all other channels are used.

4.2.5 Dual Frequency Use Not Permitted

The use of two links operating on different frequencies and carrying the same program over the same path is not permitted. System back-up (redundancy) can be achieved by using hot standby configurations. Note that ‘dual mono’ STL use is permitted, provided each transmitter carries different information (for example, one transmits the left channel and the other the right channel of a stereo audio signal).

4.2.6 STL Antennas

The notional antenna for this service is specified as that having technical characteristics similar to a two metre grid parabolic (refer to special condition AV in section 4.2.8 of this RALI). The notional antenna should be used in high spectral density areas and in all other areas where STL usage is high.

STL operators who were required to change frequency as part of the implementation of the Band Plan, were permitted initially to use their existing antenna systems in the new band. It may be necessary for these operators to upgrade their antenna systems to the notional antenna

⁷ These protection ratios were established in Spectrum Planning Report SP 29/91.

⁸ ‘Dual mono’ STL systems comprise two transmitters and two receivers.

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.

Refer to section 4.2.8 of this RALI for special conditions that may be applied.

4.2.7 Band Edge Considerations

Assignment of frequencies within 400 kHz from single channel two frequency services that use 25 kHz channels should be avoided, where practicable. This restriction affects the assignment of both channel 7 main and channel 7 interleaved and is required because of the large differences in bandwidth between STL and single channel two frequency services. The assignment of channel 7 would severely limit the number of channels available for single channel two frequency services in any area, as many single channel two frequency services could otherwise be assigned in the spectrum adjacent to channel 7. The potential for mutual interference is also increased due to the large number of single channel two frequency services that could be considered as being adjacent to an STL service on channel 7.

4.2.8 Special Condition and Advisory Note - Antenna Use

Special condition AV ⁹ may be applied to Fixed licences authorising Point to Point (STL) stations. It may be used on licences for re-issue where the poor performance of the existing antenna is preventing assignments to other STLs.

The wording of special condition AV is as follows:

This station must employ an antenna with performance characteristics equivalent to or better than a two metre diameter grid parabolic. Typical specifications - mid band gain 22 dBi, 3 dB beamwidth 13 degrees, FB ratio 24 dB and cross polar discrimination 28 dB.

Advisory note AW should be applied to all Fixed licences authorising Point to Point (STL) stations in areas where the proposed antenna has performance specifications below that of the notional antenna (refer to section 4.2.6 of this RALI).

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.

5 Sound Outside Broadcasting Links

This section of the RALI covers licensing of SOBs in the segment 845-846.5 MHz, allocated to SOBs and STLs on a co-primary basis. The assignment priority for STLs that are referred to in section 4.2.3 of RALI FX22 has been formulated to allow maximum scope for SOB use in these shared segments.

Note: The segment 846.5-852 MHz is allocated for SOB use on a secondary basis.¹⁰ 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 Engineering Section for

⁹ For further information about special conditions and advisory notes refer to the RALI entitled 'Licence Text in RADCOM (Incorporating Special Conditions and Advisory Notes)' (MS 11).

¹⁰ SOB links will be required to cease operation above 851 MHz by 30 June 2019

consideration.

SOB spectrum arrangements are summarised at Attachment C of this RALI.

SOBs 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.

SOBs 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.

5.1 SOB Conditions Contained in the Fixed LCD

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

5.2 Frequency Assignment for SOBs

5.2.1 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 user’s basis. The only frequency coordination to be conducted by the ACMA will be to determine if SOB spectrum is not available due to the use of the bands by STLs 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 SOBs.

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.

5.2.2 Frequencies

SOBs 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 (preferably one from each SOB segment); and
- the number of frequencies assigned to SOBs in high spectrum demand areas be in accordance with the usage pattern for SOBs, and in line with spectrum availability (paying regard to assignment issues at section 5.2.8 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 STLs and restrictions imposed through operation adjacent to a spectrum licensed band.

The frequencies available for selection in line with section 5.2.8 of this RALI are listed in Table 3.

Table 3: SOB Frequency List (in MHz).

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

* These frequencies are not normally available for wide band emission assignments.

** This frequency is not available for wide band emission assignments.

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 Engineering Section.

5.2.3 Spectrum Access

For coordination with STL and other fixed services, each channel assigned for SOB use in a given area should have a pre-assigned spectrum access record. Only a single record for each channel in a given area is required.

5.2.4 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.

5.2.5 Emission Limits of SOBs

SOBs may employ an emission bandwidth greater than 25 kHz to a maximum of 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.

5.2.6 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 4.2.6 of this RALI). However, it should be noted that 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 SOBs established on a semi-permanent basis).

5.2.7 Service Area

Although Fixed licences authorising SOB stations are non-assigned, the service area is restricted to enable coordination with STLs. 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 SOBs in regions of larger radius than 50 km for example, for State-wide networks, are to be referred to the Manager, Spectrum Engineering Section, for consideration

5.2.8 Band Edge Considerations for SOBs

The SOB segment is directly adjacent to the 800 MHz spectrum licensed band below 845 MHz. In order to avoid interference to these services SOBs should not normally be assigned frequencies within 400 kHz of spectrum licensed services operating within the SOB coordination area.

Out of band protection for STLs operating in bands adjacent to a spectrum licensed band is set

out in the ‘*Radiocommunications Advisory Guidelines (Managing Interference from Spectrum Licensed Transmitters - 800 MHz Band) 2012*’. A copy of this guideline is available from the ACMA website. As detailed in the guideline, SOBs operate on a no protection basis, although some protection may be afforded fortuitously through the protection of STLs.

5.3 Special Conditions

5.3.1 User Defined

Fixed licences authorising SOB stations are a non-assigned licence in 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.

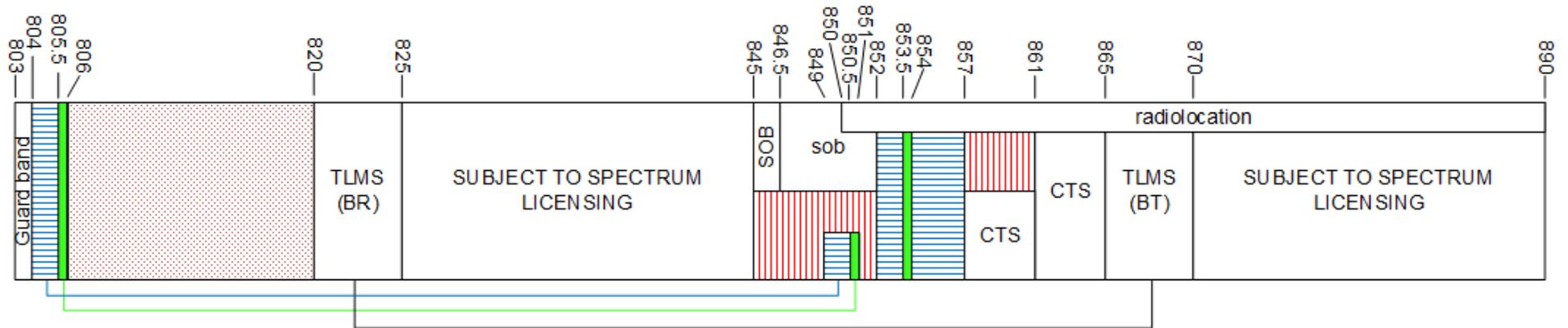
RALI Authorisation

Approved 06/08/2018

Mark Arkell

Manager
Spectrum Engineering Section
Spectrum Planning and Engineering Branch
Communications Infrastructure Division
Australian Communications and Media Authority

Attachment A - 800 MHz Band Plan Diagram



-  NOT ALLOCATED
-  FIXED POINT-TO-POINT (TWO FREQUENCY)
-  FIXED POINT-TO-MULTIPOINT (TWO FREQUENCY)
-  FIXED POINT-TO-POINT (SINGLE FREQUENCY)

Note: This diagram should be read in conjunction with Tables 1 and 2 (including notes) of the Plan.

ABBREVIATIONS

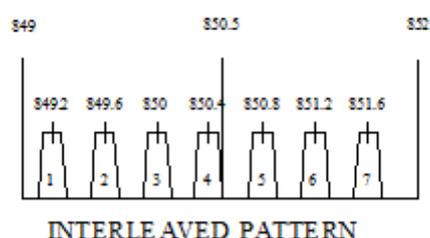
BR = Base Receive
 BT = Base Transmit
 L = Paired segments
 CTS = Cordless Telephone Service
 TLMS = Trunked Land Mobile Service
 SOB = Sound Outside Broadcast Link

LEGEND

Services printed in upper case letters are primary services. See Table 1.

Services printed in lower case letters are secondary services. See Table 2.

Attachment B - Channelling Arrangements for STLs (849-852 MHz)

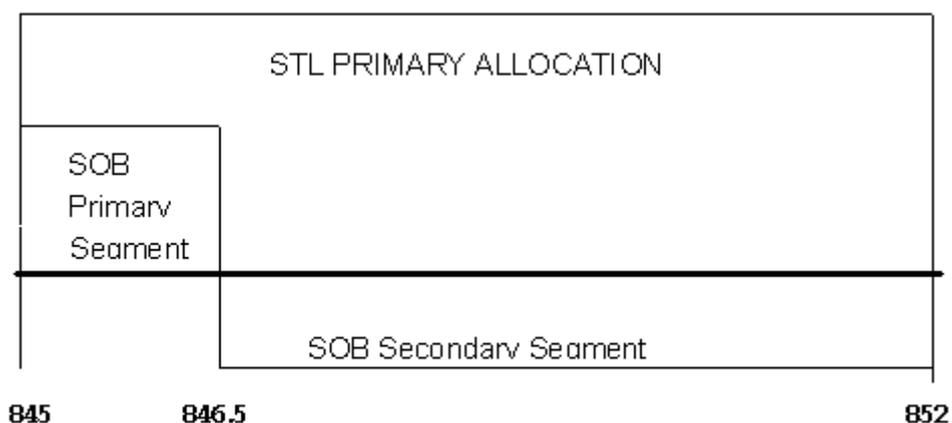


All frequencies are in MHz

NOTES:

1. This band is allocated for use by single frequency fixed point to point services such as Studio to Transmitter Links (STLs). The allocation is shared with Sound Outside Broadcast (SOB) links (refer to section 5 of the RALI and Attachment C).
2. Notional Antenna: two metre grid parabolic
3. Emission Bandwidth: greater than 25 kHz to a maximum of 400 kHz
4. Minimum Path Length: none specified
5. Typical Uses: digital STL of 250 kHz bandwidth
analogue STL of bandwidths ranging from 60 kHz to 400 kHz
6. The use of dual frequencies over a single path for redundancy/diversity purposes is not permitted. (Refer to section 4.2.5 of the RALI)
7. Channel Assignment Priorities and Restrictions:
 - (a) Assignments to STLs should be made in order from lowest channel number to highest channel number.
 - (b) Channels from the 'interleaved' pattern may be used where appropriate, for example, for smaller bandwidth systems including mono and 'dual mono' systems.
 - (c) Avoid channel 7 main and 7 interleave assignments in areas where single channel two frequency systems operate in the adjacent band.

Attachment C - Spectrum Arrangements for SOBs (845-852 MHz)



All frequencies are in MHz

NOTES:

1. SOBs operate on assigned channels on a shared basis by all users in an area. SOBs must not cause interference to other primary services and are not able to be afforded protection from such services.
2. The STL channel plan may be used for SOBs (refer to Attachment B)
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. An SOB 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 (potentially restricting assignments in the range 845-845.4 MHz).