Frequency coordination procedures for the earth station protection zones

Radiocommunications Assignment and Licensing Instruction

**rali: MS 44**

**date of effect: [insert new date when published]**

Amendment history

| Date | Comments |
| --- | --- |
| July 2018 | Initial release |
| 18 December 2018 | Consultation draft, inclusion of addition bands |
| 2 August 2019 | Update finalised |
| 17 December 2021 | Inclusion of 3400–3442.5 MHz and 3475–3542.5 MHz frequency bands to Moree, Roma and Uralla ESPZs in eastern Australia. There were no changes to the frequency ranges covered by Quirindi. |
| [Insert new date when published] | Inclusion of 24650-25250 MHz and 27000-29500 MHz at Mingenew and outlining that coordination of certain receivers in the 28 GHz band is not mandatory as these receivers are not afforded protection from existing or future earth stations. |

Suggestions for improvements to Radiocommunications Assignment and Licensing Instruction MS 44 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](mailto: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 a framework for the management of interference to and from Earth stations communicating with satellites (or space stations) in the fixed-satellite service (FSS) in specific defined areas, known as earth station protection zones (ESPZ).

The information in this document reflects the ACMA’s statement of current policy in relation to the frequency coordination of FSS Earth stations. 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   
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or by email to: [freqplan@acma.gov.au](mailto:freqplan@acma.gov.au).

## Scope

This RALI only considers the coordination with the Earth stations communicating with satellites in the fixed-satellite service. Other RALIs, including *RALI MS 45 Frequency coordination requirements between microwave fixed point-to-point links and FSS earth stations*, should be considered in conjunction with this RALI.

Proposed earth stations are not required to perform the coordination assessments detailed in this RALI. It is further noted that new earth stations deployed within an ESPZ are not required to adhere to the notional earth station characteristics defined in this RALI. However, earth stations licensed after the commencement of this RALI within an ESPZ will only be afforded protection as provided by this RALI.

Matters concerning international coordination of satellite networks are conducted within frameworks specified in the International Telecommunication Union (ITU) Radio Regulations and are not addressed in this RALI. Coordination of intra-Australian satellite networks is also outside the scope of this RALI.

This RALI is intended to evolve over time to include other bands and potentially other locations as required. Viability of the exclusion zones will be constantly reviewed and amended as required to ensure efficient use of the spectrum.

# Protection of Earth receive bands

For coordination of proposed transmitters operating co-channel with an Earth station receiver as defined at Appendix A, the coordination procedure defined in this section should be used.

## Notional Earth station receiver characteristics

Table 1 provides notional Earth station receiver characteristics and Table 2 provides values for notional Earth station receiver antenna gain that may be used for coordination in accordance with this RALI.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Location** | **Feeder loss (dB)** | **Antenna** | | | |
| **Model** | **D/λ ratio** | **Height (m a.g.l)** | **Minimum angle (degrees)** |
| Mingenew | 0 | ITU-R S.465 | >100 | 10 | 51 |
| Quirindi | 0 | ITU-R S.465 | >100 | 10 | 15 |
| Moree | 0 | ITU-R S.465 | >100 | 10 | 15 |
| Roma | 0 | ITU-R S.465 | >100 | 10 | 15 |
| Uralla | 0 | ITU-R S.465 | >100 | 25 | 5[[1]](#footnote-1) |

1. Notional Earth station receiver characteristics

|  |  |
| --- | --- |
| **Frequency Range (GHz)** | **Antenna Gain (dBi)** |
|
| 1-10 | 58 |
| 10-15 | 62 |
| 15-42.5 | 70 |

1. Notional Earth station receiver antenna gain

Given the minimum elevation angle in Table 1, in most cases the antenna discrimination will be such that the antenna gain at the relevant elevation will have no relationship to the notional transmitter antenna gain in Table 2 and will instead be given by the model listed in Table 1.

## Coordination criteria

For a successful coordination of proposed transmitters, the level of co-channel interference to a notional Earth station receiver, modelled with the characteristics detailed above, must not exceed the level listed in Table 3 below at each point listed in Appendix A. There is no requirement for consideration of adjacent channel interference.

An assessment only needs to be performed to those points listed in Appendix A that are within 210 km for frequencies below 12 GHz and 160 km for frequencies above 12 GHz of a proposed transmitter.

For the purposes of coordination in GSO frequency ranges (Table A1 and B1 of Appendix A and B respectively), the Earth station antenna shall be oriented for all azimuth-elevation combinations that point at the GSO arc within the permissible angles of elevation.

When coordinating in NGSO frequency ranges (Table A2 and B2 of Appendix A and B respectively) it is assumed that the Earth station antenna is pointing in all azimuth directions at the minimum elevation angle described in Table 1.

Table 3 provides the protection criteria and propagation model to be used in assessments. These were calculated using Recommendation ITU-R SF.1006[[2]](#footnote-2).

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Propagation model** | **Percentage time (%)** | **Maximum level of interference (dBW/MHz)** | | |
| **1 - 10 GHz** | **10 - 15 GHz** | **15 - 42.5 GHz** |
| ITU-R P.452 | 20 | -158.6 | -154.1 | -150.8 |

1. Earth station protection criteria and recommended propagation model

# Coordination from a FSS Earth station transmitter

This section provides the notional criteria required for coordination between proposed receivers and FSS Earth station transmitters.

Proposed receivers operating in one of the Earth station transmit bands defined at Appendix B must follow the coordination procedure defined in this section. [[3]](#footnote-3)

## Notional Earth station transmitter characteristics

Table 4 provides notional FSS Earth station transmitter characteristics and Table 5 provides values for notional Earth station transmitter antenna gain that can be used for coordination purposes when assessing a proposed receiver in accordance with this RALI.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Location** | **Feeder loss (dB)** | **Antenna** | | | |
| **Model** | **D/λ ratio** | **Height (m a.g.l)** | **Minimum angle (degrees)** |
| Mingenew | 0 | ITU-R S.465 | >100 | 10 | 15[[4]](#footnote-4) |
| Quirindi | 0 | ITU-R S.465 | >100 | 10 | 15 |
| Moree | 0 | ITU-R S.465 | >100 | 10 | 15 |
| Roma | 0 | ITU-R S.465 | >100 | 10 | 15 |

1. Notional FSS Earth station transmitter characteristics

|  |  |
| --- | --- |
| **Frequency Range (GHz)** | **Antenna Gain (dBi)** |
|
| 1-10 | 58 |
| 10-15 | 62 |
| 15-42.5 | 70 |

1. Notional Earth station transmitter antenna gain

Given the minimum elevation angle in Table 4, in most cases the antenna discrimination will be such that the antenna gain at the relevant elevation will have no relationship to the notional transmitter antenna gain in Table 5 and will instead be given by the model listed in Table 4.

## Coordination criteria

For successful coordination of proposed receivers it should be ensured that the level of co-channel interference from a notional Earth station transmitter, modelled with the characteristics detailed in this section for each point listed in Appendix B, meets the level of interference that is acceptable for the proposed receiver requirements.

An assessment only needs to be performed to those points listed in Appendix B that are within 210 km for frequencies below 12 GHz and 160 km for frequencies above 12 GHz of a proposed transmitter.

For the purposes of coordination in GSO frequency ranges, the Earth station antenna shall be oriented for all azimuth-elevation combinations that point at the GSO arc within the permissible angles of elevation.

For NGSO frequency ranges it is assumed that the Earth station antenna is pointing in all azimuth directions at the minimum elevation angle described in Table 4.

Table 6 provides the notional FSS Earth station transmitter coordination criteria.

|  |  |
| --- | --- |
| **Location** | **Power spectral density**  **(dBW/MHz)** |
|
| Mingenew | 30 |
| Quirindi | 30 |
| Moree | 30 |
| Roma | 30 |

1. Notional FSS Earth station transmitter power

# Relationship to RALI MS 45

RALI MS 45 ‘Frequency coordination requirements between microwave fixed point-to-point links and FSS earth stations’ describe procedures for frequency coordination between earth stations operating in the fixed-satellite service (FSS) and microwave fixed point-to-point links operating in accordance with channel arrangements of RALI FX 3. The procedures are for use when considering new fixed point-to-point links or earth stations.

When applying the procedures of RALI MS 45 in the context of new fixed point-to-point links (in the earth station protection zones), both the procedures of RALI MS 45 and this RALI should be assessed. However, at the time of publishing RALI MS 45 covers only FSS earth transmitters and therefore is currently only applicable in the case of a new fixed link receiver.

# 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](mailto:freqplan@acma.gov.au).

# RALI Authorisation

[not-approved] [insert date when approved]

Manager  
Spectrum Planning Section  
Spectrum Planning and Engineering Branch

Communications Infrastructure Division  
Australian Communications and Media Authority

# Appendix A: Earth receive bands

Table A1 GSO Earth receive band[[5]](#footnote-5) details

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **ESPZ name** | **Frequency range (MHz)** | **Point ID** | **Latitude (GDA94)** | **Longitude (GDA94)** |
| Quirindi | 3575 – 4200  6700 – 7075  10700 – 11700  12200 – 13250  17700 – 20200  37500 – 42500 | 1 | -31.278542 | 150.664064 |
| 2 | -31.531797 | 150.392637 |
| 3 | -31.758854 | 150.673901 |
| 4 | -31.334364 | 150.462804 |
| 5 | -31.683343 | 150.483362 |
| 6 | -31.524093 | 150.815250 |
| 7 | -31.472816 | 150.681203 |
| Moree | 3400-3442.5  3475-3542.5  3575 – 4200  6700 – 7075  10700 – 11700  12200 – 13250  17700 – 20200  37500 – 42500 | 1 | -29.202410 | 149.840025 |
| 2 | -29.470438 | 149.530685 |
| 3 | -29.740189 | 149.840030 |
| 4 | -29.436083 | 150.130913 |
| 5 | -29.375475 | 149.730499 |
| 6 | -29.566334 | 149.730211 |
| 7 | -29.566412 | 149.949630 |
| 8 | -29.366173 | 149.949382 |
| Roma | 3400-3442.5  3475-3542.5  3575 – 4200  6700 – 7075  10700 – 11700  12200 – 13250  17700 – 20200  37500 – 42500 | 1 | -26.571626 | 148.633980 |
| 2 | -26.590870 | 148.501616 |
| 3 | -26.708009 | 148.632882 |
| 4 | -26.840857 | 148.784921 |
| 5 | -26.710678 | 148.940348 |
| 6 | -26.588340 | 149.083815 |
| 7 | -26.571818 | 148.935420 |
| 8 | -26.516060 | 148.779018 |
| 9 | -26.589408 | 148.856840 |

Table A2 NGSO Earth receive band details

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **ESPZ name** | **Frequency range (MHz)** | **Point ID** | **Latitude (GDA94)** | **Longitude (GDA94)** |
| Mingenew | 3400 – 4200 | 1 | -29.045905 | 115.350437 |
| 2 | -29.078611 | 115.233333 |
| 3 | -29.078611 | 115.457778 |
| 4 | -28.9 | 115.457778 |
| 5 | -28.9 | 115.233333 |
| Uralla | 3400-3442.5  3475-3542.5  3600 – 4200 | 1 | -30.6315 | 151.5661 |

# Appendix B: Earth Station transmit bands

Table B1 GSO Earth transmit band[[6]](#footnote-6) details

| **ESPZ name** | **Frequency range (MHz)** | **Point ID** | **Latitude (GDA94)** | **Longitude (GDA94)** |
| --- | --- | --- | --- | --- |
| Quirindi | 5091 – 5250  5850 – 7075  13750 – 14714.5  15430 – 15630  17300 – 18400  19300 – 19700  24650 – 25250  27000 – 30000  42500 – 43500  47200 – 50200  50400 – 51400 | 1 | -31.278542 | 150.664064 |
| 2 | -31.531797 | 150.392637 |
| 3 | -31.758854 | 150.673901 |
| 4 | -31.334364 | 150.462804 |
| 5 | -31.683343 | 150.483362 |
| 6 | -31.524093 | 150.815250 |
| 7 | -31.472816 | 150.681203 |
| Moree | 5091 – 5250  5850 – 7075  13750 – 14714.5  15430 – 15630  17300 – 18400  19300 – 19700  24650 – 25250  27000 – 30000  42500 – 43500  47200 – 50200  50400 – 51400 | 1 | -29.202410 | 149.840025 |
| 2 | -29.470438 | 149.530685 |
| 3 | -29.740189 | 149.840030 |
| 4 | -29.436083 | 150.130913 |
| 5 | -29.375475 | 149.730499 |
| 6 | -29.566334 | 149.730211 |
| 7 | -29.566412 | 149.949630 |
| 8 | -29.366173 | 149.949382 |
| Roma | 5091 – 5250  5850 – 7075  13750 – 14714.5  15430 – 15630  17300 – 18400  19300 – 19700  24650 – 25250  27000 – 30000  42500 – 43500  47200 – 50200  50400 – 51400 | 1 | -26.571626 | 148.633980 |
| 2 | -26.590870 | 148.501616 |
| 3 | -26.708009 | 148.632882 |
| 4 | -26.840857 | 148.784921 |
| 5 | -26.710678 | 148.940348 |
| 6 | -26.588340 | 149.083815 |
| 7 | -26.571818 | 148.935420 |
| 8 | -26.516060 | 148.779018 |
| 9 | -26.589408 | 148.856840 |

Table B2 NGSO Earth transmit band details

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **ESPZ name** | **Frequency range (MHz)** | **Point ID** | **Latitude (GDA94)** | **Longitude (GDA94)** |
| Mingenew | 5850 – 6700  24650 – 25250  27000 - 29500 | 1 | -29.045905 | 115.350437 |
| 2 | -29.078611 | 115.233333 |
| 3 | -29.078611 | 115.457778 |
| 4 | -28.9 | 115.457778 |
| 5 | -28.9 | 115.233333 |

# Appendix C: ESPZ area definitions

| **Area name** | **HCIS** |
| --- | --- |
| Moree | MU5G, MU5H, MU5L, MU5C8, MU5C9, MU5D7, MU5D8, MU5D9, MU5K1, MU5K2, MU5K3, MU5K4, MU5K5, MU5K6, MU5K8, MU5K9, MU6A7, MU6E1, MU6E2, MU6E4, MU6E5, MU6E7, MU6E8, MU6I1, MU6I2, MU6I4, MU6I5, MU6I7 |
| Quirindi | MV3G, MV3H, MV3K, MV3L, MV3C8, MV3C9, MV3D7, MV3F3, MV3F5, MV3F6, MV3F8, MV3F9, MV3J2, MV3J3, MV3J5, MV3J6, MV3J9, MV3O1, MV3O2, MV3O3, MV3P1 |
| Roma | MT4H, MT4K, MT4L, MT4F9, MT4G2, MT4G3, MT4G4, MT4G5, MT4G6, MT4G7, MT4G8, MT4G9, MT4J3, MT4J6, MT4O1, MT4O2, MT4O3, MT4O6, MT4P1, MT4P2, MT4P3, MT4P4, MT4P5, MT5E4, MT5E7, MT5I1, MT5I2, MT5I4, MT5I5, MT5I7, MT5M1 |
| Mingenew | BU4B, BU1N, BU1M6, BU1M8, BU1M9, BU1O4, BU1O7, BU1O8, BU4A2, BU4A3, BU4A6, BU4C1, BU4C2, BU4C4 |
| Uralla | NU7K4 |

1. Mingenew and Uralla provide support for Transfer Orbit Satellite Services and other similar services. As such, the minimum angle of elevation should be considered in all azimuth directions. [↑](#footnote-ref-1)
2. Available from <https://www.itu.int/rec/R-REC-SF.1006/en>. [↑](#footnote-ref-2)
3. Coordination is not mandatory for proposed receivers operating in the range 28.1-30 GHz, or in 27.5-28.1 GHz when located outside of defined areas, as these receivers are not afforded protection from existing or future earth stations – see RALI MS46 for more information and for the description of defined areas. [↑](#footnote-ref-3)
4. A minimum angle of 3° is to be used in the bands 24.65-25.25 GHz and 27-29.5 GHz at Mingenew. [↑](#footnote-ref-4)
5. All frequency bands are in line with international allocations as provided by Appendix 7 of the ITU Radio Regulations. [↑](#footnote-ref-5)
6. All frequency bands are in line with international allocations as provided by Appendix 7 of the ITU Radio Regulations. [↑](#footnote-ref-6)