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Frequency coordination procedures for the earth station protection zones

RALI: MS 44

DATE OF EFFECT: 28 JULY 2022

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.
28 July 2022	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.

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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1 Introduction

1.1 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
Belconnen ACT 2616

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

1.2 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.

2 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.

2.1 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	5[1]
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]

Table 1 Notional Earth station receiver characteristics

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

Table 2 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.

[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.

2.2 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].

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

Table 3 Earth station protection criteria and recommended propagation model

[2] Available from https://www.itu.int/rec/R-REC-SF.1006/en.

3 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]

3.1 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]
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

Table 4 Notional FSS Earth station transmitter characteristics

[3] Coordination is recommended but 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.

[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.

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

Table 5 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.

3.2 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

Table 6 Notional FSS Earth station transmitter power

4 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.

5 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.

6 RALI Authorisation

Approved 28 July 2022

Chris Worley

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Spectrum Planning and Engineering Branch

Communications Infrastructure Division
Australian Communications and Media Authority

Appendix A: Earth receive bands

Table A1 GSO Earth receive band 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 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

ESPZ name	Frequency range (MHz)	Point ID	Latitude (GDA94)	Longitude (GDA94)
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