

APPENDIX 11: Antenna Compliance Requirements

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1. Introduction

This appendix details the compliance requirements for antennas used in the point-to-point microwave fixed service frequency bands.

Antenna compliance is determined by reference to the antenna front-to-back (F/B) ratio and antenna cross-polar discrimination (XPD) as stated by the respective product manufacturer. These values are then compared to Table 1 which provides the minimum acceptable antenna performance requirements based on F/B ratios and XPD for each band.

2. Minimum Antenna Performance Requirements

Licensees are required to employ antennas with characteristics that meet or exceed those specified in Table 1. In some instances, in order to achieve coordination in a difficult area, the ACMA may require that antennas with performance exceeding that specified in Table 1 be used in order to facilitate coordination and maximise spectrum utilisation.

The minimum requirements specified in Table 1 differ depending on the location of the fixed service:

- in designated High Spectrum Demand Areas¹ (HSDAs) point-to-point fixed service antennas must satisfy the minimum XPD performance and must satisfy the a minimum F/B ratio given in the Grade B column of Table 1; and,
- outside HSDAs point-to-point microwave fixed service antennas must satisfy the minimum XPD performance and must satisfy the minimum F/B ratio given in the Grade C column of Table 1.

¹ See section 3.3.2 of RALI FX-3

Band GHz	XPD (min) dB	Grade C F/B>x dB	Grade B F/B>x dB	Grade A F/B>x dB
1.5	25	25	30	40
1.8	25	30	35	45
2.1	25	30	40	50
2.2	25	30	40	50
3.8	30	60	60	65
6.0	30	60	60	75
6.7	30	65	65	75
7.5	25	45	55	70
8	30	60	60	75
10	30	45	55	65
11	30	60	60	75
13	25	45	55	70
15	30	45	55	65
18	30	45	55	65
22	30	45	55	65
38	30	45	55	65
50	30	45	55	65

Table 1: Minimum acceptable antenna performance requirements

Note 1: The three classes of antennas defined are differentiated on the basis of their F/B ratio. Essentially, standard (STD) antennas are Grade C, high performance (HP) antennas are Grade B and ultra high performance (UHP) antennas are Grade A. Whilst inclusion of Grade A antennas in this Table is not strictly necessary under these regulatory arrangements, it allows users to differentiate between HP and UHP antenna types and could provide a basis for future regulatory discrimination between antenna types. It might also provide a basis for a future consideration of a revision to the fees schedule to take account of the spectrum efficiency of the antenna.

Note 2: For the purposes of this appendix the front-to-back ratio is defined as the highest peak of the radiation pattern in the region $180^{\circ} \pm 40^{\circ}$ (i.e. azimuth from 140° to 220°) relative to the main beam. Cross-polar discrimination is defined as the difference between the peak of the co-polarised main beam and the maximum cross-polarised signal over an angle twice the half power beamwidth of the co-polarised main beam.

3. Coordination Requirements

The ACMA requires that frequency coordination studies be performed using manufacturer's actual antenna radiation pattern envelope (RPE) data for both proposed and existing assignments².

As a consequence actual RPE data for all licensed services will need to be accessible for the life of these services for coordination purposes. In some cases manufacturer RPE data may not be available for assignments that were licensed prior to the introduction of these antenna regulatory compliance arrangements (i.e. prior to 31 March 2005) or assignments were licensed using the notional antenna. Only in these cases will the use of notional antenna RPEs, provided at Appendix 10, be allowed in frequency coordination studies.

² Note that previously, under the Appendix 10 notional antenna regime, whenever RPE data was not available assigners could have used "a notional antenna radiation pattern envelope".

4. Provision of RPE data

Antenna RPE data for proposed new assignments must be provided to the ACMA as a condition of the proposed assignment being accepted, unless already held by the ACMA. To facilitate the process, the ACMA maintains a database of antenna RPE data files and provides a searchable list on the ACMA website. This will enable licensees and assigners to verify if an RPE data file is already held by the ACMA. Licensees only need to provide the ACMA with an RPE data file if it is not on the ACMA list.

The ACMA will provide the RPE data only when other sources cannot. RPE data is readily available from most manufacturers and in the first instance users will be expected to contact the manufacturers to obtain the RPE data.

Note: the ACMA expects that licensees submitting RPE data would normally submit it as an electronic data file in NSMA format, however, other formats may be accepted provided they provide similar information with regard to antenna pattern breakpoints and can be easily read and understood.

5. Trunk Bands

A geographic definition of trunk routes and prime sites is problematic due to the constant development of new sites and new trunk routes. However, as many trunk routes are located in non-HSDAs allowing the use of standard Grade C antennas would impact on the provision of trunk services. In order to maintain the spectrum efficiency for trunk services the front-to-back criteria in the trunk bands (3.8, 6, 6.7 and 8 GHz) for Grade C have been set to be the same as Grade B. This approach is administratively simple as it avoids a requirement to define trunk routes (and to update that definition as new trunk routes are developed). Also, specifying Grade B as a minimum for the trunk bands ensures that the spectrum efficiency in important trunk bands is not compromised by use of poorer performing antennas in those bands.

6. Prime Sites

A “prime sites” definition is also not necessary. Antennas used at sites within HSDAs are required to be Grade B or better so the spectrum utility is preserved. As mentioned above, the spectrum utility of sites that are used as part of a trunk route outside HSDAs will be subject to the tighter requirements that apply for trunk bands. For non-trunk bands spectrum availability is usually not critical at sites outside the HSDAs and so it was considered reasonable to set a less stringent compliance requirement in those cases.

7. Links Crossing HSDA boundaries

Fixed service point-to-point microwave links that simply traverse a HSDA (i.e. both ends of a link are outside the HSDA but the path partially crosses a HSDA) will not be considered to be within the HSDA. However, if one end of a link is located inside a HSDA and the other is outside, then both ends of the link will need to conform to the requirements for antennas within the HSDA for that band.

8. Antenna Measurement Standards

The ACMA does not intend mandating measurement standards. However, it would be expected that the RPE data provided would be in accordance with internationally recognised standards and methodologies. If it is found that an antenna differs markedly from the published data and is causing a problem then the ACMA may require that the antenna be replaced at the licensee's expense.

9. Exemptions

Given the flexibility provided by the new regime, no exemptions will be allowed with respect to minimum acceptable performance criteria.

The use of parabolic antennas was assumed in deriving the values included in Table 1, other types, such as 'patch' antennas, may be used as long as they conform to the requirement of having a single main axis of radiation and they meet the other relevant criteria specified for each band.