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Radiocommunications Assignment and Licensing Instruction

**COORDINATION
OF APPARATUS LICENSED SERVICES WITHIN
THE MID WEST RADIO QUIET ZONE**

RADIOCOMMUNICATIONS ASSIGNMENT AND LICENSING INSTRUCTIONS

DISCLAIMER

The Australian Communications and Media Authority (ACMA) advises that these instructions reflect the current policies of 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 Department of Communications, Information Technology 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. 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.

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COORDINATION OF APPARATUS-LICENSED SERVICES WITHIN THE MID WEST RADIO QUIET ZONE

1.0 Introduction

1.1 Purpose

The purpose of this Radiocommunications Assignment and Licensing Instruction (RALI) is to provide processes for coordination with the Mid West Radio Quiet Zone (RQZ).

The Mid West RQZ consists of inner restricted zones where new frequency assignments are not usually permitted (with exceptions assessed on a case-by-case basis), and outer coordination zones where new frequency assignments require coordination with the RQZ.

Prospective frequency assignments for transmitters that lie within the outer coordination zones are analysed to determine whether the use of a planned transmitter at a location might produce signal levels above prescribed thresholds at the centre of the RQZ. If the analysis finds that potential signals are above the prescribed threshold then the licensee must take reasonable measures to reduce the signal level reaching the centre of the RQZ to below the threshold. For example, transmitter antennas may be modified, alternative transmitter locations may be used to take advantage of terrain shielding, or transmitter EIRP may be reduced.

In those cases where the potential signal level reaching the centre of the RQZ from transmitters within the outer coordination zones (as determined by the method prescribed in this RALI) cannot be reduced below the threshold the prospective licensee shall enter discussions with the users of facilities within the RQZ to achieve a mutually agreeable solution¹. Where agreement is not possible ACMA will prescribe a solution.

1.2 Background

The radio astronomy service uses extremely sensitive radio receiving systems to detect very weak signals of cosmic origin, at much lower power levels than are generally used in other radiocommunications services. It is highly susceptible to interference from emissions by other radiocommunications services. To minimise such interference, radio astronomy antennas are usually operated in geographically remote locations.

1.3 Radio Quiet Zones

Generally speaking, a radio quiet zone (RQZ) is a geographic area within which signal levels from radiocommunications stations are controlled in some way to minimise the strength of electromagnetic energy within the area.

RQZs exist in other parts of the world. The United States established the National Radio Quiet Zone (NRQZ) in 1958, to minimise possible harmful interference to the National Radio Astronomy Observatory (NRAO) in Green Bank, West Virginia, and the radio receiving

¹ The intention of the negotiations is not to change the regulatory status of the services, but rather to encourage mutually acceptable technical solutions that would prevent avoidable interference to the radio astronomy service without imposing undue impost on non-radio astronomy services. ACMA would not normally become involved in these negotiations.

facilities for the United States Navy in Sugar Grove, West Virginia. Rectangular in shape, the NRQZ has an area of approximately 33 000 square kilometres.

An RQZ also exists around the Arecibo Observatory in Puerto Rico. Licensees in the area must make “reasonable efforts” to protect the Observatory from interference.

1.4 The Mid West Radio Quiet Zone

The Mid West RQZ provides protection for facilities within a radio astronomy site within Boolardy Station in the mid-west region of Western Australia. A site at the centre of the RQZ has been set aside specifically for the purposes of radio astronomy. It is geographically isolated, exceptionally radio-quiet and exhibits good ionospheric and tropospheric conditions for radio astronomy. It is the chosen site for a number of projects run by the CSIRO, as well as a number of other radio astronomy experiments.

The site is also Australia’s nominated site for the core of the Square Kilometre Array (SKA) telescope².

2.0 Scope

A potential assignment falls within the scope of this RALI if -

- the assignment is for an apparatus-licensed, coordinated terrestrial service station or earth station; and
- its frequency and geographical position lies within one of the prescribed zones.

This RALI does *not* apply to:

- assignments to radiocommunications systems that operate in an itinerant fashion, i.e. systems that have an area wide licence (e.g. Australia wide) and that may operate within the coordination zones from time to time,
- existing transmitters authorised for use by apparatus licences,
- transmitters whose use is authorised by spectrum or class licences within the band 100 MHz to 25.25 GHz,
- assignments to licences whose details would be kept confidential under section 152 of the *Radiocommunications Act 1992*,
- assignments to stations in the aeronautical service (mobile or fixed) or associated services supporting the operation of aircraft (e.g. radionavigation), and
- assignments to space licences.

3.0 Zones

The zones consists of inner restricted zones where new frequency assignments are not usually permitted (with exceptions assessed on a case-by-case basis), and outer coordination zones

² See <http://www.skatelescope.org>

where new frequency assignments may require coordination with the RQZ.

3.1 Restricted Zones

The restricted zones are the frequency range 100–230 MHz, within a 150 km radius, and for the frequency range 230 MHz–25.25 GHz, within a 100 km radius, of latitude 26° 42' 15" South, longitude 116° 39' 32" East (GDA94 datum).

3.2 Coordination Zones

The coordination zones consist of annuli with the inner radius being the relevant restricted zone radius and the outer radius being the coordination zone radius. The radii for various frequency bands are provided in Table 1. The centre of the zones is the same as that used for the Restricted Zones.

4.0 Procedures

4.1 Restricted Zones

Within the restricted zones, unless there are exceptional circumstances (see 5.0):

- no new assignments to apparatus-licensed coordinated terrestrial stations and earth stations are to be made;
- existing licensed services may continue to operate; and
- assignment proposals that seek to expand or modify existing apparatus-licensed services are not permitted.

4.2 Coordination Zones

If a proposed assignment lies within a coordination zone then an assessment must occur of the expected signal level reaching the centre of the RQZ.

4.2.1 Assessment

Assessment is based on the following method of determining the signal level from the proposed transmitter arriving at the centre of the RQZ:

$$\text{Tx PSD}_{(\text{dBm/Hz})} - \text{PPL} - 3.9 \geq \text{Threshold Level}$$

Where:

Tx PSD_(dBm/Hz) = Transmitter power spectral density³

PPL = Propagation Path Loss

Relevant threshold level: see Table 2.

³ A relatively uniform emission level is assumed. For less uniform emissions (e.g. analogue television signal) refer to the CSIRO for advice.

Transmitter power spectral density (Tx PSD) in the direction of the centre of the RQZ is determined by:

$$\text{Tx PSD}_{(\text{dBm/Hz})} = \text{Tx}_{(\text{dBm})} - 10\log(\text{BW}_{(\text{Hz})}) + G_{(\text{dBi})}$$

Where:

density

BW = Bandwidth in Hertz

G = Antenna Gain relative to an isotropic radiator towards the centre of the RQZ

Tx = Transmitter Power into the antenna (peak for pulsed transmitters)

Propagation Path Loss is determined as follows (a “K factor” of 4/3 is assumed⁴):

- For cases where the path is unobstructed:

$$\text{PPL} = \text{Free Space Loss} + 10 \text{ dB}$$

- For cases where the path is obstructed, PPL is determined by use of any appropriate method described in section 4 of ITU-R P.526 (versions 4 through 9). Other methods for determining the propagation path loss may also be used pending ACMA agreement.
- A 9 second digital elevation model (such as RadDEM) or better should be used. An effective antenna height of 15 metres shall be assumed for facilities within the RQZ.

Frequency Range (MHz) ⁵	Restricted Zone Radius (km)	Coordination Zone Radius (km)	Threshold (dBm/Hz)
100-230	150	260	-214
230-400	100	180	-222
400-520	100	165	-224
520-820	100	190	-224
820-1000	100	145	-228
1000-2300	100	140	-230
2300-6000	100	120	-232
6000-10000	100	Not required	-232
10000-25250	100	Not required	-236

Table 1: Radio Quiet Zone Parameters (centre latitude 26° 42' 15" South, longitude 116° 39' 32" East (GDA94 datum).

⁴ The ratio of the effective Earth radius to the actual Earth radius.

⁵ Lower limit exclusive, upper limit inclusive.

If the calculated signal level is above the threshold level, then reasonable measures (examples provided below) shall be taken to reduce the expected signal level to below the threshold.

In cases where the potential signal level reaching the centre of the RQZ (as calculated by the method prescribed in this RALI) cannot be reduced below the threshold, the prospective licensee will require agreement by the CSIRO before the frequency assignment is accepted by ACMA.

Agreement on a way ahead should be achieved within 15 working days⁶, or within a timeframe agreed to between the prospective licensee and the CSIRO. Documents confirming and describing any agreement shall accompany the frequency assignment application.

If no agreement can be made then ACMA will prescribe a solution taking into account the requirements of all stakeholders. Documents describing the reasons why agreement could not be reached must be forwarded to the Manager, Spectrum Engineering Section, ACMA⁷.

Contact details for the CSIRO are:

Email: atnf-spectrum@csiro.au

4.2.2 Reasonable Measures

Measures such as power reduction, site relocation, advantageous use of antenna directivity or notches are available to reduce the signal in the direction of the centre of the RQZ.

Operational agreements may also be made with the CSIRO. For example a licensee that only requires occasional use of a system within the RQZ may make an agreement whereby the CSIRO is informed in advance of any requirement to use the system.

Interference mitigation techniques available to the users of radio astronomy facilities may also need to be examined in cases where the signal incident on the centre of the RQZ cannot be otherwise reduced.

It may also be feasible for radiocommunications users to use alternative information transport systems, such as optical fibre.

5.0 Exceptions

Exceptions to the requirements of this RALI for prospective assignments in the restricted or coordination zones require case-by-case consideration by the Manager, Spectrum Engineering Section⁵, or for cases involving the bands managed under the *Broadcasting Services Act 1992*, approval must be obtained from the Manager, Broadcast Spectrum Strategy Section⁸. Sections 100B, 102 and 102A of the *Radiocommunications Act 1992* continue to apply.

A request for exemption from the requirements of this RALI that is accompanied with evidence

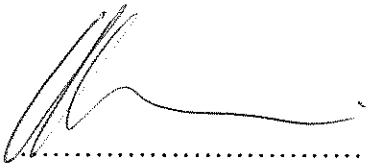
⁶ "Working day" means any day other than a Saturday, Sunday or public holiday (including public service holidays) for the whole of the State or Territory in which the assigner's registered office is located, and any day other than those between 25 December and 1 January.

⁷ Manager, Spectrum Engineering Section, ACMA, PO Box 78 Belconnen ACT 2616.

⁸ Manager, Broadcast Spectrum Strategy Section, ACMA, PO Box 78 Belconnen ACT 2616.

of CSIRO support would normally be approved by ACMA.

6.0 RALI Authorisation



.....12/09/2007

Andrew Kerans
Executive Manager
Spectrum Planning Branch
Australian Communications and Media Authority

Glossary

EIRP	Equivalent Isotropically Radiated Power
NRQZ	National Radio Quiet Zone - United States of America
RALI	Radiocommunications Assignment and Licensing Instruction
RQZ	Radio Quiet Zone
SKA	Square Kilometre Array