

SKA Project – Guidelines for Mining Activities

Guidelines for assessment of proposed mining activities within the Mineral Resource Management Area FNA 7618

Introduction

This document specifies a Mineral Resource Management Area extending 70 km from the centre of the MRO. The applicant, licensee or lessee of a tenement (or part of a tenement) within this area must submit a plan of activities to the Department of Mines and Petroleum (DMP) for approval by the Director-General of DMP. This plan must demonstrate that electromagnetic emissions from the proposed activities will not interfere with the radio-quiet requirements of the MRO. Approval of the Radio Quiet Management Plan will be a necessary requirement for approval of a Programme of Work or mining proposal by DMP under the Mining Act.

This document provides guidelines for the development of Radio Quiet Management Plans by mining applicants and for the evaluation of the Radio Quiet Management Plan by the Australian SKA Coordination Committee's Coordinator for Land Management Issues at DMP. It describes and interprets requirements for radio-astronomy protection as defined by national regulation and international standards. It also specifies essential elements to be included in the Radio Quiet Management Plan to enable adequate assessment against the radio-astronomy requirements. It also provides a consultation procedure with MRO management.

Radio-astronomy requirements

The limits for electromagnetic emissions at the MRO are given in *Radiocommunications Assignment and Licensing Instruction (RALI) MS 32, "Coordination of Apparatus Licensed Services within the Mid West Radio Quiet Zone"* issued by the Australian Communications and Media Authority (ACMA). Table 1 of RALI MS 32 provides threshold (maximum allowable) values for received power spectral density, by frequency range, at the centre of the MRO. It must be noted that some wide-band noise sources may cover more than one of the frequency ranges in Table 1 and should be evaluated accordingly. An abbreviated version of Table 1 is reproduced here.

Table 1

Frequency Range (MHz)	Maximum Allowable Threshold Signal Level (dBm/Hz)
100 - 230	-214
230 - 400	-222
400 - 520	-224
520 - 820	-224
820 - 1000	-228
1000 - 2300	-230
2300 - 6000	-232
6000 - 10000	-232
10000 - 25250	-236

The method of calculation of received power spectral density is also given in RALI MS 32. This requires information about the transmission power, frequency and bandwidth of the radio source and the gain of the antenna. In the case of purposeful radiocommunication transmitters, the power, frequency, bandwidth and antenna characteristics should be well known and can be described in the Radio Quiet Management Plan. However, for non-intentional radiators (electric motors, generators, power tools, etc), the transmitted power must be estimated from actual measurements or standards. The Radio Quiet Management Plan should provide evidence of the emitted characteristics of the proposed equipment to enable the evaluation of potential interference.

Calculation of received power at the centre of the MRO also requires an evaluation of the propagation path loss between the radio source and the MRO, either with a simple free-space equation, or by using a digital terrain map to evaluate diffraction losses. The free space equation and the relevant procedure from ITU-R Recommendation P.526-10 are given in Appendix 1 of this document. The free-space approach will provide a conservative result and should be used if there is no specific information about location or height of the radio source. It is therefore recommended that the simple free-space equation be used first; if the loss predicted is not adequate to reduce the emissions below the threshold of Table 1 in RALI MS 32, a more detailed analysis should be undertaken with the digital terrain map and the cascaded knife-edge diffraction model of Recommendation P.526-10.

Advice on the use of the digital terrain map and diffraction calculations can be provided by CSIRO. Contact details are provided at the end of this document.

For multiple sources of interference within the same development, the effect of each transmitter or piece of equipment should be calculated as if they were each located at the part of the development closest to the centre of the MRO, and the resulting power density levels should be summed within each frequency range listed in RALI MS 32.

The aggregate, over the entire development, of the calculated received power density within each frequency range must be shown to be below the appropriate threshold value(s) in RALI MS 32 Table 1. If the threshold values are exceeded, the applicant will need to consult with DMP and the management team of the MRO to modify the proposed development activities so that the thresholds can be met.

The coordinates of the Centre of the MRO, to be used for calculation purposes are as follows:

S26 42 15 Latitude, E116 39 32 Longitude

Requirements of the Radio Quiet Management Plan

The conditions imposed by the Minister for Resources specify that the applicant, licensee or lessee must ensure that electromagnetic emissions from the proposed activities will not interfere with the radio-quiet requirements of the Murchison Radio-astronomy Observatory. A Radio Quiet Management Plan submitted to DMP must therefore contain enough information about activities and equipment to confirm that the requirements described above are satisfied. Annex 1 of this document gives the information required to undertake the analysis.

Consultation procedure

A consultation procedure between the applicants, DMP and the MRO Management is proposed as follows. The applicant will submit a Radio Quiet Management Plan to the Land Management Issues Coordinator at DMP. This Radio Quiet Management Plan will include information about the equipment and activities proposed for the tenement, as outlined in Annex 1, an analysis of the aggregate power density within each frequency range (including details of the calculation method used), and conclusions about the power density as compared to the threshold values in RALI MS 32 Table 1.

The Land Management Issues Coordinator at DMP will consult with a qualified assessor to evaluate the information, analysis and conclusions in the Radio Quiet Management Plan. The cost of this initial evaluation will be covered by DMP. Within 20 working days, the Land Management Issues Coordinator at DMP will advise the applicants that the Radio Quiet Management Plan has been forwarded with a recommendation for approval or is not able to be approved without further development.

If the Radio Quiet Management Plan demonstrates that electromagnetic emissions from the proposed activities on the tenement meet the requirements of RALI MS 32 Table 1 and is approved by the Director General, DMP will advise the applicants and the MRO Management, and the activities can proceed in accord with the conditions once the licence is granted and the Programme of Work is approved. A copy of the approved Radio Quiet Management Plan will be kept in the MRO archives for future reference.

If the Radio Quiet Management Plan is assessed as not approvable in its current form, DMP will inform the applicant of the areas in which the plan has been assessed as being deficient. It is then open to the applicant to modify and resubmit the plan, if it so chooses.

CSIRO Contact:

For technical enquiries, address an email request to CSIRO:

The ATNF Frequency Manager

atnf-spectrum@csiro.au

Annex 1

Required components of a Radio Quiet Management Plan

The Radio Quiet Management Plan should include the following information for equipment proposed to be used and activities to be undertaken within the Mineral Resource Management Area.

1. Activities involving the use of radiocommunications equipment (any purposeful transmission of radio-frequency signals, such as HF/UHF radios, mobile phones, Wireless LANS).
 - a. Description of proposed activity
 - b. Manufacturer, model number(s) of equipment to be used
 - c. Number of units to be used
 - d. Frequency band and bandwidth
 - e. Power level (maximum, average)
 - f. Height of antenna when in use
 - g. Position (if fixed use), or area to be covered (if mobile use)
 - h. Hours of use per day and typical length of each use (or continuous use)
 - i. Any mitigation techniques used to reduce transmitted power
2. Activities involving the use of other electrical equipment (such as motors, generators, alternators, power tools, welders, etc)
 - a. Description of proposed activity
 - b. Manufacturer, model number(s) of equipment to be used
 - c. Number of units
 - d. Height of equipment when in use
 - e. Position (if fixed use), or area to be covered (if mobile use)
 - f. Outdoor use or indoor (specify type and materials of enclosing structure)
 - g. Hours of use per day and typical length of each use (or continuous use)
 - h. Any other information on electromagnetic emissions from device (preferably measurements from the same or similar equipment)
 - i. Any mitigation techniques used to reduce emissions from devices
3. Calculation of received power spectral density thresholds as defined in RALI MS 32 and Appendix 1 of this document, including method of calculation. Power spectral density should be summed within each frequency range based on the number of devices that have emissions in that frequency range. The propagation loss should then be applied using one of the methods in Appendix 1.
4. Summary of received power density at the MRO site for each frequency range listed in RALI MS 32 and comparison to the threshold values, and conclusions.