

Technical Advisory Guidelines – revised 1 September 2015

Q1. Where can I find information about the requirements and regulations of the Australian Radio Quiet Zone WA?

A. A general overview of the requirements and regulations of the Australian Radio Quiet Zone (RQZ WA) can be found on the websites of the Department of the Premier and Cabinet, Government of Western Australia <https://www.dpc.wa.gov.au/science/RadioQuietMidWest/Pages/default.aspx> and the Australian Square Kilometre Array Office, Commonwealth Government. <http://www.ska.gov.au/Observatory/Pages/RadioQuiet.aspx>.

The specific regulations that these Technical Advisory Guidelines relate to are:

- Radiocommunications (Mid West Radio Quiet Zone) Frequency Band Plan 2011 (<http://www.comlaw.gov.au/Details/F2011L01520>)
- Radiocommunications Assignment and Licensing Instruction (RALI) MS32 (<http://www.acma.gov.au/~media/Spectrum%20Engineering/Information/Word%20Document/RALI%20MS32%20ARQZWA.docx>)
- ACMA Class licences (<http://www.acma.gov.au/theACMA/class-licensing>)

Additional requirements apply to mining activities, including the use of electrical equipment and machinery, within the Radio Telescope Mineral Resource Management Area, but these Technical Advisory Guidelines do not relate to those requirements. Further information on the regulation of mining activity in the Australian RQZ WA is available on the website of the Department of Mines and Petroleum, Government of Western Australia: <http://www.dmp.wa.gov.au/SKA-Project-12511.aspx>.

Q2. What kinds of devices/equipment may be affected by the regulations of the Australian Radio Quiet Zone WA?

A. Any device or equipment that uses radio signals for communication or sensing is potentially affected by the regulations of the RQZ. Such devices include satellite earth stations, television or radio broadcast towers, point-to-point radio links, two-way radios, mobile base stations, radar, amateur radio, and maritime and aeronautical radiocommunications. Consumer radio devices including mobile phones, CB radios, satellite phones, wireless monitoring systems and equipment using WiFi and Bluetooth are also affected by conditions on class licences. (Note that these lists are not exhaustive.)

Q3. What information is required to estimate the interference from proposed transmitters?

A. The following information is required:

- Frequency of transmission
- Bandwidth of transmission
- Power level of transmission
- Height of transmitter above local ground
- Type of antenna used at transmitter
- Geographic location of transmitter
- Antenna pointing direction

(Note that all of this information is normally provided to the ACMA when applying for a radiocommunications licence.)

Q4. What calculations are required to estimate the interference from proposed transmitters?

A. The following calculations are required:

- Terrain profile between transmitter and centre of the RQZ
- Loss due to terrain effects over this path

- Loss due to free space distance between transmitter and the centre of the RQZ
- Received signal level per unit bandwidth
- Power level over the area within 50 km of the RQZ centre
- Comparison to thresholds in RALI MS 32.

Q5. What propagation prediction method does CSIRO use to compute the interference?

A. The interference received at a reference point (such as the centre of the RQZ) can be calculated from the transmitter characteristics, listed above, and the estimated propagation loss between the location of interference and the reference location. To calculate the propagation loss, CSIRO uses the diffraction prediction method described by the International Telecommunication Union (ITU) in Section 4.5 of Recommendation ITU-R P.526-13 (<http://www.itu.int/rec/R-REC-P.526-13-201311-I/en>) which accounts for the effect of the terrain, including the curvature of the Earth. A terrain profile is required to carry out this calculation. CSIRO uses the SRTM (Shuttle Radar Topography Mission) terrain data sampled at 3 arcsecond resolution for this application. The diffraction loss is added to the basic transmission loss due to distance, calculated with the Friis equation.

The estimated interference level at the reference point is then compared to the threshold interference levels tabulated in RALI MS 32. If the estimated level is below the threshold, there is no need for further reduction; if the estimated level is above the threshold, actions to reduce the level must be considered.

For the calculation of power level over the area within 50 km of the RQZ centre, CSIRO calculates the interference level at grid points spaced by 1 km across the zone. The same propagation method described above is used.

Q6. Are there minimum required distances from the MRO centre for typical devices to sufficiently minimise the potential for interference?

A. The interference from a particular transmitting device to a reference location is highly dependent on the actual terrain between the two sites, as well as on the height of the transmitter, the transmitter frequency, antenna directivity and the other factors listed above. Conservative assumptions (e.g. average terrain, typical antenna heights, antenna directed towards the MRO centre etc.) would be required to estimate safe separation distances for a generic device. This could result in minimum separation distances which are much larger than may be required if the analysis was undertaken with the specific parameters (e.g. specific terrain). To avoid making radio frequency interference mitigation requirements unnecessarily onerous for industry, a case by case approach is being used.

Note that the Coordination Zone sizes in RALI MS 32 were developed to represent the distance beyond which it is not likely that transmitters will cause interference. Equipment outside those coordination zones does not need to be analysed under the terms of the RALI.

Note also that devices within 70km of the centre of the RQZ are almost certain to produce unacceptable radio-frequency interference. The 70km radius Inner Zone of the RQZ has more stringent restrictions on activities than the Coordination Zones.

Q7. What kinds of activities can be undertaken by a proponent to reduce interference?

A. Strategies for reducing detrimental interference to the radio astronomy service are described in Section 4.5 of RALI MS 32. They may (depending on individual circumstances) include:

- Reducing the equivalent radiated power (EIRP) of the system that is radiated in the direction of radio astronomy receivers by reducing transmitter power or antenna gain or both;
- Changing the location of the transmitter to take advantage of more terrain shielding;
- Reducing transmitting antenna height; and/or

- In the case of point to point links, ensuring the orientation of the link is not directed towards a radio astronomy receiver location.

Q8. Where can I find more information about coexistence in the context of the RQZ?

A. Information about coexistence can be found on the Government of Western Australia, Department of the Premier and Cabinet website;

<https://www.dpc.wa.gov.au/science/RadioQuietMidWest/Pages/FacilitatingCoexistence.aspx>

and on the website of the Commonwealth Government, Australian SKA Office website;

<http://ska.gov.au/Observatory/Pages/RadioQuiet.aspx>

Q9. What kinds of activities does CSIRO undertake to help facilitate a coexistence solution?

A. CSIRO is committed to continuing its current work with industry to facilitate practical and cost-effective solutions in a timely manner. CSIRO will help maximise the opportunity for shared use of spectrum within acceptable limits and available technical resources.

CSIRO's expertise and resources have enabled CSIRO and industry to achieve mutually satisfactory technical solutions for all activities brought to us for consultation under both the ACMA and DMP radio-quiet measures. CSIRO will continue to provide a similar level of assistance, including:

- meeting and communicating with system designers employed by the industry proponent;
- undertaking analysis and modelling of radio frequency interference;
- helping to specify criteria for interference mitigation techniques;
- suggesting preliminary interference mitigation techniques for system designs to further explore;
- assessing the expected impact of proposed interference mitigation techniques; and/or
- engaging in collaborative technical work, within CSIRO's area of expertise, to explore possible solutions.

Q10. Where can I find out more about CSIRO's role in the Radio Quiet Zone ?

A. Further information is available online at <http://www.atnf.csiro.au/projects/askap/ARQZWA.html>

Q11. Who should I contact at CSIRO to discuss further?

A. Please address queries to atnf-spectrum@csiro.au.

IMPORTANT INFORMATION

This document has been prepared for general information purposes only to assist industry to comply with the requirements of the Australian Radio-quiet Zone WA (Australian RQZ WA). It provides only a general overview and is not a replacement for the documents describing the specific requirements. Industry is advised to consult the key documents described in Question 1 above.

This document may be amended from time to time to take changing circumstances into account, including relevant information received following consultations with industry or the community on the impact of radio-frequency interference in the Australian RQZ WA. Industry should contact CSIRO at an early stage when investigating radio-quiet compliance of their activity.

Understanding the radio-frequency impact from the use of certain equipment or devices is a technically complex area. Industry is advised to seek assistance from professionals with extensive experience in the field of radio-frequency interference when assessing such impact.