1. SCOPE

Free TV Operational Practice OP 69 is a guideline for use of radio frequency spectrum bands for the application of electronic news gathering (ENG) and television outside broadcast (TVOB) rural and remote areas not covered by specific capital city region Operational Practices 63 to 68 and 70 as shown bounded of the red lines in Figure 1.

This Operational Practice has been developed to assist all those involved in ENG and TVOB operations in rural and remote areas with relevant instructions for access to and coordination of the bands assigned by the Australian Communications and Media Authority for ENG and TVOB operations as specified in ACMA's Radiocommunications Advisory Licensing instruction (RALI) FX 21.

2. FREQUENCY BAND ASSIGNED and LICENSED to ENG and TVOB

This Operational Practice applies in the rural and remote areas and their surrounds as defined by defined by the outside of the red zones as shown in Figure 1 (hereafter referred to as the "red zones"). These zones are the capital city regions where Operational Practices 63 to 68 and 70 apply.

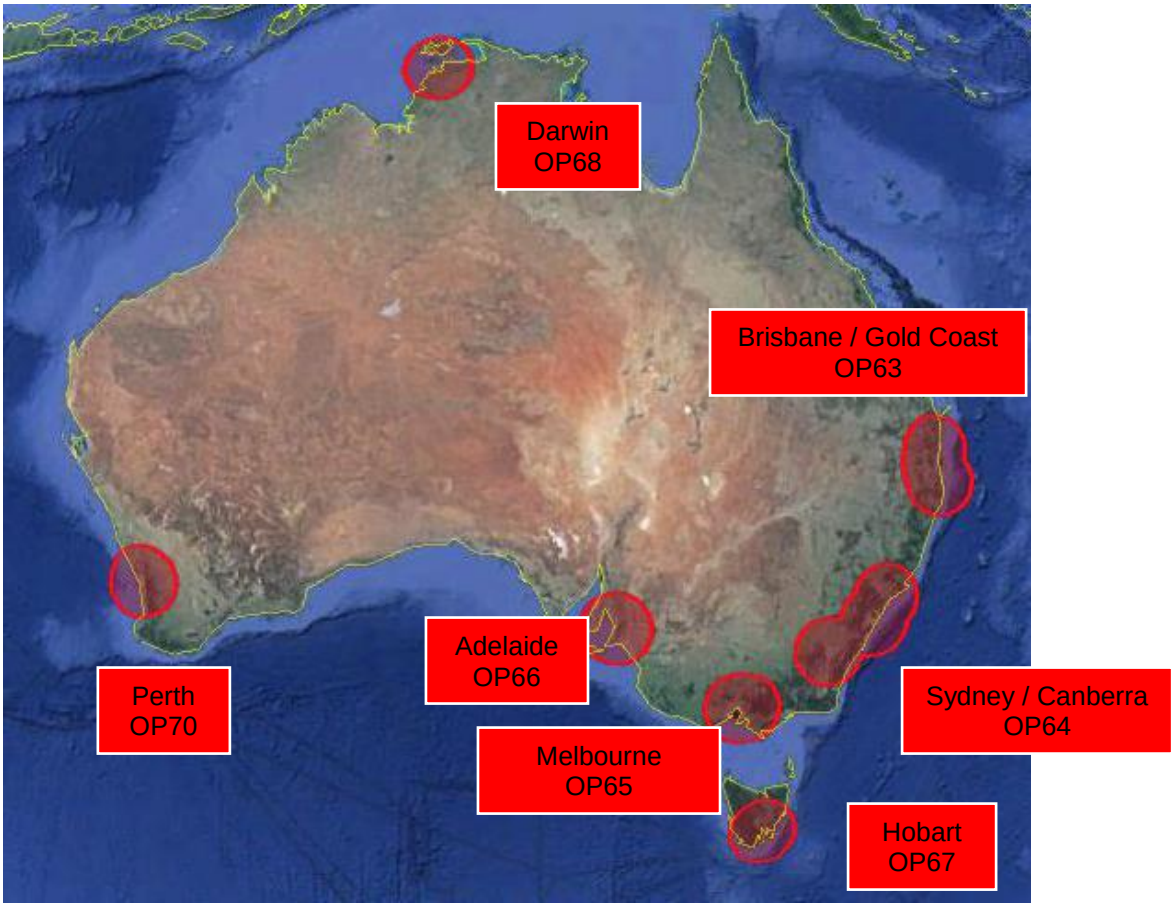

Figure 1 Capital City Area Definitions

Channel arrangements for TOB services in the frequency bands 2010 - 2110 MHz and 2200 - 2300 MHz are to be implemented in a phased approach across Australia. For the rural and remote regions this re-allocation period commenced November 2013 and will conclude on 31 January 2016. These arrangements are illustrated in Figure 2, showing the major change being the allocation of the band 2268 – 2300 MHz to free to air broadcasters for transition until 31 January 2016 and to subscription television thereafter. Each channel in the raster is identified by a three or four character code used by broadcasters for coordination and planning.

In the sub-band 2268 – 2300 MHz, until 31 January 2016, the prime objective is to facilitate the transition of ABC, Seven Network, Nine Network Australia and the Network Ten TOB operations from the 2.5 GHz band. In this band licensees will be required to self coordinate use. However, it should be noted that the ABC have licenced 2268 – 2278 MHz until 1st August 2015.

After 31 January 2016, the sub-band 2268-2300 MHz will be available for use by FOX Sports who will coordinate the subscription television (STV) use of this sub-band.

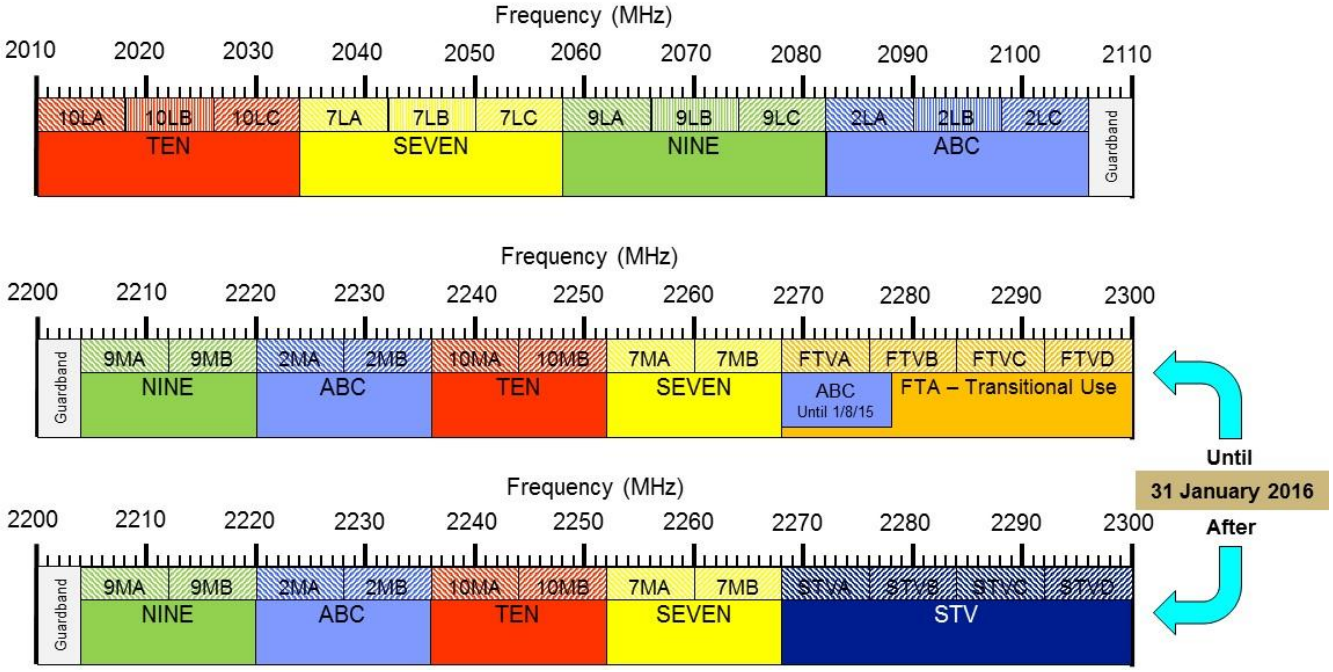

Figure 2: 2 GHz and 2.2 GHz TOB channelling arrangements

3. PERMISSABLE EQUIPMENT SPECIFICATIONS FOR ENG and TVOB OPERATIONS

Across the bands in which TVOB and ENG are permitted to operate, there are a range of power, height and equipment type limits that apply in various band segments. These are shown in Table 1. The figures provide for effective isotropic radiated power (EIRP) radiated within an 8 MHz channel. Wireless cameras are nominally operated at 2 metres above the local ground height.

Table 1 TOB Equipment Permitted in the 2 GHz and 2.2 GHz Bands

Frequency Range (MHz)	Wireless Cameras	TVOB Vans and Temporary Links	Helicopters and other airborne links
	EIRP	EIRP	EIRP
2010 -2110	26 dBm	62.5 dBm	62.5 dBm
2200 -2268	26 dBm	62.5 dBm	**Not permitted**
2268 - 2300	26 dBm	62.5 dBm	**Not permitted**

4. SPECTRUM SHARING AND CO-ORDINATION IN THE 2GHz BAND

4.1 Overview

The band 2010 – 2110 MHz is shared with fixed point-to-point microwave link systems (in two different channel rasters) uplinks to satellite systems and downlinks from satellite systems as shown in Figure 3. TOB and ENG operations are more likely to interfere with fixed link systems and earth station downlinks, whereas earth station uplinks would be considered interferors to TOB / ENG receivers.

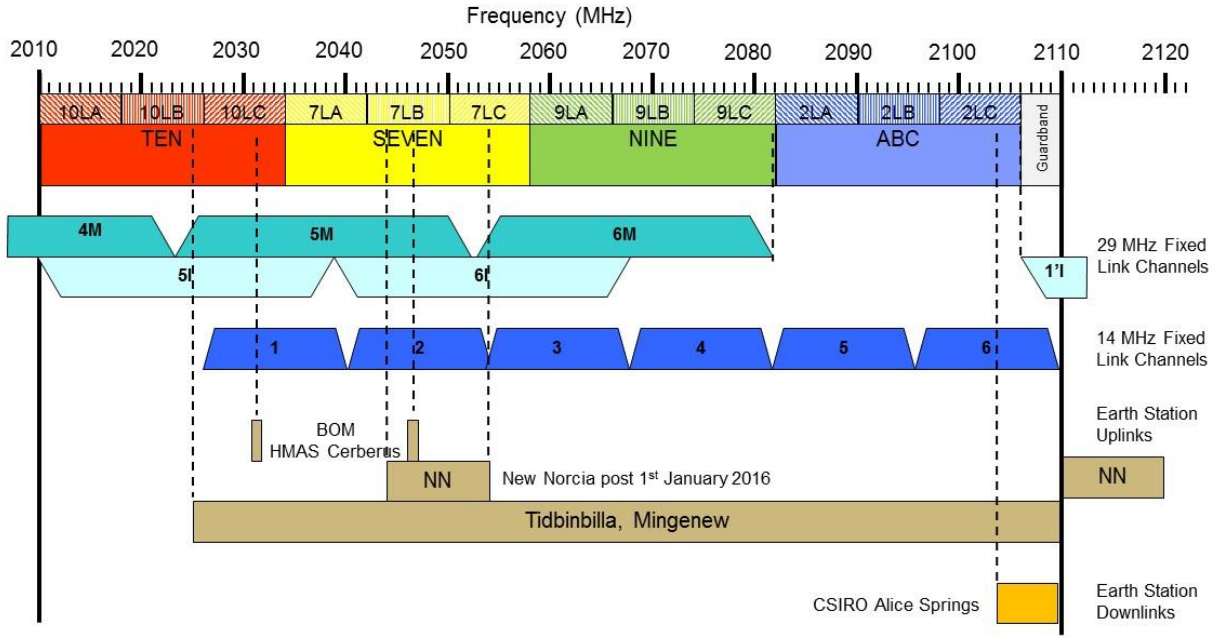

Figure 3 Systems in the 2 GHz Band

For each other service that TOB / ENG shares the band 2010 – 2110 MHz, there are various clearance, embargoed and exclusion zones. These are shown in Figure 4.

Supporting Australia's bid to host a new radioastronomy facility, the Square Kilometre Array (SKA), the ACMA has placed limits on transmitters to develop a radio quiet zone (RQZ) in remote Western Australia, near Boolardy station, centred 26.704167 South, 116.658889 East (GDA94 datum). TOB transmitters must not operate within 150 km of this location as shown by the purple area in Figure 4.

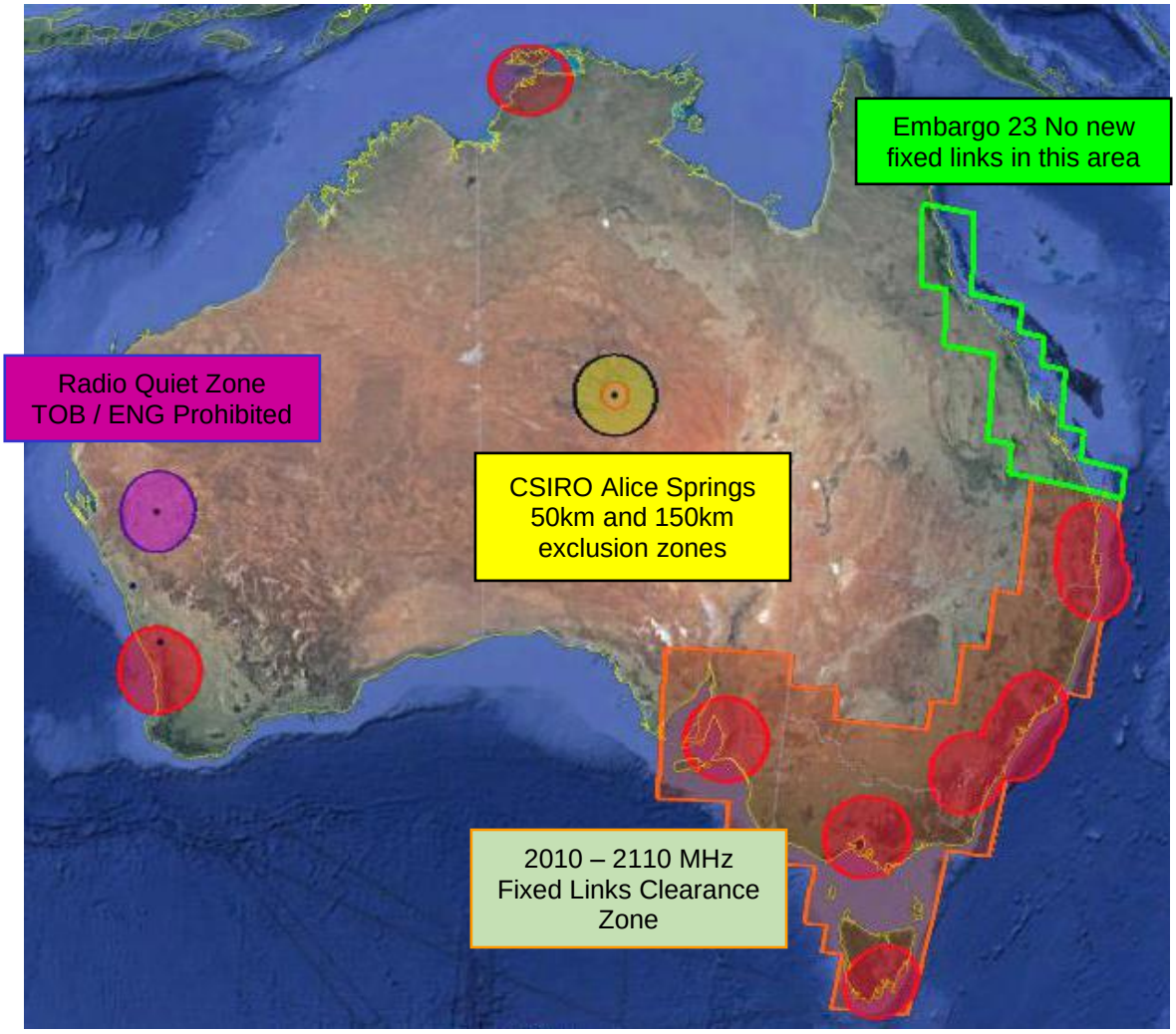

Figure 4 Co-ordination and Clearance Zones in the 2 GHz Band

4.2 Co-ordination with Shared Services

4.2.1 Channel Selection Procedure

Although TOB / ENG shares with many other services in remote areas, it is likely that interference to and from other services will be avoided by careful channel selection in the 2 GHz band. The following procedure should enable a suitable channel to be found. However, when significant events occur which require extensive concentrated deployment of ENG facilities, careful co-ordination will be required.

Simple Channel Selection Procedure

1. Check in Figure 4 for co-ordination zones with other services in the area where the proposed TOB / ENG deployment will occur.
2. If the TOB / ENG transmitter is **in** the orange zone in Figure 4, fixed links have been cleared and there is no need to co-ordinate with other services, so select a channel from within the broadcaster's licenced channels.
3. If additional channels are required and cannot be found in Step 2, arrange with another broadcaster to temporarily share their channel.
4. If deployment is **outside** the orange zone in Figure 4, contact the broadcaster's control centre who will assign a channel after undertaking additional co-ordination procedures with fixed links as described in Section 4.2.2.
5. If the ENG receiver will be near New Norcia or Mingenew Earth stations, check the requirements of Section 4.2.3.
6. If the deployment is within 150 km of the CSIRO Alice Springs earth station, check the requirements of Section 4.2.4 which affects channel 2LC.

4.2.2 Fixed Links

Fixed microwave links occupy both the 2 GHz and 2.2 GHz bands in rural and remote areas. These are allocated according to the ACMA RALI FX-3 which provides two band plans:

- The "2.1 GHz Band Plan" which provides for 12 duplex channels in a main (M) and interleaved (I) channel raster based on a channel spacing of 29 MHz. The main and interleaved channels are offset by 14.5 MHz. Channels in this plan are shown in Figure 3 and Figure 5 as "29 MHz Fixed Link Channels".
- The "2.2 GHz Band Plan" which provides for 6 duplex channels in a channel raster based on a channel spacing of 14 MHz. Channels in this plan are shown in Figure 3 and Figure 5 as "14 MHz Fixed Link Channels".

No frequency coordination is required between TOB transmitters and fixed links receivers within the 2 GHz fixed link clearance areas (the orange zone in in Figure 4), therefore no co-ordination is required when operating within the orange zone which covers most of regional south eastern Australia and there should be no interference to TOB / ENG receivers from fixed links in the orange zone.

In other rural and remote areas, co-ordination needs to be undertaken by examining the installed links within 200 km of the proposed TOB transmitter location and avoiding the channels used by these links. Generally one of the broadcaster's channels will be available in at a location. If additional channels are required, contact another broadcaster and arrange to temporarily share their channels.

4.2.3 Satellite Earth Station Uplinks

TOB / ENG receivers are not protected from interference from satellite earth station uplinks. In rural and remote areas, earth stations uplinking in the 2 GHz band are located at New Norcia (31.049444°S, 116.190000°E) operating between 2044 – 2054 MHz (affects channels 7LA and 7LB) and Mingenew Earth station (29.046989°S, 115.347197°E)[1] operating between 2025 - 2110

[1] All coordinates in this and the following section use the ADG66 geodetic systems

MHz (affects channels 10LB (part) 10LC, 7LA, 7LB, 7LC, 9LA, 9LB, 9LC, 2LA, 2LB and 2LC). It is unlikely that TOB / ENG receivers will be located in close proximity to these uplinks, but if so, operation in these frequencies should be avoided.

4.2.4 Satellite Earth Station Downlinks

The CSIRO Earth station Alice Springs (23.761351°S, 133.881068°E) receives signals in the band 2103.406-2109.406 MHz so no TOB / ENG facilities are allowed to operate on these frequencies within 50 km of the site. Only wireless cameras are allowed to operate between 50 km and 150 km from the site on these frequencies. Channel 2LC is the only impacted TOB /ENG channel.

5. SPECTRUM SHARING AND CO-ORDINATION IN THE 2.2GHz BAND

5.1 Overview

The band 2200 – 2300 MHz is shared with fixed point-to-point microwave link systems (in two different channel rasters), aeronautical mobile telemetry, uplinks and downlinks from satellite systems and radio-astronomy.

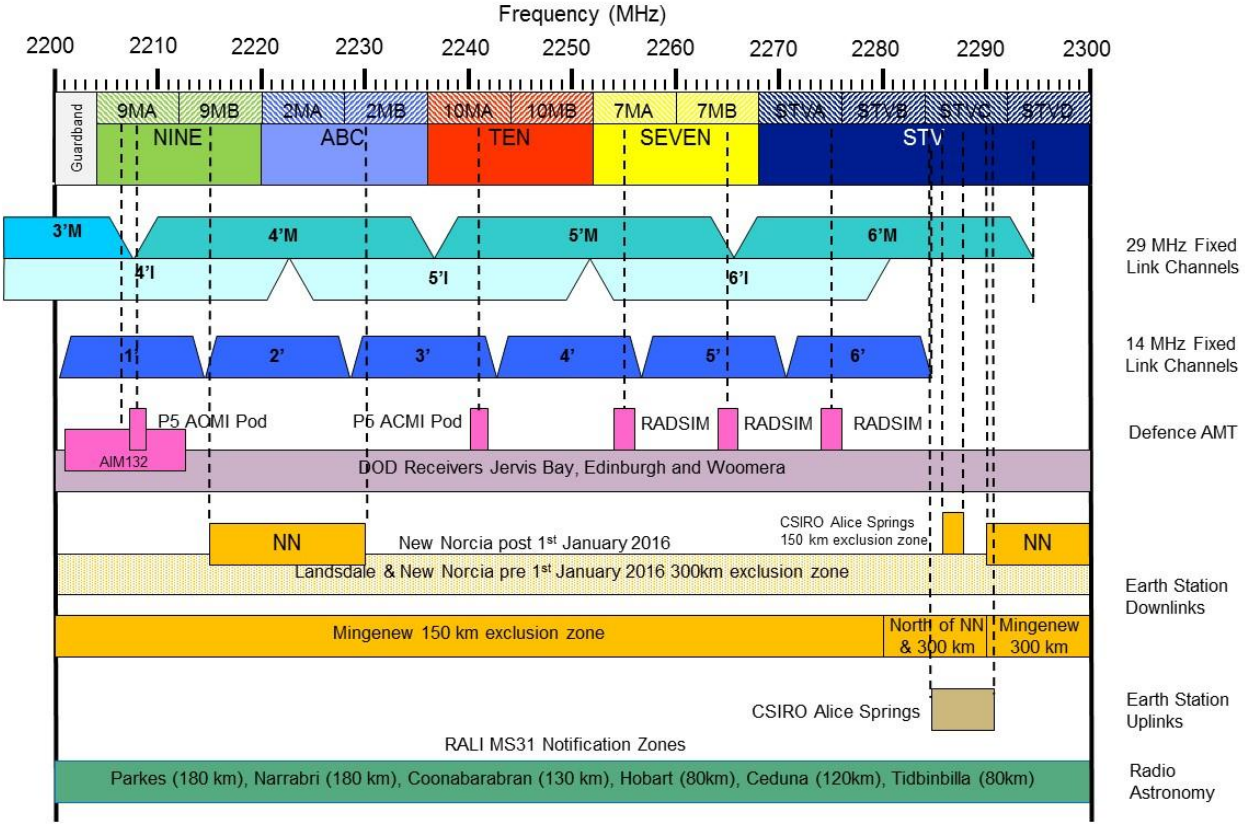

Figure 5 Systems in the 2.2 GHz Band

For each other service that TOB / ENG shares the band 2200 – 2300 MHz, there are various clearance, embargoed and exclusion zones. These are shown in Figure 6. If additional detail is required in Figure 6, a kml file is available from Free TV for use with applications such as Google Earth.

Supporting Australia's bid to host a new radioastronomy facility, the Square Kilometre Array (SKA), the ACMA has placed limits on transmitters to develop a radio quiet zone (RQZ) in remote Western Australia, near Boolardy station, centred 26.704167 South, 116.658889 East (GDA94 datum).

TOB transmitters must not operate within 150 km of this location as shown by the purple area in Figure 6.

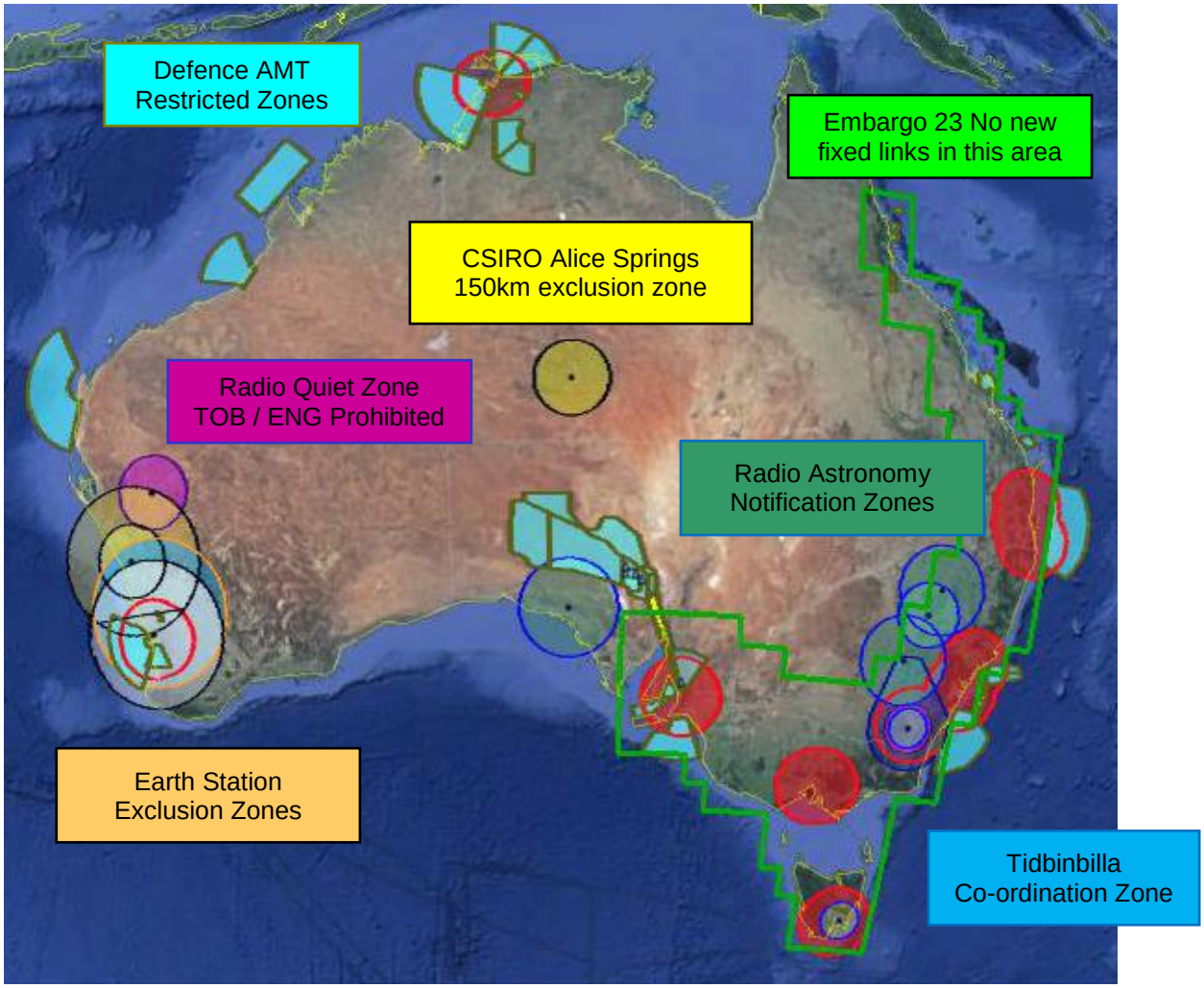

Figure 6 Co-ordination and Clearance Zones in the 2.2 GHz Band

5.2 Co-ordination with Shared Services

5.2.1 Channel Selection Procedure

In remote areas more co-ordination is required with other services in the 2.2 GHz band compared to what is required in the 2 GHz band. Therefore use of the 2.2 GHz band should be considered only if the TOB / ENG deployment cannot be satisfied by using channels in the 2 GHz band.

In many areas it is likely that interference to and from other services will be avoided by careful channel selection. The following procedure should enable a suitable channel to be found. However, when significant events occur which require extensive concentrated deployment of ENG transmitters and receivers, careful co-ordination will be required.

Simple Channel Selection Procedure

1. Check in Figure 6 for co-ordination zones with other services in the area where the proposed TOB / ENG deployment will occur.
2. Undertake the co-ordination procedure for fixed links as shown in Section 5.2.2.
3. If the TOB / ENG receiver deployment is near a Restricted Area as shown in cyan in Figure 6, check for Defence AMT notifications as detailed in Section 5.2.3.
4. If the TOB / ENG receiver will be near the CSIRO Alice Springs earth station, avoid using channel STVC. See Section 5.2.4.
5. If the TOB / ENG transmitter deployment is within the earth station exclusion zones in Section 5.2.5, channels as listed in Table 3 cannot be used.
6. If the TOB / ENG transmitter deployment is within the Tidbinbilla earth station co-ordination zones in Figure 7, follow the requirements of Section 0.
7. If the TOB / ENG transmitter deployment is within the radio observatory notification zones in Table 4, follow the requirements of Section 5.2.7.

5.2.2 Fixed Links

Co-ordination needs to be undertaken by examining the installed links within 200 km of the proposed TOB transmitter location and avoiding the channels used by these links. Generally one of the broadcaster's channels will be available in at a location. If additional channels are required, contact another broadcaster and arrange to temporarily share their channels. Note that within the Embargo 23 area from North Queensland to the Spencer Gulf (shown bounded in green in green Figure 6), as the population of fixed links will not change, this procedure may be undertaken once to determine available TOB / ENG channels in an area and this may be noted for rapid response to future ENG requirements.

5.2.3 Defence Aeronautical Mobile Telemetry (AMT)

Under RALI FX-21 the Department of Defence has the responsibility to :

- provide standing advice to TOB operators for, regular use in Defence training/operating areas, the broad technical and geographic characteristics of ongoing AMT activities, and
- for irregular, short duration and location specific AMT activities, Defence will notify their usage of the band on an as needed basis. This will include, where appropriate, time and area of operation and TOB channels affected.

Defence currently hold licences shown in Table 2.

Table 2 Defence AMT Licences

Defence System	ACMA Licence Number	Carrier Frequency (MHz)	Lower Frequency (MHz)	Upper Frequency (MHz)	Max EIRP spectral density (dBm/MHz)	Affected TOB Licensee
RADSIM	1231884	2255	2254	2256	44	Seven
RADSIM	1231885	2265	2264	2266	44	Seven
RADSIM	1231886	2275	2274	2276	44	ABC (until 1/8/15), other FTA (until 31/1/16), STV after 31/1/16
P5 ACMI Pod	1958149	2208	2207.2	2208.8	32.7	Nine
P5 ACMI Pod	Not on register	2241	2240.2	2241.8	32.7	Ten
AIM132	Not on register	2206.5	2200.65	2212.35		Nine

AMT transmissions shall occur only while within the restricted areas or transit zones.

5.2.4 Satellite Earth Station Uplinks

TOB / ENG receivers are not protected from interference from satellite earth station uplinks. The CSIRO Earth station Alice Springs (23.761351°S, 133.881068°E) transmits signals in the band 2284.5 – 2290.5 MHz so use of TOB / ENG receivers on channel STVC in the Alice Springs area should be avoided.

5.2.5 Satellite Earth Station Downlinks

To protect earth station receivers, the ACMA has stipulated various TOB / ENG exclusion zones around licensed earth station facilities as shown in Table 3.

Table 3 Earth Station Exclusion Zones in the 2.2 GHz Band

Earth Station	Location (Latitude, Longitude) [2]	Frequency Range (MHz)	Exclusion Zone Distance (km)	Notes	Affected TOB Licensee / Channel
Tidbinbilla Earth station (CDSCC)	-35.402497°, 148.981394°	2200 - 2300	Varies. Refer TOB licensees for more details		All
Landsdale Earth station	-31.809444°, 115.886111°	2200 - 2300	300	Until 1st January 2016, no co-ord required after this date	All
New Norcia Earth station	-31.049444°, 116.190000°	2200 - 2300	300	Until 1st January 2016	All
		2215 – 2230 2290 - 2300	300	After 1st January 2016	9MB, 2MA, 2MB, STVC, STVD
Mingenew Earth station	-29.046989°, 115.347197°	2200 - 2280	150		All except STVB - D
		2280 - 2290	North of New Norcia and within 300km		STVB, STVC
		2290 - 2300	300		STVC, STVD
CSIRO Earth station Alice Springs	-23.761351°, 133.881068°	2286.5 – 2288.5	150		STVC

5.2.6 CDSCC Tidbinbilla Earth Station

Satellite earth station downlinks are required to be protected at the CDSCC at Tidbinbilla. As these are links from satellites in deep space, they are receiving extremely low signal levels (often requiring post-reception computer processed correlation to extract signals from noise) so RALI FX-21 imposes a large coordination zone for this band.

The coordination area for TOB wireless cameras is based on the power and height restrictions of 23dBm/8MHz and 2m respectively and is shown in Figure 7 as the purple circle. The coordination area for TOB news vans is based on the power and height restrictions of 56 dBm/8MHz and 10m respectively and is shown in Figure 7 as the blue area. TOB operations above these power / height levels need to be co-ordinated with the Tidbinbilla earth station.

[2] All coordinates use the ADG66 geodetic systems

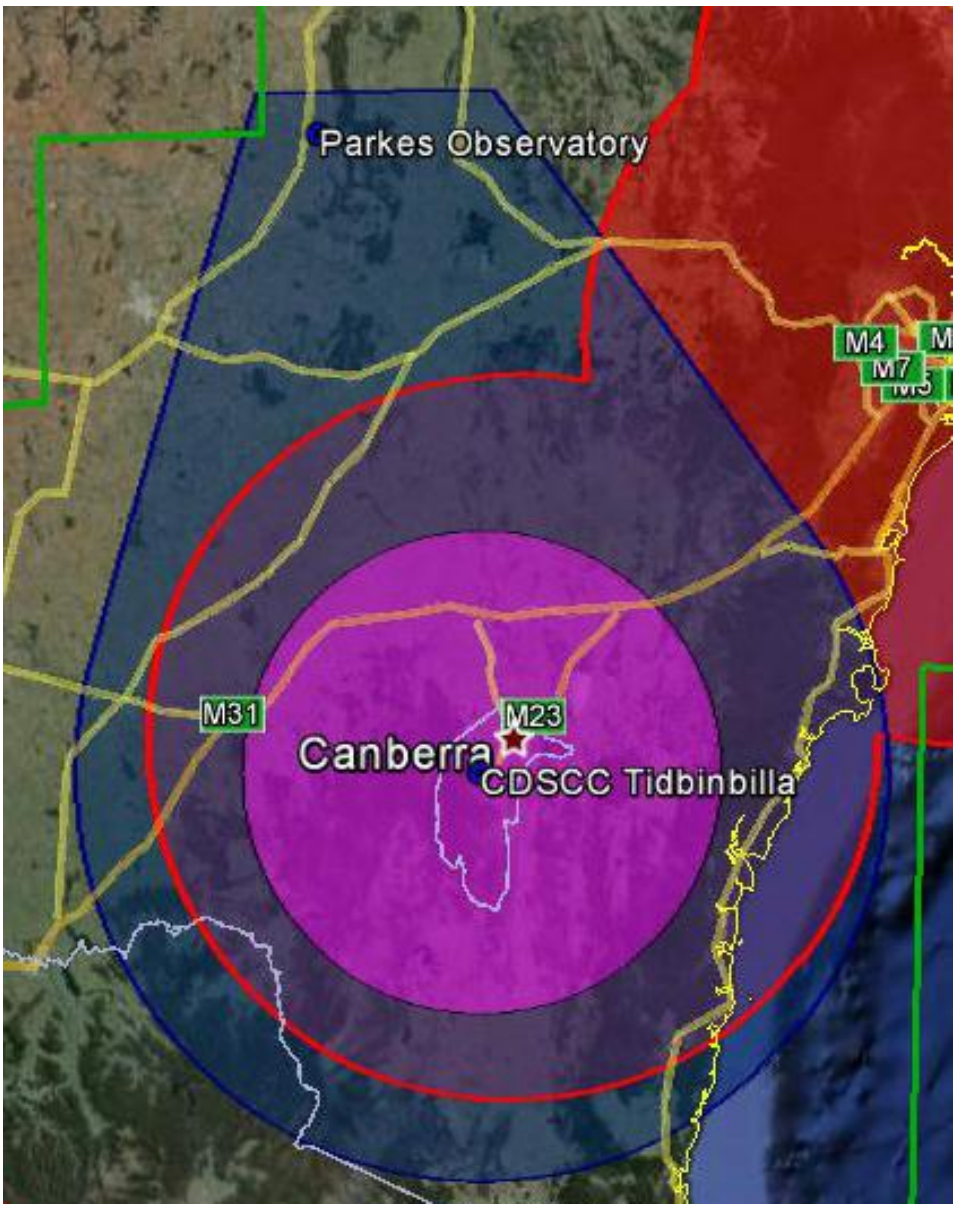

Figure 7 Tidbinbilla Co-ordination Zones in the 2.2 GHz Band

5.2.7 Radio Astronomy

RALI MS31 has established "Radio Sensitive Zones" around key Australian radio astronomy facilities and provides details of “notification zones” for areas where operation of other links might impede the operation of key radio astronomy facilities. RALI FX21 acknowledges that RALI MS31 does not apply to radiocommunications systems that operate in an itinerant fashion (such as TOB transmitters operating under area wide licenses), but encourages TOB licensees to notify when operating near an Observatory.

Table 4 Radio Astronomy Notification Zones in the 2.2 GHz Band

Observatory	Location (Latitude, Longitude) [3]	Notification Zone (km radius)
Parkes Observatory	32° 59' 59.9" S 148° 15' 44.4" E	180
Paul Wild Observatory Narrabri	30° 18' 52.0" S 149° 32' 56.3" E	180
Mopra Observatory Coonabarabran	31° 16' 4.5" S 149° 5' 58.7" E	130
Mount Pleasant Observatory Hobart	42° 48' 12.9" S 147° 26' 25.9" E	80
Ceduna Observatory	31° 52' 08.8" S 133° 48' 35.4" E	120
Canberra Deep Space Communication	35° 23' 54.0" S 148° 58' 40.0" E	80

6. REFERENCES FOR SPECTRUM USAGE FOR ENG AND TVOB OPERATIONS

RALI FX-21 Television Outside Broadcasting Services in the Bands 1980-2110 MHz and 2170-2300 MHz.

Go to www.acma.gov.au and search for RALI FX 21

RALI FX-3 Microwave fixed Services Frequency Coordination

Go to www.acma.gov.au and search for RALI FX3

EMBARGO 23. An embargo on new assignments to support television outside broadcast and future replanning activities.

Go to www.acma.gov.au and search for Embargo 23

[3] All coordinates use the ADG66 geodetic systems