



Telco
Authority

Assignment Guidelines and Instructions for the Public Safety 4.9 GHz Allocation (4940-4990 MHz)

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Document Location

These guidelines and instructions have been developed for assigning frequencies from the Class Licensed 4.9 GHz government public safety allocation of spectrum (4940-4990 MHz).

The master copy of the document is held with the Telco Authority Spectrum Management Office (SMO) currently at the following location:

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Document History

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18/08/15	0.2	Robert Crawford	Improved information around radioastronomy site interference after ACMA and CSIRO input
26/08/15	1.0	Robert Crawford	Final document

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1 Purpose

The Telco Authority has developed these Guidelines and Instructions to support assignment arrangements for the Australian Communications and Media Authority (ACMA) Class Licensed public safety and emergency response spectrum in the 4.9 GHz Band – specifically 4940-4990 MHz.

2 Context

- 2.1** The frequency range 4940-4990 MHz is ratified by the International Telecommunication Union (ITU) for use by government agencies responsible for providing defence, national security, law enforcement and emergency services that support public safety in the Asia-Pacific and the Americas (ITU Regions 2 and 3).
- 2.2** After a period of consultation, the ACMA created the *Radiocommunications (Public Safety and Emergency Response) Class Licence 2013*¹.
- 2.3** The Class Licence authorises the operation of a radiocommunications device for the purpose of:
- Performing a public safety or emergency response function
 - Supporting the performance of a public safety or emergency response function
 - Facilitating the performance of a public safety or emergency response function by a public safety body.
- 2.4** In the Class Licence, **public safety or emergency response function** means a function relating to:
- The compliance or enforcement of the laws of the Commonwealth, a State or Territory
 - The provision of an ambulance, fire-fighting, search or rescue service
 - The protection of life, property or infrastructure
 - Securing the health or safety of the public
 - The provision of assistance and relief to any person affected by a natural disaster, extreme weather conditions or other emergency.
- 2.5** In NSW, the Telco Authority has the mandated responsibility for managing and coordinating assignments from this Class Licensed 4.9 GHz band allocation.

3 Approved Uses of the Public Safety Allocation

The band may be used for any terrestrial based radio transmission including data, voice, and video. Point-to-point and multipoint operations are permitted. Airborne applications are permitted but only in the channels designated for this purpose (see Section 7) and within the requirements established for protection of radio astronomy sites (see Section 6.6).

¹ Available at <http://14/www.co5mlaw.gov.au/Details/C2013G00786>

4 Band and Channelling Arrangements

4.1 The channelling plan designated by the ACMA for the band consists of 22 channels – 15 x 1 MHz and 7 x 5 MHz providing scalability for assigning devices. The band and channel plan as called out in Schedule 1 of the Class Licence is detailed below in Table 1 and Figure 1.

Channel Number	Bandwidth (MHz)	Centre Frequency (MHz)	Lower Frequency (MHz)	Higher Frequency (MHz)
01	1	4940.5000	4940	4941
02	1	4941.5000	4941	4942
03	1	4942.5000	4942	4943
04	1	4943.5000	4943	4944
05	1	4944.5000	4944	4945
06	1	4945.5000	4945	4946
07	1	4946.5000	4946	4947
08	1	4947.5000	4947	4948
09	1	4948.5000	4948	4949
10	1	4949.5000	4949	4950
11	5	4952.5000	4950	4955
12	5	4957.5000	4955	4960
13	5	4962.5000	4960	4965
14	5	4967.5000	4965	4970
15	5	4972.5000	4970	4975
16	5	4977.5000	4975	4980
17	5	4982.5000	4980	4985
18	1	4985.5000	4985	4986
19	1	4986.5000	4986	4987
20	1	4987.5000	4987	4988
21	1	4988.5000	4988	4989
22	1	4989.5000	4989	4990

Table 1: Class Licence Schedule 1 Band and Channel Details

Band Plan for the 4.9 GHz Public Safety and Emergency Response Class Licensed spectrum

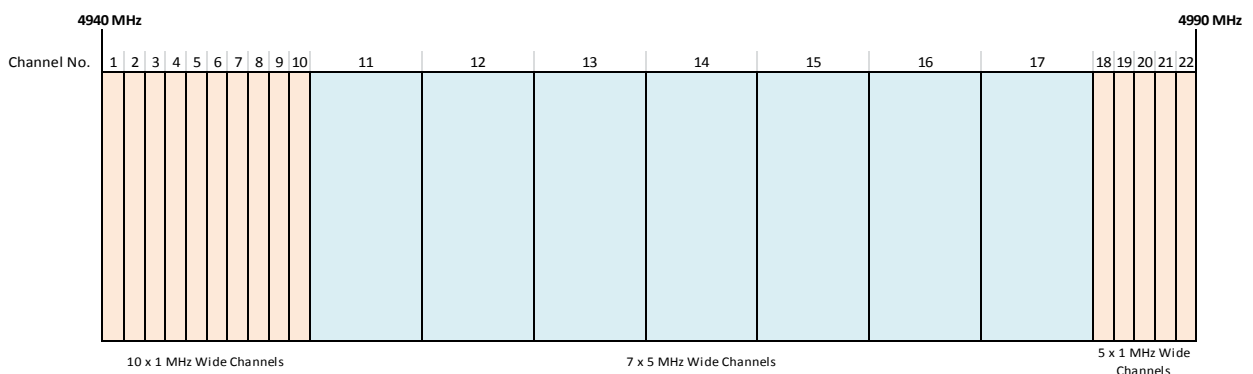


Figure 1: Band and Channel Details

4.2 A person must only operate a radiocommunications device under this Class Licence on a channel as shown in Table 1 and Figure 1 or two or more contiguous channels, including those shown in Section 4 Aggregating Channels that create 5, 10, 15 and 20 MHz channel

bandwidths.

- 4.3** Channels 11 to 22 are called out in Section 6.6 as impacting on the radio astronomy sites located in NSW. These sites have a 250 kilometre coordination zone specified for high power airborne mobile services and a 70 – 160 kilometre coordination zone for high power fixed services (distance dependant on the nominated radio astronomy site with details showing in Table 9).

5 Aggregating Channels

- 5.1** The following channels are permitted for aggregation to create channel bandwidths of 5, 10, 15 or 20 MHz and in accordance with section 5.1.2.
- 5.1.1** Channel numbers 1 through to 10 and 18 through to 22 are 1 MHz bandwidth channels and channel numbers 11 through to 17 are 5 MHz bandwidth channels.
- 5.1.2** The following tables shown in sections 5.2, 5.3, 5.4 and 5.5 list centre frequencies to be licensed for aggregated channels only. A coordinated and issued assignment may contain any combination of bandwidths from aggregated channels provided that the bandwidths do not overlap. The bandwidth edges (lower and upper frequencies) and relevant Figures are provided to aid in planning.
- 5.1.3** Channel aggregation may be utilised to increase bandwidth with an increase in transmitter power and EIRP that does not exceed the maximum power spectral density as specified in subsection 6.2 and section 6.3 respectively.

5.2 Aggregated 5 MHz Channels

- 5.2.1** Table 2 and Figure 2 below show 5 MHz Bandwidth aggregation channel details.

Channel Numbers	Bandwidth (MHz)	Centre Frequency (MHz)	Lower Frequency (MHz)	Higher Frequency (MHz)
01-05	5	4942.5000	4940	4945
06-10	5	4947.5000	4945	4950
11	5	4952.5000	4950	4955
12	5	4957.5000	4955	4960
13	5	4962.5000	4960	4965
14	5	4967.5000	4965	4970
15	5	4972.5000	4970	4975
16	5	4977.5000	4975	4980
17	5	4982.5000	4980	4985
18-22	5	4987.5000	4985	4990

Table 2: 5 MHz Channel Aggregation

Aggregated 5 MHz Band Plan for the 4.9 GHz Public Safety and Emergency Response Class Licensed spectrum

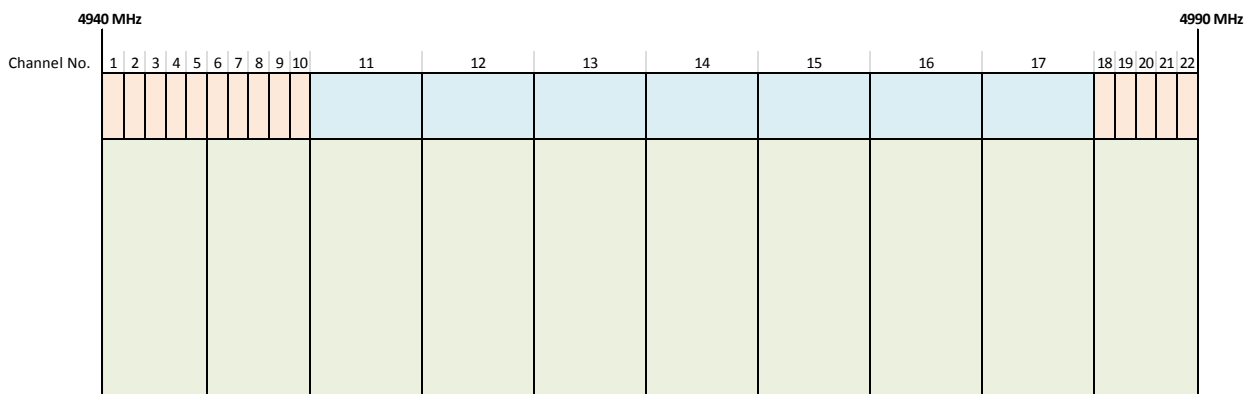


Figure 2: 5 MHz Aggregated Channel Details

5.3 Aggregated 10 MHz Channels

5.3.1 Table 3 and Figure 3 below show 10 MHz Bandwidth aggregation channel details.

Channel Numbers	Bandwidth (MHz)	Centre Frequency (MHz)	Lower Frequency (MHz)	Higher Frequency (MHz)
01-10	10	4945.0000	4940	4950
06-11	10	4950.0000	4945	4955
11-12	10	4955.0000	4950	4960
12-13	10	4960.0000	4955	4965
13-14	10	4965.0000	4960	4970
14-15	10	4970.0000	4965	4975
15-16	10	4975.0000	4970	4980
16-17	10	4980.0000	4975	4985
17-22	10	4985.0000	4980	4990

Table 3: 10 MHz Channel Aggregation

Aggregated 10 MHz Band Plan for the 4.9 GHz Public Safety and Emergency Response Class Licensed spectrum

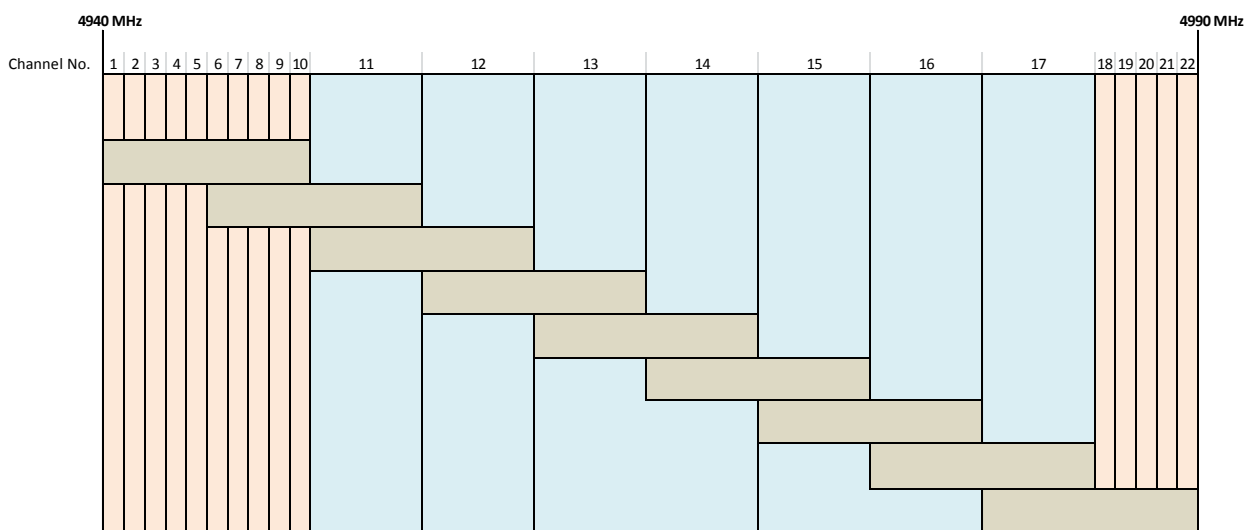


Figure 3: 10 MHz Aggregated Channel Details

5.4 Aggregated 15 MHz Channels

5.4.1 Table 4 and Figure 4 below show 15 MHz Bandwidth aggregation channel details.

Channel Numbers	Bandwidth (MHz)	Centre Frequency (MHz)	Lower Frequency (MHz)	Higher Frequency (MHz)
01-11	15	4947.5000	4940	4955
06-12	15	4952.5000	4945	4960
11-13	15	4947.5000	4950	4965
12-14	15	4962.5000	4955	4970
13-15	15	4967.5000	4960	4975
14-16	15	4972.5000	4965	4980
15-17	15	4977.5000	4970	4985
16-22	15	4982.5000	4975	4990

Table 4: 15 MHz Channel Aggregation

Aggregated 15 MHz Band Plan for the 4.9 GHz Public Safety and Emergency Response Class Licensed spectrum

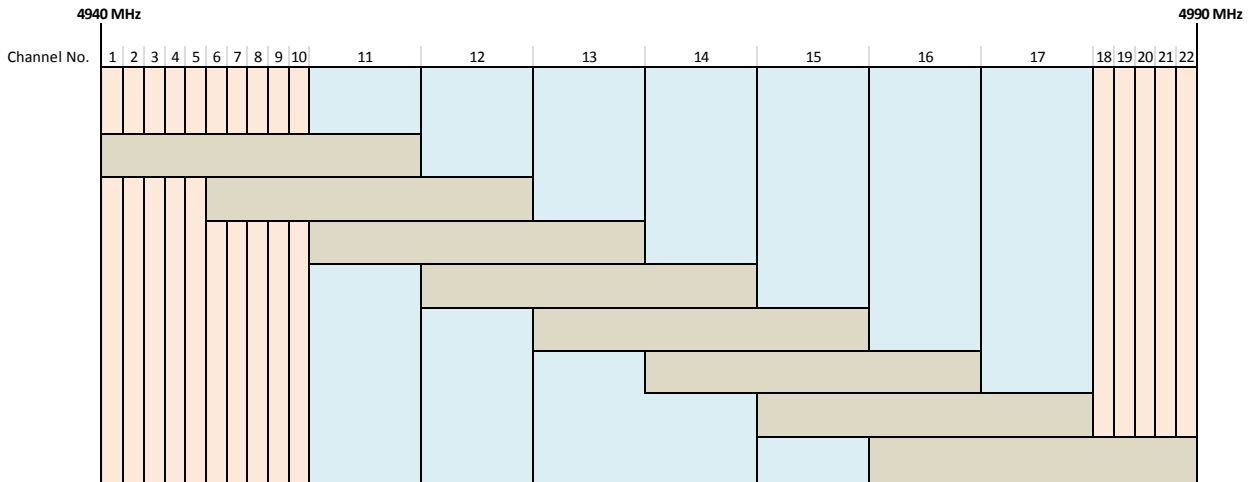


Figure 4: 15 MHz Aggregated Channel Details

5.5 Aggregated 20 MHz Channels

5.5.1 Table 5 and Figure 5 below show 20 MHz Bandwidth aggregation channel details.

Channel Numbers	Bandwidth (MHz)	Centre Frequency (MHz)	Lower Frequency (MHz)	Higher Frequency (MHz)
01-12	20	4950.0000	4940	4960
06-13	20	4955.0000	4945	4965
11-14	20	4960.0000	4950	4970
12-15	20	4965.0000	4955	4965
13-16	20	4970.0000	4960	4980
14-17	20	4975.0000	4965	4985
15-22	20	4980.0000	4970	4990

Table 5: 20 MHz Channel Aggregation

Aggregated 20 MHz Band Plan for the 4.9 GHz Public Safety and Emergency Response Class Licensed spectrum

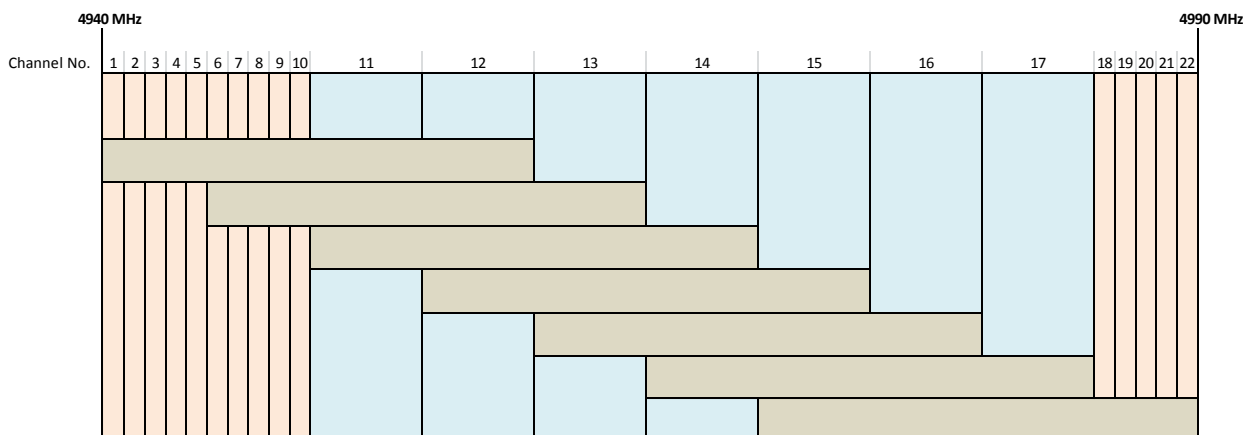


Figure 5: 20 MHz Aggregated Channel Details

6 Class Licence Conditions

The ACMA has specified a number of conditions that are attached to this Class Licence. Sections 6.1 through to 6.6 detail specified conditions that impact on the coordination of channels for assigning.

6.1 Operation of radiocommunications transmitter within emission mask

6.1.1 A person must not operate a radiocommunications transmitter under this Class Licence unless operation of the transmitter complies with Emission Mask L or Emission Mask M set out in the following Table 6.

6.1.2 The purpose of the emission masks is to ensure that emissions into adjacent frequencies are contained to an acceptable level, so as to allow for coexistence with other services.

Fraction of Channel Bandwidth (BW)	Attenuation (dB) relative to Peak Average Power	
	Emission Mask L	Emission Mask M
$0 > BW > 0.45$	0	0
$0.45 > BW > 0.50$	$219 \log(BW/0.45)$	$568 \log(BW/0.45)$
$0.50 > BW > 0.55$	$10 + 242 \log(BW/0.5)$	$26 + 145 \log(BW/0.5)$
$0.55 > BW > 1$	$20 + 31 \log(BW/0.55)$	$32 + 31 \log(BW/0.55)$
$1 > BW > 1.5$	$28 + 68 \log(BW)$	$40 + 57 \log(BW)$
$BW > 1.5$	50	50

Table 6: Emission Mask and Attenuation Details

6.2 Radiocommunications transmitter maximum power within emission mask

6.2.1 The maximum transmitter power is to be measured in a 1 MHz reference bandwidth.

6.2.2 Emission mask L – must not exceed a maximum transmitter power of 7dBm/MHz.

6.2.3 Emission mask M – must not exceed a maximum transmitter power of 20dBm/MHz.

6.3 Operation of radiocommunications transmitter within maximum EIRP level

6.3.1 Under this Class licence, a person must not operate a radiocommunications transmitter of a kind and for a type of service mentioned in Column 1 in Table 7 below at a level of EIRP that exceeds the maximum EIRP shown in Column 2 of Table 7.

6.3.2 Under this Class licence, a person must operate the radiocommunications transmitter to comply with the applicable emission mask shown in Column 3 of Table 7 below.

6.3.3 The maximum equivalent isotopically radiated power (EIRP) is to be measured in a 1 MHz reference bandwidth and the applicable emission masks in Column 3 are those specified in Table 6.

Column 1	Column 2	Column 3
Kind of transmitter and type of service	Maximum EIRP (dBm/MHz)	Applicable Emission Mask
Low power transmitter	16	L
High power transmitter in a fixed service	46	M
High power transmitter in a mobile service	29	M
High power airborne mobile transmitter in a mobile service	36	M

Table 7: Maximum EIRP Details

6.4 Harmful interference

6.4.1 A radiocommunications receiver communicating with a radiocommunications device operated under this Class Licence will not be afforded protection from harmful interference caused by other radiocommunications devices.

6.4.2 A person must not operate a radiocommunications transmitter under this Class Licence if its operation causes harmful interference to another radiocommunications device operated under a licence.

6.4.3 For the avoidance of doubt, the condition in subsection 6.4.1 applies notwithstanding any other condition in this Class Licence.

6.5 Fixed services limitation

- 6.5.1** A person must not operate a radiocommunications device under this Class Licence to provide a fixed service from a fixed location, if the radiocommunications device has been fixed at that location and operational for a period exceeding six (6) months.

6.6 Interference with radio astronomy observations

The operation of a radiocommunications device under this Class Licence is subject to the conditions set out in this section if the device is operated on one or more of channels 11 to 22 as shown in Table 1 and Figure 1.

The radio astronomy sites impacted by NSW coordination under this Class Licence are shown in Table 8 below with the geographic coordinates provided (GDA94 Datum).

Site	Latitude	Longitude
Parkes Observatory, Parkes	-32.998403	148.263514
Paul Wild Observatory, Narrabri	-30.312889	149.550122
Mopra Observatory, Coonabarabran	-31.267811	149.099644
Canberra Deep Space Communication Complex, Tidbinbilla	-35.398461	148.977683

Table 8: NSW Radio Astronomy Site Details

- 6.6.1** If a person operates a radiocommunications transmitter under this Class Licence, in a fixed service, at a location within the prescribed (fixed service) radius of a radio astronomy site as shown in Table 8, any interference caused by the transmitter must not exceed the radio astronomy interference threshold set out in respect of the site in Table 10².
- 6.6.2** If a person operates an airborne mobile transmitter under this Class Licence, in a mobile service, at a location within the prescribed (mobile service – airborne) radius of a radio astronomy site as shown in Table 9, any interference caused by the transmitter must not exceed the radio astronomy interference thresholds set out in respect of the site in Table 10.
- 6.6.3** The 250 kilometres radius coordination zones for each of the radio astronomy sites that can be impacted by high power airborne mobile services have been consolidated on to a spatial layer shown in Appendix A.

² In the case of services needed for emergency response, coordination with the astronomy sites around this threshold will occur.

Transmitter	Parques Observatory, Parkes	Paul Wild Observatory, Narrabri	Mopra Observatory, Coonabarabran	Canberra Deep Space Communication Complex, Tidbinbilla
	Radius (km)			
High power transmitter in a fixed service	160	160	120	70
High power airborne mobile transmitter in a mobile service	250	250	250	250

Table 9: NSW Radio Astronomy Prescribed Radii

Site	Parques Observatory, Parkes	Paul Wild Observatory, Narrabri	Mopra Observatory, Coonabarabran	Canberra Deep Space Communication Complex, Tidbinbilla
Threshold Level (dBm/Hz)	-237	-232	-204	-204

Table 10: NSW Radio Astronomy Interference Thresholds

7 Aeronautical Use

Due to the increase in coordination and interference issues with deploying aeronautical mobile operations (see Section 6.6) they will only be permitted under the following conditions:

- The applicant shall provide a full description of the proposed operations that includes
 - Altitude above ground that the service will operate at³
 - Area of operations and earth stations that the downlinked transmissions will be sent to
and demonstrate that it will protect the following from interference:
 - Radio astronomy operations from NSW sites as shown in Table 8.
 - Terrestrial services using the 4940-4990 MHz public safety allocation.
- Total power output cannot exceed the value as shown in Table 7.

³ Preliminary modelling undertaken by the ACMA with altitudes of 1,000, 2,000 and 3,000 metres indicates change of impact on risk of interference in the radioastronomy coordination zone.

7.1 Channels to support airborne applications

The channels designated to support airborne applications are Channels 1 through to 10 inclusive as showing in Table 1 and Figure 1. These channels have been identified as the least problematic with creating adjacent band interference issues (astronomy operations are primary users in the upper adjacent band).

8 Fixed links

Point-to-point and multipoint applications (fixed services) are permitted to operate under the ACMA Class License conditions for a period not exceeding six (6) months.

8.1 Permitted use conditions

Fixed point-to-point and point-to-multipoint communications are permitted using channels from this allocation but application must be related to the protection of life, health or property. Unattended and continuous operation of voice, data and video operations is permitted.

For coordination purposes, the Telco Authority requires sites supported by the fixed services to be identified and licensed if the deployment exceeds one (1) month.

8.2 Defining fixed link applications

For the purpose of assigning against this allocation, fixed link applications are defined as:

- Fixed links that connect 4.9 GHz base and mobile stations that are used to deliver broadband service, as well as other public safety network using spectrum designated for broadband use.
- Fixed 4.9 GHz links that are used to deliver broadband service, such as a fixed video surveillance link used to monitor a high-risk target or environment.

8.3 Designated channels for supporting fixed link applications

The channels designated to support fixed link applications are Channels 18 through to 22 inclusive as showing in Table 1 and Figure 1.

9 Procedure for Frequency Coordination

Entities eligible to access channels from the public safety 4.9 GHz spectrum will initially contact the Telco Authority Spectrum Management Office (SMO) with advice on the system/s that is proposed to be supported by a coordinated channel allocation.

Provided the system is eligible, there are two types of events that may require operational support through deployment of equipment supported by the public safety 4940-4990 MHz spectrum allocation and each will require a process for coordinating assignment of frequencies/channels.

9.1 Forecast events

These are planned events in NSW that create a response impact on agencies – events such as the City to Surf event in Sydney and visiting dignitaries.

As these events are forecast, agencies that need to deploy a 4940-4990 MHz system/s for increased operational capability will plan well before the event.

All agencies planning on deploying 4940-4990 MHz system/s to support planned events need to provide the following details to the Telco Authority who will identify and allocate the frequencies.

- Proposed date for initial deployment
- Proposed date for activating the system/s
- Proposed date for deactivating the system/s
- Deployment location
- Period of deployment (in days)
- Equipment proposed to be deployed
- Frequency preference (if any)

Frequencies will be allocated according to the Class Licence conditions and to minimise any interference issues for the duration of the deployment and recorded in the SMO assignment register.

9.2 Emergency events/incident

These are unplanned events in NSW that create a response impact on agencies – events such as urban violence and fires.

These events are not forecast and as agencies need to be agile in their individual or combined response, deployment of a 4940-4990 MHz system/s for increased operational capability will feature in the strategic planning put together for these scenarios.

The agency that establishes command and control at the emergency/incident will determine the most suitable frequencies for assigning to support the operational capability in line with the Class Licence conditions. They will provide the assigned frequency information to the Telco Authority so further coordination activities that may be required can be managed efficiently.

10 Adjacent State/Territory Coordination

New South Wales shares borders with Queensland, Victoria, South Australia and the Australian Capital Territory.

The Telco Authority will coordinate with these other States and Territory where applications for channel allocation are within 50 kilometres of the border region.

11 Resolving assignment conflict

As the 4.9 GHz public safety allocation is a shared resource to support public safety operations,

conflict may arise in the use of channels to support specific applications.

The following business priority list for accessing channels in the allocation should be used to resolve conflicts of use:

- Priority 1 - Disaster and extreme emergency operations for mutual aid and interagency communications
- Priority 2 - Emergency or urgent operations involving imminent danger to the safety of life or property
- Priority 3 - Special event control activities, generally of a pre-planned nature, and generally involving joint participation of two or more agencies - includes drills, tests and exercises
- Priority 4 - Single agency secondary communication

12 Further Information

Telco Authority Spectrum Management Office: telco.spectrum@finance.nsw.gov.au

Appendices

Appendix A - the radio astronomy sites 250 kms coordination zone

Figure 6 below consolidates the 250 kilometre coordination zones from the four radio astronomy sites that impact on high power airborne mobile services in NSW.

The Canberra Deep Space Communication Complex at Tidbinbilla in the ACT is not currently operating in the 4.9 GHz band but should be checked regularly as that status may change.

Schedules for each of the radio astronomy sites can be found at:

Mopra - <http://www.narrabri.atnf.csiro.au/observing/schedules/>

Narrabri - (also referred to as Australia Telescope Compact Array)
<http://www.narrabri.atnf.csiro.au/observing/schedules/>

Parkes - <http://www.parkes.atnf.csiro.au/observing/schedules/>

Tidbinbilla - <http://www.atnf.csiro.au/observers/tidbinbilla/>

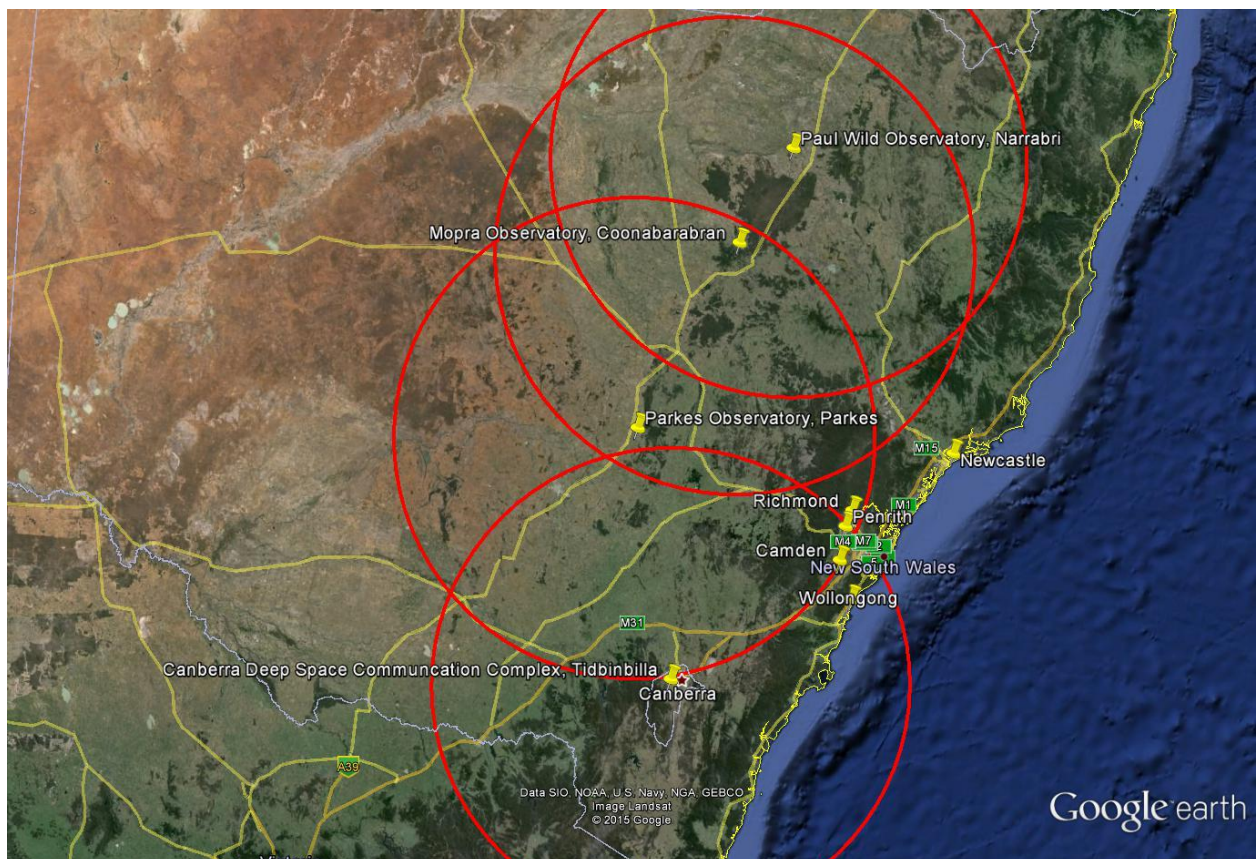


Figure 6: Consolidated 250 kms coordination zone for high powered airborne mobile services

