

Interim access to 5055 – 5065 MHz for Line of Sight (LoS) Remotely Piloted Aircraft Systems (RPAS) Control and Non-Payload Communication (CNPC) links

RALI: MS 48

DATE OF EFFECT: 24/08/2022

Amendment history

Date	Comments
April 2022	Release of the initial draft
August 2022	Release of the first version of RALI

Suggestions for improvements to Radiocommunications Assignment and Licensing Instruction MS 48 may be addressed to:

The Manager, Spectrum Planning Section
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PO Box 78
Belconnen ACT 2616

or by email to: freqplan@acma.gov.au.

Please notify the ACMA of any inaccuracy or ambiguity found in this RALI, so that it can be investigated and appropriate action taken.

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1 Introduction

1.1 Purpose

The purpose of this RALI is to detail interim licensing arrangements to establish Line of Sight (LoS) Remotely Piloted Aircraft Systems (RPAS) Control and Non-Payload Communication (CNPC) links in the 5055–5065 MHz frequency band.

The information in this document reflects the ACMA's statement of current policy in relation to facilitating the operation of RPAS in controlled airspace. In making decisions, accredited frequency assigners and ACMA's officers should take all relevant factors into account and decide each case on its merits. Issues relating to this document that appear to fall outside the enunciated policy should be referred to:

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1.2 Background

Remotely Piloted Aircraft Systems (RPAS) (also known as drones or Unmanned Aerial Vehicles (UAVs)) currently use radiocommunication technologies authorised under the Radiocommunications Low Interference Potential Devices Class Licence 2015 (the LIPD class licence)¹ for both payload and control communications in non-controlled airspace. However, the operation of RPAS in controlled airspace is far more heavily regulated and current radiocommunications licensing arrangements will require further consideration to address the need for safe integration of the aircraft into current Air Traffic Control (ATC) systems².

In the Australian Radiofrequency Spectrum Plan 2021 (the Spectrum Plan), the 5030–5091 MHz band is allocated to the Aeronautical Mobile (Route) Service (AM(R)S) and Aeronautical Mobile-Satellite (Route) Service (AMS(R)S). Line-of-sight (LoS) RPAS CNPC in this band is intended to be facilitated under the (AM(R)S). Consistent with operation of other area-wide AM(R)S systems in Australia, licences will be issued on the basis that no interference may be caused to other services, nor can protection from interference be claimed.

In April 2021, the ACMA released a [discussion paper](#) examining future use of the 5030-5091 MHz band for RPAS CNPC. The discussion paper gave an

¹ The current version of the LIPD class licence is available on the [Federal Register of Legislation website](#).

² In Australia, there are two major types of airspace: controlled, and uncontrolled. Controlled airspace in Australia is actively monitored and managed by air traffic controllers. To enter controlled airspace, an aircraft must first gain a clearance from an air traffic controller. Uncontrolled airspace has no supervision by air traffic control so no clearance is required to operate in uncontrolled airspace.

overview of the current status of the spectrum arrangements for 5030-5091 MHz LoS RPAS CNPC in Australia and internationally. The paper sought views on whether it would be appropriate to begin the development of arrangements to facilitate LoS CNPC in the band, focusing on six specific issues.

While respondents were enthusiastic in their responses about proceeding with domestic arrangements to support growth in domestic RPAS interests, international spectrum management arrangements are yet to be finalised for this allocation. This creates the risk that any domestic arrangements established now may ultimately be inconsistent with global arrangements creating equipment availability and interoperability issues.

To help balance these considerations, we have undertaken to release an options paper with specific proposals for ongoing arrangements at a later date when global developments are clearer, including when the ITU-R has completed development of the relevant report (unlikely to be completed until Q4 2022 at the earliest (more likely 2023)).

In the meantime, we are enabling interim aeronautical mobile licensing arrangements (as distinct from the current temporary access that made access possible under scientific licensing) that are based on current draft arrangements being considered within ITU-R³. With that in mind, domestic access arrangements might, in the long term, vary from the interim arrangements as international arrangements mature.

This paper sets out those interim arrangements for access to a segment of the 5030-5091 MHz band for RPAS CNPC. It is important for licensee to note that these arrangements are interim in nature and there may be a need for a change in operation of assignments authorised under this RALI in the future.

1.3 Scope

This RALI sets out the steps necessary for licensing of LoS RPAS CNPC systems in the 5055 – 5065 MHz band on an interim basis. Section 2 of this document details procedures for frequency assignment. Assignments are required to adhere to technical limits included in Section 3, and Section 4 lists the licensing conditions.

This document does not specify any device-to-device coordination, rather it sets out the process (Section 2) for choosing and assigning channels in a way that will reduce interference potential between devices so long as certain operating parameters (Section 3) are adhered to. This is an interim measure that is intended to facilitate general interference management through the use of geographic separation of co-frequency use.

Importantly, apparatus licenced access to spectrum does not imply approval to operate RPAS – such approvals are the jurisdiction of aeronautical safety authorities and prospective RPAS operators should ensure all necessary compliance with other regulations, including necessary technical assessments

³ The latest working document towards a preliminary draft new Recommendation ITU-R M.[CNPC_CHAR_5GHz] can be found [here](#).

(including of the interference environment) to ensure the safe operation of their systems consistent with all applicable laws and regulations etc.

1.4 Relevant ITU-R documents

This interim guideline has been drawn from two ITU-R documents.

- > Report ITU-R M.2171 Characteristics of unmanned aircraft systems and spectrum requirements to support their safe operation in non-segregated airspace⁴.
- > Draft new Recommendation (PDNR ITU-R.M.[CNPC_CHAR_5GHz]⁵) (referred to as “the draft Recommendation” from here on) which specifies the characteristics of terrestrial air-ground links operating in the aeronautical mobile (route) service (AM(R)S) in the frequency band 5030-5091 MHz.

The technical and operational characteristics described in the current version (updated in ITU-R WP5B meeting in July 2022) of the draft Recommendation have been considered in developing this interim assignment and licensing instruction for LoS RPAS CNPC links operating in 5055–5065 MHz band, and should be used in analysing compatibility between unmanned aircraft.

⁴ Available on the [ITU website](#).

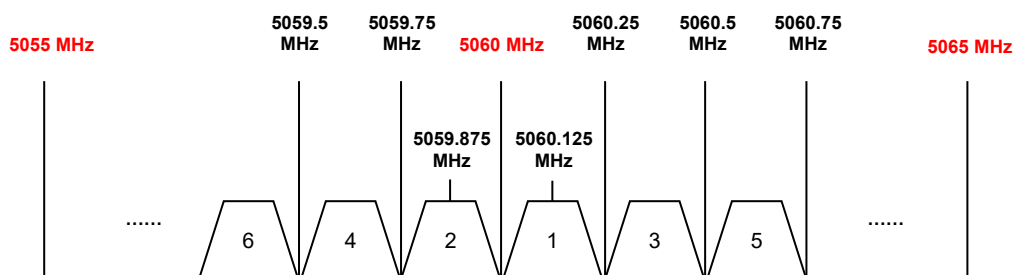
⁵ Working Document Towards a Preliminary Draft New Recommendation ITU-R.M.[CNPC_CHAR_5GHz] on the characteristics and protection criteria of terrestrial and satellite unmanned aircraft system control and non-payload communications links operating in the aeronautical mobile (route) service and aeronautical mobile satellite (R) service in the band 5 030-5 091 MHz

2 Frequency assignment

2.1 Spectrum and channelling arrangements

A maximum 250 kHz occupied bandwidth is available for both ground and airborne radio systems. The interim channelling arrangement for the 5055–5065 MHz range comprises forty 250 kHz channels. This arrangement is shown in Figure 1.

Figure 1 RPAS CNPC link channel plan for 5055-5065 MHz frequency band



Channels are spaced evenly both in the upper and lower 5 MHz range from the mid-band frequency (5060 MHz). This has been done so deployments are initially concentrated in the middle of the band and expand outwards from there. Further details of this channelling arrangement are included in Appendix A. Channels may be aggregated for wider-bandwidth CNPC on an exceptional basis – refer to section 5 for details on exceptions to the requirements of this RALI.

2.2 Assignment procedure

For these interim purposes, the notional geographic service area for LoS operation is defined as being a 200 km radius from the registered aeronautical station location.

Within the geographic area subject to the prospective assignment, first check the occupancy of each channel n within the service area (either partial or full geographic overlap is considered occupied), starting from $n = 1$ and ascending serially (ie. $n = 2$, then 3... up to 40). The channel centre frequencies for each value of n are determined as follows:

$n = \text{odd numbers: upper band channels:}$

$$\text{Centre frequency} = [5060 + \frac{n}{2} * 0.25] \text{ MHz}$$

$n = \text{even numbers: lower band channels:}$

$$\text{Centre frequency} = [5060 - \frac{n-1}{2} * 0.25] \text{ MHz}$$

Assign the first available (unassigned) channel in that area, such that the lower and upper channel frequency boundaries will be the calculated centre-

frequency minus 125 kHz and plus 125 kHz respectively. If all 40 channels are unavailable within the area subject to the prospective assignment, then the assignment cannot be made. It may be possible to shift the centre of the notional service area to avoid partial overlap on a given channel, such that the channel then becomes available for assignment in the adjusted service area.

This process will ensure assignments are loaded centrally towards the 5060 MHz mid-band frequency.

2.3 Licence type

As per the Civil Aviation Safety Regulations 1998⁶, an RPA is defined as a remotely piloted aircraft, other than a balloon, a kite, or a model aircraft. Using this definition, any RPA operated in the controlled airspace is categorised as an aircraft. On that basis, Aeronautical licences⁷ are to be issued to the RPAS operators for using the 5055 – 5065 MHz band for LoS CNPC links.

⁶ The Civil Aviation Safety Regulations 1998 is available on the [Federal Register of Legislation website](#).

⁷ Details of the Aeronautical licence type including the corresponding Licence Conditions Determination (LCD) can be accessed from the [ACMA website](#).

3 Technical requirements

This chapter describes the notional operating requirements for CNPC systems assigned under this guideline.

3.1 General specifications – airborne and ground stations

The technical characteristics in Table 1 have been extracted from the draft Recommendation for RPAS GRS and ARS CNPC links. Prospective licensees are required to adhere to these technical specifications. Adherence will increase the likelihood that operating characteristics will not need to be changed when permanent arrangements are introduced in the band.

Table 1 Transmission and reception characteristics for the control and non-payload communication link system

	Units	Airborne	Ground
Frequency of operation	MHz	5055 to 5065	5055 to 5065
Duplexing		Time Division Duplex (TDD)	Time Division Duplex (TDD)
Transmit/receive duration up from control station down from the RPA	msec	23 Up plus 1.3 Guard 23 Down plus 2.7 Guard	23 Up plus 1.3 Guard 23 Down plus 2.7 Guard
Occupied bandwidth, C	kHz	Variable per application with a maximum of 250	Variable per application with a maximum of 250
Antenna gain	dBi	3	22.5
Maximum transmitting antenna height	m	22 860 (MSL) Typical 8 000	2 to 50 Typical 10
Transmitter conducted power	dBm	40	40
Transmitter in band emission limits	dBc/kHz	-96 at 2 MHz offset See Table 3	-96 at 2 MHz offset See Table 3
Receiver noise figure	dB	7	7
Receiver sensitivity	dBm	GMSK: -118, -115 and -113 QPSK @ 20 ksps: -120.5 and -118 QSPK @ 80 ksps: -114.5 and -112	GMSK: -118, -115 and -113 QPSK @ 20 ksps: -120.5 and -118 QSPK @ 80 ksps: -114.5 and -112
Receiver in band rejection – except the operating channel	dB	One channel separation: 23 Two channel separation: 43 Three channel separation: 57 2 MHz or more separation: 63	One channel separation: 23 Two channel separation: 43 Three channel separation: 57 2 MHz or more separation: 63

3.2 Additional emission limits for ground stations

GRSs operated under RPAS CNPC link licences in 5055–5065 MHz band are subject to additional in-band emission limits as per Table 2 below:

Table 2 Ground Station Transmitter in band emission limits

Offset from carrier frequency	dBc/kHz
Channel width ÷ 2	-54
1.5 × channel width	-74
500 kHz	-90
2 000 kHz	-96

For operation of GRS/control stations, prospective licensees are required to maintain the antenna pattern set out in the draft Recommendation (reproduced in Table 3).

Table 3 Control station elevation antenna pattern (for all azimuths)

Elevation degrees	Gain dBi
0.5	21.5
1.5	22.0
2.5	22.5
3.5	22.0
7	19.5
11.5	16.5
16	14.0
32	9.0
64	4.0
>75	3.0

4 Licensing Conditions

4.1 Applicable licensing conditions

Conditions of operation which apply to an individual licence are to be printed on the licence under the heading 'Special Conditions'. The application of special conditions by the ACMA will be considered on a case-by-case basis as required.

4.1.1 Notional service area

The following licence condition is to be applied to all licences authorising the operation of an AM(R)S RPA system in 5055–5065 MHz band:

The licensee should ensure that the notional geographic service area for LoS operation is confined to a 200 km radius from the registered aeronautical station location.

4.2 Advisory notes

As this arrangement is interim in nature, the ACMA's intention is to limit the term of any licence to one-year. Renewal will be considered on a case-by-case basis and licences may be amended to align with permanent arrangements when they are made.

4.2.1 Interference to existing RPAS CNPC link licensees

The following advisory note is to be applied to all licences authorising the operation of an AM(R)S RPA system in 5055–5065 MHz band:

For the purposes of interference management, this licence is issued on a first-in-time basis. New licensees shall not claim protection from any existing licensed RPAS CNPC operation nor shall cause any interference to them.

4.2.2 Standard duration of the licence

The following advisory note is to be applied to all licences authorising the operation of an AM(R)S RPA system in 5055–5065 MHz band:

This licence has been issued for a 1-year duration and will not be automatically invoiced for renewal. The licensee is required to re-apply for renewal should they propose to continue operation beyond the expiry date.

4.2.3 Operating parameters

The following advisory note is to be applied to all licences authorising the operation of an AM(R)S RPA system in 5055–5065 MHz band:

This licence has been issued as part of an interim licensing arrangement to facilitate the use of 5055-5065 MHz for RPAS CNPC. Depending on the outcome of future planning and licensing considerations for the band, the ACMA may seek to amend the frequency or other operating parameters of the licence to align with longer-term planning arrangements.

5 Exceptions

Exceptions to the requirements of this RALI are subject to case-by-case consideration by the Manager, Spectrum Planning Section.

A request for exemption would need to be accompanied by evidence to support the request.

All requests for exemptions should be submitted to freqplan@acma.gov.au.

6 RALI Authorisation

Approved 24 August 2022

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Spectrum Planning and Engineering Branch

Communications Infrastructure Division
Australian Communications and Media Authority

Appendix A: Detailed Channelling Arrangement

Channel number	Lower frequency MHz	Centre frequency MHz	Upper frequency MHz
1	5060	5060.125	5060.25
2	5059.75	5059.875	5060
3	5060.25	5060.375	5060.5
4	5059.5	5059.625	5059.75
5	5060.5	5060.625	5060.75
6	5059.25	5059.375	5059.5
7	5060.75	5060.875	5061
8	5059	5059.125	5059.25
9	5061	5061.125	5061.25
10	5058.75	5058.875	5059
11	5061.25	5061.375	5061.5
12	5058.5	5058.625	5058.75
13	5061.5	5061.625	5061.75
14	5058.25	5058.375	5058.5
15	5061.75	5061.875	5062
16	5058	5058.125	5058.25
17	5062	5062.125	5062.25
18	5057.75	5057.875	5058
19	5062.25	5062.375	5062.5
20	5057.5	5057.625	5057.75
21	5062.5	5062.625	5062.75

Channel number	Lower frequency MHz	Centre frequency MHz	Upper frequency MHz
22	5057.25	5057.375	5057.5
23	5062.75	5062.875	5063
24	5057	5057.125	5057.25
25	5063	5063.125	5063.25
26	5056.75	5056.875	5057
27	5063.25	5063.375	5063.5
28	5056.5	5056.625	5056.75
29	5063.5	5063.625	5063.75
30	5056.25	5056.375	5056.5
31	5063.75	5063.875	5064
32	5056	5056.125	5056.25
33	5064	5064.125	5064.25
34	5055.75	5055.875	5056
35	5064.25	5064.375	5064.5
36	5055.5	5055.625	5055.75
37	5064.5	5064.625	5064.75
38	5055.25	5055.375	5055.5
39	5064.75	5064.875	5065
40	5055	5055.125	5055.25