Review of 3700-4200 MHz, 3.4 GHz bands spectrum and apparatus licensing technical frameworks

3400-4000 MHz Technical Liaison Group paper

MARCH 2021

Canberra

Red Building   
Benjamin Offices  
Chan Street   
Belconnen ACT

PO Box 78  
Belconnen ACT 2616

T +61 2 6219 5555  
F +61 2 6219 5353

Melbourne

Level 32   
Melbourne Central Tower  
360 Elizabeth Street   
Melbourne VIC

PO Box 13112  
Law Courts   
Melbourne VIC 8010

T +61 3 9963 6800  
F +61 3 9963 6899

Sydney

Level 5   
The Bay Centre  
65 Pirrama Road   
Pyrmont NSW

PO Box Q500  
Queen Victoria Building   
NSW 1230

T +61 2 9334 7700  
F +61 2 9334 7799

Copyright notice

[Creative Commons logo](http://i.creativecommons.org/l/by/3.0/88x31.png)

<https://creativecommons.org/licenses/by/4.0/>

With the exception of coats of arms, logos, emblems, images, other third-party material or devices protected by a trademark, this content is made available under the terms of the Creative Commons Attribution 4.0 International (CC BY 4.0) licence.

We request attribution as © Commonwealth of Australia (Australian Communications and Media Authority) 2021.

All other rights are reserved.

The Australian Communications and Media Authority has undertaken reasonable enquiries to identify material owned by third parties and secure permission for its reproduction. Permission may need to be obtained from third parties to re-use their material.

Written enquiries may be sent to:

Manager, Editorial Services  
PO Box 13112  
Law Courts  
Melbourne VIC 8010  
Email: [info@acma.gov.au](mailto:info@acma.gov.au)

[Version control iii](#_Toc94603240)

[Introduction 1](#_Toc94603241)

[Planning outcomes and preliminary views across the 3400-4200 MHz frequency range 2](#_Toc94603242)

[Further implementation considerations 3](#_Toc94603243)

[Scope of the TLG 6](#_Toc94603244)

[Revised near-term focus of the TLG 7](#_Toc94603245)

[Outline of paper 9](#_Toc94603246)

[~~Timeline~~ 9](#_Toc94603247)

[Miscellaneous issues 10](#_Toc94603248)

[Purpose 10](#_Toc94603249)

[Possible definitions of metro and major regional areas for AWLs (not essential for remote) 10](#_Toc94603250)

[The future of Embargo 78 13](#_Toc94603251)

[Proposal for a new ESPZ 13](#_Toc94603252)

[The pricing of AWLs 13](#_Toc94603253)

[Point-to-point service arrangements (essential for remote) 14](#_Toc94603254)

[Background 14](#_Toc94603255)

[PTP channel plan options 14](#_Toc94603256)

[ACMA staff preliminary views 15](#_Toc94603257)

[Use of possible PTP Option 1 15](#_Toc94603258)

[Retention of PTP Option 2 15](#_Toc94603259)

[PTP Co-existence issues 15](#_Toc94603260)

[Coexistence between WBB and aeronautical radionavigation services 16](#_Toc94603261)

[Background 16](#_Toc94603262)

[Recent developments 16](#_Toc94603263)

[Domestic 16](#_Toc94603264)

[ICAO 16](#_Toc94603265)

[The European Union 17](#_Toc94603266)

[The United States of America 17](#_Toc94603267)

[France 19](#_Toc94603268)

[Belgium 19](#_Toc94603269)

[Canada 20](#_Toc94603270)

[The United Kingdom 3.8-4.2 GHz band 21](#_Toc94603271)

[Japan 21](#_Toc94603272)

[ACMA studies on coexistence 21](#_Toc94603273)

[Possible methods to manage coexistence 22](#_Toc94603274)

[Potential draft approaches to manage coexistence 24](#_Toc94603275)

[Summary of how possible Approach B mitigations manage typical use cases 26](#_Toc94603276)

[Reasons for identifying Approach A 27](#_Toc94603277)

[Reasons for identifying Approach B 27](#_Toc94603278)

[How to incorporate possible Approach B mitigations into the technical framework 28](#_Toc94603279)

[Future progress on WBB and Radio Altimeter coexistence 28](#_Toc94603280)

[Area Wide Licensing framework 29](#_Toc94603281)

[Background 29](#_Toc94603282)

[Preliminary view 29](#_Toc94603283)

[Coexistence with other services 29](#_Toc94603284)

[Revised view about coordinating between WBB services (not essential for remote) 32](#_Toc94603285)

[Consideration for multiple use cases and unsynchronised use 32](#_Toc94603286)

[Ideas for consideration 32](#_Toc94603287)

[DBC for unsynchronised use (restricted cell spectrum spaces) 37](#_Toc94603288)

[How to accommodate FSS AWL receive in the example possible arrangements 37](#_Toc94603289)

[How to interpret the remaining TLG paper 37](#_Toc94603290)

[Comments received 37](#_Toc94603291)

[Managing coexistence between AWLs in the 3400-4000 MHz range 39](#_Toc94603292)

[AWLs optimised for WBB use (essential for remote) 39](#_Toc94603293)

[AWLs optimised for FSS receive earth station use in the frequency range 3800-4000 MHz in metropolitan and major regional areas (not essential for remote) 40](#_Toc94603294)

[Spectrum licensed devices operating in the 3400-3800 MHz range (geographic boundary management essential for remote) 42](#_Toc94603295)

[FSS AL receive devices operating in the 3400-4200 MHz range (essential for remote) 43](#_Toc94603296)

[PTP AL receive devices operating in the 3400-4200 MHz range (essential for remote) 43](#_Toc94603297)

[PMP AL receive devices operating in the 3400-3700 MHz range (essential for remote) 43](#_Toc94603298)

[Radiolocation services operating in the 3100-3600 MHz range (essential for remote) 44](#_Toc94603299)

[Radiolocation services operating in the 3700-4000 MHz range authorised under 10(7) of the ARSP (essential for remote) 44](#_Toc94603300)

[Coexistence with the Woomera Protected Area (essential for remote) 44](#_Toc94603301)

[Coexistence with the Darwin and Geraldton coordination zones (essential for remote) 45](#_Toc94603302)

[Feedback on the zones discussed above 45](#_Toc94603303)

[Coexistence with Earth Station Protection Zones (ESPZs) (essential for remote) 45](#_Toc94603304)

[Coexistence with the Mid West Radio Quiet Zone (RQZ) (essential for remote) 46](#_Toc94603305)

[Class licensed devices operating in the 3400-4200 MHz range (essential for remote) 46](#_Toc94603306)

[Amateur service below 3400 MHz and in the 3400-3575 MHz range (essential for remote) 46](#_Toc94603307)

[AWL assignment conditions (most elements essential for remote) 47](#_Toc94603308)

[Minimum area and bandwidth limits (this does not apply to FSS in remote areas) 47](#_Toc94603309)

[Maximum area and bandwidth limits (not essential for remote technical framework) 48](#_Toc94603310)

[Assignment rules (essential for remote) 48](#_Toc94603311)

[Recording device details in the RRL (essential for remote) 49](#_Toc94603312)

[Consequential policy document changes (essential for remote) 50](#_Toc94603313)

[Proposed changes to RALI FX03 50](#_Toc94603314)

[Proposed changes to RALI FX19 51](#_Toc94603315)

[Extended 3.4 GHz band spectrum licensing technical framework 54](#_Toc94603316)

[Background 54](#_Toc94603317)

[The existing 3.4 GHz band spectrum licensing technical framework 54](#_Toc94603318)

[Conditions on the spectrum licence 55](#_Toc94603319)

[Unacceptable levels of interference 55](#_Toc94603320)

[Radiocommunications advisory guidelines 56](#_Toc94603321)

[Possible changes to the 3.4 GHz spectrum licensing technical framework (not required for remote) 57](#_Toc94603322)

[Consequential changes 57](#_Toc94603323)

[Appendix A: Defined geographic areas (remote only definition essential to remote) 60](#_Toc94603324)

[Appendix B: Wireless broadband and radio altimeter study 67](#_Toc94603325)

[Appendix C: PTP channel plan options 68](#_Toc94603326)

[Appendix D: Updated Wireless broadband and radio altimeter study 69](#_Toc94603327)

[Appendix E: Draft AWL Licence Condition Determination 70](#_Toc94603328)

[Appendix F: Draft RALI MS47: Frequency coordination and licensing procedures for Area-Wide Licence (AWL) in the 3400–4000 MHz band 71](#_Toc94603329)

# Version control

|  |  |  |
| --- | --- | --- |
| **Version** | **Comments** | **Date** |
| Version 1 | Initial release to members | 5 July 2021 |
| Version 2 | Second release to members after submissions to version 1 and initial discussions with formed Working Groups. | 15 September 2021 |
| Version 3 | Third release to members ahead of public release of a remote area TLG “snapshot” after version 2 comments. | 21 December 2021 |
| Version 3.0 bis | Post member review of version 3. Version for public release. | 2 March 2022 |

# Introduction

In January 2021, the Australian Communications and Media Authority (ACMA) released the [*Replanning the 3700-4200 MHz band - Outcomes paper*](https://www.acma.gov.au/consultations/2020-07/planning-options-3700-4200-mhz-band-consultation-222020) (the 2021 Outcomes paper).This paper described the ACMA’s planning outcomes and preliminary views to introduce wireless broadband services in the 3700-4200 MHz band, using a combination of apparatus and spectrum licensing arrangements. Preliminary views on key licence conditions were also included in the Outcomes paper, however it was noted that these conditions would be decided later as part of future consultation processes, such as this Technical Liaison Group (TLG) and routine consultation on updates to Radiocommunications Licensing and Assignment Instructions (RALIs) and other legislative instruments, as applicable.

The Outcomes paper also stated that the ACMA would, as far as practical, extend or align frameworks and the timing of their development with similar ones in the 3400-3700 MHz (3.4 GHz) band. The paper [*Optimising arrangements for the 3400-3575 MHz band: Planning decisions and preliminary views*](https://www.acma.gov.au/consultations/2019-08/optimising-3400-3575-mhz-band-consultation-122019)(the 2019 Outcomes paper) outlines the planning outcomes for the 3.4 GHz band.

To facilitate development of apparatus and spectrum licence arrangements, the ACMA formed a technical liaison group (TLG) to review/develop spectrum and apparatus licence technical frameworks for the broader 3400-4000 MHz range (where applicable). A TLG is a short-term advisory body convened by the ACMA. Its purpose is to provide advice on the development of, or possible changes to, a spectrum or apparatus licence technical framework. The TLG was formed in July 2021 and remote aspects were finalised in December 2021, excepting the consideration of coexistence with radio altimeters. Membership included representatives from existing incumbent licensees, mobile network operators, satellite service operators, vendors, wireless broadband network operators, the aviation sector, nbn, Defence and DITRDC.

The purpose of this paper is to:

Record draft potential spectrum planning, including technical, arrangements for apparatus and spectrum licensing uses of the 3400-4000 MHz frequency range as outlined in the 2019 and 2021 Outcomes papers.

summarise feedback on these draft arrangements from the TLG.

As it is proposed to consider extending and aligning technical arrangements as much as practicable between the 3.4 GHz and 3700-4200 MHz bands, in this paper the bands are referred to collectively as the “***extended 3.4 GHz band***”. The TLG itself is referred to as the 3400-4000 MHz TLG. Where previous planning work is referenced, the applicable name of the band is used.

**Status and distribution**

The purpose of this paper is to share potential spectrum planning, including technical, arrangements for apparatus and spectrum licensed uses of the 3400-4000 MHz band (consistent with established outcomes) and to document feedback from TLG members. The document is informal in nature, makes no definitive proposals and has not been considered by the ACMA Authority. Outcomes from the TLG will be considered by the ACMA when developing formal proposals for public consultation.

As an informal document, its development has been shared with members of this TLG only and not released publicly until this version. This version is the first public exposure, describing the considerations and discussions with the TLG, with a focus on remote areas, concurrently with the formal public consultation on the technical framework for remote areas. It represents a snapshot of views and information as of late December 2021. Any draft technical framework documents attached may have been superseded by versions attached to the remote area consultation package.

The TLG will continue to work on issues related to areas other than remote, noting that this also may require review of the technical framework for remote areas.

## Planning outcomes and preliminary views across the 3400-4200 MHz frequency range

Key announcements in the 2021 Outcomes paper included:

In metropolitan and regional areas in the 3700–3800 MHz range, clearing over time existing fixed satellite service (FSS) and point-to-point (PTP) services and introducing arrangements to allow for wide-area wireless broadband (WA WBB) services. The ACMA was of the preliminary view that spectrum licensing would be the preferred licensing mechanism for WA WBB uses and a 5-year re-allocation period for existing licensed FSS and PTP services is appropriate.

In remote areas in the 3700–3800 MHz range, introducing apparatus licensing arrangements to support local area wireless broadband (LA WBB) services on a shared basis with existing FSS and PTP services. New apparatus licensed FSS will be permitted on a coordinated, shared basis with licences for LA WBB services, but the ACMA’s preliminary view was that new PTP licences should not be issued, to simplify new PTP technical arrangements in the band. Existing licensed PTP services would be allowed to continue (grandfathered[[1]](#footnote-2)). The ACMA would further investigate the most appropriate apparatus licence type to use to authorise LA WBB in this case.

Australia-wide, in the 3800–4000 MHz frequency range, introducing arrangements to support LA WBB services on a shared basis with existing FSS and PTP services. New apparatus licences for FSS and PTP services would be issued on a coordinated, shared basis with LA WBB. The ACMA was of the preliminary view that area-wide apparatus licensing would be the preferred licensing mechanism for LA WBB uses in at least the metropolitan and regional areas.

Australia-wide, retaining the 4000–4200 MHz range for apparatus licensed FSS and PTP services only, and varying PTP arrangements if required to be consistent with this decision.

Maintaining existing arrangements for apparatus licensed radiolocation services and devices operating under class licences.

Maintaining Earth Station Protection Zones (ESPZs) and arrangements under RALI MS44 during implementation of new arrangements.[[2]](#footnote-3) The ACMA did not propose these areas be identified for spectrum licensing or being permitted for apparatus licensing other than for FSS earth station receivers in the band.

Another announcement in the 2021 Outcomes paper was that the ACMA would, as far as practical, extend or align frameworks and the timing of their development with similar ones in the 3.4 GHz band. While more details on those outcomes can be found in the 2019 Outcomes paper, these include:

* The development of LA WBB[[3]](#footnote-4) arrangements in remote areas across 3400-3700 MHz
* The development of LA WBB arrangements in regional areas across 3400-3700 MHz
* The development of spectrum licensing arrangements in specific areas and frequency ranges across 3400-3700 MHz.

Further implementation considerations

Having further considered the preliminary views for the extended 3.4 GHz band, the ACMA decided to further investigate:

* Extending and modifying the 3.4 GHz spectrum licensing technical framework to accommodate the applicable WA WBB spectrum spaces in 3700-3800 MHz.
* Potentially implementing an area wide licence (AWL) framework for all LA WBB apparatus licensed spectrum spaces across the 3400-4000 MHz range.
* Optimising the possible AWL framework for LA WBB and FSS, at least in metro and yet to be defined major regional areas, but not for PTP services. Noting that PTP could be deployed under AWLs if desired.
* Conducting further work on whether the AWL framework should be optimised to include FSS in remote and regional areas outside of the to be defined major regional areas.

No final decisions have yet been made on whether incumbent PMP, FSS or PTP services in AWL areas should transition to the AWL framework but the current summary of preliminary ACMA staff views is that:

* There should be only one technical framework for new licences of a specific service category such as WBB, fixed or FSS, in any given spectrum space.
* Incumbent services should not be required to transition to an AWL framework in any spectrum space proposed for AWL.
* There should not be any new PTP services in metropolitan or major regional areas in the 3800-4000 MHz range.
* FSS services can continue to be licensed using the site based FSS receive apparatus licence type in remote areas and in “other regional areas”, outside of any ranges proposed for spectrum licensing.

Table 1 summarises the current high-level views of possible licensing arrangements that could be implemented across 3400‑4200 MHz band, based on the above considerations and feedback within the TLG. This should be used indicatively only for incumbent and prospective licensees to understand potential impacts to incumbent services and future opportunities. Note that as this now represents broad uses and not specific use cases, it refers generically to WBB rather than WA WBB or LA WBB.

Summary of possible licensing arrangements for the extended 3.4 GHz band by spectrum space

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| REGION | 3400-3575 MHz | 3575-3700 MHz | 3700-3800 MHz | 3800-4000 MHz | 4000-4200 MHz |
| Metro | WBB via SL[[4]](#footnote-5) | WBB via SL | WBB via SL | WBB/FSS via AWL  Incumbent PTP and FSS via AL | FSS, PTP via AL |
| Major regional | WBB via SL in parts  WBB/FSS via AWL in parts  Incumbent PMP  Amateur[[5]](#footnote-6) | WBB via SL | WBB via SL | WBB/FSS via AWL  Incumbent PTP and FSS via AL | FSS, PTP via AL |
| Other regional | WBB via SL in parts  WBB via AWL in parts  Incumbent PMP  FSS via AL  Amateur | WBB via SL | WBB via SL | WBB via AWL  FSS, PTP via AL | FSS, PTP via AL |
| Remote | WBB via AWL  FSS via AL  Incumbent PMP  Amateur | WBB via AWL  FSS via AL  Incumbent PMP  Incumbent PTP via AL | WBB via AWL  FSS via AL  Incumbent PTP via AL | WBB via AWL  FSS, PTP via AL | FSS, PTP via AL |
| ESPZ | FSS via AL | FSS via AL | FSS via AL | FSS via AL | FSS via AL |

AWL – Area wide licence, LA WBB – local area wireless broadband, PMP – point to multipoint, FSS – fixed satellite service, WA WBB – wide area wireless broadband, PTP – point to point, SL – spectrum licence

Scope of the TLG

The scope of the TLG is to determine:

* appropriate changes to PTP arrangements and assignment instructions in the 3700-4200 MHz band, including the 3.8 GHz PTP channel plan, and guidance on planning flexibility in RALI FX03.
* Coexistence between services, including interference management criteria (defining parameters, acceptable levels of interference and methods to manage interference), for aeronautical radio-navigation services in the 4200-4400 MHz band (aircraft radio altimeters) as an input into spectrum and apparatus licensing technical frameworks.
* Potential changes to the 3.4 GHz band spectrum licensing technical framework required to extend to, and accommodate, 3700-3800 MHz in specified geographic areas. This includes a review of spectrum licence core conditions, s.145(4) determination of unacceptable levels of interference, the Radiocommunications Advisory Guidelines made under s.262 and the minimum contiguous bandwidths for trading.[[6]](#footnote-7)
* Potential AWL apparatus licensing framework/s, optimised for LA WBB and FSS, in future applicable spectrum spaces across 3400-4000 MHz. This may include, but is not limited to, retiring RALI FX14 and RALI MS39 as well as changes to RALI FX19 and FX03. It will also include the development of a schedule for the [Radiocommunications Licence Conditions (Area-Wide Licence) Determination 2020](https://www.legislation.gov.au/Details/F2020C01124) (the AWL LCD) to support the AWL framework/s.
* Obtain views on mechanisms to potentially transition incumbent apparatus licensed PMP and FSS services to possible AWL framework/s in future applicable spectrum spaces.
* Obtain views on definitions of geographic areas for major regional areas and other regional areas.
* Obtain views on the future of PTP services in metro and major regional areas.

The following was not in scope of the TLG:

* Allocation pricing, methods and timeframes.
* The future of Spectrum Embargo 78.
* Outcomes of the 3.4 GHz metropolitan “urban excise” activity.
* Decisions and preliminary views from the outcomes paper in relation to the amount of spectrum identified for WA WBB or LA WBB.
* Licensing arrangements for amateur services.
* Licensing arrangements for scientific unassigned services.

Note that:

* The TLG is the first step in the process of reviewing or establishing a technical framework. The ACMA will use the outcomes of the TLG to publicly consult on proposed changes to, or new, relevant instruments that will form the extended 3.4 GHz band technical frameworks. TLG members will be able to provide comments on the technical frameworks both as part of the informal TLG and the subsequent formal public consultation processes.
* While the ACMA strives to achieve consensus with members, the final decision on the content of, or changes to, a spectrum or apparatus licence technical framework rests with the ACMA. This is particularly relevant in cases where consensus cannot be achieved on an issue, or advice from the TLG is not provided within a reasonable time frame.
* Where a statement is made such as “the AWL”, “the proposed AWL”, “the allocation” etc these are not to be considered formal decisions at this point. The decision to implement any technical framework is not made until the legislative instruments have been passed.

Revised near-term focus of the TLG

The scope of the TLG initially aimed to resolve issues relevant to all potential parts of the technical framework and possible allocation processes, in all spectrum spaces. After TLG discussion and feedback to the first version of the paper, it was apparent that it was not practical to resolve all issues sufficiently, in time for the possible allocation of AWL licences in remote areas, as per the timeline outlined in the following section.

Consequently, the focus of the TLG paper is on those aspects of the technical framework that will allow the remote area allocation to continue as planned. Views on other issues were still sought and most documented, to be further considered and resolved, at a later stage of this TLG. The relevant parts of this TLG paper have been identified to reflect what is essential, what has some impact and what is likely to have little impact on proposed remote area allocations.

In summary, the critical elements to define to enable a proposed remote area allocation are:

* Future PTP service arrangements
* Most aspects of the AWL technical framework:
  + Managing interference with WBB services operating under other AWLs.
  + managing co-channel interference with devices operating under spectrum licences in the frequency range 3400-3800 MHz in capital cities and variously defined regional areas (geographic boundary management essential for remote).
  + managing interference with FSS receive earth stations (earth receive apparatus licences – not FSS AWLs) in variously defined spectrum spaces in the frequency range 3400-4200 MHz.
  + managing interference with incumbent point-to-multipoint (PMP) services in variously defined spectrum spaces in the frequency range 3400-3700 MHz.
  + managing interference with legacy, incumbent and future PTP services operating in the frequency range 3580-4200 MHz (3.8 GHz PTP band)
  + coexistence with aeronautical radionavigation (radio altimeter) services operated in the adjacent 4200-4400 MHz band.
  + managing interference with radiolocation services operating between 3100 MHz and 3600 MHz.
  + managing interference with radiolocation services in the Northern Territory in the 3700-4200 MHz band authorised under clause 10 (7) of the Australian Radiofrequency Spectrum Plan (ARSP).
  + managing interference with amateur services operating in various spectrum spaces in the 3300-3400 MHz and in 3400-3600 MHz frequency ranges.
  + managing interference into earth station protection zones (ESPZ).
  + managing interference into the mid-west radio quiet zone in WA.
  + managing interference into the Woomera Protected Area (WPA) in SA.
  + Definition of restrictions to deploying services within 150 km of the General post offices (GPO)s of Darwin and Geraldton.
  + managing interference with class licensed devices operating under the low interference potential devices (LIPD) classes 71A (ground and wall penetrating radar), 80 (building material analysis transmitters) and 78(a) (ultra-wideband transmitters) operating across various ranges but at the least across the 3.1-4.8 GHz range.

It is expected that the AWL framework to support deployments in remote areas can be drafted in a way that requires no changes to the spectrum licensing (SL) framework, although some parts of the SL framework will be referenced and intended to apply to AWLs in remote areas.

To support AWL deployments in remote areas the following instruments and documents will need to be drafted:

* Amendments to the AWL LCD to include conditions for stations operating in the 3400-4000 MHz band.
* New AWL RALI (MS47) for the 3400-4000 MHz band.
* Consequential changes to RALI FX3, RALI FX19 and the suppression of RALI FX14 and RALI MS39.

The structure of some documents may need to change to enable the remote allocation process, including temporarily placing other elements of the 3.4-4 GHz technical framework in RALI MS47, pending finalisation of the overall technical framework. For example, any relevant clauses in the SL framework that are required to change, and are referenced by draft RALI MS47 or AWL LCD, may need to be temporarily placed in the AWL RALI MS47. The framework would then be modified in the lead-up to future allocations in other areas (following consultation).

Pending further legal advice, changes to other instruments may be required to support WBB AWL deployments in remote areas.

Note that, in remote areas:

* it is proposed that FSS earth stations will continue to be permitted to be licensed via earth receive apparatus licences.
* once AWL arrangements are in place new PMP licences would no longer be supported within the area defined by Australian Spectrum Map Grid.
* incumbent PMP licences would continue to be protected, as described in RALI MS47, but would be encouraged to move to the AWL licence type.

**Request for feedback**

TLG members were encouraged to focus their attention on the above issues that are essential for the development of remote area arrangements.

Telstra noted the risk of prioritising the technical framework for remote areas at the expense of addressing issues in other areas. Telstra questioned the priority given to development of arrangements for remote areas. Given the strong interest in accessing the band for WBB, the ACMA wants to commence making it available as soon as practicable, with the remote areas first as they are expected to be the least complicated to allocate.

# Outline of paper

This paper has been divided into discussion on the following issues:

* Miscellaneous issues and those out of the formal scope of the TLG.
* Point to point service arrangements.
* Coexistence between WBB and aeronautical radionavigation services.
* Area wide licensing framework/s.
* Extended 3.4 GHz band spectrum licensing technical framework.

~~Timeline~~

# Miscellaneous issues

Purpose

This section was introduced to discuss issues and views that are either outside of the main TLG scope or that span multiple elements of the scope.

Possible definitions of metro and major regional areas for AWLs (not essential for remote)

The intent of question 3 in the TLG paper version 1 was to get feedback to assist with the following other aspects of the wider project:

* Potentially identify regional areas where demand and desired density for WBB and other services under an AWL framework are significantly higher than other areas.
* Identify major regional and metro areas where new PTP and FSS receive (rx) services would not be allocated.
* Areas of higher WBB demand and density may lead to the ACMA considering different allocation methods for AWL in these areas, compared with remote and “other regional” areas.
* The intent would be that the same relevant geographic definition would be used for allocation of new possible AWL and SL spectrum segments across 3700-4000 MHz, as much as is practicable. Because of legacy arrangements, there are a variety of regional definitions in the 3400-3700 MHz range.

ACMA staff initially put forward a view to consider using Table 15 of [RALI SM26](https://www.acma.gov.au/publications/2021-05/instruction/rali-sm26-restrictions-apparatus-licensing-spectrum-licensed-spaces), to describe the possible metro and major regional areas for possible new AWL (and, incorrectly, SL) allocations across 3400-4000 MHz .

As indicated, this proposal was incorrect and was highlighted by members who were concerned by the potential for more fragmentation across the 3400-4000 MHz range. The proposal has not changed since the outcomes paper in that any spectrum to be proposed for spectrum licensing in the 3700-3800 MHz range should use the 3.6 GHz band process definitions of metro and regional areas.

Embedded below are Google Earth files that indicatively show more detail around the possible spectrum spaces under the original ACMA staff idea.

 

In its response to the initial ACMA staff view, AMTA supported the use of Table 15 from [RALI SM26](https://www.acma.gov.au/publications/2021-05/instruction/rali-sm26-restrictions-apparatus-licensing-spectrum-licensed-spaces) as a starting point but also supported including areas described in Table 23 of [RALI SM26,](https://www.acma.gov.au/publications/2021-05/instruction/rali-sm26-restrictions-apparatus-licensing-spectrum-licensed-spaces) Optus proposed using Table 23 as a starting point. Both requested any definition based on Table 23 be expanded to consider the propagation differences between the 3400-4000 MHz band and the 26 GHz band for which Table 23 was developed. This should include consideration that the areas be large enough so that any proposed s.145 device boundary criteria can be reasonable. Note that both tables also encompass existing metro areas. AMTA noted that, as a RALI SM26 based definition may affect some PTP services, that they could consider the omission of Armidale, Mildura and Shepparton from the “Major Regional” definition.

Figure : Table 15 from RALI SM26

Map

Description automatically generated

Figure : Table 23 from RALI SM26

Map

Description automatically generated

AMTA sought more information about the exact purpose of having such definitions. The intent of this section is to provide some clarity regarding the purpose of the definitions. The ACMA will also use the feedback provided in consultation processes associated with future phases of the allocation project in the band when considering the definitions of geographic areas.

AMTA also noted that the circulated KMLs, also above, did not include any proposed allocation of the small segment 3540 MHz to 3542.5 MHz (see definition of “Areas 265 MHz available” in the “possible AWL areas in 3400-4000 MHz” KML. This segment could be proposed for allocation by AWL or SL.

Views were sought on use of the 3540-3542.5 MHz segment or other minor adjustments to AWL/SL boundaries (low priority).

Further views were sought on overall geographic area definitions (low priority)

Satellite industry members were concerned about whether the remote area definition would affect sea area use (such as resource exploration platforms) by FSS services. Noting that licensing arrangements do not change for FSS services in these areas, they can continue to be licensed as FSS rx. However, for AWL (WBB) in remote areas, where the current proposal is to define licences by HCIS area, this does have implications in sea areas. The Australian Spectrum Map Grid, which defines the HCIS structure, only covers a relatively short distance from the Australian coastline. At this stage, the ACMA staff view is that WBB services outside of the ASMG be licensed as site-based point-to-multipoint services[[7]](#footnote-8) on an exemptional basis. The full definition of remote areas has been added to Appendix A for clarity.

The future of Embargo 78

Satellite operators expressed the view that Embargo 78 is prejudiced against FSS AL services and should therefore be lifted before AWLs are allocated. In response, the ACMA notes that the intent of the embargo is the opposite, in that the embargo restricts all services equally until new allocation arrangements are in place. For all proposed licensing arrangements that would be inconsistent with an embargo, we consider each exemption request on its merits at the time of application. In this context, we have sometimes allowed exemptions from Embargo 78.

Proposal for a new ESPZ

Intelsat, Inmarsat, Speedcast and SES proposed that a “central” ESPZ be established near Cooper Pedy to cover 3,400 – 42,500 MHz but especially 3,400-4,200 MHz. While out of the scope of the TLG, given that the introduction of WBB into remote areas may affect the utility of future FSS services, the ACMA proposes to consider its merits in the finalisation of the technical framework as it applies to remote areas. If no clear decision is reached then, we may preserve options by Embargoing new services, other than FSS rx, in the proposed ESPZ area, until one is made.

The pricing of AWLs

Satellite operators supported the development of indicative pricing for FSS rx AWLs (not applicable in remote areas). We anticipate providing more information about pricing in general and for possible FSS use cases as the ACMA progresses its work relating to the planning, licensing and allocation arrangements in metro and regional areas.

# Point-to-point service arrangements (essential for remote)

Background

ACMA planning decisions made for the 3400-4000 MHz band will restrict new point-to-point (PTP) services to the 3800-4200 MHz frequency range.

It was also the ACMA’s preliminary view that that it was desirable to make channelling arrangements (and use) flexible to maximize the utility of the remaining available channels. This was on the assumption that the existing channel plan remained the basis for the future.

There were other decisions to make in relation to PTP services that input was sought:

* Should existing PTP services in any spectrum space proposed for AWL be grandfathered?
* Should new PTP services in any spectrum space proposed for AWL be restricted, noting that the AWL framework could potentially be used for PTP services? For example, should new PTP deployments be restricted in capital cities and major regional areas?
* Views were sought on proposed changes and other ways to be able to use the remaining channels in the 3.8 GHz PTP band flexibly.

There were different views in the TLG about PTP services:

* Telstra initially proposed an alternate, 29 MHz channel bandwidth, PTP channel plan. While it was agreed that this be considered as an option, it was noted that it may complicate coexistence with a 10 MHz based WBB raster. Telstra subsequently indicated that equipment for this channel raster was unlikely to be available.
* Telstra highlighted that it uses PTP links in the 3.8 GHz band for the provision of USO services to King Island, Flinders Island and in eastern Victoria near Cann River, where It is not possible to retune these links as they are used as frequency redundancy.
* It was Digital Distribution Australia’s (DDA’s) view that any possible two-channel plans should be allowed to coexist and that existing services should have “reserved access” to retune to any new channel plan.
* There was a view from most TLG members who made comment, that an AWL framework was not efficient for PTP services.
* Some members were of the view that PTP services should be transitioned to AWL.

### PTP channel plan options

The restriction of new PTP, site-based apparatus licensed services, to 3800-4200 MHz was considered using two possible channel raster options:

1. maintain the existing raster, detailed in the [RALI FX03](https://www.acma.gov.au/publications/2019-09/instruction/rali-fx3-microwave-fixed-services) 3.8 GHz channel plan. New services will be restricted to channels 7 and 1’ through 7’; or
2. define a new 29 MHz channel raster based on one from ITU-R F.382-8.

Appendix C provided a comparison of the two channel plan options considered as well as possible changes to RALI FX03 if a restricted version of the existing raster was retained under option 1.

### ACMA staff preliminary views

It is the preliminary ACMA staff view that there should only be one channel raster used for new PTP services.

It is the ACMA staff preliminary view that new PTP site-based apparatus licensed services should not be licensed in major regional or metro areas across 3800-4000 MHz as PTP, also noting the proposal to clear PTP services from metro and regional areas in ranges identified for spectrum licensing after a 5-year reallocation period. This aligns with the proposed approach for FSS services, and, while not proposed to be optimised for PTP uses, the proposed AWL framework could be used. The band is intended for long haul routes and there are other, higher frequency, bands that can be used in these higher density areas. Any PTP services deployed under an AWL would be subject to the same restrictions (including any synchronisation fallback requirement) as other services. Licensees would need to consider this when deciding whether to deploy PTP services under an AWL.

The ACMA staff preliminary view is that incumbent PTP services, outside of proposed new SL spectrum spaces, can be grandfathered. However, new PTP site-based apparatus licensed services will be restricted to the 3800-4200 MHz band in remote and regional areas.

### Use of possible PTP Option 1

With feedback that Option 2 may not be practicable, the focus turned to how to practically transition to Option 1. To avoid the potential for conflicting licence applications, this needs to occur in a limited period before the allocation of AWLs and SLs in regional and metropolitan areas. PTP site-based apparatus licensees would also be free to retune/transition after these allocation processes are completed.

The ACMA staff preliminary view remains that, under the restricted Option 1 raster, licensees deploy site specific engineering solutions, such as greater RF filtering or vertical isolation as required, to coordinate between PTP services but are free from any site sense or duplexing requirements.

### Retention of PTP Option 2

While there was feedback that Option 2 may not be practicable, the ACMA preliminary staff view is that it prefers to retain this as an option at this point, and will further examine the practicalities of using PTP Option 2 and conduct formal technical framework consultation in 2022 including both PTP options.

### PTP Co-existence issues

Views were sought on coexistence issues between site based PTP and AWLs, including whether it may be appropriate to require the use of RF filters on new PTP systems. Feedback from members was that coordination requirements between PTP and AWLs, including registered receivers, needs to be fully documented. The ACMA has reviewed the requirements and made changes to both the draft RALI MS47 and proposed changes to RALI FX03, to ensure there is sufficient guidance to co-ordinate between PTP and AWL services.

# Coexistence between WBB and aeronautical radionavigation services

Background

The 2021 Outcomes paper noted that while the ACMA considered a 200 MHz guard band between WBB and radio altimeters should be sufficient, coexistence would be further considered in the development of detailed technical frameworks for WBB. This would provide further opportunity to identify any necessary technical conditions (likely only in the apparatus licensed segment of the band) to protect adjacent band radio altimeters.

Throughout the 3700-4200 MHz consultation process it was observed that some technical studies concluded that there was potential for interference from WBB to radio altimeters below 4000 MHz, but this should, according to those studies, already be occurring for existing WBB deployments in the 3.4 GHz (3400-3700 MHz) band (and potentially other bands below this). There has not been any incident of interference reported to either the ACMA or Airservices that can be definitively attributed to WBB services at this point. This may have resulted from:

* Assumed parameters of WBB and/or radio altimeter services in studies not representing actual deployments accurately enough.
* Inaccuracy of methods used to assess and study coexistence.
* Faults with radio altimeters not being routinely reported to regulators.

Recent developments

Work on the subject has been conducted in several countries, with some making decisions around mitigations appropriate for their own circumstances. Understanding the overseas studies and decisions, including what may be relevant to the proposed decisions here in the 3400-4000 MHz range, will assist in determining whether specific additional coexistence and interference mitigation methods are required and what they could be.

### Domestic

The Civil Aviation and Safety Authority (CASA) issued an Airworthiness Bulletin (AWB) in August 2021, concerning the potential interference of radio altimeter systems, and has updated it several times. As of publishing, the latest version is [Issue 4](https://www.casa.gov.au/files/awb-34-020-issue-4-potential-interference-radio-altimeter-systems). It describes the potential issue, includes a summary of recently reported failures on approach, and encourages operators to report failures and fault events.

### ICAO

The International Civil Aviation Organisation’s (ICAO) Frequency Spectrum Management Panel (FSMP) [WG/11](https://www.icao.int/safety/FSMP/Lists/Meetings/DispForm.aspx?ID=15&ContentTypeId=0x0100775D4F62D6A47C4B8092FD88410F3070) meeting was held in March 2021. There were several working and information papers presented to the meeting related to radio altimeter performance and coexistence with WBB like services under Agenda item 3.

ICAO FSMP [WG/12](https://www.icao.int/safety/FSMP/Lists/Meetings/DispForm.aspx?ID=16&ContentTypeId=0x0100775D4F62D6A47C4B8092FD88410F3070) was held in October 2021 where, again, radio altimeter issues were covered under Agenda item 3. The draft report indicated that the Radio altimeter Standards and Recommended Practices (SARPS) job card was reviewed and agreed to review the text of the job card and for participants to see if generic guidance could be developed to assist aviation authorities to analyse potential 5G impacts given local implementations.

Relevant input documents to the meeting included a summary of the Status on replanning the 3700–4200 MHz band in Australia (Airservices Australia) and a presentation on the Interference Susceptibility Evaluations of Pulsed Radio Altimeters Due to 5G Mobile Base Station Signal (Electronic Navigation Research Institute, Japan). The latter recorded the test results differences between these tests with two sample units of the same model as tested by the Ministry of Internal Affairs and Communications (MIC).

### The European Union

During the January 2021 European Electronic Communications Committee (ECC) Project Team 1 (PT1) (IMT matters) [meeting](https://cept.org/ecc/groups/ecc/ecc-pt1/client/meeting-documents/?flid=28709), a new work [item](https://cept.org/Documents/ecc-pt1/62871/ecc-pt1-21-086_annex-viii-12_draft-new-wi-radio-altimeters) concerning radio altimeters was developed and submitted to the ECC for approval.

ECC PT1 meetings #68 and #69 were held in April and September 2021. Documents relevant to radio altimeters include [ECC PT1(21)117](https://www.cept.org/Documents/ecc-pt1/64066/ecc-pt1-21-117_france-wi-5g-radioaltimeters), [ECC PT1(21)115](https://www.cept.org/Documents/ecc-pt1/64064/ecc-pt1-21-115_eurocontrol-icao-state-letter-on-potential-safety-concerns-regarding-interference-to-radio-altimeters), [ECC PT1(21)184](https://www.cept.org/Documents/ecc-pt1/65941/ecc-pt1-21-184_norway-results-of-the-preliminary-test-of-compatibility-between-mfcn-operating-in-3400-3800-mhz-and-radio-altimeters-operating-in-4200-4400-mhz), [ECC PT1(21)188](https://cept.org/Documents/ecc-pt1/65959/ecc-pt1-21-188_gsa-mfcn-characteristics-for-wi-on-radio-altimeters), [ECC PT1(21)192](https://www.cept.org/Documents/ecc-pt1/65970/ecc-pt1-21-192_france-radioaltimeter), [ECC PT1(210234 ANNEX VIII-14](https://cept.org/Documents/ecc-pt1/66761/ecc-pt1-21-234-annex-viii-14_working-doc-on-ecc-report-on-radio-altimeters). The latter is a skeleton working document for an EC report on the Compatibility between WBB operating in 3400-3800 MHz and Radio Altimeters (RA) operating in 4200-4400 MHz. The draft meeting [minutes](https://cept.org/ecc/groups/ecc/ecc-pt1/client/meeting-documents/file-history/?fid=66780) noted the lack of progress in obtaining accurate radio altimeter parameters and what to do in their absence.

### The United States of America

In the United States (US), there has been ongoing discussion about the [RTCA Report 274-20](https://www.rtca.org/wp-content/uploads/2020/10/SC-239-5G-Interference-Assessment-Report_274-20-PMC-2073_accepted_changes.pdf), which was referenced in the 3700-4200 MHz Outcomes paper. Some of the submissions on the issue were shared with the TLG, principally from the Cellular Telecommunications and Internet Association ( [CTIA](https://www.ctia.org/)) and the Radio Technical Commission for Aeronautics ( [RTCA](https://www.rtca.org/)). In short, there is no agreement from the CTIA that the RTCA report accurately represents the potential for interference from 5G services into radio altimeters.

In November 2021, the Federal Aviation Administration (FAA[[8]](#footnote-9)) release a special airworthiness [bulletin](https://rgl.faa.gov/Regulatory_and_Guidance_Library/rgSAIB.nsf/(LookupSAIBs)/AIR-21-18?OpenDocument) (SAIB). In summary, it recommends that aviation manufacturers and operators provide radio altimeter design, deployment and usage information to federal authorities so that altimeters can be assessed to guide risk assessment of whether further mitigation is warranted above that stated in the SAIB. It requests altimeter and aircraft manufacturers provide information and conduct their own testing to determine appropriate aircraft operational restrictions. Operators are requested to manage passenger electronic devices and potential degradation of radio altimeter capabilities, ahead of a staged WBB deployment from 5 December 2021, initially restricted to 46 markets and to the 3700-3800 MHz range.

On 4 November 2021, US carriers Verizon and AT&T [announced](https://www.reuters.com/article/usa-communications-air-safety-idCNL1N2RV1T0) that they would delay their rollouts until 5 January at the request of the Transportation department. On 25 November 2021, they subsequently [advised](https://ecfsapi.fcc.gov/file/11241848723664/2021-11-24%20ATT%20Verizon%20Letter%20FINAL.pdf) the FCC that they would voluntarily limit 5G base station powers, expiring July 6 2022 unless credible evidence to warrant it’s continuation emerges.

The temporary limits were:

* limiting base station effective [[9]](#footnote-10)isotropic radiated power (EIRP) to no more than the lesser of: (a) 62 dBm/MHz or (b) 48 + 20 × log10(1/sin(Ɵ)) dBm/MHz, where Ɵ is the elevation angle above the horizontal plane of the base station antenna.
* A series of limits near public airports with paved runways and heliports:
* 1. Limit C-band power flux density (“PFD”) to a maximum of -30 dBW/m2 /MHz within the horizontal plane surface 300 feet above the established airport elevation described by swinging arcs of 1 nautical mile (6,076 feet) radius from the center of each end of the primary surface of each paved runway and connecting the adjacent arcs by lines tangent to those arcs.
* 2. Limit C-band PFD to a maximum of -31 dBW/m2 /MHz at the surface of all paved runways, within the boundaries of the runway edges and runway threshold lines.
* 3. Limit C-band PFD to a maximum of -19 dBW/m2 /MHz at the surface of all paved aprons and paved taxiways (i.e., movement and non-movement areas).
* 4. Limit C-band EIRP from 5G base stations to no more than 37 dBm/MHz in a rectangular area centered on the runway centerline with a length extending to 1,000 feet beyond the runway threshold at each end of the paved runway, and laterally from the extended centerline, up to and including 600 feet on either side.
* 5. Limit C-band EIRP from 5G base stations to no more than 55 dBm/MHz EIRP in the area from 600 feet laterally up to and including 1,000 feet laterally on either side of the runway centerline extended to 1,000 feet beyond the runway threshold at each end of the runway.
* 6. Base stations within the Final Approach Box (“FAB”), as defined below, at either end of all paved runways, will:
  + 6.1 Use C-band antennas that do not exceed a centerline height equivalent to a 50:1 approach surface above the touchdown zone elevation beginning at the primary surface, where the touchdown zone elevation is the highest elevation along the first 3,000 feet of the runway at that end of the runway and the primary surface is a surface longitudinally centered on a runway that extends 200 feet beyond each end of that runway.29
  + 6.2 Limit C-band EIRP above the horizon to no more than the lesser of: (a) 62 dBm/MHz or (b) 39 + [0.005788 × (Dm - 305m)] + [20 × log10(1/sin(Ɵ))] dBm/MHz, where Dm is the horizontal distance from the base station to the runway threshold and Ɵ is the elevation angle above the horizontal plane of the base station antenna.
  + 6.3 For purposes of 6.1 and 6.2, the FAB is defined as an isoceles trapezoid with its short side (top) orthogonal to the runway centerline (extended beyond the runway threshold), centered on the extended runway centerline, with the top positioned 1,000 feet from the runway threshold away from the runway, with a height of 5,100 feet, and with a long side (bottom) that is 3,772 feet.

In addition, for all public use Heliports, limit C-band PFD to no more than -16 dBW/m2/MHz on the primary surfaces of helipads.

Subsequent to the Verizon and AT&T letter, the Aerospace Industries Association (AIA) [wrote](https://ecfsapi.fcc.gov/file/1206159800868/Aviation's%20Safety%20Proposal%2012.6.pdf) to the FCC on 6 December 2021, with their own proposal for safety measures, considering that the Verizon and AT&T proposals were “inadequate and far too narrow to ensure the safety and economic vitality of the aviation industry”. It retains some elements of the Verizon/AT&T proposal but adds a number of different elements in order to “preclude the need for an AMOC (Alternate Means of Compliance) and provide compatibility with relevant user category 1 (large air transport / cargo) platforms” (and a subset of Category 2 regional commuter jets/turboprops).

It defines limits on defined “protected services” and also, to better cater for helicopters, it also modifies the Verizon/AT&T general EIRP limit curve.

The Aerospace Vehicle Systems Institute (AVSI) also released on 6 December 2021 to the FCC a number of documents related to “Derivation of Radar Altimeter Interference Tolerance Masks” that were summarised in the RTCA report. They can be found through the [filings](https://www.fcc.gov/ecfs/search/filings?proceedings_name=18-122&sort=date_disseminated,DESC) for the US C-band project.

### France

From information contained in the ICAO FSMP meeting WG11 input [document](https://www.icao.int/safety/FSMP/MeetingDocs/FSMP%20WG11/IP/FSMP-WG11-IP03_5G%20vs%20RA%20Actions%20taken%20in%20France%20to%20mitigate%20interference_r1.doc), mitigations in France included, in the range 3400-3800 MHz:

No operation above the horizon (removed in Mar 2021)

Operators must take measures to avoid grating lobes as far as practicable

Protection Zones around IFR aerodromes, these zones do not apply if the operator provides calculations that show that radio altimeters are protected

Safety zone:

Applied to all IFR aerodromes and some helicopter platforms

Extends 910 m from the width edge of the runway and 2100 m from the ends where 5G base stations not allowed to transmit

To protect where the aircraft is at or below 61 m

Precaution zone:

Either side of the safety zones

To protect where the aircraft is below 305 m

5G base stations are coordinated (there isn’t further information on what this means)

800 m wide and 6100 m from the ends of the exclusion zone.

Studies were based on the RTCA studies, including the aviation industry 6 dB “safety factor”. Given the ACMA comments on the RTCA report in the Outcomes paper, these mitigations are likely to be conservative. France considered that the unwanted emission environment in Europe is different from that in the USA, and consequently decided not to consider the unwanted emission assessment of the RTCA report.

### Belgium

The Belgian regulator, the Institute for Postal Services and Telecommunications (IBPT), [consulted](https://www.bipt.be/file/cc73d96153bbd5448a56f19d925d05b1379c7f21/91bb4c06ca66065139c768b8107dcb05ec8a399f/Consultation_conditions_techniques_operationnelles_brouillages_prejudiciables_bande_frequences_3400-3800_MHz.pdf) [[10]](#footnote-11) in April 2021 on a draft decision on revised technical conditions for the 3400-3800 MHz band. It is silent on coexistence with radio altimeters.

### Canada

The Canadian regulator, the Department of Innovation, Science and Economic Development (ISED), made [decisions](https://www.ic.gc.ca/eic/site/smt-gst.nsf/eng/h_sf09570.html), updated after consultation, in June 2021 about introducing WBB into the 3700-3980 MHz and in 3450-3650 MHz frequency ranges. They have been [monitoring](https://www.ic.gc.ca/eic/site/smt-gst.nsf/eng/sf11692.html) the radio altimeter issue in the latter range and extended a [consultation](https://www.ic.gc.ca/eic/site/smt-gst.nsf/eng/sf11736.html) on revised proposed technical operations. ISED conducted their own studies and looked at the international situation. After review, they proposed an approach, similar to France, of [exclusion](https://www.ic.gc.ca/eic/site/smt-gst.nsf/eng/sf11725.html) zones and [protection](https://www.ic.gc.ca/eic/site/smt-gst.nsf/eng/sf11725.html) zones, the latter with a specified PFD limit to apply. This is initially in the range 3450-3650 MHz, and they are still [consulting](https://www.ic.gc.ca/eic/site/smt-gst.nsf/eng/sf11757.html) on 3650-3980 MHz, but are proposing to extend the mitigations up to 3900 MHz. Indoor stations are exempt from the mitigation requirements. To further manage issues with military and emergency service helicopters, with insufficient information of their altimeter fleets at this time, ISED has proposed a national antenna down-tilt/vertical scan requirement. They are currently scheduled to auction the 3800 MHz band in Q1 2023.

Studies used the ITU-R M.2059 criteria, including protecting the full receiver noise floor, regardless of the likely received level from the radio altimeter transmitter. The scenario studied was similar to the static case in the first ACMA study and did not use beamforming for the AAS case. Consequently, it is likely to be conservative compared with practical radio altimeters and WBB deployments using AAS.

Extracts concerning restrictions:

General restrictions

Outdoor non-AAS and AAS fixed point-to-point and point-to-multipoint stations operating with a positive angle with reference to the horizon (i.e. above) shall not exceed a maximum EIRP of 62 dBm per radio frequency (RF) channel.

Outdoor non-AAS and AAS base stations are required to operate their antenna systems at a negative elevation angle with reference to the horizon. Operators of AAS base stations are prohibited from vertical scanning (i.e., directing energy from antenna elements to form beams) at positive elevation angles with reference to the horizon.

No licensee may operate a station within an exclusion zone.

The provisions do not apply to indoor stations.

Exclusion zone definition

The exclusion zones are rectangular areas around airport runways where automated landing is authorized in Canada. The exclusion zones extend 910 metres on either side of the runway edge and 2100 metres from the runway thresholds.

Protected zone definition

The protection zones are rectangular areas that extend from the edge of the exclusion zones. For each runway there are two protection zones, each extending from either end of an exclusion zone. A protection zone is 1000 metres wide and extends 6100 metres from each end of an exclusion zone.

Technical and operational requirements in protection zones

All outdoor fixed (wireless access) and base stations operating within the protection zones must not exceed a PFD limit of -38.80 dBW/m2 in 1 MHz at a height of 91.44 metres (300 feet) above ground. The PFD limit shall be satisfied 100% of the time and be evaluated for all combinations of elevation and azimuth angles above the horizon relative to the location of the fixed or base station.

In cases of overlap between the exclusion zone and the protection zone, the exclusion zone takes precedence.

### The United Kingdom 3.8-4.2 GHz band

The first ACMA study included comments on the Office of Communications (OFCOM) study and the proposed operating parameters in the United Kingdom (UK). They determined that the low and medium power deployment model for WBB in the band in the UK did not require mitigations.

### Japan

From various references:

[The compatibility study between 5G base stations and radio altimeters in Japan and update of the result of measurement campaign](https://www.icao.int/safety/FSMP/MeetingDocs/FSMP%20WG11/WP/FSMP-WG11-WP30_5GJapan.docx)

[01.pdf (soumu.go.jp)](https://www.tele.soumu.go.jp/resource/j/equ/mra/pdf/30/e/01.pdf) page 12

<https://www.5gamericas.org/wp-content/uploads/2021/07/Mid-Band-Spectrum-and-the-Co-Existence-with-Radio-Altimeters.pdf>

* <https://www.soumu.go.jp/main_content/000582446.pdf> (in Japanese)

It is concluded that the following mitigations were proposed to be implemented:

A 100 MHz guard band from the 4200 MHz lower edge of the radio altimeter band.

For stations operating 100 MHz adjacent to the guard band (4000-4100 MHz)[[11]](#footnote-12) there is a 200 m separation of high power 5G base stations from an aircraft approach route, which is an area of about 1 km separation from an airport.

* For helicopter aerodromes, 5G base stations should have a separation distance of 50m for macro-cell and 20m for small-cell stations.
* More stringent base station spurious emissions were proposed than typical in 3GPP specifications. For stations between 4000 and 4100 MHz, base stations in this frequency range are required to reduce unwanted emissions into the radio altimeter band to -39 dBm/MHz, or -46 dBm/MHz for base stations with an EIRP of 25 dBm/MHz or less.

Studies used radio altimeter parameters from ITU-R M.2059, considering different base station densities in different areas and used a statistically derived “beam forming antenna envelope” to consider potential interference from base stations. It is expected that the study is more accurate for the overload mechanism than the French or Canadian cases, but still potentially conservative due to the “envelope” approach. For the spurious case, use of the ITU-R M.2059 radio altimeter receiver noise floor protection to derive spurious emission requirements means it is likely conservative for that case.

ACMA studies on coexistence

In preparation for the TLG, ACMA staff reviewed existing coexistence studies and conducted further studies, examining the current WA WBB deployments in the 3.6 GHz band. These studies still used simplifying assumptions around active antenna systems (AAS) and did not model the effects of mobile user equipment (UEs). The studies re-confirmed that:

* Use of AAS for WBB deployments may significantly reduce the modelled potential for interference.
* Studies are very sensitive to the assumed radio altimeter front end filter and to the assumed vertical radiation pattern of WBB base stations.
* Existing deployments in the 3.6 GHz band may not be expected to cause significant interference to radio altimeters if they are using AAS and some effective average down tilt.

These studies are included at *Appendix B: Wireless broadband and radio altimeter compatibility study*.

* Feedback on the studies was sought to help assist in developing appropriate mitigations from interference from WBB to radio altimeters.

The ACMA received feedback on the Appendix B studies:

* Views on modelling WBB base stations more accurately, including recent ITU-R study group work in the area
* Views on other aircraft operational scenarios that should be modelled
* Views and input on more accurate modelling of radio altimeters that are applicable in Australia
* Views that, due to discussions around factors affecting radio altimeter assumed loop loss, that the receiver desensitisation mechanism should be considered in studies.

The ACMA took feedback and completed new studies*.*

The RA-CG expressed concern that the study did not examine all scenarios that may be applicable in remote areas and “*seeks to expand consideration beyond just airports and landing locations to areas where there is an identified major risk to aviation safety, such as Police and Emergency Services and Defence low level operations”*. The ACMA has previously sought information of these scenarios to be able to model them but was not provided with sufficiently detailed information to be able to develop study models for them.

The studies were further developed and are finalised in an updated *Appendix D: Updated Wireless broadband and radio altimeter compatibility study.*

Possible methods to manage coexistence

Noting that in the 2021 Outcomes paper stated that while the ACMA considered a 200 MHz guard band between WBB and radio altimeters should be sufficient, coexistence would be further considered in the development of detailed technical frameworks for WBB. This would provide the opportunity to identify any necessary technical conditions (likely only in the apparatus licensed segment of the band) to protect adjacent band radio altimeters.

The ACMA staff view is that complete resolution of this issue may not be required to support defining the allocation proposals of AWLs in remote areas. However, if possible, it would be desirable to identify if any additional mitigation management arrangements (beyond the 200 MHz guard band) before any AWLs are issued. It was the view of aviation stakeholders that the issue be fully resolved before any allocation of AWLs in the band.

While the ACMA has not formed a view on whether any additional mitigations beyond the 200 MHz guard band are required, the following possible methods, in isolation or in combination, were identified to the TLG to be initially considered to manage coexistence between WBB and radio altimeters, if required, in addition to the proposed 200 MHz guard band:

1. Implementing suitable local frequency guard bands and/or case-by-case frequency separation with affected services. This could include imposing a larger guard band within a certain distance of airports.
2. Geographically restricting WBB services around airports and landing locations where radio altimeters are used.
3. Placing other technical deployment restrictions on WBB deployments near airports. This could include height restrictions, PFD or EIRP limits around airports, and/or limits on the directivity of WBB radiation patterns.
4. Consider adopting stricter unwanted emission limits for WBB in the 4000-4200 MHz band. Given that the predominant interference mechanism may be altimeter receiver overload, rather than receiver desensitisation, this may not be sufficiently effective.
5. Not specifying any restrictions, other than “no interference” clauses in relevant instruments and licences. This could include some guidance on how to achieve this, such as required coordination distances around airports and the provision of notional radio altimeter parameters.

Feedback received on managing coexistence between WBB and radio altimeters was provided by the TLG:

* There was differing views on which method would be preferrable, but there was no support for method E, and the radio altimeter coordination group (RA-CG) preferred method C.
* The RA-CG considers that additional mitigations are required, including in remote areas, and wants those mitigations to be consistent with international models, appropriate and covering a range of potential operational aircraft scenarios, beyond those modelled in the ACMA studies.
* There was general agreement that work to better quantify the technical restrictions potentially required was necessary and the ACMA would update studies to present possible technical parameter-based mitigation methods.
* Telco sector members did not agree that there was sufficient evidence that any mitigations above the 200 MHz guard band proposed are required.
* Telstra proposed that, if possible, a wider temporary guard band (3800-4000 MHz) could be used in remote areas until the issue is resolved. They also asked that antenna downtilts be considered instead of restricted antenna heights if such a mitigation was proven to be required.
* AMTA recognised the need to progress with remote areas but proposed that any conservative approaches should only apply to the first release of AWLs and be temporary.
* Ericsson suggested there were no need for additional mitigations in remote areas, but other areas needed further study. However, any additional mitigations should be temporary until deployed fleets of radio altimeters have improved.

Potential draft approaches to manage coexistence

Based on TLG feedback, subsequent revision of ACMA studies and a review of international approaches, ACMA staff have identified two broad approaches that it considers appropriate seek to feedback on, to manage coexistence initially in remote areas on an interim basis.

The inclusion of the approach below that includes additional mitigations is not an indication that the ACMA or ACMA staff have formed a view that additional mitigations are necessary. Rather, it is included in this version of the TLG paper to expose a potential framework for additional mitigations if these are deemed necessary to allow stakeholders to consider possible approaches. Importantly, if additional mitigations are deemed necessary, they do not necessarily have to be of the exact nature of the approach below – mitigations could be a subset of these, for example, or use alternate methods of definition.

Being interim in nature, any licences issued would need to include a clear indication that the technical framework may change if or when necessary to take into account additional information relevant to the coexistence scenario.

For both approaches, the rest of the technical framework as currently proposed, would apply, including in-band and out-of-band power limits.

1. Approach A: No additional mitigations above the proposed 200 MHz guard band nationwide.
2. Approach B: In remote areas above 3700 MHz:
   1. An exclusion zone where WBB base stations cannot be deployed, equivalent to the French and Canadian exclusion zone, i.e. the exclusion zones extend 910 metres laterally either side of a runway edge of a paved runway and 2100 metres beyond the runway thresholds.
   2. A restricted zone applies, the same width as the exclusion zone, but extending another 2100m beyond the ends of the exclusion zone.
   3. No AWL transmitter devices can be registered in any exclusion zone.
   4. In restricted zones, non-AAS transmitters cannot be registered unless the peak EIRP is no more than 41 dBm/MHz and they are required to operate their antenna systems at a negative elevation angle with reference to the horizon.
   5. In restricted zones, non-AAS transmitters cannot be registered unless the peak total EIRP of unwanted emissions is no more than -3 dBm/MHz in the 4200-4400 MHz range.
   6. In restricted zones, AAS transmitters cannot be registered unless the peak EIRP is no more than 58 dBm/MHz and they are prohibited from vertical scanning (i.e. directing its highest gain above the horizontal plane when forming beams) at positive elevation angles with reference to the horizon.
   7. For all heliports, limit PFD to no more than -16 dBW/m2/MHz on the primary surfaces of their helipads.
   8. Outside of exclusion and protection zones, non-AAS transmitters cannot be registered if the peak EIRP exceeds 53 dBm/MHz.
   9. Outside of exclusion and protection zones, AAS transmitters cannot be registered if the EIRP exceeds 62 dBm/MHz.
   10. Further consideration of whether restrictions on out-of-band emissions need to be made in restricted zones or more broadly.

Further work is likely to be required to define the airports and heliports that are required to support radio altimeter use.

Example of zones as they could apply to the Sydney parallel runway:

Map

Description automatically generated

### Summary of how possible Approach B mitigations manage typical use cases

Table 1 below summarises how each possible approach B mitigation manages typical uses cases.

Table 1: summary of possible Approach B mitigations vs use case

|  |  |  |  |
| --- | --- | --- | --- |
| **Approach B clause** | **Around airports** | **Around heliports** | **Other areas** |
| B.1 | ✓ |  |  |
| B.2 | ✓ |  |  |
| B.3 | ✓ |  |  |
| B.4 | ✓ |  |  |
| B.5 | ✓ |  |  |
| B.6 | ✓ |  |  |
| B.7 |  | ✓ |  |
| B.8 |  | ✓ | ✓ |
| B.9 |  | ✓ | ✓ |
| B.10 | ✓ | ✓ | ✓ |

### Reasons for identifying Approach A

* ACMA staff view the Japanese study as the most accurate overseas for the overload mechanism. Japan is not proposing any exclusion zones for frequencies below 4000 MHz. The laboratory tests on some radio altimeter models, in ICAO FSMP-WG/11 WP/30, support this, with very high-power levels being required with a 200 MHz guard band before altitude errors occur.
* The ACMA staff view is that the Japan study is still conservative with respect to the spurious mechanism, as it protects the receiver noise floor, which is not necessary for most use cases. This is supported by the revised ACMA study that indicate that mitigations for the spurious mechanism are likely not necessary in most cases. The laboratory tests on some radio altimeter models in ICAO FSMP-WG/11 WP/30 support that there is likely less potential than ITU-R M.2059 would suggest, noting “In comparison to the worst case of Recommendation ITU-R M.2059[4], the measured threshold values are higher than -117 dBm/MHz.”.
* There have been no confirmed reports of interference to radio altimeters that can directly attributed to WBB services in the wider 3400-4000 MHz band, either in existing Australian deployments or overseas, of which ACMA staff are aware.
* Field trials, reported in the ECC inputs in the European Union section, while constrained, did not observe any interference.

### Reasons for identifying Approach B

* Some administrations overseas that are proposing macro deployments are proposing forms of mitigations such as exclusion or restricted zones and/or (equivalent isotropic radiated power (EIRP)/Power flux density (PFD) limits. Given there is still uncertainty about potential coexistence, aligning with overseas approaches may be prudent, especially in the international flight context.
* The revised ACMA study, Attachment D, indicates potential for overload interference from unwanted emissions for non-AAS with some radio altimeter models, and marginal for AAS. The sensitivity analysis in the study indicates that a mitigation involving restricting power in the vicinity of airports, for the use case examined, is likely the most appropriate mitigation as antenna height and downtilt restrictions do not seem as effective.
* As the revised study is based on existing deployment locations, it cannot be extrapolated to all cases. Consequently, the ACMA staff view is that it may be prudent to propose an exclusion zone as part of Approach B, at least as a temporary measure, while noting our previous statement on the Canadian studies that their exclusion zone definition were based on are likely too conservative.
* The reason to restrict mitigations to above 3700 MHz is based on the lack of confirmed evidence for any radio altimeter coexistence issues with the existing Australian WBB deployments below 3700 MHz.

The ACMA will include these two approaches in the technical framework to be publicly consulted on in Q1 2022. Submissions to that consultation, as well as any continuing work within the TLG, will inform the ACMA’s decision on measures for remote areas, on an interim basis, at that time.

The ACMA will also consider further the issue of potential interference from unwanted emissions . The preliminary ACMA staff view is that the ACMA studies are conservative in this aspect and the actual potential for interference is low.

### How to incorporate possible Approach B mitigations into the technical framework

The ACMA staff preliminary view was that any additional mitigations identified that may be required could be specified in an updated s.145 instrument for spectrum licensed services and in the AWL LCD for AWL services. The RA-CG provided feedback that they should be attached as licence conditions for AWL to be flexible. This is likely not to be very flexible, as the conditions would be attached for the whole licence period. To enable flexibility, at this time, the ACMA staff preliminary view is to:

* Describe any required mitigations in RALI MS47
* Reference RALI MS47 within the AWL LCD.

This will enable the ACMA to change the mitigations relatively quickly, yet they will be enforced by the AWL LCD. For the versions attached along with this TLG paper, the possible Approach B mitigations have not been included.

Note that, at this stage, WBB unwanted emission limits and their frequency boundaries have been drafted using the existing 3.4 GHz spectrum licensing technical framework as a basis, modified to reflect the WBB use of part of 3GPP NR band N77 (upper limit of 4200 MHz). Consequently, the out-of-band/spurious domain boundary has been proposed to be at 4240 MHz, in-line with 3GPP specifications. This is proposed to be able to support the use of standard 3GPP N77 transmitting equipment. This can be reviewed, as required, to sufficiently protect radio altimeter receiver sensitivity as further work is done and the mechanism better understood.

Feedback during the TLG was that the specification of these limits needed to change for non-AAS systems, from a TRP based limit to a per-antenna port limit, to align with 3GPP. The ACMA has updated the proposed limits in the AWL LCD and will propose to update the spectrum licensing technical framework at the appropriate time for non-remote areas.

### Future progress on WBB and Radio Altimeter coexistence

The ACMA recognises that there is still no general agreement on the issue. Consequently, we intend to hold a meeting of the TLG radio altimeter working group (RA-WG) only, in January 2022 to provide an opportunity for further feedback. We do not intend to seek formal written feedback due to restricted timeframes. Feedback at the TLG RA-WG meeting will be considered by the ACMA in finalising its formal consultation package where appropriate options are expected to be included in the draft technical framework for consultation.

If additional mitigations are included in the technical framework these will be reviewed as necessary as knowledge on the issue improves. The technical framework would then be modified for future allocations, where formal consultation will again occur.

# Area Wide Licensing framework

Background

In January 2020, the ACMA made a new apparatus licence type – an ‘area-wide apparatus licence’ (AWL).[[12]](#footnote-13) An AWL authorises the operation of devices within a defined area and frequency, like the operation of spectrum licence. As per the *further implementation consideration* section it was stated that an AWL framework will be considered in those parts of the 3400-4000 MHz band that are not subject to spectrum licensing. It is proposed to:

* optimise the proposed AWL framework for LA WBB and FSS, at least in metro and yet to be defined major regional areas, but not PTP services. The framework could be used by PTP if desired.
* conduct further work on whether the AWL framework should be optimised to include FSS in remote and regional areas outside of the to be defined major regional areas.

While an AWL may be optimised for a particular type of use, any technology or service type can be deployed within the licensed area provided if it fits within the envelope of the technical framework.

Preliminary view

As stated in the outcomes paper, the ACMA’s preliminary view is that any AWL technical framework should align, as much as is practicable, with the 3.4 GHz spectrum licensing technical framework. However, the ACMA view is also that the aim of any AWL technical framework, and its relationship with the spectrum licensing technical framework, is that together they should support as wide a range of WBB applications and use cases as practicable.

Coexistence with other services

Devices operated under a potential extended 3.4 GHz band AWL would need to coexist not only with other AWL services, but also with services operating under another apparatus licence type or a spectrum licence, in and adjacent to, the extended 3.4 GHz band. The extended 3.4 GHz band AWL technical framework would need to include provisions to manage coexistence with the following:

* services operating under other AWLs:
* WBB in the frequency range 3400-4000 MHz (essential for remote AWLs).
* Primary FSS receive earth stations in the frequency range 3700-4000 MHz (FSS AWLs are only being considered in metropolitan and major regional areas, so this is not essential for finalising the remote AWL case).
* devices operating under spectrum licences in the frequency range 3400-3800 MHz in capital cities and variously defined regional areas (geographic boundary management essential for the remote AWL case).
* incumbent and new FSS receive earth stations in variously defined spectrum spaces in the frequency range 3400-4200 MHz (essential for the remote AWL case).
* incumbent PMP services in variously defined spectrum spaces in the frequency range 3400-3700 MHz (essential for the remote AWL case).
* legacy, incumbent and future fixed point-to-point services operating in the frequency range 3580-4200 MHz (3.8 GHz PTP band) (essential for the remote AWL case).
* aeronautical radionavigation (radio altimeter) services operated in the adjacent 4200-4400 MHz band. (desirable but potentially not essential for the remote AWL case)
* radiolocation services between 3100 MHz and 3600 MHz (essential for the remote AWL case).
* radiolocation services in the Northern Territory in the 3700-4200 MHz band authorised under clause 10 (7) of the ARSP (essential for the remote AWL case).
* amateur services operating in various spectrum spaces in the 3300-3400 MHz and in 3400-3600 MHz frequency ranges. (essential for the remote AWL case)
* earth station protection zones (essential for the remote AWL case).
* the mid-west radio quiet zone in WA (essential for the remote AWL case).
* The Woomera Protected Area (WPA) in SA (essential for the remote AWL case).
* Within 150 km of the GPOs of Darwin and Geraldton (essential for the remote AWL case).
* class licensed devices operating under the LIPD classes 71A (ground and wall penetrating radar), 80 (building material analysis transmitters) and 78(a) (ultra-wideband transmitters) operating across various ranges but at the least across the 3.1-4.8 GHz range (essential for the remote AWL case).

This chapter outlines proposed coexistence arrangements with the services listed above and other relevant coexistence issues. As much as is practicable, it is proposed to use the same methods and parameters in the existing 3.4 GHz spectrum licensing technical framework.

Possible approaches to being able to accommodate a wide range of WBB applications, with different desirable TDD frame structures, are discussed in the following *Revised view about coordinating between WBB services (not essential for remote)* section.

The following draft documents to describe a potential technical framework are included as Appendices, but should not be considered final at this stage:

* Appendix E: Draft updated AWL Licence Condition Determination
* Appendix F: Draft RALI MS47: Frequency coordination and licensing procedures for Area-Wide Licence (AWL) in the 3400–4000 MHz band

TLG members expressed a range of views on the draft AWL LCD and Draft RALI MS47:

* Telco sector members indicated that the limit for out-of-band and spurious emissions for non-AAS systems was at odds with the 3GPP method and requested that the limits apply “per antenna port” rather than to Total Radiated Power” (TRP). We have considered this view and revised the draft LCD to reflect a per port limit. Note that this has the potential to increase out-of-band emissions into the radio-altimeter band, but in practice real values are not expected to increase, given the 200 MHz frequency separation from possible WBB services. (i.e. while the out-of-band domain will extend to 4240 MHz, the normal behaviour of intermodulation shoulders from transmitters mean that levels at frequencies above 4200 MHz are expected to be low).
* Telco sector members expressed a similar view that in-band limits for non-AAS systems should also align with 3GPP and change to a per transmitter limit. Given the more static antenna pattern behaviour of non-AAS systems, and no limit on their size or complexity, the ACMA staff preliminary view is that this unreasonably increases the risk of interference as it may lead to high static EIRPs. Consequently, we propose to maintain the TRP based in-band limit for all systems.

## Revised view about coordinating between WBB services (not essential for remote)

### Consideration for multiple use cases and unsynchronised use

It is a developing view in the TLG and by ACMA staff that:

* A variety of wider area WBB and more localised WBB use cases need to be supported in the AWL and wider technical framework.
* It may not be practicable for a fallback synchronisation scheme for AWL to be the same as that for any adjacent SL framework.
* Different local area use cases are likely to require different TDD frame structures and the ability to use different TDD frame structures should be supported.

This has the following likely implications for the technical framework:

* An acceptable means to manage interference between SL and AWL spectrum spaces needs to be developed that does not rely on a common fallback synchronisation scheme.
* A means to manage interference between AWL users in close geographic or frequency proximity using different TDD frame structures could be considered for some areas.

It is the ACMA staff current preliminary view that this revised view generally only needs to be considered in metropolitan and major regional areas. The expected higher availability of spectrum and lower demand in remote and other regional areas means that the fallback synchronisation method currently proposed, plus a potential “preferred priority assignment scheme” can sufficiently meet the expected variety of use cases in these areas. For geographic boundaries between AWL and SL spectrum spaces there may be some applicability, *see the Spectrum licensed devices operating in the 3400-3800 MHz range* section.

### Ideas for consideration

There are two approaches to support unsynchronised use between apparatus licensed WBB services:

* Under the current approach detailed for AWLs, a fallback synchronisation requirement is proposed. This means that in the event of interference, if licensees are unable to negotiate a resolution, they would be required to adopt a defined frame structure and synchronise the timing of uplink and downlink transmission. To support unsynchronised use, AWL licensees could also choose to take out licenses with a larger geographical area and licensed bandwidth to isolate them from other users. It is noted that both macro cell and small cell use cases could be supported under this approach as desired by licensees.
* Parts of the 3400-4000 MHz band could be identified for ‘restricted cell’[[13]](#footnote-14) (RC) use. This use case would be similar to what has been identified in the [Planning for wireless broadband use of urban areas in the 3400–3475 MHz band - consultation 31/2021](https://www.acma.gov.au/consultations/2021-08/planning-wireless-broadband-use-urban-areas-3400-3475-mhz-band-consultation-312021). To reduce the potential for interference, the restricted cell case would place limits on certain parameters, such as EIRP and possibly antenna heights. An appropriate Device Boundary Criteria (DBC) would also be needed to further reduce the potential for interference. This could support operators planning to deploy highly localised services covering a small geographical area, for example university campuses, factories, a specific building, ports etc. A restricted cell approach could be considered via AWLs, site-based apparatus licensing (e.g. point-to-multipoint) or class licence.

Considering the above points, ACMA staff have identified three possible options for further discussion regarding WBB apparatus licensed use of the broader 3400-4000 MHz band:

* Option 1: Dedicate a portion of the 3800-4000 MHz band for ‘restricted cell’ use in metropolitan and major regional centres. A ‘macro cell’[[14]](#footnote-15) model would be adopted in all other areas and frequencies (it is noted that this would also allow licensees to take out smaller licensed areas to deploy small cells as desired). Designated spectrum for a restricted cell approach is not proposed in remote and low demand regional areas. This is due to the quanta of spectrum available in those areas, the typically lower density of deployments and ability for licensees to deploy macro or small cells under the proposed AWL framework. This option is illustrated in Figure 3.
* Option 2: Dedicate urban excise areas for restricted cell use. A ‘macro cell’ model would be adopted in all other areas and frequencies (it is noted that this would also allow licensees to take out smaller licensed areas to deploy small cells as desired). This option is illustrated in Figure 4.
* Option 3: Implement a macro cell model in all frequencies and areas in the 3400-4000 MHz band (it is noted that this would also allow licensees to take out smaller licensed areas to deploy small cells as desired). A benefit of this approach is that it would simplify arrangements across the band (as the same arrangements would apply everywhere). This option is illustrated in Figure 4.

Options for urban excise areas is currently under consultation in the [Planning for wireless broadband use of urban areas in the 3400–3475 MHz band - consultation 31/2021](https://www.acma.gov.au/consultations/2021-08/planning-wireless-broadband-use-urban-areas-3400-3475-mhz-band-consultation-312021). Note that these options for consideration above are not consistent with the ACMA preliminary preferred option in the urban areas options paper. These alternative options are provided in the context of taking a possible holistic approach for the 3400-4000 MHz band.

It is noted that the same outcome is proposed for remote areas under all options identified.

Under all options identified above, it is proposed to introduce a “restricted use band”[[15]](#footnote-16) (RB), similar to that proposed in some of the options in the [Planning for wireless broadband use of urban areas in the 3400–3475 MHz band - consultation 31/2021](https://www.acma.gov.au/consultations/2021-08/planning-wireless-broadband-use-urban-areas-3400-3475-mhz-band-consultation-312021). This would help manage interference between unsynchronised SL<>AWL or macro AWL<>RC AWL services. Other apparatus licensed service types, such as FSS, amateurs and PTP where applicable, would be permitted to operate within RBs on a first in time coordinated basis (or secondary basis where such allocations apply).

The size of an RB is a balance between potential interference from adjacent frequency services and spectrum utility. Based on similar discussions around the size of a RB in the [Planning for wireless broadband use of urban areas in the 3400–3475 MHz band - consultation 31/2021](https://www.acma.gov.au/consultations/2021-08/planning-wireless-broadband-use-urban-areas-3400-3475-mhz-band-consultation-312021), 15 MHz may be appropriate between SL and “macro” WBB spectrum spaces and either 5 or 10 MHz between macro and RC WBB spectrum spaces. The sizes of the RBs to buffer the existing spectrum licensed spectrum spaces and apparatus licensed spaces below 3600 MHz are not yet proposed, noting that RBs of any significant size (>5 MHz) are likely to affect the utility of some of the smaller apparatus licensed WBB spectrum spaces significantly.

Figure : Illustration of Option 1

ex = existing , RB = restricted band, R. Cell = restricted cell, AM = amateur, SL = spectrum licences, FSS = fixed satellite service, AWL = area wide licence, PTP = point to point



Note: This is a simplified representation of arrangements in the 3400-4000 MHz band intended to facilitate discussion. For example, frequency ranges shown are not to scale, there are some major regional centres in low demand area 2 (i.e. Ballarat, Bendigo and Toowoomba), there may be other major regional areas that would be identified in the low demand regional area 2 segment and existing PTP arrangements extend down to 3590 MHz rather than 3600 MHz.

Figure : Illustration of Option 2 & 3 (the difference between these options is in the use of urban excise areas)

ex = existing , RB = restricted band, R. Cell = restricted cell, AM = amateur, SL = spectrum licences, FSS = fixed satellite service, AWL = area wide licence, PTP = point to point



Note: This is a simplified representation of arrangements in the 3400-4000 MHz band intended to facilitate discussion. For example, frequency ranges shown are not to scale, there are some major regional centres in low demand area 2 (i.e. Ballarat, Bendigo and Toowoomba), there may be other major regional areas that would be identified in the low demand regional area 2 segment and existing PTP arrangements extend down to 3590 MHz rather than 3600 MHz.

### DBC for unsynchronised use (restricted cell spectrum spaces)

For any possible restricted cell spectrum spaces, where non-aligned TDD frame structures need to be accommodated, a revised DBC needs to be considered. This revised DBC for restricted cell spectrum spaces could be:

* Similar to LA WBB plans in France and Germany, a potential boundary limit could be 30-32 dBuV/m/5 MHz **(-92.8 to -90.8 dBm/MHz/m2 PFD**).
* Alternatively, the same PFD limit could be used as proposed for Option 2 or 3 of the [Planning for wireless broadband use of urban areas in the 3400–3475 MHz band - consultation 31/2021](https://www.acma.gov.au/consultations/2021-08/planning-wireless-broadband-use-urban-areas-3400-3475-mhz-band-consultation-312021), which is **-99.9 dBm/MHz/m2**(at heights of between 5 and 100 m above ground level).

To further help manage interference for the restricted cell case, restrictions on transmit antenna heights, transmitter power or EIRP could also be specified, similar to those in the [Planning for wireless broadband use of urban areas in the 3400–3475 MHz band - consultation 31/2021](https://www.acma.gov.au/consultations/2021-08/planning-wireless-broadband-use-urban-areas-3400-3475-mhz-band-consultation-312021) options 2 and 3:

* + The maximum transmitter EIRP must not exceed 40 dBm.
  + The power spectral density of a transmitter must not exceed 23 dBm EIRP per MHz.
  + The maximum outdoor antenna height must not exceed 5 m.
  + (or if the same PFD limit is adopted as proposed in the Urban excise options paper, the same proposed additional restrictions as in the Urban excise options paper)

The choice of DBC is a balance between the geographic density of different licensees versus the utility of an individual licensee. It is not proposed to consider different DBC levels between non-AAS and AAS systems, at this stage, but we are happy to hear views on this.

### How to accommodate FSS AWL receive in the example possible arrangements

For cases where a FSS AWL licence is desired that straddles the frequency boundary between the possible macro cell and restricted cell proposals in the 3800-4000 MHz band, this could be supported under the FSS AWL licence type. It is also proposed that FSS AWLs could also be licensed within RBs.

### How to interpret the remaining TLG paper

Except as noted, the remaining parts of the TLG paper and the draft technical framework have been updated to take into account feedback largely for remote areas only, or common to all areas. It is expected that the technical framework will be modified, as required, pending future outcomes in non-remote areas.

The ACMA received a range of member views on the revised proposal. We will consider these views further in the TLG and when finalising the technical frameworks for non-remote areas.

### Comments received

The ACMA currently notes *some* of the various member views on these ideas as they may apply to arrangements outside of remote areas. The ACMA acknowledges all of the views received and will continue to develop the ideas across the 3400-4000 MHz band implementation projects:

* Telco sector members generally supported the RB concept, if they were wholly within AWL spectrum spaces.
* Telco members proposed that 3540.0 MHz to 3542.5 MHz be allocated as SLs.
* Telco members generally supported segregation of AWL use cases and a strongly prescriptive assignment priority scheme.
* Telco members generally supported “city-wide” AWL allocations in metro areas, except Pivotel, who supported HCIS level 1 based AWLs and that they be allocated to non-incumbent SL holders first.
* FSG proposed a stepped coordination approach with sync initially then different size RBs.
* Swoop had concerns about the use of RBs above 3800 MHz in non-remote areas, the administrative overhead of a priority assignment scheme and proposed the use of low impact guidelines in place of height limits for unsynchronised or RB services.
* AMTA remains concerned about the use of AWLs for LA WBB in high demand areas.

## Managing coexistence [[16]](#footnote-17)between AWLs in the 3400-4000 MHz range

### AWLs optimised for WBB use (essential for remote)

As previously discussed, the ACMA is considering making any possible AWL framework as similar as practicable to the 3.4 GHz spectrum licensing technical framework. Consequently, coexistence between AWLs optimised for LA WBB use could be managed as detailed below. The approach originally proposed between AWLs in remote, regional, and metropolitan areas was:

* At the frequency boundary:
* Unwanted emission limits specified on the apparatus licence that reflect those on 3.4 GHz spectrum licences (with adjusted frequency boundary to reflect the LA WBB allocation/s). (see Licence Schedule 2 of an example [licence](https://web.acma.gov.au/rrl/licence_image.extract_pdf?pLICENCE_NO=10917463))
* The same (time division duplex) synchronisation fallback requirement as specified on 3.4 GHz spectrum licences. (see Licence Schedule 4 (11) of the example [licence](https://web.acma.gov.au/rrl/licence_image.extract_pdf?pLICENCE_NO=10917463)). This defines a 4G frame structure (or equivalent) be used.
* The same co-sited device requirement as applied to 3.4 GHz spectrum licences. (see Licence Schedule 4 (3) of an example [licence](https://web.acma.gov.au/rrl/licence_image.extract_pdf?pLICENCE_NO=10917463))
* At the geographic area boundary:
* Applying the 3.4 GHz spectrum licence device boundary criteria[[17]](#footnote-18) (DBC) at the geographic boundary of an AWL licence (as detailed in the [Radiocommunications (Unacceptable Levels of Interference — 3.4 GHz Band) Determination 2015](https://www.legislation.gov.au/Series/F2015L00727))
* The same (time division duplex) synchronisation fallback requirement as specified on 3.4 GHz spectrum licences. (see Licence Schedule 4 (11) of the example [licence](https://web.acma.gov.au/rrl/licence_image.extract_pdf?pLICENCE_NO=10917463))

At both the frequency and area boundaries the synchronisation fallback requirement will act as a fallback (on a case-by-case basis) should interference occur which cannot be resolved through negotiation between relevant parties. A synchronisation fallback requirement already exists on 3.4 GHz band spectrum licences. It is proposed that this same synchronisation fallback requirement be placed on AWLs through an update to the [Radiocommunications Licence Conditions (Area-Wide Licence) Determination 2020](https://www.legislation.gov.au/Details/F2020L00070) (AWL LCD). The current draft update is at *Appendix E: Draft updated AWL Licence Condition Determination.*

There were different views on the appropriate frame structure that should be incorporated into the fall-back synchronisation requirements between AWL services. AMTA, Telstra and Optus wanted it to match the equivalent 3.4 GHz spectrum licensing technical framework fallback, and Optus noted that the existing fallback was based on 4G. Swoop preferred flexibility, but any structure should support fixed broadband delivery and use a maximum asymmetric DL/UL ratio of 3:1/4:1, if it is required. As per the revised Appendix E, the proposed clauses around the fall-back synchronisation requirements have been modified for clarity, but the structure defined aligns with the current 3.4 GHz spectrum licensing technical framework.

Concerning unwanted emissions, Telco operators and manufacturers identified that the currently proposed limits in the AWL, and existing SL, technical frameworks, do not align with 3GPP standards in this regard for non-AAS. As discussed elsewhere in this document, we propose to change the limit definition to “per antenna port” under the draft AWL LCD, to align with the 3GPP, and will consider a similar future change to the SL technical framework.

### AWLs optimised for FSS receive earth station use in the frequency range 3800-4000 MHz in metropolitan and major regional areas (not essential for remote)

As previously discussed, the ACMA proposes to optimise any AWL framework for LA WBB and FSS receive services in metro and major regional areas in the 3800-4000 MHz band.

The intent is, for FSS receivers operating under any AWL framework in these areas, that FSS operators licence sufficient spectrum and geographic area such that the potential interference from neighbouring (in location and in frequency) LA WBB AWLs is acceptable to the FSS licensee, by accepting the appropriate device boundary criteria and unwanted emissions limits for the spectrum space.

Multiple FSS receive AWLs will be permitted to overlap each other in any given area, but not to overlap WBB Tx AWLs (unless agreed between licensees). The mechanism for identifying which AWL licences are FSS, and hence can overlap, is proposed to be via a licence condition, outlined in the draft RALI MS47.

There were different views in the TLG on how FSS services could be incorporated into a single AWL framework, including whether more flexible channelling arrangements should be allowed for AWLs optimised to include FSS use.

The proposed AWL for FSS receivers was not supported by a number of satellite members as their view is that it is the reverse of the first-in-time coordination method, which has been relied on for many years, in which case the first-in-time licensee has priority and new licensees have to find a way to minimise interference to the existing licence (especially an existing receive-only licence). The current apparatus licence (AL) arrangements for FSS earth receive stations works and so they support it remaining as the licensing methodology for FSS earth receive stations for the 3400-4200 MHz band under consideration in all areas of Australia.

If the ACMA proceeds with AWLs for FSS receivers, satellite operators generally would prefer flexible channelling/assigned bandwidth arrangements or felt that existing incumbents were already denying large areas in capital cities so enforcing a 10 MHz MCB for FSS was not necessary to reflect the additional denial caused by new, AWL based, FSS services. They subsequently suggested an approach like that in the 26 GHz AWL framework, requesting licensing of a single HCIS level 00 cell only for each FSS station.

It was AMTA’s view that a simplistic fixed MCB approach, without further consideration of FSS operating practicalities, was likely to be inefficient and cause considerable spectrum denial to AWL transmitters. They suggested requiring an FSS AWL operator to licence the complete LNB bandwidth or the MCB, whichever is greater. It was also AMTA’s view that incumbent FSS should migrate to AWLs.

At this time, the ACMA staff preliminary view has not changed, but will continue to take input ahead of finalising the technical framework for areas where AWLs for FSS are currently proposed (major regional and metropolitan areas). Parts of the draft AWL LCD and RALI MS47 specifically in relation to the future possible FSS receive AWLs have consequently been removed, as they may change and would not be included in the formal consultation of the technical framework that would apply to remote areas.

Spectrum licensed devices operating in the 3400-3800 MHz range (geographic boundary management essential for remote)

It was originally proposed that the same mechanisms developed to manage interference between AWLs be adopted to manage interference between AWLs and 3.4 GHz spectrum licences. This would result in reciprocal interference management arrangements at the licence boundaries between AWL apparatus and spectrum licences.

After reviewing feedback in the TLG, ACMA staff have explored, and is continuing to explore, a different method to manage co-channel interference between AWL and SL services. The intention of this new approach is to support unsynchronised operation between AWLs and SLs.

The existing spectrum licence DBC assumes synchronised use. Therefore, it considers interference from a proposed base station into a notional user terminal in an adjacent area. An assumption is also made that user terminals near a geographical boundary are pointing away from the adjacent area licence, so a lower receiver gain is assumed for the calculation.

To support possible unsynchronised use, interference from a base station to another base station would need to be assumed. This would result in a higher antenna height and gain being applied to the notional receiver used in DBC calculations. It is also proposed that where there is agreement, AWLs could be licensed closer or adjacent to an existing spectrum licence boundary. Such a DBC currently exists in RALI FX19 and is applied to PMP licences issued in the 3.6 GHz band.

Views were sought around an alternate DBC that could be used between AWL and SL geographic boundaries, to support different TDD frame structures between the SL and AWL services, and how it should be defined. Most telco members supported a more stringent, “asymmetrical” DBC for interference from AWLs into SL services and to retain the existing fallback frame structure described in the 3.4 GHz spectrum licensing technical framework for both SLs, AWLs and between them. DB telecommunications view was that measures like those in RALI FX19 could be adapted to the AWL/SL boundary DBC. Optus and Ericsson requested more work to be conducted, including studies, to resolve SL<>AWL coordination issues. Pivotel did not see major issues with AWLs being able to synchronise together in major metropolitan areas. Swoop favoured imposing sync requirements on AWL in AWL/SL boundaries and more broadly in low demand areas.

The ACMA will consider these views further in relation to other geographic areas, but for the priority remote areas, the ACMA staff preliminary view is to:

* Re-arrange information in draft RALI MS47 to clarify that a different DBC applies for AWL into SL compared with other boundary cases.
* maintain the same fallback synchronisation scheme for AWLs and SLs (as there were no dissenting views).
* Propose a revised assignment priority scheme (see later section) to encourage contiguity of spectrum holdings across SL/AWL geographic boundaries.

FSS AL receive devices operating in the 3400-4200 MHz range (essential for remote)

WBB AWL licensees will need to protect any incumbent FSS earth receive AL services to the same requirements as that in the [Radiocommunications Advisory Guidelines (Managing Interference from Spectrum Licensed Transmitters — 3.4 GHz Band) 2015](https://www.legislation.gov.au/Series/F2015L00728) (“Tx RAG”). Any future AWL and licensed FSS services would then need to be coordinated on a first-in-time basis using the protection criteria from the Tx RAG.

The criteria in the Tx RAG is also used to coordinate new FSS ALs. New FSS ALs can then expect the level of protection detailed in the Tx RAG when new devices are deployed under an AWL. Given apparatus and spectrum licensed WBB arrangements are being expanded to cover the entire 3400-4000 MHz band, the ACMA sought advice from the TLG on whether the criteria in the Tx RAG is still appropriate.

Satellite operators provided a submission proposing, and providing supporting evidence for, changed values to protect FSS receive devices under the Tx RAG (and from WBB AWL devices by reference as is currently proposed). The ACMA staff preliminary view, currently, is that the existing Tx RAG clauses have been operating successfully in dense spectrum licensed areas in the 3.4-3.7 GHz range, both in relation to the relocation period and in ongoing coordination. Given that the initial remote allocation is a generally lower density area, we do not propose to revise the Tx RAG clauses in relation to FSS at this time. We will consider the input and further inputs in consideration of revising the Tx RAG for the future allocations in other geographic areas.

Some other members had the view that more work was required to examine how best to protect FSS services from AWLs, such as proposing that a FSS AWL takes out a bandwidth equal to the entire (filtered) LNB bandwidth. As AWLs for FSS are not currently being proposed for remote areas, the ACMA staff current preliminary view is not to change proposed arrangements and maintain the protections in the Tx RAG which are also referenced in the proposed AWL technical framework.

PTP AL receive devices operating in the 3400-4200 MHz range (essential for remote)

WBB AWL licensees will need to protect any existing fixed (PTP) AL services to the same effective level of protection as that stated in the Tx RAG (the RAG references RALI FX03 for the protection criteria). Any future AWL and licensed PTP services would then need to be coordinated on a first-in-time basis using the relevant protection criteria for each licence type.

To provide clarity. draft RALI MS47 has been modified to include elements from RALI MS39 to determine AWL coverage area and fixed interference area.

PMP AL receive devices operating in the 3400-3700 MHz range (essential for remote)

AWL licensees will need to protect any existing PMP AL services as if they were operating unsynchronised. This is to ensure existing services are not impacted by new AWL licences.

As there are likely to be several different time division duplex (TDD) frame structures and technologies in use by incumbent PMP licensees, the draft protection criteria in AWL RALI MS47 proposes that AWL WBB services will need to coordinate with incumbent PMP when within 15 MHz of an assigned licence within a specified geographic proximity. Beyond the 15 MHz separation, a notification process will also be proposed. This will provide time for PMP licensees to install RF filters to their systems if required to manage adjacent channel interference.

It is intended that once AWL arrangements are in place, no new PMP licences would be issued.

Radiolocation services operating in the 3100-3600 MHz range (essential for remote)

AWL licensees will need to comply with the Tx RAG with regards to radiolocation services (Part 6) and with the section 3.2(4) of the [Radiocommunications Advisory Guidelines (Managing Interference to Spectrum Licensed Receivers – 3.4 GHz Band) 2015](https://www.legislation.gov.au/Details/F2018C00568) (“Rx RAG”).

No views in the TLG were expressed about the following issue that requested introducing a minimum receiver blocking performance:

For interference management purposes with radiolocation services, should a minimum receiver blocking performance below 3400 MHz be defined for devices operating under AWLs (i.e. this would apply to FSS and LA WBB)?

Telco sector members suggested that if one were to be introduced, that it be based on appropriate clauses in 3GPP TS38.104. Satellite sector members requested a clarification as to whether there is an impact on FSS. Consequently, the current ACMA staff preliminary view is that we do not propose to make changes to the applicable Tx RAG clauses. As a result, there is no impact on SL, FSS rx AL or FSS AWL services.

Radiolocation services operating in the 3700-4000 MHz range authorised under 10(7) of the ARSP (essential for remote)

Existing Defence radiolocation services operating under this authorisation have a licence special condition that states that “No interference shall be caused to any Radiocommunication station or service and no protection from interference by such stations or services shall be afforded.” However, this condition was applied before arrangements for WBB were considered in the band.

Because of the higher potential for mutual interference caused by the introduction of WBB services compared with incumbent service types in the area across 3400-4000 MHz, the current view is that this should be managed by adopting a policy of not normally issuing AWL transmit licences in the range of 3700-4000 MHz and within 100 km of, or within 3600-3700 MHz and within 60 km of, latitude 15°38’55” South and longitude 131°54’04” East (GDA94 Datum).

Coexistence with the Woomera Protected Area (essential for remote)

There are existing conditions in several RALIs (including RALI FX19) in relation to the Woomera Prohibited Area (WPA). These state that “Requests for any assignments inside and within 100 km of the WPA, as defined in embargo 52, are to be referred to the ACMA for preliminary coordination consultation.” Embargo 52 states a policy of not making assignments within 3400-3573 MHz or 3600-3700 MHz inside the area designated for the WPA.

The current view is that coexistence with the WPA can be managed by adopting a policy of not normally issuing AWL licences within the Woomera Protected Area, as defined in embargo 52, and including a note on any AWL issued within 100 km of this area that no protection is afforded from transmissions from within the WPA.

Coexistence with the Darwin and Geraldton coordination zones (essential for remote)

There are existing condition zones in several RALIs (including RALI FX3, RALI FX19 and RALI MS39) stating that “Requests for any assignments within 150 km of latitude 12˚26’59” South and longitude 130˚50’0” East (GDA94 Datum) in Darwin (NT) and latitude 28˚45’59” South and longitude 114˚37’0” East (GDA94 Datum) in Geraldton (WA), are to be referred to the ACMA for preliminary coordination consultation.”

Because of the different coexistence considerations caused by the introduction of WBB services compared with incumbent service types in the areas across 3400-4000 MHz, the current view is that this should be managed by adopting a policy of not normally issuing AWL transmit licences within 150 km of latitude 12˚26’59” South and longitude 130˚50’0” East (GDA94 Datum) in Darwin (NT) and latitude 28˚45’59” South and longitude 114˚37’0” East (GDA94 Datum) in Geraldton (WA).

### Feedback on the zones discussed above

It was the view of Optus that the status quo be maintained for ARSP 10(7) services.

It was the view of Pivotel that any “exclusion zones” in remote areas would reduce the utility of AWL services by an unacceptable amount.

It is the current ACMA preliminary staff view that the proposed mechanisms remain as drafted in order to manage the coexistence in these areas.

Coexistence with Earth Station Protection Zones (ESPZs) (essential for remote)

WBB AWL licensees will need to comply with coordination requirements stated in the existing 3.4 GHz SL Tx RAG with regards to ESPZs (Part 9 including the references to RALI MS44) and Uralla (Part 10). As per the spectrum licensing technical framework chapter, Part 10 may be reviewed and rolled into Part 9.

For flexibility, it is proposed that AWL licences may be allocated up to an ESPZ area boundary, but before registering devices, compliance with the relevant Tx RAG coordination requirements (which point to RALI MS44) needs to be successful.

LMA had a view in the TLG that a satellite operator should not be required to seek a spectrum access agreement in any part of the 3400-4200 MHz band from any terrestrial service if the emissions from the satellite comply with the ITU-R article 21 PFD limits, or generally for TOSS, TT&C or IOT FSS uses. The ACMA staff preliminary view is that current proposed arrangements should not change, and not to introduce changed requirements and maintain the current proposed mechanisms:

* coordination requirements between earth receivers and terrestrial services as to be included in the proposed updates to the AWL LCD, new AWL RALI MS47 and the updated 3.4 GHz SL Tx RAG are met
* requirements for the ACMA [BOP](https://www.acma.gov.au/procedure-earth-and-earth-receive-licensing-and-registering-earth-stations) (including consistency with ITU requirements such as PFD limits) are met
* restrictions on earth station locations as outlined in spectrum embargoes, RALIs  and BOPs such as [Restriction on earth station licensing near Alice Springs](https://www.acma.gov.au/restriction-earth-station-licensing-near-alice-springs) are met.

Note that RALI MS44 currently includes coordination requirements for FSS services at ESPZ in eastern Australia and the Uralla earth station facility in the 3600-4200 MHz range. It is proposed to update these to include the 3400-3442.5 MHz and 3475-3542.5 MHz ranges (except at Quirindi) in the current consultation of [Planning for wireless broadband use in urban areas in the 3400–3475 MHz band Options paper.](https://www.acma.gov.au/consultations/2021-08/planning-wireless-broadband-use-urban-areas-3400-3475-mhz-band-consultation-312021)

Coexistence with the Mid West Radio Quiet Zone (RQZ) (essential for remote)

Similarly to existing licence conditions for the 3.4 GHz spectrum licensing technical framework, WBB AWL licensees will need to follow RALI [MS32](https://www.acma.gov.au/publications/2019-08/instruction/rali-ms32-mid-west-radio-quiet-zone) *Coordination of Apparatus licensed services with the mid-west radio quiet zone.*

Class licensed devices operating in the 3400-4200 MHz range (essential for remote)

Various class licensed devices currently operate in the 3400-4000 MHz range, including:

building material analysis transmitters and ground penetrating radars operating in the 30–12400 MHz range

UWB transmitters operating in the 3100–4800 MHz band.

Operation of devices under the LIPD Class Licence is on a ‘no interference and no protection’ basis with other licensed services. The use of UWB ground and wall penetrating radar devices make the identification and resolution of interference more difficult than registered apparatus licensed devices. These concerns can be applied generally to all class licensed devices and ACMA staff considers the low power nature of these services greatly reduces the risk of interference. Consequently, the ACMA staff preliminary view is that there is not a case to change the licensing arrangements for these specific devices.

The RAG Tx Part 7 also discusses the [Radiocommunications (Low Interference Potential Devices) Class Licence 2015](https://www.legislation.gov.au/Series/F2015L01438) and states that the operation of radiocommunications transmitters under these class licences is on a no-interference and no-protection basis.

Amateur service below 3400 MHz and in the 3400-3575 MHz range (essential for remote)

Current arrangements for the amateur service are described in the [Amateur LCD](https://www.legislation.gov.au/Details/F2020C00376). The Amateur services are allocated on a secondary basis in the [Australian Radiofrequency Spectrum Plan](https://www.acma.gov.au/australian-radiofrequency-spectrum-plan). This means the operate on a no interference and no protection basis to primary services. Service deployed under both AWLs and SLs are considered primary services, consequently any amateur use must take this into account.

The ACMA also [consulted](https://www.acma.gov.au/consultations/2021-01/review-non-assigned-amateur-and-outpost-regulatory-arrangements-consultation-012021) on future arrangements for the non-assigned amateur service. None of the possible options for new arrangements suggest changing the effective of the “no interference, no protection” interference management approach. The RAG Tx Part 7 also deals with the [Radiocommunications (Overseas Amateurs Visiting Australia) Class Licence 2015](https://www.legislation.gov.au/Series/F2015L01114) and states that “the operation of radiocommunications transmitters under these class licences is on a no-interference and no-protection basis”.

AWL assignment conditions (most elements essential for remote)

This section provides an outline of possible conditions dealing with the allocation of ‘area-wide’ apparatus licences in the extended 3.4 GHz band. These conditions would apply if ‘area-wide’ apparatus licences are administratively allocated.

It is proposed that ‘area-wide’ apparatus licences are designed to be scalable (in both frequency and area) to suit the needs of individual licensees.[[18]](#footnote-19) However, it is necessary to specify some assignment conditions to help enable the efficient and effective use of spectrum:

* The area/frequency combination of an ‘area-wide’ apparatus licence is large enough to support a service (i.e., the area and/or bandwidth authorised by the licence is not too small to make the licence unusable)
* Improve spectrum efficiency:
* Spectrum can be more efficiently used if the same licensee holds co-frequency licences on both sides of geographic boundaries (e.g., across the spectrum/apparatus licence boundary in the extended 3.4 GHz band). Having contiguous geographic holdings will allow a licensee to manage in-band interference more effectively between adjacent cells.
* An ordered frequency assignment priority will reduce the instances of small unusable ‘pockets’ of spectrum being left unlicensed in-between frequency adjacent licensees.

This section discusses proposals to address the above issues.

### Minimum area and bandwidth limits (this does not apply to FSS in remote areas)

The smallest geographic ‘building-block’ used in spectrum licences (referred to as a standard trading unit or STU) is a geographic area equal to a Level 1 HCIS cell of the 2012 Australian Spectrum Map Grid ([ASMG](https://www.acma.gov.au/australian-spectrum-map-grid)) – which is 5x5 minutes in size (approximately 9×9 kilometre). In consideration of the new LA WBB use cases that the 3700-4200 MHz and 3.4 GHz band planning outcomes were designed to promote, it may be beneficial to use a smaller Hierarchical Cell Identification Scheme (HCIS) level. Given the propagation in the band and that a range of use cases is likely for LA WBB applications, the use of HCIS level 0, as defined in the revised ASMG is likely to be appropriate. The ASMG explains the relationships between the HCIS levels.

There were different views among TLG members if HCIS level 0 was considered appropriate, with many members responding to the TLG V2 indicating that HCIS level 1 was more appropriate, as it was felt to be more spectrum efficient for most WBB use cases. Satellite members preferred HCIS level 00 for FSS AWL receive licensing, if an approach similar to that adopted in the 28 GHz band was adopted. The ACMA staff current preliminary view remains that level 0 is likely to promote a wider range of use cases, but may propose both HCIS level 0 and level 1 as options for allocation in the formal consultation.

All spectrum licences are subject to a minimum bandwidth requirement (known as the minimum contiguous bandwidth – or MCB), which is enforced when spectrum is traded on the secondary market.[[19]](#footnote-20). The difference with a ‘area-wide’ apparatus licence is that, for administratively issued licences, a minimum allocation bandwidth needs to be specified to help limit unnecessary segmentation of the band at the allocation stage.

The minimum allocation bandwidth should be set at the minimum amount of spectrum needed to provide a viable service. The minimum channel bandwidth of the technology likely to be deployed under a 3400-4000 MHz band ‘area-wide’ apparatus licence, 3GPP NR, is 10 MHz. However, more efficient use of spectrum is achievable if larger channels sizes are used, with up to 100 MHz possible.

The existing PMP channel plan in the 3.6 GHz band, described in RALI [FX19](https://www.acma.gov.au/publications/2019-09/instruction/rali-fx19-broadband-wireless-access-1900-1920-and-3575-3700-mhz-bands), is currently a TDD scheme using 10 MHz or 20 MHz bandwidths for new assignments. Under the planning decisions, incumbent PMP services may end up deciding to transition to the AWL framework.

Relevant parts of the [spectrum licensing trading rule determination](https://www.legislation.gov.au/Details/F2020C01120) for the 3.4 GHz and 3.6 GHz bands defined minimum contiguous bandwidths of 10 MHz.

Consequently, the ACMA staff current preliminary view is to use a MCB also of 10 MHz for the extended 3.4 GHz band and for AWL allocations.

The ACMA previously asked if 10 MHz should be the minimum bandwidth that an extended 3.4 GHz band ‘area-wide’ apparatus licence can be issued for? Should different limits apply for AWLs optimised for FSS use (i.e. receive only AWLs)?

There were various views in the TLG about the MCB for FSS services under AWLs, with satellite operators wanting to be able to licence smaller bandwidths. The ACMA staff note that having a consistent MCB for both FSS and WBB AWL, better reflects the spectrum denial caused by a service, given that most WBB technologies in this band will be constrained to a minimum channel bandwidth of 10 MHz. Note that, in remote and “other regional” areas, site based FSS earth receive licensing is currently proposed to remain the licensing mechanism and no MCBs are proposed to apply.

### Maximum area and bandwidth limits (not essential for remote technical framework)

There are no maximum area or bandwidth limits proposed at this time under the technical framework, however it should be noted that such limits may be considered and applied to access spectrum across the 3400-4000 MHz band. If such limits are proposed, they will be discussed as part of the development of allocation arrangements for the band.

### Assignment rules (essential for remote)

The following assignment rules for AWLs were proposed to be included in a new RALI (MS47) which will aim to improve the efficient allocation and use of spectrum as well as aiding coexistence with incumbent services. These rules would apply for licences which are administratively allocated.

* Frequency assignments must follow a 10 MHz channel raster, where multiple channels can be aggregated (maximum aggregated bandwidth limits are still under consideration outside of the TLG).
* For WBB AWLs, only a single apparatus licence can be issued for a frequency range in a particular HCIS for transmitters.
* The geographic area authorised by an ‘area-wide’ apparatus licence must consist of only whole HCIS cells of a specified minimum size (see above in the *Minimum area and bandwidth limits* section).
* Where possible, the frequency range of a new apparatus licence should align with an existing extended 3.4 GHz band (either spectrum or apparatus licensed) licence held by the licensee. This aims to help manage adjacent-area interference.
* To better manage coexistence between both spectrum licences and AWLs, as well as between AWLs, in remote areas, it may be preferable to assign groups of licensees that may have similar TDD frame structure needs in the same part of spectrum. For example, Telcos could have nominal priority to channels in a segment, other downlink heavy users in another and more uplink heavy users in a remaining segment. It is also proposed that, in the event a prospective licensee cannot access spectrum in accordance with the preferred assignment model, they are not limited from applying for licences in other parts of the band.

Members provided different views on the possible priority assignment scheme:

* AMTA, Optus, Telstra and Pivotel supported a prescriptive, preferred priority, scheme that would better ensure an operator could get contiguous spectrum across metro, regional and remote areas.
* DB Telecommunications also saw merit in a prescriptive scheme, similar to that in RALI MS34.

Feedback on a possible priority assignment scheme, as well as further considerations across the whole 3400-4000 MHz band spectrum spaces, resulted in a revised proposal, to apply at least for remote areas at this time, included in a revised RALI MS47:

* Existing spectrum licence holders in the 3400-4000 MHz band would be encouraged to licence AWLs in the same spectrum as they hold, and preferably below 3700 MHz.
* Applicants that are not spectrum licence holders in the 3400-4000 MHz band would be encouraged to licence AWLs in the same spectrum as they hold, and preferably above 3700 MHz.
* For future FSS AWL rx licensees, they would be encouraged to licence from the “top down”, if possible.

As further work is conducted in relation to allocations in non-remote areas, the priority scheme may be further developed.

### Recording device details in the RRL (essential for remote)

To aid in the management and resolution of interference issues, it is proposed that the details of certain types of transmitters operated under an extended 3.4 GHz band ‘area-wide’ apparatus licence are required to be included in the RRL before they are operated (for simplicity, this is referred to ‘registration’ in this paper). This is a similar approach used under spectrum licensing regimes and it is proposed to align registration requirements with that in the 3.4 GHz spectrum licensing technical framework.

For FSS receive services in an AWL framework all receivers will be required to be registered if they wish to be afforded protection under applicable SL or AWL technical frameworks.

Consequential policy document changes (essential for remote)

As PMP and PTS services in the 3.4 GHz band will either be transitioned to the AWL framework or to the spectrum licensing technical framework, the following policy document changes will occur:

* Retiring RALI FX14 “Point to multipoint fixed services in specified parts of the 3.4–3.5 GHz band”. No new PMP services will be issued in that frequency range once AWL arrangements are in place. Protection criteria for incumbent PMP will be contained in a new AWL RALI.
* Modifying RALI FX19 “Broadband Wireless Access 1900 to 1920 and 3575 to 3700 MHz bands” to remove references the 3575-3700 MHz range. No new PMP services will be issued in the 3575-3700 MHz band once AWL arrangements are in place. Protection criteria for incumbent PMP will be contained in a new AWL RALI.
* Modifying RALI FX03 “microwave fixed services“ to remove references to point-to-multipoint services in the 3.4 GHz (3425-3492.5 MHz) band, RALI FX14 and to provide guidance to the flexible use of the channel raster in the band.
* Retiring RALI MS39 “Frequency coordination and licensing procedures for apparatus licensed public telecommunications services in the 3.5 GHz band” as there will no longer be PTS services in the band.
* Creating a new RALI (MS47) to document the AWL framework coordination requirements with other services and to incorporate relevant coordination criteria from FX14, FX19, FX03 and MS39.

### Proposed changes to RALI FX03

Possible changes to RALI FX03, if PTP Option A was adopted, are contained in Appendix C.

### Proposed changes to RALI FX19

The proposed changes simply remove reference to the RALI covering Broadband Wireless Access services in the 3575-3700 MHz range.

1. : Proposed changes to RALI FX19

| **Clause/s** | **Proposed change** |
| --- | --- |
| 3.2 BWA transmitter into fixed link receiver | Removed 3.2 paragraph 3 & 5 |
|  |  |
| 3.3 Fixed link transmitter to BWA receiver | Removed 3.2 paragraph 2 & 4 |
|  |  |
|  |  |  |
| 3.4 BWA transmitter into Spectrum Licensed Space | Removed 3.4.1 3575-3770 MHz references in paragraph 3 |  |
| 3.4.1 Adjacent Area Coordination |  |  |
| 3.4 BWA transmitter into Spectrum Licensed Space | Removed 3.4.2 3575-3770 MHz references in paragraph 1 & 2 |  |
| 3.4.2 Adjacent Band Coordination |  |  |
| 3.5 Spectrum Licensed Device into BWA receiver | Removed 3.5.2 3575-3770 MHz references in paragraph 1, 2 & 3 |  |
| 3.5.2 Adjacent Band Coordination |  |  |
| 3.8 3600-4200 MHz Band: BWA Transmitters into FSS | Removed section 3.8 |  |
|  |  |  |
| 3.9 3575-3600 MHz Band: Amateur Service into BWA | Removed sections 3.9 & 3.10 |  |
| 3.10 3575-3600 MHz Band: BWA into Amateur Service |  |  |
| 3.11 3400-3600 MHz Band: Radiolocation into BWA | Removed sections 3.11 & 3.12 |  |
| 3.12 3400-3600 MHz Band: BWA into Radiolocation |  |  |
| 3.13 Coordination with specific regional areas | Removed 3.13 3575-3770 MHz references in paragraph 3 & Table 3 and paragraph 5 |  |
|  |  |  |
| 4.4 Assessing Interference: BWA into Fixed Links | Removed 4.4 & 4.5 3575-3770 MHz references in footnotes and in the table under step 1 |  |
| 4.5 Assessing Interference: Fixed Links into BWA |  |  |
| 4.6 Assessing Interference: Amateur Services into BWA | Removed section 4.6 completely. |  |
|  |  |  |
| 4.7 Assessing Interference: BWA to BWA | Removed 3575-3700 MHz references in paragraph 2 under Step 1 |  |
|  |  |  |
| 4.8 Assessing interference: BWA to Spectrum Licensed Rx | Removed 4.8 3 paragraph 2 |  |
|  |  |  |
| 4.9 Assessing interference: Spectrum Licensed Tx to BWA | Removed 4.8 sentences in paragraph 2 & 3 with reference to 3542.5-3700 MHz |  |
|  |  |  |
| 4.10 Assessing interference: BWA to FSS (3700-4200 MHz) | Removed 4.10 & 4.11 sections |  |
| 4.11 Assessing interference: BWA to FSS (3600-3700 MHz) |  |
| 4.12 Site Engineering Aspects | Removed 4.12 a sentence in paragraph 2 with reference to 3.4GHz |  |
|  |  |  |
| 4.13 Assignment Rules | Removed 4.13.2 section and 3575-3700 MHz reference in 4.13.4 Summary table under 4.13 assignment rules |  |
| 4.13.2 3575-3700 MHz band |  |  |
| 4.13.4 Summary table: assignment priority rules |  |  |
| 5.1 Overview of Licensing | Removed references in 3575-3700 MHz in paragraph 3 and paragraph 4 in section 5.1 |  |
|  |  |  |
| 5.2 Licence Conditions | Removed 3575-3700 MHz references in paragraph 2 in section 5.2 |  |
|  |  |  |
| 5.2.1 Special Conditions | Removed paragraph 3 & 4 in section 5.2.1 |  |
|  |  |  |
| 5.2.2 Advisory Notes | Removed paragraph 3 & 4 in section 5.2.2 |  |
|  |  |  |
| 5.4 3.6 GHz Band Specific Requirements | Removed section 5.4 |  |
|  |  |  |
| Attachment 2a:  2. Victim BWA receiver and Interfering 3.8 GHz Fixed link transmitter | Removed Section 2. Victim BWA receiver and Interfering 3.8 GHz Fixed link transmitter table in attachment 2a |  |
|  |  |
| Attachment 2b: Protection Criteria: 1.8, 2.1 and 3.8 GHz fixed point-to-point receivers | Removed Section 2. Victim BWA receiver and Interfering 3.8 GHz Fixed link transmitter table in attachment 2b |  |
|  |  |  |
| Attachment 2d: Protection Criteria: 3600-4200 MHz band Earth Station receivers | Removed Attachment 2d |  |
|  |  |  |
| ANNEX 1: 3575-3700 MHz Band Specific Requirements | Removed Attachment 2d |  |
|  |  |  |
| Attachment 4: Co-channel – BWA transmitter within 200 km of a spectrum licence boundary | Removed references to 3575-3700 MHz band in paragraphs 2, under subheadings "Calculation of Horizontally Radiated Power (HRP)" & "Coordination Level" |  |
|  |  |  |
| Attachment 5: Coordination of BWA licences with Earth Stations | Removed Attachment 5 |  |
|  |  |  |

# Extended 3.4 GHz band spectrum licensing technical framework

Background

The ACMA develops a technical framework for every band subject to spectrum licensing. Each framework is a collection of technical and regulatory conditions applicable to the use of radiocommunications devices in the spectrum-licensed band. The purpose of the technical framework is to define the technical conditions and constraints under which a device may be deployed and operated within the specified geographic area and frequency band of the licence.

Although the technical framework is optimised for technologies, or services most likely to be deployed in the band, it is intended to be technology flexible. This means licensees can operate any type of radiocommunications device for any purpose, provided they comply with the technical framework relevant to the licence.

A technical framework consists of three interlocking regulatory elements provided for under the *Radiocommunications Act 1992* (the Act):

* The conditions specified on the spectrum licence—in particular, the core conditions that define the spectrum space (both frequency and geographical area) and the level of emissions permitted inside and across the frequency boundaries of the licence (section 66 of the Act).
* A determination of unacceptable interference for the purpose of device registration in each band (section 145 of the Act). This defines permissible levels of emissions across geographical licence boundaries and can also define various deployment constraints.
* Radiocommunications advisory guidelines (RAG) that provide assistance and advice for coordination with stations in other services when and where required (section 262 of the Act). This includes detailing interference management criteria with incumbent apparatus and other spectrum licences.

A more comprehensive explanation of spectrum licensing technical frameworks is provided in the document [*Know your obligations—Spectrum licensees*.](https://www.acma.gov.au/publications/2012-12/guide/spectrum-licencees-know-your-obligations)

The ACMA staff preliminary view is that the ACMA should extend and adapt the existing 3.4 GHz spectrum licensing technical framework to metropolitan and regional areas across 3700-3800 MHz.

The existing 3.4 GHz band spectrum licensing technical framework

The 3.4 GHz spectrum licensing technical framework is optimised for Time Division Duplex (TDD) technologies. The relevant existing 3.4 GHz band technical framework instruments are:

* Spectrum Licence ([current licence holders and copies of licences](https://web.acma.gov.au/rrl/browse_licences.licence_list?pSV_ID=85&pSS_ID=861))
* [Radiocommunications (Unacceptable Levels of Interference – 3.4 GHz Band) Determination 2015](https://www.legislation.gov.au/Series/F2015L00727) (the s.145(4) determination)
* [Radiocommunications Advisory Guidelines (Managing Interference from Spectrum Licensed Transmitters — 3.4 GHz Band) 2015](https://www.legislation.gov.au/Series/F2015L00728) (the RAG Tx)
* [Radiocommunications Advisory Guidelines (Managing Interference to Spectrum Licensed Receivers – 3.4 GHz Band) 2015](https://www.legislation.gov.au/Details/F2013L02150) (the RAG Rx)

Details of the TLG process (including relevant papers) that developed the current 3.4 GHz band technical framework are available on [the ACMA website](https://www.acma.gov.au/spectrum-licence-technical-liaison-groups).

Conditions on the spectrum licence

Each spectrum licence includes both core conditions and statutory conditions specified under relevant sections of the Act. The Act also provides that other specific conditions may be included by the ACMA.

* **Core conditions**—required under section 66, these conditions define the spectrum space within which the licensee is authorised to operate radiocommunications devices under the licence, and the maximum permitted level of radio emissions inside and outside the band. These conditions are included in all spectrum licences.
* **Statutory conditions**—required under sections 67 to 69A, these conditions include information about payment of charges, use by third parties, residency, registration of transmitters and devices exempt from registration. These conditions are included in all spectrum licences.
* **Other conditions**—conditions placed on licences under section 71 generally provide for the efficient management of the spectrum and administration of the Act. These conditions may vary from one band or licence to another.

The core conditions of a spectrum licence form the fundamental building blocks for operation of a spectrum-licensed device, and for managing interference with adjacent frequency bands and geographic areas. Section 66 of the Act states spectrum licences must specify the following core conditions:

* the part or parts of the spectrum in which operation of radiocommunications devices is authorised under the licence (frequency range of operation)
* the maximum permitted level of radio emission, in parts of the spectrum outside the frequency range specified on the licence, which may be caused by operation of radiocommunications devices under the licence (outside-the-band emission)
* the area within which operation of radiocommunications devices is authorised under the licence (geographic area of operation)
* the maximum permitted level of radio emission that may be caused by the operation of radiocommunications devices under the licence (outside-the-area emission).

Unacceptable levels of interference

Spectrum licensees are required to register a radiocommunications transmitter in the Register of Radiocommunications Licences before they may be operated under the licence. The only exception to this is if there is a condition on licences that exempts certain types of transmitter.

Subsection 145(1) of the Act gives the ACMA the power to refuse to register a radiocommunications transmitter if it is satisfied that the operation of the transmitter could cause an unacceptable level of interference to the operation of other radiocommunications devices. Under subsection 145(4) of the Act, the ACMA can make a determination (referred to as a section 145 determination) that sets out what is considered unacceptable levels of interference for each spectrum-licensed band.

A section 145 determination sets out the circumstances in which devices are deemed to cause unacceptable levels of interference. These circumstances typically include:

* if the levels of emissions from a device at the geographical boundary of a licence exceed a defined level
* if the operation of the transmitter will cause a breach of a core condition of the licence
* if the deployment of the device is outside any deployment constraints defined for the band.

Radiocommunications advisory guidelines

Further guidance on interference management with other licensed services is provided in Radiocommunications Advisory Guidelines (RAGs) made under section 262 of the Act. RAGs can refer to any aspect of radiocommunications or radio emissions.

Generally, RAGs include provisions to help assess the possible interference between spectrum-licensed devices and services operating under spectrum, apparatus or class licences. Potentially affected services are identified in the RAGs to enable licensees to assess and mitigate the risk of interference between these services.

It is important to note that where a case of interference arises between a spectrum-licensed device and another licensed device, the ACMA will refer to the provisions of the RAGs in resolving the matter. In general, affected licensees can also negotiate their own arrangements to manage interference. Such arrangements will also be considered when resolving any interference disputes.

# Possible changes to the 3.4 GHz spectrum licensing technical framework (not required for remote)

This section of the paper details the changes to the 3.4 GHz technical framework proposed by the TLG as they pertain to the items for review identified in the *Scope of the TLG* section.

Consequential changes

The TLG has identified the following consequential changes to the [3.4 GHz band technical framework](https://www.acma.gov.au/34-ghz-technical-framework) that are required to support the extension to accommodate the 3700-3800 MHz range in metro and regional areas:

|  |  |  |  |
| --- | --- | --- | --- |
| DOCUMENT | ITEM | CLAUSE/para | CHANGE |
| Tx RAG |  | 1.5 (1) | Redefine 3.4 GHz band to 3400-3800 MHz  Remove retired RALIs and insert new RALI definitions. |
|  | 2.1 | Correct the text (it is not “Australia-wide”) |
|  | 2.3 | Modify BWA dot point to refer to both BWA and AWLs. |
|  | 3.1-3.2 | Update to reflect changes to PTP arrangements if required, but unlikely. |
|  | 4.3 | Update frequency ranges referred to as required.  Change the offset definition in table 1 of 4.3 (4) to refer to the “nearest”, rather than “lower” edge, as there will now be potential for WBB services to be above the frequency of incumbent FSS services. |
|  | 4.4 | Update references to reallocation declarations as required. |
|  | 5 | Remove reference to RALIs proposed to be retired and update with a reference to protection criteria defined in the new AWL RALI. |
|  | (blank) | [previous possible change moved to the S.145 document] |
|  | 7 | Review class licence part to reflect devices in 3700-3800 MHz. |
|  | 8 | Update scope to ensure AWL receivers are covering by this part as well. |
|  | 9.2 | Update notes about reviewing ESPZs |
| Rx RAG |  | 1.4 (1) | Redefine 3.4 GHz band to 3400-3800 MHz |
|  | 3.1 (2) | Update ranges as required. |
|  | 3.1 (5) | Update ranges as required. |
|  | 3.2 (4) | Update to reflect agreed radiolocation service coordination requirements if required [not proposed at this stage] |
|  | Sched 1 (5) | Update blocking ranges. |
|  | 5 (1) | Redefine 3.4 GHz band to 3400-3800 MHz |
| S.145 determination |  | Definitions (3) | Redefine 3.4 GHz band to 3400-3800 MHz |
|  | [9 unacceptable level of interference] | [If proven necessary, add new clauses to coordinate services above 3700 MHz with radio altimeters] |
| Example spectrum licence |  | Sched 2 6-9 | Modify limit for non-AAS systems to apply per antenna port and not total radiated power. |
|  |  | Sched 2 9 | Modify upper frequency for non-registered devices from 3805 MHz to 3905 MHz. |
|  |  | Sched 2 10 | Modify upper frequency for non-registered devices from 3805 MHz to 3905 MHz. |
|  |  | Sched 2 Table 6 | (agreed in 3.4 GHz TLG meeting so should now not be required) Update table for AAS rx unwanted emissions based on [3GPP](https://www.3gpp.org/ftp/Specs/2020-09/Rel-16/38_series/38104-g50.zip). (to -36 and -30dBm per cell/sector) |
|  |  | Sched 4 13 | Update to reflect two reallocation periods/ranges |

Although not a priority for remote areas, views were sought on changes to the spectrum licensing technical framework.

Similar to the AWL framework, telco members proposed to align both in-band and out of band emission limits to 3GPP for non-AAS systems, changing to per antenna port limits from total radiated power limits. As per comments in the AWL framework section, the ACMA staff preliminary view is to make the change to out of band and spurious emission limits but not in-band limits.

# Appendix A: Defined geographic areas (remote only definition essential to remote)

The ACMA has defined potential geographical areas for the possible future allocation of the extended 3.4 GHz band. A brief description of each is:

* Metropolitan—covers all capital cities (except Darwin and Hobart). It mirrors the metro areas defined in the [Radiocommunications (Spectrum Re-allocation—3.6 GHz Band for Adelaide and Eastern Metropolitan Australia) Declaration 2018](https://www.legislation.gov.au/Details/F2018L00225/Html/Text) and the [Radiocommunications (Spectrum Re-allocation—3.6 GHz Band for Perth) Declaration 2018](https://www.legislation.gov.au/Details/F2018L00221)*.*
* Regional—mirrors the regional areas subject to spectrum licensing in the 3.6 GHz band as defined in the [Radiocommunications (Spectrum Re-allocation—Regional 1800 MHz Band) Declaration 2015](https://www.legislation.gov.au/Details/F2015L00753). This area will be further broken down into high demand and low demand regional areas.
* Remote—includes those areas of Australia defined under the Australian Spectrum Map Grid not covered by metropolitan and Regional areas.

Australia-wide—covers all of Australia but excludes Australian external territories.

As per previous discussions, the Regional area is likely to be further segregated into “major regional areas” and “other regional areas”. Different allocations may be developed in these two areas.

The Australian Spectrum Map Grid (ASMG) is used to define geographical areas over which spectrum licences are issued. The Hierarchical Cell Identification Scheme (HCIS) is a naming convention developed by the ACMA that applies unique ‘names’ to each of the cells that make up the ASMG. The ASMG and HCIS are described in detail in the document [*The Australian spectrum map grid 2012*](https://www.acma.gov.au/sites/default/files/2019-10/The%20Australian%20spectrum%20map%20grid%202012_0.PDF).

The HCIS coordinates in Table 2: HCIS description of areas can be converted into a Placemark file (viewable in Google Earth) through a facility on the [ACMA website](https://www.acma.gov.au/convert-hcis-area-description-placemark).

Figure 1: Extended 3.4 GHz band geographical area descriptions

Map

Description automatically generated

Table 2: HCIS description of areas

| Area | Sub-area name | HCIS |
| --- | --- | --- |
| Metropolitan | Adelaide | IW3J,IW3K,IW3L,IW3N,IW3O,IW3P,IW6B,IW6C,IW6D,IW6F,IW6G,IW6H,IW3E5,IW3E6,IW3E8,IW3E9,IW3F4,IW3F5,IW3F6,IW3F7,IW3F8,IW3F9,IW3G4,IW3G5,IW3G6,IW3G7,IW3G8,IW3G9,IW3H4,IW3H5,IW3H6,IW3H7,IW3H8,IW3H9,IW3I2,IW3I3,IW3I5,IW3I6,IW3I8,IW3I9,IW3M2,IW3M3,IW3M5,IW3M6,IW3M8,IW3M9,IW6A2,IW6A3,IW6A5,IW6A6,IW6A8,IW6A9,IW6E2,IW6E3,IW6E5,IW6E6,IW6E8,IW6E9,JW1E4,JW1E7,JW1I1,JW1I4,JW1I7,JW1M1,JW1M4 |
| Brisbane | NT9,NT8C,NT8D,NT8G,NT8H,NT8K,NT8L,NT8O,NT8P,NU3A,NU3B,NU3C,NU3D,NU3F,NU3G,NU3H,NT5O4,NT5O5,NT5O6,NT5O7,NT5O8,NT5O9,NT5P4,NT5P5,NT5P6,NT5P7,NT5P8,NT5P9,NT6M4,NT6M5,NT6M6,NT6M7,NT6M8,NT6M9,NT6N4,NT6N5,NT6N6,NT6N7,NT6N8,NT6N9,NT6O4,NT6O5,NT6O6,NT6O7,NT6O8,NT6O9,NT6P4,NT6P5,NT6P6,NT6P7,NT6P8,NT6P9,NU2C1,NU2C2,NU2C3,NU2D1,NU2D2,NU2D3,NU2D5,NU2D6,NU2D8,NU2D9,NU2H2,NU2H3,NU3E1,NU3E2,NU3E3,NU3E5,NU3E6,NU3E8,NU3E9,NU3I2,NU3I3,NU3J1,NU3J2,NU3J3,NU3K1,NU3K2,NU3K3,NU3L1,NU3L2,NU3L3 |
| Canberra | MW4D,MW4H,MW4L,MW5A,MW5B,MW5E,MW5F,MW5I,MW5J,MW1P4,MW1P5,MW1P6,MW1P7,MW1P8,MW1P9,MW2M4,MW2M5,MW2M6,MW2M7,MW2M8,MW2M9,MW2N4,MW2N5,MW2N6,MW2N7,MW2N8,MW2N9,MW4P1,MW4P2,MW4P3,MW5M1,MW5M2,MW5M3,MW5N1,MW5N2,MW5N3 |
| Melbourne | KX3J,KX3K,KX3L,KX3N,KX3O,KX3P,KX6A,KX6B,KX6C,KX6D,KX6E,KX6F,KX6G,KX6H,KX6I,KX6J,KX6K,KX6L,LX1I,LX1M,LX1N,LX1O,LX4A,LX4B,LX4C,LX4E,LX4I,KX3E9,KX3F5,KX3F6,KX3F7,KX3F8,KX3F9,KX3G1,KX3G2,KX3G4,KX3G5,KX3G6,KX3G7,KX3G8,KX3G9,KX3H4,KX3H5,KX3H6,KX3H7,KX3H8,KX3H9,KX3I3,KX3I6,KX3I8,KX3I9,KX3M2,KX3M3,KX3M4,KX3M5,KX3M6,KX3M7,KX3M8,KX3M9,LX1E4,LX1E7,LX1E8,LX1E9,LX1J1,LX1J4,LX1J5,LX1J6,LX1J7,LX1J8,LX1J9,LX1K4,LX1K7,LX4F1,LX4F2,LX4F4,LX4F5,LX4F7,LX4F8,LX4J1,LX4J2,LX4J4,LX4J5,LX4J7,LX4J8 |
| Perth | BV1I,BV1J,BV1K,BV1L,BV1M,BV1N,BV1O,BV1P,BV2I,BV2J,BV2M,BV2N,BV4A,BV4B,BV4C,BV4D,BV4E,BV4F,BV4G,BV4H,BV4I,BV4J,BV4K,BV4L,BV5A,BV5B,BV5E,BV5F,BV5I,BV5J,BV1E7,BV1E8,BV1E9,BV1F7,BV1F8,BV1F9,BV1G7,BV1G8,BV1G9,BV1H7,BV1H8,BV1H9,BV2E7,BV2E8,BV2E9,BV2F7,BV2F8,BV2F9,BV4M1,BV4M2,BV4M3,BV4N1,BV4N2,BV4N3,BV4O1,BV4O2,BV4O3,BV4P1,BV4P2,BV4P3,BV5M1,BV5M2,BV5M3,BV5N1,BV5N2,BV5N3 |
| Sydney | MV9I,MV9J,MV9K,MV9L,MV9M,MV9N,MV9O,MV9P,MW3C,MW3D,MW3G,MW3H,MW3K,MW3L,NV4N,NV4O,NV4P,NV5M,NV5N,NV5O,NV5P,NV7B,NV7C,NV7D,NV7E,NV7F,NV7G,NV7H,NV7I,NV7J,NV7K,NV7L,NV7M,NV7N,NV7O,NV7P,NW1A,NW1B,NW1C,NW1D,NW1E,NW1F,NW1G,NW1H,NW1I,NW1J,NW1K,NW1L,MV9D6,MV9D9,MV9E4,MV9E5,MV9E6,MV9E7,MV9E8,MV9E9,MV9F4,MV9F5,MV9F6,MV9F7,MV9F8,MV9F9,MV9G4,MV9G5,MV9G6,MV9G7,MV9G8,MV9G9,MV9H3,MV9H4,MV9H5,MV9H6,MV9H7,MV9H8,MV9H9,MW3B2,MW3B3,MW3B5,MW3B6,MW3B8,MW3B9,MW3F2,MW3F3,MW3F5,MW3F6,MW3F8,MW3F9,MW3J2,MW3J3,MW3O1,MW3O2,MW3O3,MW3P1,MW3P2,MW3P3,NV4I5,NV4I6,NV4I8,NV4I9,NV4J4,NV4J5,NV4J6,NV4J7,NV4J8,NV4J9,NV4K4,NV4K5,NV4K6,NV4K7,NV4K8,NV4K9,NV4L4,NV4L5,NV4L6,NV4L7,NV4L8,NV4L9,NV4M2,NV4M3,NV4M5,NV4M6,NV4M8,NV4M9,NV5I4,NV5I5,NV5I6,NV5I7,NV5I8,NV5I9,NV5J4,NV5J5,NV5J6,NV5J7,NV5J8,NV5J9,NV5K4,NV5K5,NV5K6,NV5K7,NV5K8,NV5K9,NV5L4,NV5L5,NV5L6,NV5L7,NV5L8,NV5L9,NV7A2,NV7A3,NV7A4,NV7A5,NV7A6,NV7A7,NV7A8,NV7A9,NW1M1,NW1M2,NW1M3,NW1N1,NW1N2,NW1N3,NW1O1,NW1O2,NW1O3,NW1P1,NW1P2,NW1P3 |
| Regional | - | CV,DV,IV,JV,KQ,KV,KW,LR,LV,LW,LY,MS,MT,MU,AU9,AV9,AW3,BU7,BU8,BV3,BV6,BV7,BV8,BV9,BW1,BW2,BW3,BW5,BW6,CW1,CW2,CW3,CW4,DW1,DW2,DW3,EV1,EV2,EV3,EV4,EV5,EV6,EV7,FV1,FV2,FV3,FV4,FV5,GV1,GV2,GV3,GV6,HV1,HV2,HV3,HV4,HV5,HV6,HV8,HV9,HW3,HW6,IW1,IW2,IW4,IW5,IW7,IW8,IW9,JW2,JW3,JW4,JW5,JW6,JW7,JW8,JW9,JX1,JX2,JX3,JX5,JX6,KO1,KO4,KO5,KO7,KO8,KP1,KP2,KP4,KP5,KP6,KP7,KP8,KP9,KX1,KX2,KX4,KX5,KX8,KX9,KY2,KY3,KY6,LP4,LP7,LQ1,LQ2,LQ4,LQ5,LQ7,LQ8,LX2,LX3,LX5,LX6,LX7,LX8,LX9,LZ1,LZ2,LZ3,MR1,MR4,MR5,MR7,MR8,MR9,MV1,MV2,MV3,MV4,MV5,MV6,MV7,MV8,MW6,MW7,MW8,MW9,MX1,MX2,MX3,MX4,MX7,MY1,MY4,MY7,MZ1,NS4,NS7,NS8,NS9,NT1,NT2,NT3,NT4,NT7,NU1,NU4,NU5,NU6,NU7,NU8,NU9,NV1,NV2,NV3,AU6I,AU6J,AU6K,AU6L,AU6M,AU6N,AU6O,AU6P,BU4H,BU4I,BU4J,BU4K,BU4L,BU4M,BU4N,BU4O,BU4P,BU5E,BU5F,BU5G,BU5H,BU5I,BU5J,BU5K,BU5L,BU5M,BU5N,BU5O,BU5P,BU9A,BU9B,BU9E,BU9F,BU9I,BU9J,BU9M,BU9N,BV1A,BV1B,BV1C,BV1D,BV2A,BV2B,BV2C,BV2D,BV2G,BV2H,BV2K,BV2L,BV2O,BV2P,BV5C,BV5D,BV5G,BV5H,BV5K,BV5L,BV5O,BV5P,IW3A,IW3B,IW3C,IW3D,IW6I,IW6J,IW6K,IW6L,IW6M,IW6N,IW6O,IW6P,JW1A,JW1B,JW1C,JW1D,JW1F,JW1G,JW1H,JW1J,JW1K,JW1L,JW1N,JW1O,JW1P,KX3A,KX3B,KX3C,KX3D,KX6M,KX6N,KX6O,KX6P,LX1A,LX1B,LX1C,LX1D,LX1F,LX1G,LX1H,LX1L,LX1P,LX4D,LX4G,LX4H,LX4K,LX4L,LX4M,LX4N,LX4O,LX4P,MV9A,MV9B,MV9C,MW1A,MW1B,MW1C,MW1D,MW1E,MW1F,MW1G,MW1H,MW1I,MW1J,MW1K,MW1L,MW1M,MW1N,MW1O,MW2A,MW2B,MW2C,MW2D,MW2E,MW2F,MW2G,MW2H,MW2I,MW2J,MW2K,MW2L,MW2O,MW2P,MW3A,MW3E,MW3I,MW3M,MW3N,MW4A,MW4B,MW4C,MW4E,MW4F,MW4G,MW4I,MW4J,MW4K,MW4M,MW4N,MW4O,MW5C,MW5D,MW5G,MW5H,MW5K,MW5L,MW5O,MW5P,NT5A,NT5B,NT5C,NT5D,NT5E,NT5F,NT5G,NT5H,NT5I,NT5J,NT5K,NT5L,NT5M,NT5N,NT6A,NT6B,NT6C,NT6D,NT6E,NT6F,NT6G,NT6H,NT6I,NT6J,NT6K,NT6L,NT8A,NT8B,NT8E,NT8F,NT8I,NT8J,NT8M,NT8N,NU2A,NU2B,NU2E,NU2F,NU2G,NU2I,NU2J,NU2K,NU2L,NU2M,NU2N,NU2O,NU2P,NU3M,NU3N,NU3O,NU3P,NV4A,NV4B,NV4C,NV4D,NV4E,NV4F,NV4G,NV4H,NV5A,NV5B,NV5C,NV5D,NV5E,NV5F,NV5G,NV5H,BV1E1,BV1E2,BV1E3,BV1E4,BV1E5,BV1E6,BV1F1,BV1F2,BV1F3,BV1F4,BV1F5,BV1F6,BV1G1,BV1G2,BV1G3,BV1G4,BV1G5,BV1G6,BV1H1,BV1H2,BV1H3,BV1H4,BV1H5,BV1H6,BV2E1,BV2E2,BV2E3,BV2E4,BV2E5,BV2E6,BV2F1,BV2F2,BV2F3,BV2F4,BV2F5,BV2F6,BV4M4,BV4M5,BV4M6,BV4M7,BV4M8,BV4M9,BV4N4,BV4N5,BV4N6,BV4N7,BV4N8,BV4N9,BV4O4,BV4O5,BV4O6,BV4O7,BV4O8,BV4O9,BV4P4,BV4P5,BV4P6,BV4P7,BV4P8,BV4P9,BV5M4,BV5M5,BV5M6,BV5M7,BV5M8,BV5M9,BV5N4,BV5N5,BV5N6,BV5N7,BV5N8,BV5N9,IW3E1,IW3E2,IW3E3,IW3E4,IW3E7,IW3F1,IW3F2,IW3F3,IW3G1,IW3G2,IW3G3,IW3H1,IW3H2,IW3H3,IW3I1,IW3I4,IW3I7,IW3M1,IW3M4,IW3M7,IW6A1,IW6A4,IW6A7,IW6E1,IW6E4,IW6E7,JW1E1,JW1E2,JW1E3,JW1E5,JW1E6,JW1E8,JW1E9,JW1I2,JW1I3,JW1I5,JW1I6,JW1I8,JW1I9,JW1M2,JW1M3,JW1M5,JW1M6,JW1M7,JW1M8,JW1M9,KX3E1,KX3E2,KX3E3,KX3E4,KX3E5,KX3E6,KX3E7,KX3E8,KX3F1,KX3F2,KX3F3,KX3F4,KX3G3,KX3H1,KX3H2,KX3H3,KX3I1,KX3I2,KX3I4,KX3I5,KX3I7,KX3M1,LX1E1,LX1E2,LX1E3,LX1E5,LX1E6,LX1J2,LX1J3,LX1K1,LX1K2,LX1K3,LX1K5,LX1K6,LX1K8,LX1K9,LX4F3,LX4F6,LX4F9,LX4J3,LX4J6,LX4J9,MV9D1,MV9D2,MV9D3,MV9D4,MV9D5,MV9D7,MV9D8,MV9E1,MV9E2,MV9E3,MV9F1,MV9F2,MV9F3,MV9G1,MV9G2,MV9G3,MV9H1,MV9H2,MW1P1,MW1P2,MW1P3,MW2M1,MW2M2,MW2M3,MW2N1,MW2N2,MW2N3,MW3B1,MW3B4,MW3B7,MW3F1,MW3F4,MW3F7,MW3J1,MW3J4,MW3J5,MW3J6,MW3J7,MW3J8,MW3J9,MW3O4,MW3O5,MW3O6,MW3O7,MW3O8,MW3O9,MW3P4,MW3P5,MW3P6,MW3P7,MW3P8,MW3P9,MW4P4,MW4P5,MW4P6,MW4P7,MW4P8,MW4P9,MW5M4,MW5M5,MW5M6,MW5M7,MW5M8,MW5M9,MW5N4,MW5N5,MW5N6,MW5N7,MW5N8,MW5N9,NT5O1,NT5O2,NT5O3,NT5P1,NT5P2,NT5P3,NT6M1,NT6M2,NT6M3,NT6N1,NT6N2,NT6N3,NT6O1,NT6O2,NT6O3,NT6P1,NT6P2,NT6P3,NU2C4,NU2C5,NU2C6,NU2C7,NU2C8,NU2C9,NU2D4,NU2D7,NU2H1,NU2H4,NU2H5,NU2H6,NU2H7,NU2H8,NU2H9,NU3E4,NU3E7,NU3I1,NU3I4,NU3I5,NU3I6,NU3I7,NU3I8,NU3I9,NU3J4,NU3J5,NU3J6,NU3J7,NU3J8,NU3J9,NU3K4,NU3K5,NU3K6,NU3K7,NU3K8,NU3K9,NU3L4,NU3L5,NU3L6,NU3L7,NU3L8,NU3L9,NV4I1,NV4I2,NV4I3,NV4I4,NV4I7,NV4J1,NV4J2,NV4J3,NV4K1,NV4K2,NV4K3,NV4L1,NV4L2,NV4L3,NV4M1,NV4M4,NV4M7,NV5I1,NV5I2,NV5I3,NV5J1,NV5J2,NV5J3,NV5K1,NV5K2,NV5K3,NV5L1,NV5L2,NV5L3,NV7A1,NW1M4,NW1M5,NW1M6,NW1M7,NW1M8,NW1M9,NW1N4,NW1N5,NW1N6,NW1N7,NW1N8,NW1N9,NW1O4,NW1O5,NW1O6,NW1O7,NW1O8,NW1O9,NW1P4,NW1P5,NW1P6,NW1P7,NW1P8,NW1P9,MT4H,MT4K,MT4L,MU5G,MU5H,MU5L,MV3G,MV3H,MV3K,MV3L,MT4F9,MT4G2,MT4G3,MT4G4,MT4G5,MT4G6,MT4G7,MT4G8,MT4G9,MT4J3,MT4J6,MT4O1,MT4O2,MT4O3,MT4O6,MT4P1,MT4P2,MT4P3,MT4P4,MT4P5,MT5E4,MT5E7,MT5I1,MT5I2,MT5I4,MT5I5,MT5I7,MT5M1,MU5C8,MU5C9,MU5D7,MU5D8,MU5D9,MU5K1,MU5K2,MU5K3,MU5K4,MU5K5,MU5K6,MU5K8,MU5K9,MU6A7,MU6E1,MU6E2,MU6E4,MU6E5,MU6E7,MU6E8,MU6I1,MU6I2,MU6I4,MU6I5,MU6I7,MV3C8,MV3C9,MV3D7,MV3F3,MV3F5,MV3F6,MV3F8,MV3F9,MV3J2,MV3J3,MV3J5,MV3J6,MV3J9,MV3O1,MV3O2,MV3O3,MV3P1,NU7K4,CV,DV,IV,JV,KQ,KV,KW,LR,LV,LW,LY,MS,AU9,AV9,AW3,BU7,BU8,BV3,BV6,BV7,BV8,BV9,BW1,BW2,BW3,BW5,BW6,CW1,CW2,CW3,CW4,DW1,DW2,DW3,EV1,EV2,EV3,EV4,EV5,EV6,EV7,FV1,FV2,FV3,FV4,FV5,GV1,GV2,GV3,GV6,HV1,HV2,HV3,HV4,HV5,HV6,HV8,HV9,HW3,HW6,IW1,IW2,IW4,IW5,IW7,IW8,IW9,JW2,JW3,JW4,JW5,JW6,JW7,JW8,JW9,JX1,JX2,JX3,JX5,JX6,KO1,KO4,KO5,KO7,KO8,KP1,KP2,KP4,KP5,KP6,KP7,KP8,KP9,KX1,KX2,KX4,KX5,KX8,KX9,KY2,KY3,KY6,LP4,LP7,LQ1,LQ2,LQ4,LQ5,LQ7,LQ8,LX2,LX3,LX5,LX6,LX7,LX8,LX9,LZ1,LZ2,LZ3,MR1,MR4,MR5,MR7,MR8,MR9,MT1,MT2,MT3,MT6,MT7,MT8,MT9,MU1,MU2,MU3,MU4,MU7,MU8,MU9,MV1,MV2,MV4,MV5,MV6,MV7,MV8,MW6,MW7,MW8,MW9,MX1,MX2,MX3,MX4,MX7,MY1,MY4,MY7,MZ1,NS4,NS7,NS8,NS9,NT1,NT2,NT3,NT4,NT7,NU1,NU4,NU5,NU6,NU8,NU9,NV1,NV2,NV3,AU6I,AU6J,AU6K,AU6L,AU6M,AU6N,AU6O,AU6P,BU4H,BU4I,BU4J,BU4K,BU4L,BU4M,BU4N,BU4O,BU4P,BU5E,BU5F,BU5G,BU5H,BU5I,BU5J,BU5K,BU5L,BU5M,BU5N,BU5O,BU5P,BU9A,BU9B,BU9E,BU9F,BU9I,BU9J,BU9M,BU9N,BV1A,BV1B,BV1C,BV1D,BV2A,BV2B,BV2C,BV2D,BV2G,BV2H,BV2K,BV2L,BV2O,BV2P,BV5C,BV5D,BV5G,BV5H,BV5K,BV5L,BV5O,BV5P,IW3A,IW3B,IW3C,IW3D,IW6I,IW6J,IW6K,IW6L,IW6M,IW6N,IW6O,IW6P,JW1A,JW1B,JW1C,JW1D,JW1F,JW1G,JW1H,JW1J,JW1K,JW1L,JW1N,JW1O,JW1P,KX3A,KX3B,KX3C,KX3D,KX6M,KX6N,KX6O,KX6P,LX1A,LX1B,LX1C,LX1D,LX1F,LX1G,LX1H,LX1L,LX1P,LX4D,LX4G,LX4H,LX4K,LX4L,LX4M,LX4N,LX4O,LX4P,MT4A,MT4B,MT4C,MT4D,MT4E,MT4I,MT4M,MT4N,MT5A,MT5B,MT5C,MT5D,MT5F,MT5G,MT5H,MT5J,MT5K,MT5L,MT5N,MT5O,MT5P,MU5A,MU5B,MU5E,MU5F,MU5I,MU5J,MU5M,MU5N,MU5O,MU5P,MU6B,MU6C,MU6D,MU6F,MU6G,MU6H,MU6J,MU6K,MU6L,MU6M,MU6N,MU6O,MU6P,MV3A,MV3B,MV3E,MV3I,MV3M,MV3N,MV9A,MV9B,MV9C,MW1A,MW1B,MW1C,MW1D,MW1E,MW1F,MW1G,MW1H,MW1I,MW1J,MW1K,MW1L,MW1M,MW1N,MW1O,MW2A,MW2B,MW2C,MW2D,MW2E,MW2F,MW2G,MW2H,MW2I,MW2J,MW2K,MW2L,MW2O,MW2P,MW3A,MW3E,MW3I,MW3M,MW3N,MW4A,MW4B,MW4C,MW4E,MW4F,MW4G,MW4I,MW4J,MW4K,MW4M,MW4N,MW4O,MW5C,MW5D,MW5G,MW5H,MW5K,MW5L,MW5O,MW5P,NT5A,NT5B,NT5C,NT5D,NT5E,NT5F,NT5G,NT5H,NT5I,NT5J,NT5K,NT5L,NT5M,NT5N,NT6A,NT6B,NT6C,NT6D,NT6E,NT6F,NT6G,NT6H,NT6I,NT6J,NT6K,NT6L,NT8A,NT8B,NT8E,NT8F,NT8I,NT8J,NT8M,NT8N,NU2A,NU2B,NU2E,NU2F,NU2G,NU2I,NU2J,NU2K,NU2L,NU2M,NU2N,NU2O,NU2P,NU3M,NU3N,NU3O,NU3P,NU7A,NU7B,NU7C,NU7D,NU7E,NU7F,NU7G,NU7H,NU7I,NU7J,NU7L,NU7M,NU7N,NU7O,NU7P,NV4A,NV4B,NV4C,NV4D,NV4E,NV4F,NV4G,NV4H,NV5A,NV5B,NV5C,NV5D,NV5E,NV5F,NV5G,NV5H,BV1E1,BV1E2,BV1E3,BV1E4,BV1E5,BV1E6,BV1F1,BV1F2,BV1F3,BV1F4,BV1F5,BV1F6,BV1G1,BV1G2,BV1G3,BV1G4,BV1G5,BV1G6,BV1H1,BV1H2,BV1H3,BV1H4,BV1H5,BV1H6,BV2E1,BV2E2,BV2E3,BV2E4,BV2E5,BV2E6,BV2F1,BV2F2,BV2F3,BV2F4,BV2F5,BV2F6,BV4M4,BV4M5,BV4M6,BV4M7,BV4M8,BV4M9,BV4N4,BV4N5,BV4N6,BV4N7,BV4N8,BV4N9,BV4O4,BV4O5,BV4O6,BV4O7,BV4O8,BV4O9,BV4P4,BV4P5,BV4P6,BV4P7,BV4P8,BV4P9,BV5M4,BV5M5,BV5M6,BV5M7,BV5M8,BV5M9,BV5N4,BV5N5,BV5N6,BV5N7,BV5N8,BV5N9,IW3E1,IW3E2,IW3E3,IW3E4,IW3E7,IW3F1,IW3F2,IW3F3,IW3G1,IW3G2,IW3G3,IW3H1,IW3H2,IW3H3,IW3I1,IW3I4,IW3I7,IW3M1,IW3M4,IW3M7,IW6A1,IW6A4,IW6A7,IW6E1,IW6E4,IW6E7,JW1E1,JW1E2,JW1E3,JW1E5,JW1E6,JW1E8,JW1E9,JW1I2,JW1I3,JW1I5,JW1I6,JW1I8,JW1I9,JW1M2,JW1M3,JW1M5,JW1M6,JW1M7,JW1M8,JW1M9,KX3E1,KX3E2,KX3E3,KX3E4,KX3E5,KX3E6,KX3E7,KX3E8,KX3F1,KX3F2,KX3F3,KX3F4,KX3G3,KX3H1,KX3H2,KX3H3,KX3I1,KX3I2,KX3I4,KX3I5,KX3I7,KX3M1,LX1E1,LX1E2,LX1E3,LX1E5,LX1E6,LX1J2,LX1J3,LX1K1,LX1K2,LX1K3,LX1K5,LX1K6,LX1K8,LX1K9,LX4F3,LX4F6,LX4F9,LX4J3,LX4J6,LX4J9,MT4F1,MT4F2,MT4F3,MT4F4,MT4F5,MT4F6,MT4F7,MT4F8,MT4G1,MT4J1,MT4J2,MT4J4,MT4J5,MT4J7,MT4J8,MT4J9,MT4O4,MT4O5,MT4O7,MT4O8,MT4O9,MT4P6,MT4P7,MT4P8,MT4P9,MT5E1,MT5E2,MT5E3,MT5E5,MT5E6,MT5E8,MT5E9,MT5I3,MT5I6,MT5I8,MT5I9,MT5M2,MT5M3,MT5M4,MT5M5,MT5M6,MT5M7,MT5M8,MT5M9,MU5C1,MU5C2,MU5C3,MU5C4,MU5C5,MU5C6,MU5C7,MU5D1,MU5D2,MU5D3,MU5D4,MU5D5,MU5D6,MU5K7,MU6A1,MU6A2,MU6A3,MU6A4,MU6A5,MU6A6,MU6A8,MU6A9,MU6E3,MU6E6,MU6E9,MU6I3,MU6I6,MU6I8,MU6I9,MV3C1,MV3C2,MV3C3,MV3C4,MV3C5,MV3C6,MV3C7,MV3D1,MV3D2,MV3D3,MV3D4,MV3D5,MV3D6,MV3D8,MV3D9,MV3F1,MV3F2,MV3F4,MV3F7,MV3J1,MV3J4,MV3J7,MV3J8,MV3O4,MV3O5,MV3O6,MV3O7,MV3O8,MV3O9,MV3P2,MV3P3,MV3P4,MV3P5,MV3P6,MV3P7,MV3P8,MV3P9,MV9D1,MV9D2,MV9D3,MV9D4,MV9D5,MV9D7,MV9D8,MV9E1,MV9E2,MV9E3,MV9F1,MV9F2,MV9F3,MV9G1,MV9G2,MV9G3,MV9H1,MV9H2,MW1P1,MW1P2,MW1P3,MW2M1,MW2M2,MW2M3,MW2N1,MW2N2,MW2N3,MW3B1,MW3B4,MW3B7,MW3F1,MW3F4,MW3F7,MW3J1,MW3J4,MW3J5,MW3J6,MW3J7,MW3J8,MW3J9,MW3O4,MW3O5,MW3O6,MW3O7,MW3O8,MW3O9,MW3P4,MW3P5,MW3P6,MW3P7,MW3P8,MW3P9,MW4P4,MW4P5,MW4P6,MW4P7,MW4P8,MW4P9,MW5M4,MW5M5,MW5M6,MW5M7,MW5M8,MW5M9,MW5N4,MW5N5,MW5N6,MW5N7,MW5N8,MW5N9,NT5O1,NT5O2,NT5O3,NT5P1,NT5P2,NT5P3,NT6M1,NT6M2,NT6M3,NT6N1,NT6N2,NT6N3,NT6O1,NT6O2,NT6O3,NT6P1,NT6P2,NT6P3,NU2C4,NU2C5,NU2C6,NU2C7,NU2C8,NU2C9,NU2D4,NU2D7,NU2H1,NU2H4,NU2H5,NU2H6,NU2H7,NU2H8,NU2H9,NU3E4,NU3E7,NU3I1,NU3I4,NU3I5,NU3I6,NU3I7,NU3I8,NU3I9,NU3J4,NU3J5,NU3J6,NU3J7,NU3J8,NU3J9,NU3K4,NU3K5,NU3K6,NU3K7,NU3K8,NU3K9,NU3L4,NU3L5,NU3L6,NU3L7,NU3L8,NU3L9,NU7K1,NU7K2,NU7K3,NU7K5,NU7K6,NU7K7,NU7K8,NU7K9,NV4I1,NV4I2,NV4I3,NV4I4,NV4I7,NV4J1,NV4J2,NV4J3,NV4K1,NV4K2,NV4K3,NV4L1,NV4L2,NV4L3,NV4M1,NV4M4,NV4M7,NV5I1,NV5I2,NV5I3,NV5J1,NV5J2,NV5J3,NV5K1,NV5K2,NV5K3,NV5L1,NV5L2,NV5L3,NV7A1,NW1M4,NW1M5,NW1M6,NW1M7,NW1M8,NW1M9,NW1N4,NW1N5,NW1N6,NW1N7,NW1N8,NW1N9,NW1O4,NW1O5,NW1O6,NW1O7,NW1O8,NW1O9,NW1P4,NW1P5,NW1P6,NW1P7,NW1P8,NW1P9 |
| Remote | - | BR, BS, BT, CR, CS, CT, CU, DQ, DR, DS, DT, DU, EP, EQ, ER, ES, ET, EU, FP, FQ, FR, FS, FT, FU, GP, GQ, GR, GS, GT, GU, HO, HP, HQ, HR, HS, HT, HU, IO, IP, IQ, IR, IS, IT, IU, JO, JP, JQ, JR, JS, JT, JU, KR, KS, KT, KU, LS, LT, LU, AR8, AR9, AS2, AS3, AS5, AS6, AS8, AS9, AT1, AT2, AT3, AT5, AT6, AT8, AT9, AU2, AU3, BU1, BU2, BU3, BU6, GO3, GO4, GO5, GO6, GO7, GO8, GO9, AU6A, AU6B, AU6C, AU6D, AU6E, AU6F, AU6G, AU6H, BU4A, BU4B, BU4C, BU4D, BU4E, BU4F, BU4G, BU5A, BU5B, BU5C, BU5D, BU9C, BU9D, BU9G, BU9H, BU9K, BU9L, BU9O, BU9P |
| Australia-wide | – | AR8, AR9, AS2, AS3, AS5, AS6, AS8, AS9, AT1, AT2, AT3, AT5, AT6, AT8, AT9, AU2, AU3, AU6, AU9, AV9, AW3, BR, BS, BT, BU, BV, BW1, BW2, BW3, BW5, BW6, CR, CS, CT, CU, CV, CW1, CW2, CW3, CW4, DQ, DR, DS, DT, DU, DV, DW1, DW2, DW3, EP, EQ, ER, ES, ET, EU, EV1, EV2, EV3, EV4, EV5, EV6, EV7, FP, FQ, FR, FS, FT, FU, FV1, FV2, FV3, FV4, FV5, GO3, GO4, GO5, GO6, GO7, GO8, GO9, GP, GQ, GR, GS, GT, GU, GV1, GV2, GV3, GV6, HO, HP, HQ, HR, HS, HT, HU, HV1, HV2, HV3, HV4, HV5, HV6, HV8, HV9, HW3, HW6, IO, IP, IQ, IR, IS, IT, IU, IV, IW, JO, JP, JQ, JR, JS, JT, JU, JV, JW, JX1, JX2, JX3, JX5, JX6, KO1, KO4, KO5, KO7, KO8, KP1, KP2, KP4, KP5, KP6, KP7, KP8, KP9, KQ, KR, KS, KT, KU, KV, KW, KX1, KX2, KX3, KX4, KX5, KX6, KX8, KX9, KY2, KY3, KY6, LP4, LP7, LQ1, LQ2, LQ4, LQ5, LQ7, LQ8, LR, LS, LT, LU, LV, LW, LX, LY, LZ1, LZ2, LZ3, MR1, MR4, MR5, MR7, MR8, MR9, MS, MT, MU, MV, MW, MX1, MX2, MX3, MX4, MX7, MY1, MY4, MY7, MZ1, NS4, NS7, NS8, NS9, NT, NU, NV1, NV2, NV3, NV4, NV5, NV7, NW1 |

# Appendix B: Wireless broadband and radio altimeter study

Existing deployments around airports

[see attached document]

# Appendix C: PTP channel plan options

[see attached document]

# Appendix D: Updated Wireless broadband and radio altimeter study

[see attached document]

# Appendix E: Draft AWL Licence Condition Determination

[see attached document]

# Appendix F: Draft RALI MS47: Frequency coordination and licensing procedures for Area-Wide Licence (AWL) in the 3400–4000 MHz band

[see attached document]

1. The action of allowing existing services to continue under current arrangements while new arrangements are put in place for new services is known as ‘grandfathering’ [↑](#footnote-ref-2)
2. The ACMA may review ESPZ arrangements, including assessing whether all of the eastern Australia ESPZs are still required in the band. [↑](#footnote-ref-3)
3. Further referred to commonly as LA WBB [↑](#footnote-ref-4)
4. Largely, with urban excise areas to be decided. An ACMA consultation on options for these areas was released in August 2021. [↑](#footnote-ref-5)
5. Licensing frameworks for Amateur services are currently being [reviewed](https://www.acma.gov.au/consultations/2021-01/review-non-assigned-amateur-and-outpost-regulatory-arrangements-consultation-012021) separately by the ACMA. [↑](#footnote-ref-6)
6. This item was expanded in V2 of the TLG paper to include those other spectrum spaces that were proposed to be allocated via Spectrum Licensing across the wider 3400-4000 MHz range. [↑](#footnote-ref-7)
7. It is not possible to offer PMTS Class B licences as there are not complete taxation arrangements across the who 3400-4000 MHz range [↑](#footnote-ref-8)
8. Also see the FAA website for any subsequent related Airworthiness Directives (ADs) and Notice to Airmen or Notice to Air Missions (NOTAMs) [↑](#footnote-ref-9)
9. As quoted, we would use “equivalent” [↑](#footnote-ref-10)
10. Available in French and Dutch only [↑](#footnote-ref-11)
11. The range the restriction applies were taken from draft modified ministry direction (the last Japan reference). The first reference does not have any such range specified on the restriction. [↑](#footnote-ref-12)
12. More information is available on the [ACMA website](https://www.acma.gov.au/acma-creates-new-licence-type). [↑](#footnote-ref-13)
13. For the purposes of this paper, a restricted cell is considered to be a base station that has some form of restrictions on its operation that limits or reduces the size of the radio coverage to user terminals (e.g., limits on EIRP and antenna heights). It encompasses terms such as micro-cells, small cells, femtocells, etc. [↑](#footnote-ref-14)
14. For the purposes of this paper, a macro-cell is considered to refer to a base station within a mobile network that provides radio coverage to user terminals over a large area. They are typically characterised by transmitters with high power and high gain antennas with antennas mounted on towers, masts, roof-tops and other existing structures to support wide-area coverage. [↑](#footnote-ref-15)
15. In context of this paper, a restricted-use band refers to a defined frequency range were either no operation is permitted, or operation is only permitted under certain conditions (e.g., agreement between operators). [↑](#footnote-ref-16)
16. Changed from “interference” in TLG V3 as it is more accurate, as there is always a determined acceptable level of interference. [↑](#footnote-ref-17)
17. This section concerns coexistence between AWL boundaries. A different section discusses conditions between AWL and SL boundaries. [↑](#footnote-ref-18)
18. For licences which have been aggregated over time (i.e. the frequency bandwidth and/or area authorised by the licence has changed), frequency and area boundary conditions will apply at the ‘outer’ boundary of the licence. [↑](#footnote-ref-19)
19. These rules are contained in the [*Radiocommunications (Trading Rules for Spectrum Licences) Determination 2012*](https://www.legislation.gov.au/Details/F2018C00564)(trading determination). [↑](#footnote-ref-20)