Review of 3.4 GHz band spectrum licensing technical framework

3400-4000 MHz Technical Liaison Group paper

FEBRUARY 2023

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# Version control

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| --- | --- | --- |
| **Version** | **Comments** | **Date** |
| Version 1.0 | Initial release | 5 July 2021 |
| Version 2 | Second release after submissions to version 1 and initial discussions with formed Working Groups. | 15 September 2021 |
| Version 3.0 | Third version frozen for public release of a remote area TLG “snapshot” after version 2 comments. | 21 December 2021 |
| Version 4.0 | Fourth version focussed on 3.4 GHz SLTF   * Removing aspects not intended to be covered in the revised scope/terms of reference * Revisions to proposed SLTF changes | September 2022 |
| Version 4.1 | Corrections on in-band limits text | 30 September 2022 |
| Version 4.2 | Minor editorial to elements listed in “revised focus of the TLG” section and inclusion of a new attachment G, “radio altimeter report” | 7 October 2022 |
| Version 5.0 | Post TLG submissions to Version 4.2   * Update of background and tenses * Recording of TLG views in summary | 9 December 2022 |
| Version 5.1 | Post TLG member review, for TLG package public release | 9 February 2023 |

# 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.

In March 2022, the ACMA consulted on [*the Proposed spectrum re-allocation declaration for the 3.4 GHz and 3.7 GHz bands*](http://collaboration/organisation/cid/speb/sp/SectionDocuments/3700-4200%20MHz/implementation/TLG%20V4/Proposed%20spectrum%20re-allocation%20declaration%20for%20the%203.4%20GHz%20and%203.7%20GHz%20bands). After considering the submissions received, we made the [Radiocommunications (Spectrum Re-allocation – 3.4 GHz and 3.7 GHz Bands) Declaration 2022](https://www.legislation.gov.au/Details/F2022L00983)*,* which re-allocated parts of the 3.4 GHz (3400–3575 MHz) and the 3.7 GHz (3700–3800 MHz) bands for spectrum licensing.

The ACMA plans to conduct an auction of spectrum licences in the 3.4 GHz and 3.7 GHz bands in 2023. We plan to consult on draft instruments for the auction in Q4 2022[[1]](#footnote-2).

The purpose of this paper is to:

Record draft potential spectrum planning, including technical, arrangements for spectrum licensing use of the 3400-3800 MHz frequency range as outlined in the 2019 and 2021 Outcomes papers.

summarise feedback on these draft arrangements from the TLG.

It was proposed to consider extending and aligning technical arrangements as much as practicable, between the extant 3.4 GHz SLTF and the new 3.4 GHz and 3.7 GHz spectrum licensed bands. Consequently, 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.

Submissions to non-radio-altimeter related aspects of the TLG package closed at on 14 October 2022. Submissions to radio altimeter aspects closed on 31 October 2022. Members had the opportunity to review the summary record of their views before 31December 2022.

**Status and distribution**

The purpose of this paper is to share potential spectrum planning, including technical, arrangements for 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 yet released publicly.

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

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 newly re-allocated spectrum spaces in 3.4 GHz and 3.7 GHz bands.

Scope of the TLG

The 3400-4000 MHz band TLG considered the following issues:

* potential changes to the existing 3.4 GHz band spectrum licensing technical framework required to accommodate the newly re-allocated spectrum space in the 3.4 GHz and 3.7 GHz bands. This includes a review of spectrum licence core conditions, s.145(4) determination on unacceptable levels of interference and the Radiocommunications Advisory Guidelines made under s.262.
* further consideration of coexistence between wireless broadband in the 3700-3800 MHz band and aeronautical radio-navigation services in the 4200-4400 MHz band (aircraft radio altimeters) as an input into spectrum and apparatus licensing technical frameworks.

The following was not in scope of the TLG:

* allocation methods and timeframes.
* technical frameworks other than the revised 3.4 GHz spectrum licensing technical framework.

Note that:

* Finalised information about the proposed approach to manage coexistence between wireless broadband and aeronautical radio-navigation services was not available in the initial release of V4. It was released with version V4.2 on 7 October 2022.
* The TLG is one 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 spectrum licensing technical framework. TLG members will be able to provide comments on the technical framework 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.

Revised focus of the TLG

As noted, significant input has already been received on technical frameworks applicable in the 3400-4000 MHz range.

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. It was then refocussed in late 2021 to remote areas only.

This re-engagement of the TLG focussed on the spectrum licensing technical framework only. The TLG may be re-engaged in early 2023 to consider aspects of AWL technical frameworks in non-remote areas.

The critical elements to define to enable a spectrum licence allocation include most aspects that were also relevant to the remote AWL technical framework:

* managing interference with WBB services operating under AWLs, both in remote areas in 3400-4000 MHz and in adjacent frequencies in the same potential areas for future AWL allocations.
* managing co-frequency and adjacent frequency interference with devices operating under spectrum licences in the frequency range 3400-3800 MHz in capital cities and variously defined regional areas.
* managing interference with FSS receive earth stations (earth receive apparatus licences – not possible future FSS operating under 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 4200-4400 MHz band.
* Coexistence with the Amateur service.
* managing interference with radiolocation services operating between 3300-3400 MHz and 3400-3600 MHz.
* managing interference into earth station protection zones (ESPZ).
* managing interference into the earth station facility near Uralla, NSW.
* managing interference into the mid-west radio quiet zone (RQZ).

To support the SL deployments, the following instruments and documents will need to be drafted:

* Amendments to the [Radiocommunications (Unacceptable Levels of Interference – 3.4 GHz Band) Determination 2015](https://www.legislation.gov.au/Series/F2015L00727) (the s.145(4) determination)
* Amendments to the [Radiocommunications Advisory Guidelines (Managing Interference from Spectrum Licensed Transmitters — 3.4 GHz Band) 2015](https://www.legislation.gov.au/Series/F2015L00728) (the RAG Tx)
* Amendments to the [Radiocommunications Advisory Guidelines (Managing Interference to Spectrum Licensed Receivers – 3.4 GHz Band) 2015](https://www.legislation.gov.au/Details/F2013L02150) (the RAG Rx)

Draft RALI MS47 is also included with the spectrum licensing technical framework draft documents as it is referenced by some of the draft amended instruments and considers some aspects of coordination with SL services.

**Request for feedback**

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

## Legal Review

It is noted that the draft amended instruments provided to the TLG had not undergone legal review. It is possible there could be changes to the text in these draft instruments after such a review has been conducted.

Under the currently proposed timeline, a legal review of the draft instruments will be performed and finalised in time for public consultation of the draft technical framework towards the end of 2022.

# Outline of paper

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

* coexistence between WBB and aeronautical radionavigation services.
* extended 3.4 GHz band spectrum licensing technical framework.

Timeline

The ACMA is proposing to consult on the spectrum licensing allocation instruments, including the spectrum licensing technical framework, in Q1 2023. An indicative timeframe is detailed in Table 1.

Indicative timeline for the extended 3.4 GHz band TLG

|  |  |
| --- | --- |
| Key steps | Proposed Date |
| New TLG process   * release of TLG paper (V4.0) * Deadline for submissions/comments on TLG paper (V4.0) * Deadline for submissions/comments on the RA report * Release of TLG paper (V5.0) for review of member’s views * Finalise TLG paper, suspend TLG ahead of public release | September 2022 - January 2023  21 September 2022  14 October 2022  31 October 2022  9 December 2022  January 2023 |
| Public consultation on the drafts of the technical framework instruments | Q1 2023 |
| Public release of the TLG paper in parallel with the public consultation on the drafts of the technical framework instruments | Q1 2023 |
| Finalisation of technical frameworks (including instruments) | Q2 2023 |

# Coexistence between WBB and aeronautical radionavigation services

Background

The ACMA has prepared a draft report, Attachment G, which consolidates the ACMA current understanding of the coexistence of RAs and WBB systems, as well as the current proposed approach to manage coexistence.

### TLG Member Views

TLG member views are grouped into several categories related to the structure of the RA report and the proposed mitigations.

### 200 MHz guard band permanent mitigation

AMTA, supported by Optus, Telstra, strongly supported their existing view that a 200 MHz guard band alone was a sufficient mitigation and that there has been ample time since the issue arose for the aviation sector to improve the performance of radio altimeters. Ericsson suggested that The ACMA should consider whether it is possible to make 4000 – 4100 MHz an interim guard band, using the additional 100MHz recovered from the guard band for additional “restricted band” spectrum in addition to the 3950-4000 MHz and with the same restrictions proposed.

### Coordination recommendation permanent mitigation

The ACMA had proposed a coordination recommendation providing guidance for all WBB services in 3400-4000 MHz to, effectively, take care and consider the potential of interference when planning deployments around airports and helipads.

AMTA, supported by Optus, Telstra and Ericsson questioned the vagueness, purpose, practicality and resourcing required to implement the proposed coordination recommendation. The view was also expressed that application of it to existing spectrum licences below 3700 MHz dilutes their existing utility and goes against principles of the Act in “provid[es]spectrum licensees with a high degree of exclusivity and certainty, making the licence type suited to supporting scenarios where licensees have long-term investment requirements”.

Telstra indicated that, given the little difference in RA filter performance across the band, there is no need to have this “soft” requirement below 3800 MHz and should be restricted to above 3800 MHz.

Aviation sector stakeholders the RA-CG, Boeing, AusALPA and the AAA had the opposite view and that, given the safety-of-life importance of the use of RAs, the ACMA must take a more prescriptive and proactive approach to managing potential interference to RAs when no specific mitigations apply. Boeing, in addition, expressed the opinion that this approach is likely to be in breach of Australia’s obligations under the Radio Regulations.

### Frequency boundary for where interim specific mitigations were proposed to apply

The ACMA had proposed that the temporary mitigations only apply above 3800 MHz.

AMTA strongly agreed that mitigations should not apply below 3800 MHz and exemptions should also be considered for indoor WBB systems between 3800-4000 MHz, in a similar manner to decisions in Canada. They do not oppose the interim mitigations in 3800-4000 MHz as a compromise only to progress the issue but their view is that any mitigations are not necessary.

Telstra and Optus generally supported AMTA’s views.

Ericsson accepted the general approach as a pragmatic balance.

The RA-CG indicated that the temporary mitigations should apply to all new licences, down to 3700 MHz and indicated that CASA may need to consider operational restrictions upon examining the risk if the boundary was not changed to 3700 MHz.

Similarly, CASA indicated that the mitigations should be considered below 3800 MHz to 3700 MHz as there was no experience with WBB above 3700 MHz in Australia yet.

Boeing supported the “everywhere” mitigations above 3800 MHz but considered the ACMA proposed decision for a 3800 MHz boundary was fundamentally flawed and based on a poor interpretation of the evidence, citing an acknowledgment by the ACMA of potential interference from existing deployments which was at odds with the stated precautionary approach. In their view the lack of a causal link should not be a determinant to exclude mitigation measures from operations below 3800 MHz. They strongly recommended that the temporary mitigations apply down to 3700 MHz and also be considered down to 3575 MHz.

The AAA noted that CASA is seeking protection above 3700 MHz.

AusALPA supported the RA-CG contribution and agreed with Boeing that existing WBB deployments below 3700 MHz are in no way vindicated by the lack of evidence, noting that “the absence of evidence is not evidence of absence”.

### Views on the specific interim mitigations proposed above 3800 MHz

The ACMA had proposed that the temporary mitigations only apply above 3800 MHz.

Telstra believed the French mitigations, from which the proposed mitigations were derived, are not evidence-based.

Optus noted the very conservative nature of the studies upon which the mitigations were based and indicated that the 18 dBi grating lobe used to determine some aspects of the mitigations was far too high, pointing to a CTIA filing to the US FCC process. Optus believe, looking at the ‘near collision’ scenario in the draft RTCA DO-399 report that, based on possible future RA performance, no coordination was likely to be required with EIRPs up to 65 dBm/MHz.

Ericsson indicated that their equipment for bands b42, 43, n78 and sub-band n77 could meet the interim additional unwanted emissions mitigation for radios with capabilities up to 4100 MHz, and that grating lobes were already being minimised for other interference mitigation requirements.

The RA-CG implied that the 62 dBm/MHz EIRP limit should be applied ongoing and to all deployments.

CASA suggested that the unwanted emissions temporary mitigation should be made an ongoing, permanent requirement. They suggested that the proposed restricted cell areas in regional and remote areas in 3950 – 4000 MHz be extended to include remote areas.

Boeing supported the purpose of the interim mitigations but said more time would be required to be able to comment in detail and hence they should be considered preliminary. They noted that there were expected other factors such as wind shear and operational manoeuvres that could cause aircraft to drift outside of the exclusions/restricted zones. They supported the mitigations that are proposed to apply everywhere above 3800 MHz (not just around identified airports).

### Where the temporary mitigations should apply

The RA report included a draft list of runway approaches, identified by CASA, where the “identified runway” proposed temporary mitigations were proposed to apply.

CASA provided an updated list, accurate as of 1 December 2022.

Airservices, the AAA and AusALPA were concerned with how to accommodate the identification of future approaches requiring protection, including when WBB rollouts had already occurred, and also noted the potential impacts of restricting protection to the ILS classes in the current draft list of approaches. The RA-CG also wanted to raise the awareness of helicopter and emergency aviation operations where only the “everywhere” mitigations are proposed to apply.

### Timeframe for the temporary mitigations

In the RA report, the ACMA had proposed that the temporary mitigations be time -limited to 31 December 2024.

Telstra implored the aviation industry to expedite RA retrofits and wanted an unambiguous signal from the ACMA that the interim mitigations would cease on 1/1/2025.

AMTA and Optus suggested a 31 December 2023 end to temporary mitigations, based on the expected progress of the US interim retrofit program.

Ericsson also asked for a shorter mitigation period, based on the US proposing to retrofit RAs by mid-2023.

Aviation sector members generally did not agree with a 31 December 2024 timeframe, or one based around the interim retrofit of filters to RAs as is happening in the US program, and wanted the timeframe instead based on a reasonable expectation to be able to fit new radio altimeters based on the developing new standard/MOPs and the expected subsequent revised FAA TSO that would drive retrofitting.

Boeing indicated that it would likely take 3 years to globally fit new RAs based on the interim US retrofit spec (but also noted the US interim retrofit program was already under strain), and to the new standard could be of the order of 6-8 years but was too early to be definitive.

The AAA indicated that the new FAA TSO, to be based on the new RA standard, would not be available until the end of 2023.

QANTAS indicated that they were working with avionics suppliers to introduce RA modifications but ongoing debate about the ACMA 5G implementation model is generating concern that the modifications would not adequately address the 5G threat to aircraft safety.

### Other feedback

The AAA indicated that a whole-of-government approach to resolve the issue was needed and that in their experience this aspect had, so far, been disappointing.

# Aspects of remote AWL technical framework applicable for consideration to the spectrum licensing technical framework

Unwanted emission power limits

TLG members had previously expressed a range of views on the draft AWL LCD and Draft RALI MS47 that had some relevance to a SLTF:

* 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 propose a per port limit in the SLTF.

It was subsequently proposed to largely align proposed unwanted emission limits with appropriate 3GPP limits. A document was shared with TLG members to guide them in understanding what specific 3GPP clauses the proposed framework values have been based on, where appropriate. It is not included as an appendix.

### TLG Member Views

Ericsson acknowledged that the proposed changes to the SLTF in this regard now aligned with 3GPP.

In-band power limits

It is not proposed to change the current technical framework in-band limit from the 48 dBm/5 MHz TRP definition in the existing framework.

Revised view about coordinating between SL and AWL WBB services

It was a view previously in the TLG and by ACMA staff that:

* A variety of wide 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.

This has the following likely implications for the SL 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.

It was the ACMA staff current preliminary view that this revised view generally only needs to be considered in SL areas. As per the draft AWL LCD for remote areas, it is not now proposed for SL services to have a fallback synchronisation scheme with AWL services under the SLTF, as detailed in the proposed RAG Tx. Under draft RALI MS47, AWL services in remote areas have a different, more stringent, device boundary criterion with spectrum licenced services compared with AWLs, removing the need for SL services to have a fallback synchronisation scheme with remote AWLs.

### TLG Member Views

AMTA, Optus and Telstra noted the proposed changes to RAG Tx clauses 8.1 and 8.2 that extended its use to include potential site-to-site coordination of spectrum licensed devices with AWL devices across a geographic boundary. Their general view was strong opposition, as the “stringent” device boundary criterion was already proposed to manage interference from AWL to SL, so that it was both unnecessary, onerous and problematic to include AWLs in these clauses.

Pivotel were concerned that the use of the stringent DBC for AWL to SL coordination would not allow flexibility for AWLs to synchronise with SLs and get closer to the boundary. AMTA, Optus and Telstra noted a willingness to provide information to AWLs to allow them to synchronise, but a formal agreement was not desirable.

AMTA, Optus and Telstra noted the current reference to the stringent DBC only applying to remote areas and questioned whether it was intended to apply to all future AWL/SL boundaries.

AMTA indicated that AWLs should operate as “no interference no protection” from SLs, with support from Optus and Telstra.

Coexistence with other WBB service types in adjacent frequency segments

Measures need to be defined to manage interference between 3.4 GHz spectrum licensed services and adjacent frequency apparatus licensed WBB services. This includes possible future restricted cell services in the 3400-3475 MHz band in urban areas and those operating under AWLs in the 3750/3800-3950 MHz band.

To manage such interference the following measures are proposed:

* Restrict access to the 3470-3475 MHz band for new apparatus licences in defined urban areas.
* Restrict access to the 15 MHz directly adjacent to a 3.4 GHz band spectrum licence for AWLs.

Access to this spectrum by prospective apparatus licensees would generally be limited to cases where there is agreement with the adjacent 3.4 GHz band spectrum licensee. This helps to ensure measures are in place to manage interference.

A new section 12 to the RAG Tx was proposed to detail the above future arrangements. In addition, RALI MS47 would also be updated, as required, to assist in managing coexistence between any AWL services in these possible future AWL ranges and the spectrum licensed services.

### TLG Member Views

AMTA agreed with the proposal for “restricted use bands” and was supported by Optus and Telstra.

FSS AL receive devices operating in the 3400-4200 MHz range

As presented in the March and July 2022 spectrum tune-ups in relation to the allocations in 3400-4000 MHz, issues around the possibility of FSS AL services unduly preventing AWL device registration in remote areas were discussed. This resulted in the ACMA proposing revisions to the draft MS47 to require a new FSS AL to coordinate with the AWL area to allow for future registration of devices in the area. As this situation is also relevant to SLs, coordination with the SL area is necessary to allow future registration of devices, it is proposed to require this to occur for FSS ALs for SLs as well in the final RALI MS47.

For the coordination of SLs with incumbent FSS ALs there were several cases to consider:

1. Protection of incumbent FSS ALs within a SL spectrum space during the SL reallocation period.
2. Protection of incumbent FSS ALs outside an SL spectrum space during the SL reallocation period.
3. Protection of incumbent FSS ALs outside an SL spectrum space after the SL reallocation period.
4. Protection of new FSS ALs outside a SL spectrum space after the reallocation period commences.

In the staff view in TLG V4, the differences relate primarily to the consideration of the assumed RF filter, including whether it should apply to an FSS AL licence frequency upper bound as well as lower bound, under RAG Tx section 4. As also proposed after the spectrum tune-ups, new FSS ALs were proposed to be permitted to licence a frequency range around which RF filtering was possible.

It was the staff view for TLG V4 that it would not be reasonable to assume the RF filter exists at the upper frequency bound of an FSS AL licence for cases 1 or 2, but that it would be reasonable for cases 3 and 4. In case 3, there is a reasonable period of time for an FSS AL to obtain filters to reflect licensing, or to re-licensed for the licence to reflect a practical filter. For case 4, there is reasonable time for a potential FSS AL licensee to plan for a licence to match a practical filter.

Satellite operators previously provided a submission proposing, and providing supporting evidence for, changed values to protect FSS receive devices under the RAG Tx. The ACMA staff preliminary view, currently, is that the existing RAG Tx 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. We do not propose to revise the RAG Tx clauses in relation to FSS at this time.

### TLG Member Views

Intelsat, SES and Speedcast questioned the basis for the parameters used for SL to earth station coordination in Table 1 of the RAG Tx (and similarly in RALI MS47 for AWL to earth station). (Note the parameters were not proposed to be changed from the extant SLTF).

They proposed new values for some coordination parameters to better protect earth stations and some technical basis for their proposal.

They questioned the practicality and cost of custom RF filters for earth stations and the alternative of licensing wide bandwidths was likely to be prohibitive in future metro and regional areas and urged the released of future possible AWL pricing for those areas as soon as practicable. They did support the concessional “no RF filter at the upper edge” during the reallocation period proposal. They (Intelsat, SES and Speedcast) have also raised a number of times their specific concerns with the use of AWLs for FSS C-band earth stations should they be proposed, as planned for the future allocations in regional and metropolitan areas.

AMTA, Optus and Telstra also suggested that the table 1 of the RAG Tx RF filter values should be updated, as filters available in the market today offered better performance.

AMTA noted that the earth station to AWL/SL coordination method described in the draft RALI MS47 did not appear to cover the geographic overlap by adjacent frequency AWLs/SLs.

Telstra noted that the earth station to AWL/SL coordination method described in the draft RALI MS47 only appeared to be specified for remote area earth stations and questioned its wider application.

PMP AL receive devices operating in the 3400-3700 MHz range

It was intended that once SL arrangements are in place, no new PMP licences would be issued. However, incumbent services, during and after the reallocation period need to be protected. These requirements are now described in draft RALI MS47 which is intended to be referred to in the RAG Tx under Part 5.

### TLG Member Views

AMTA made specific comments around coordination conditions proposed for AWLs with PMPs under draft RALI MS47.

Telstra questioned the need for a new condition in draft RALI MS47 that proposed a 20 km exclusion zone for AWLs around incumbent PMPs, which was intended to allow a transition path for PMPs to move to AWLs.

Coexistence with Earth Station Protection Zones (ESPZs)

Spectrum licensees will need to comply with coordination requirements stated in the existing 3.4 GHz SL RAG Tx with regards to ESPZs (Part 9 including the references to RALI MS44) and Uralla (Part 10).

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

LMA previously indicated 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 was that current proposed arrangements should not change (i.e. no changed requirements to be introduced) and to maintain the current proposed mechanisms, which are:

* 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 RAG Tx 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 now includes coordination requirements for FSS services at ESPZ in eastern Australia and the Uralla earth station facility in 3400-3442.5 MHz and 3475-4542.5 MHz ranges (except at Quirindi) as well as the 3600-4200 MHz range.

Coexistence with the Mid West Radio Quiet Zone (RQZ)

Similarly to existing licence conditions for the 3.4 GHz spectrum licensing technical framework, SL 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

Various class licensed devices currently operate in the 3400-4200 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’ (NINP) 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. Staff do propose to modify the text of 7.2 (Protection requirements) as NINP does not apply to all class licences. Specifically, this change is proposed to be made so that SLs still have to consider the operation of radio altimeters in the adjacent 4200-4400 MHz range.

Amateur service in the 3400-3575 MHz range

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 SLs are considered primary services, consequently any amateur use must take this into account.

The ACMA [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”.

As outlined in the [FYSO](https://www.acma.gov.au/publications/2022-09/plan/five-year-spectrum-outlook-2022-27), the review of the non-assigned amateur and output licensing arrangements is occurring in Q3 2022. It is currently expected that amateurs will transition to class licensing arrangements, and those arrangements will not permit amateur services in 3400-3600 MHz in metro and regional areas. The ACMA consulted on the proposed amateur class licence from 29 September to 29 November 2022, via [IFC 31/2022](https://www.acma.gov.au/consultations/2022-09/proposed-amateur-class-licensing-arrangements-and-higher-power-operation-consultation-312022?utm_medium=email&utm_campaign=Have%20your%20say%20%20proposed%20amateur%20class%20licence%20and%20considerations%20for%20higher%20power%20operation&utm_content=Have%20your%20say%20%20proposed%20amateur%20class%20licence%20and%20considerations%20for%20higher%20power%20operation+Preview+CID_8ff76c5bcb8b75a9c3db389a153c0300&utm_source=SendEmailCampaigns&utm_term=ACMA%20website).

### Miscellaneous TLG Member Views

Telstra reiterated their view that the minimum HCIS level for AWL allocation should be level 1, not level 0 as currently proposed.

Telstra, supported by AMTA, raised the potential implications of inaccurate licensing date fields in the RRL affecting the correct determination of first-in-time and/or date-based technical coordination requirements.

# 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.

# Proposed changes to the 3.4 GHz spectrum licensing technical framework

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

In addition to editorial changes, the TLG considered 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 spectrum spaces identified in the reallocation declaration.

### TLG Member Views

Most views were related to SL coordination proposals with other services and were noted in the previous sections.

Telstra agreed that SL to SL clauses in the proposed SLTF were good.

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| DOCUMENT | ITEM | CLAUSE/para | CHANGE |
| RAG Tx |  | 1.5 (1) | Redefine 3.4 GHz band to 3400-3800 MHz  Remove retired/non applicable RALIs FX 19 and MS 39 and insert new RALI definition for MS 47 |
|  | 2.1 | Correct the text (it is not “Australia-wide”) |
|  | 2.3 | Update circumstances covered in the RAG Tx. This includes:   * Aeronautical mobile and radionavigation services in 4200-4400 MHz * Adjacent frequency apparatus licensed WBB services in 3400-4000 MHz |
|  | 4.3 | Update to co-channel frequency ranges in section 4.3(1)(c)(ii).  Consider changes to the offset definition in table 1 of 4.3 (4) to include both FSS licence edges rather than “lower” edge in some cases, as there will now be potential for WBB services to be above the frequency of incumbent FSS services in some cases. |
|  | 4.4 | Update frequency range that the additional protection requirements apply to, so they cover incumbent earth receive stations in 3700-3800 MHz.  Add 4.4 (1) (d) to reflect the Radiocommunications (Spectrum Re-allocation – 3.4 GHz and 3.7 GHz Bands) Declaration 2022 |
|  | 5 | Remove reference to RALIs proposed to be retired and update with a reference to protection criteria defined in RALI MS47. |
|  | 6 | Add note indicating aeronautical mobile and aeronautical radiodetermination services in the 4200-4400 MHz band are covered in Part 11 |
|  | 7 | Update frequency range definition to account for increase in spectrum licence space.  Update so Part 7 does not apply to the *Radiocommunications (Aircraft and Aeronautical Mobile Stations) Class Licence 2016*. That class licence is covered by new Part 11. |
|  | 8 | Update scope to ensure AWL receivers are covered by this part as well. |
|  | 9.2 | Update note about reviewing ESPZs |
|  | 10 | Update protection requirements to account for [inclusion of segments of the 3400-3600 MHz band into RALI MS44](https://www.acma.gov.au/consultations/2021-08/planning-wireless-broadband-use-urban-areas-3400-3475-mhz-band-consultation-312021). |
|  | new Part 11 | Placeholder only for possible new part to manage coexistence with radio altimeters if required. |
|  | New Part 12 | New part that provides guidance on how adjacent channel interference is managed between devices operating under a 3.4 GHz spectrum licence and apparatus licensed WBB services (including AWLs). |
| RAG Rx |  | 1.4 (1) | Redefine 3.4 GHz band to 3400-3800 MHz  Include RALI MS47 definition  Remove unused definitions |
|  | 3.1 (2) | Update to account for latest re-allocation declaration. |
|  | 3.1 (3)-(6) | Delete subsection 3.1(3) and renumber.  Update to (5) account for changes to 3.1(2) |
|  | Sched 1 (5) | Update blocking range to 3340-3860 MHz. |
| S.145 determination |  | Entire instrument | Align formatting and text with the latest template used for s.145 determinations. |
|  | Definitions (3) | Redefine 3.4 GHz band to 3400-3800 MHz |
| Sample spectrum licence |  | Definitions | Change definition of 3.4 GHz band to 3400 to 3800 MHz.  Inclusion of definitions for AWL and mean power, re-allocation zones (i.e. areas subject to reallocation), unwanted emissions and upper or lower frequency limits.  Substitution of reference to the marketing plan to the s.145 determination for additional definitions. This avoids sunsetting instrument issues. |
|  |  | Schedule 1 Part 3 | Addition of renewal statement. Note this only applies to licences that will be issued in the newly re-allocated spectrum – not existing licences. Key aspects of the statement are still TBD and will form part of the public consultation process of the 3.4/3.7 GHz marketing plan. |
|  |  | Schedule 2  . | General editorial changes to text throughout the schedule to align with changes made to licences in other bands.  Updates to core condition and table references and numbering as required. E.g. Section 4 is updated to reference core conditions 5 to 12 (instead of 5 to 10). |
|  |  | Schedule 2 Sections 6 to 11 | Modification to unwanted emission limits to align with category B limits in 3GPP TS 38.104 and 3GPP TS 38.101-1. For further clarity, the frequency ranges these limits apply have been specified.  Modification of the frequency range spurious emissions apply for devices exempt from registration to align with 3GPP TS 38.101-1 – upper limit changed from 3805 MHz to 3905 MHz. |
|  |  | Schedule 3 | General editorial changes to text throughout the schedule to align with changes made to licences in other bands. |
|  |  | Schedule 4  Section 13 | Modification to include protection for apparatus licences affected by the recent re-allocation of spectrum in the 3.4 GHz and 3.7 GHz bands. |
|  |  | Schedule 4  New section 1 | Placeholder only for possible new part to reference relevant new part of RAG Tx to manage coexistence with radio altimeters if required. |
|  |  | Schedule 5 | General editorial changes to text throughout the schedule to align with changes made to licences in other bands. |
|  |  | Schedule 3 | General editorial changes to text throughout the schedule to align with changes made to licences in other bands. |
|  |  | Schedule 4 | General editorial changes to text throughout the schedule to align with changes made to licences in other bands. |

# List of Attachments

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| Attachment | Description |
| A | Draft amended 3.4 GHz RAG Tx |
| B | Draft amended 3.4 GHz RAG Rx |
| C | Draft amended 3.4 GHz S.145 determination |
| D | Draft amended 3.4 GHz Sample spectrum licence |
| E | Track changes version of draft amended 3.4 GHz Sample spectrum licence |
| F | Draft RALI MS47 for reference |
| G | Radio altimeter report |

1. February 2023: Note that project timings in the paper represent those presented during the TLG process and may not represent the most recent ACMA plans [↑](#footnote-ref-2)