3.4 GHz and 3.6 GHz band spectrum licence technical framework

Consultation paper

May 2018

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 or 1800 226 667  
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//](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) 2018.

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 and Design  
PO Box 13112  
Law Courts  
Melbourne VIC 8010  
Email: [info@acma.gov.au](mailto:info@acma.gov.au)

[Executive summary 1](#_Toc514146644)

[Issues for comment 4](#_Toc514146645)

[Introduction 6](#_Toc514146646)

[Spectrum reform 6](#_Toc514146647)

[Scope 7](#_Toc514146648)

[Indicative timeline 7](#_Toc514146649)

[Proposed technical framework 9](#_Toc514146650)

[Technical Liaison Groups (TLGs) 9](#_Toc514146651)

[Draft instruments for consultation 11](#_Toc514146652)

[Conditions on the spectrum licence 12](#_Toc514146653)

[Option 1: Licence conditions 13](#_Toc514146654)

[Option 2: Licence conditions 15](#_Toc514146655)

[Unacceptable levels of interference 16](#_Toc514146656)

[Radiocommunications Advisory Guidelines 18](#_Toc514146657)

[Managing interference from spectrum-licensed transmitters 18](#_Toc514146658)

[Managing interference to spectrum-licensed receivers 20](#_Toc514146659)

[Standard trading units and minimum contiguous bandwidth 22](#_Toc514146660)

[Preliminary views 23](#_Toc514146661)

[Invitation to comment 25](#_Toc514146662)

[Making a submission 25](#_Toc514146663)

Executive summary

Consistent with the re-allocation declarations made by the Minister for Communications in March 2018, the ACMA is preparing for the allocation of spectrum licences in the 3.6 GHz band (3575–3700 MHz) in metropolitan and regional areas of Australia. A necessary part of this process is the development of a technical framework that will apply to the band. Following preliminary industry engagement through a Technical Liaison Group (TLG), this paper seeks comment on the draft technical framework that will apply to the 3.6 GHz band.

Information and advice received during the 3.6 GHz band TLG process (which ran from 10 March to 27 April 2018) provides the basis for the technical framework presented for formal comment in this paper. A key recommendation from the TLG is to have a single technical framework covering both the 3.4 GHz[[1]](#footnote-2) and 3.6 GHz bands. This is because these bands are directly adjacent to each other and considered substitutable. A single framework for both bands would also assist in any reorganisation of the bands to defragment holdings between licensees in the broader 3400–3700 MHz range.

A consequence of this approach, however, is that all existing 3.4 GHz spectrum licence holders must agree to some key changes before they can be adopted by the ACMA. This is in recognition of the rights existing 3.4 GHz spectrum licensees have, and the limitations the ACMA has in imposing some changes on these licences (and associated extant instruments that make up the existing technical framework for the 3.4 GHz band).

While the TLG was able to achieve a large degree of consensus on many aspects of a common technical framework, it became clear there may be restrictions on the ability of some 3.4 GHz spectrum licensees to adopt a completely common technical approach. The primary point of difference concerned the use of common ‘network synchronisation’ arrangements as the most efficient way to efficiently achieve co-existence between 3.4 and 3.6 GHz spectrum licences.

In short, while there was general agreement that network synchronisation was a viable approach, there were differing views on the specific synchronisation structure that was appropriate, at least in the short-term. The majority of the TLG was of the view that a 3:1 ratio of downlink to uplink capacity was preferred. However, this was not agreed by all parties, with an alternative view being that a 1:1 ratio was necessary for at least a period of time.

To provide more time for stakeholders to consider their position while also managing the contingency that agreement from all 3.4 GHz spectrum licensees may not be achieved, the ACMA has developed multiple technical framework options for consideration.

**Option 1** is based on the identification of a common network synchronisation[[2]](#footnote-3) requirement across both the 3.4 GHz and 3.6 GHz bands. This requirement would only apply in the event there would otherwise be interference caused and the affected spectrum licensees have not agreed on an alternative way to manage it. The specific synchronisation approach identified as being acceptable to most participants of the TLG was a 3:1 ratio of downlink to uplink capacity.

The main benefit of this approach is that it removes or at least minimises the need for guard bands or other restrictions to achieve coexistence between licences in adjoining bands. This would result in considerable efficiencies in the use of existing licences as well as the adjacent parts of the 3.6 GHz band. However, to implement this approach, agreement on which synchronisation structure to adopt is highly desirable. Agreement is also required from all existing 3.4 GHz spectrum licensees before their existing 3.4 GHz licences can be amended.

**Alternative approaches to Option 1** have also been identified (referred to in the paper as sub-options of Option 1). These approaches would ultimately see a move to the preferred synchronisation approach of 3:1 downlink to uplink ratio as the fall-back coexistence measure between 3.4 GHz and 3.6 GHz spectrum licensees. These approaches however accommodate the possibility that agreement can only be reached to implement an agreed synchronisation structure at a defined point in the future. These approaches, via various mechanisms, identify either:

1. a delayed start to 3.6 GHz band spectrum licences to align with the date that the 3:1 downlink to uplink ratio synchronisation structure would come into effect. Under this approach, apparatus licence arrangements would be developed to support early access to spectrum for successful 3.6 GHz band bidders. These early access arrangements would have conditions ensuring coexistence with existing 3.4 GHz spectrum licensees in manner suitable for those licensees; or
2. adoption of a temporary synchronisation arrangement, for example, a 1:1 downlink to uplink ratio, for a defined period. After this defined period, and following notification to affected users and a period of transition, the generally preferred synchronisation arrangement of a 3:1 downlink to uplink ratio would come into effect.

The ACMA notes that the preliminary view of one 3.4 GHz licensee is that a period of up to five years, from the commencement of a requirement to adopt a 3:1 synchronisation ratio, may be required to move from a temporary 1:1 synchronisation ratio to an ongoing 3:1 ratio, although this transition period may be considerably shorter in some circumstances.

**Option 2** is based on the use of strict unwanted emission limits to manage interference between 3.4 GHz and 3.6 GHz band licences. Under this option, it is proposed that 3.6 GHz band licences would adopt the synchronisation arrangements detailed in Option 1 (that is, a 3:1 ratio). Meanwhile, coexistence amongst 3.4 GHz spectrum licensees would continue to rely on the use of a combination of restricted blocks and strict unwanted emission limits between licences. Coexistence between 3.4 GHz and 3.6 GHz spectrum licences would be achieved via the implementation of strict unwanted emission limits at the 3.4/3.6 GHz boundary. This approach would use common technical framework instruments for the 3.4 GHz and 3.6 GHz bands to address issues which were identified, and consensus reached, in the TLG.

Disadvantages of this approach are the additional costs that would be imposed on spectrum licensees to achieve these strict unwanted emission levels along with the need for substantial guard bands to ensure coexistence at the 3.4/3.6 GHz spectrum licence boundary.

This approach does not require the agreement of 3.4 GHz spectrum licensees to implement with respect to the synchronisation issue but does need their consent to changes to the associated technical framework documents.

**Option 3** is a variant to Option 2 that could be used if 3.4 GHz licensees did not agree to *any* changes to the existing 3.4 GHz technical framework. This option would see existing 3.4 GHz licences and associated instruments left untouched. New technical framework instruments would be made for the 3.6 GHz licences. These 3.6 GHz specific instruments would be consistent as otherwise proposed under Option 2 modified to apply solely to the 3.6 GHz band.

The disadvantages outlined for Option 2 also apply to this option. In addition, beneficial changes to use of the 3.4 GHz band identified in the TLG that would have been possible through variations to technical instruments, would not be achieved.

This approach does not require the agreement of 3.4 GHz spectrum licensees to implement.

On balance, the ACMA considers it desirable for coexistence between 3.4 GHz and 3.6 GHz spectrum licences to be achieved through a synchronisation approach acceptable to all parties. On this basis, the ACMA preliminary view is that Option 1 (or an approach that achieves this outcome over time) should be adopted if all 3.4 GHz spectrum licensees agree, and there is general support from prospective 3.6 GHz licensees. If agreement on a synchronisation approach cannot be reached, the ACMA is of the preliminary view that Option 2 should be adopted. The ACMA is of the preliminary view that Option 3 is only considered appropriate if no agreement can be achieved with 3.4 GHz spectrum licensees on any changes to the existing 3.4 GHz technical framework.

The ACMA invites comments on the issues raised in this paper and associated instruments. The intent is for this feedback to enable the ACMA to make decisions on the technical framework in July 2018.

# Issues for comment

The ACMA invites comments on updates to the instruments that form the 3.4 GHz technical framework, including their expansion to encompass the 3.6 GHz band.

Specific questions are featured in the relevant sections of this paper and collated below. Attachments A–I are available on the [ACMA website](https://www.acma.gov.au/theACMA/Consultations/Consultations/Current-and-Closed-Consultations).

1. **The ACMA seeks comment from interested stakeholders on the draft spectrum licences for the 3.4 GHz band at Attachment A (for Option 1) and Attachment B (for Option 2).**
2. **The ACMA seeks comment on the proposed sub-options 1a and 1b, including wording for the temporary synchronisation configuration. If sub-option 1b is adopted, what would be an appropriate time frame for the temporary synchronisation configuration to apply? What would be an appropriate time frame for the transition period (when both the temporary and Attachment A configuration would apply)?**
3. **The ACMA seeks comment on the proposed stricter unwanted emission limit in the 3100–3380 MHz frequency range, including whether it is appropriate to follow the Electronic Communications Committee and adopt an even stricter limit should they decide to adopt one.**
4. **The ACMA seeks comment from interested stakeholders on the proposed changes to the arrangements for unacceptable levels of interference in the 3.4 GHz band set out in the draft Radiocommunications (Unacceptable Levels of Interference – 3.4 GHz Band) Determination 2015 at attachments C, H and I.**
5. **The ACMA seeks comment on potential methods to improve the device boundary criteria for paths over water. Is the text proposed by the ACMA suitable?**
6. **The ACMA seeks comment from interested stakeholders on the draft Radiocommunications Advisory Guidelines (Managing Interference from Spectrum Licensed Transmitters – 3.4 GHz Band) 2015 at attachments D and H (for Option 1) and attachments E and I (for Option 2)**
7. **The ACMA seeks comment on the suitability of the updated coexistence arrangements for earth stations?**
8. **The ACMA seeks comment on the suitability of the proposed amendments regarding coexistence with apparatus-licensed BWA services?**
9. **The ACMA seeks comment from interested stakeholders on the draft Radiocommunications Advisory Guidelines (Managing Interference to Spectrum Licensed Receivers – 3.4 GHz Band) 2015 at attachments F and H (for Option 1) and attachments G and I (for Option 2).**
10. **The ACMA seeks comment on the proposed additional out-of-band emission limit in cases where a synchronisation requirement does not apply. Is it appropriate to share the 20 MHz guard band equally between adjacent band licensees? If agreement cannot be achieved with all 3.4 GHz band licensees to share the 20 MHz guard band, are the proposed alternative limits suitable?**
11. **The ACMA seeks comment from interested stakeholders on the proposed amendment to the Radiocommunications (Trading Rules for Spectrum Licences) Determination 2012** **to define a minimum contiguous bandwidth of 10 MHz for the 3.6 GHz band, as detailed in attachments H and I.**
12. **The ACMA seeks comment from interested stakeholders on the proposed amendment to the Radiocommunications (Trading Rules for Spectrum Licences) Determination 2012 to remove the minimum contiguous bandwidth for the 27 GHz band, as detailed in attachments H and I.**

# Introduction

The Australian Communications and Media Authority (the ACMA) develops a technical framework for each spectrum-licensed band. Each framework is a collection of technical and regulatory conditions applicable to the use of radiocommunications devices in a 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 geographic area and frequency bands specified in 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.

On 5 March 2018, the Minister for Communications made three re-allocation declarations that re-allocated the 3575–3700 MHz (3.6 GHz) band in defined metropolitan and regional areas for the issue of spectrum licences. A technical framework for the 3.6 GHz band needs to be developed before spectrum licences can be allocated. This consultation paper outlines the proposed 3.6 GHz spectrum licence technical framework.

## Spectrum reform

The government is reforming the spectrum management framework within Australia. These reforms will simplify the regulatory framework and support new and innovative technologies and services.

Currently, the Radiocommunications Bill and draft transitional and consequential legislation is being finalised before introduction into Parliament. The Department of Communications and the Arts (DoCA) has stated during consultation with stakeholders and interested parties that transition to a new framework would take place over a number of years. In addition, the commencement of the new legislation would occur approximately 12-months after passage of the Bill through Parliament.

Given the time frames associated with the 3.6 GHz band allocation, the ACMA is developing new arrangements in this band, assuming the existing regulatory regime will apply. If any licences are issued under the current regulatory regime, those licences will transition to the new legislative framework in the same manner as other spectrum licences that are in operation at the time the new framework commences. The ACMA will take into account relevant opportunities offered by the implementation of the new legislative framework, if and when applicable.

The relatively long re-allocation periods in Perth and regional Australia mean that arrangements applying to incumbent apparatus licensees in the 3.6 GHz band may be affected by the new legislative framework. In any transition process, the ACMA expects that the intent of the re-allocation period—that is, that the ACMA may continue to authorise incumbent licensees to operate until the end of the period, should they choose to do so—will be preserved. However, the new legislative framework may change some details about the way the operation of transmitters is authorised—for example, the licence that provides this authorisation may change over the course of the re-allocation period. Regardless of the design of any licence that is issued under the new Bill, the licence will continue to authorise the services that are currently provided under the existing licence until the date the relevant re-allocation period ends, but not beyond.

Spectrum licences issued as a result of this auction may also be affected by the new legislative framework. The ACMA understands that transitional and consequential legislation will provide that, five years after the commencement of the main provisions of the Radiocommunications Bill 2018 (the Bill), the *Radiocommunications Act 1992* will be repealed, and spectrum licences will be deemed to be licences issued under the Bill. The ACMA understands that the transitional and consequential legislation will preserve the rights of spectrum licensees, and will also provide the option for spectrum licensees to voluntarily swap their spectrum licence at an earlier time for a licence issued under the Bill that provides similar rights and obligations.

Inquiries about spectrum reform can be emailed to [spectrumreform@communications.gov.au](mailto:spectrumreform@communications.gov.au).

## Scope

The scope to this consultation paper is limited to the technical framework instruments for the 3.4 GHz and 3.6 GHz bands only—these are included in attachments A–I. New RALIs and updates to existing RALIs will be consulted on separately.

Consultation on the proposed allocation instruments for the 3.6 GHz band is being carried out in parallel to this paper. Allocation instruments being consulted on include the draft Marketing Plan, which contains the proposed sample licence as discussed in the *Conditions on the spectrum licence* section of this paper. Further details of this parallel consultation process are available on the [ACMA website](https://www.acma.gov.au/theACMA/Consultations/Consultations/Current-and-Closed-Consultations).

## Indicative timeline

The ACMA has prepared an indicative timeline, shown in Table 1 below, to assist those interested in the 3.4 GHz band technical framework, as well as potential bidders in the 3.6 GHz band auction. The ACMA emphasises that the dates in this timeline are estimates only and may change as the allocation process progresses, including in light of information provided by potential bidders during consultation.

The ACMA proposes to commence the application process in August 2018 and commence the auction in late October 2018. If the auction is still underway in late December 2018, recess periods would be introduced to make allowances for the Christmas/New Year period.

The ACMA will provide updated timelines on its website as, and when, further information becomes available.

Table 1: Indicative timeline for the 3.6 GHz band auction

|  | Event | Date |
| --- | --- | --- |
| 1. 1. | The ACMA invites comments on the draft technical framework instruments—this paper. The ACMA also invites comments of the draft allocation instruments—parallel consultation process. | 18 May 2018 |
|  | The ACMA:   * Makes amendments to the relevant instruments that form the 3.4 GHz band spectrum licence technical framework and registers them on the Federal Register of Legislation. * Approves the sample spectrum licence that will be included in the marketing plan for the 3.6 GHz band allocation. * Makes allocation instruments and registers them on the Federal Register of Legislation. | 24 July 2018 |
|  | The ACMA advertises auction, publishes the *Applicant information pack* and applications open. | 2 August 2018 |
|  | Application deadline. By this date, applicants are required to:   * submit a completed application form * submit a completed deed of acknowledgement form * submit a completed deed of confidentiality form * submit a completed preference nomination form * pay the application fee * pay the required eligibility payment or provide a deed of financial security, or a combination of both. | 30 August 2018 |
|  | The ACMA gives each applicant details about the identity of all other applicants and their associates and asks each applicant to make a statutory declaration by the declaration deadline about whether they are affiliated with another applicant. | After application deadline |
|  | The ACMA tells registered bidders that they have been registered and may participate in the auction, and gives them information to enable their participation (for example, information about how to access and use the online auction system). | After application deadline |
|  | Mock auction held to familiarise registered bidders with the auction system. | October 2018 |
|  | The ACMA notifies registered bidders about the start date and time of the first round in the auction. | October 2018 |
|  | Estimated auction commencement | Late October 2018 |

Note: The above timetable is indicative and for guidance purposes only. It is subject to change and should not be relied upon.

# Proposed technical framework

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

* 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). Section 71 also provides for the ACMA to apply other conditions in a spectrum licence.
* A determination of unacceptable interference for the purpose of device registration in each band (section 145).

Radiocommunications advisory guidelines that provide assistance and advice for coordination with stations in other services when and where required (section 262).

A more comprehensive explanation of spectrum licence technical frameworks is provided in the document [*Know your obligations—Spectrum licensees*](http://www.acma.gov.au/theACMA/Library/Industry-library/Spectrum/know-your-obligationshelp-for-spectrum-licensees).

## Technical Liaison Groups (TLGs)

The ACMA generally reviews or develops a new technical framework through the formation of a Technical Liaison Group (TLG). A TLG is a short-term advisory body convened by the ACMA as a forum for consultation between the ACMA, industry and other stakeholders with an interest in the technical aspects of spectrum licences.

In March 2018, the ACMA formed the 3.6 GHz band Technical Liaison Group (TLG) to provide advice on the development of each component of the technical framework for the 3.6 GHz band.[[3]](#footnote-4) On 27 April 2018 the TLG completed consideration of the sample licence (and associated conditions), the determination of unacceptable interference and advisory guidelines.[[4]](#footnote-5)The outcomes of the 3.6 GHz TLG are available on the [ACMA website](http://www.acma.gov.au/Industry/Spectrum/Radiocomms-licensing/Spectrum-licences/spectrum-licence-technical-liaison-groups), with a summary of these outcomes provided in the next section. The resulting proposed technical framework for the 3.6 GHz band is then discussed in subsequent sections of this paper.

One of the key outcomes of the TLG process was a recommendation to have a single technical framework covering both the 3.4 GHz band and 3.6 GHz band. This is because the bands are directly adjacent to each other and considered substitutable. A single framework would also simplify network design for any licensees that end up holding spectrum in both bands, and would help to reduce the complexity of any future defragmentation of spectrum holdings in the broader 3400–3700 MHz band.

In attempting to develop a single technical framework, three possible options were identified as follows:

* **Option 1** is based on the identification of a common network synchronisation[[5]](#footnote-6) requirement across both the 3.4 GHz and 3.6 GHz bands. This requirement would only apply in the event there would otherwise be interference caused and the affected spectrum licensees have not agreed on an alternative way to manage it. The specific synchronisation approach identified as being acceptable to most participants of the TLG was a 3:1 ratio of downlink to uplink capacity. The main benefit of this approach is that it removes or at least minimises the need for guard bands or other restrictions to achieve coexistence between licences in adjoining bands. This would result in considerable efficiencies in the use of existing licences as well as the adjacent parts of the 3.6 GHz band. However, to implement this approach, agreement on which synchronisation structure to adopt is highly desirable. Agreement is also required from all existing 3.4 GHz spectrum licensees before their existing 3.4 GHz licences can be amended.
* **Option 2** is based on the use of strict unwanted emission limits to manage interference between 3.4 GHz and 3.6 GHz band licences. Under this option, it is proposed 3.6 GHz band licences would adopt the synchronisation arrangements detailed in Option 1 (that is, a 3:1 ratio). Meanwhile, coexistence among 3.4 GHz spectrum licensees would continue to rely on the use of a combination of restricted blocks and strict unwanted emission limits between licences. Coexistence between 3.4 GHz and 3.6 GHz spectrum licences would be achieved via the implementation of strict unwanted emission limits at the 3.4/3.6 GHz boundary. Disadvantages of this approach are the additional costs that would be imposed on spectrum licensees to achieve these strict unwanted emission levels, along with the need for substantial guard bands to ensure coexistence at the 3.4/3.6 GHz spectrum licence boundary. This approach does not require the agreement of 3.4 GHz spectrum licensees to implement.

**Option 3** is a variant to Option 2 that could be used if 3.4 GHz licensees do not agree to *any* changes to the existing 3.4 GHz technical framework. This option would see existing 3.4 GHz licences and associated instruments left untouched. New technical framework instruments would be made for the 3.6 GHz licences. These 3.6 GHz specific instruments would be consistent with what is proposed under Option 2, but modified to apply solely to the 3.6 GHz band. The disadvantages outlined for Option 2 also apply to this option. In addition, beneficial changes to the use of the 3.4 GHz band identified in the TLG, which would have been possible through variations to technical instruments, would not be achieved. This approach does not require the agreement of 3.4 GHz spectrum licensees to implement.

Alternative approaches to Option 1 have been also identified (referred to in the paper as sub-options of Option 1). These approaches would ultimately use the preferred synchronisation approach of the 3:1 downlink to uplink ratio as the coexistence measure between 3.4 and 3.6 GHz spectrum licensees. These approaches accommodate the possibility that agreement can only be reached to implement an agreed synchronisation structure at a defined point in the future. These approaches, via various mechanisms, identify either:

* a delayed start to 3.6 GHz band spectrum licences to align with the date that the 3:1 downlink to uplink ratio synchronisation structure would come into effect. Under this approach, apparatus licence arrangements would be developed to support early access to spectrum for successful 3.6 GHz band bidders. These early access arrangements would have conditions ensuring coexistence with existing 3.4 GHz spectrum licensees in manner suitable for those licensees; or
* adoption of a temporary synchronisation arrangement, for example, a 1:1 downlink to uplink ratio, for a defined period. After this defined period, and following notification to affected users and a period of transition, the generally preferred synchronisation arrangement of a 3:1 downlink to uplink ratio would come into effect.

The ACMA has considered the outcomes of the TLG in putting forward two options for a technical framework that covers both the 3.4 GHz and 3.6 GHz bands. Under both these options, the ACMA proposes that the existing unacceptable interference determination and advisory guidelines that form the current 3.4 GHz band technical framework be amended to also include the 3.6 GHz band. Options for spectrum licences in the 3.4 GHz and 3.6 GHz bands are also presented.

The ACMA also proposes a third option in the event there is no agreement from existing 3.4 GHz band licensees to adopt options 1 or 2. This option, referred to as Option 3, is a variation to Option 2 that would see the existing unacceptable interference determination and advisory guidelines that form the current 3.4 GHz band technical framework left untouched (and hence, are not included with this paper). In addition to this, the unacceptable interference determination and advisory guidelines proposed for Option 2 would be modified to only refer to the 3.6 GHz band.

To provide further background to interested stakeholders, the recent outcomes of the 3.6 GHz TLG are available on the [ACMA website](http://www.acma.gov.au/Industry/Spectrum/Radiocomms-licensing/Spectrum-licences/spectrum-licence-technical-liaison-groups). The paper *Development of the 3.6 GHz spectrum licence technical framework – Technical Liaison Group Consultation Paper v3.1* (the TLG paper) contains detailed discussions on how the proposed technical framework was developed. The TLG paper should be read in conjunction with this paper.

It is noted that discussion within the TLG is still ongoing on the development of:

* updates to RALI FX19, which will describe the protection criteria for point-to-multipoint licences in the 3.6 GHz band

a new RALI MS44, which will contain protection requirements for earth station protection zones (ESPZ) and earth stations operating at the Uralla earth station facility.

These RALIs will be incorporated by reference in the [Radiocommunications Advisory Guidelines (Managing Interference from Spectrum Licensed Transmitters - 3.4 GHz Band) 2015](https://www.legislation.gov.au/Details/F2015L00728), and as a licence condition (in the case of RALI MS44). It is intended that public consultation on these RALI’s will occur under a separate consultation process after the TLG has had time to consider them.

## Draft instruments for consultation

Based on the outcomes of the 3.6 GHz TLG, the ACMA has drafted two sets of updates to relevant technical framework instruments and sample licences reflecting each of the options outlined above.

Note that variations to the Unacceptable Levels of Interference Determination, Radiocommunications Advisory Guidelines and the Radiocommunications (Trading Rules for Spectrum Licences) Determination are provided in omnibus variation instruments contained in attachments H (for Option 1) and I (for Option 2). The consolidated drafts, for both options 1 and 2, of the Unacceptable Levels of Interference Determination and Radiocommunications Advisory Guidelines (contained in attachments C–G) are included only to aid readability of the proposed changes—the omnibus variations will take precedence if there are discrepancies between them and the consolidated drafts.

The following is a list of the attachments relevant to each option:

* **Option 1:**
* draft sample licence for the 3.4 GHz band at Attachment A
* draft Radiocommunications (Unacceptable Levels of Interference – 3.4 GHz Band) Determination 2015 at Attachment C
* draft Radiocommunications Advisory Guidelines (Managing Interference from Spectrum Licensed Transmitters – 3.4 GHz Band) 2015 at Attachment D
* draft Radiocommunications Advisory Guidelines (Managing Interference to Spectrum Licensed Receivers – 3.4 GHz Band) 2015 at Attachment F
* draft Radiocommunications – 3.4 GHz Band Omnibus Variation 2018 (No.1) at Attachment H.
* **Option 2:**
* draft sample licence for the 3.4 GHz band at Attachment B
* draft Radiocommunications (Unacceptable Levels of Interference – 3.4 GHz Band) Determination 2015 at Attachment C
* draft Radiocommunications Advisory Guidelines (Managing Interference from Spectrum Licensed Transmitters – 3.4 GHz Band) 2015 at Attachment E
* draft Radiocommunications Advisory Guidelines (Managing Interference to Spectrum Licensed Receivers – 3.4 GHz Band) 2015 at Attachment G
* draft Radiocommunications – 3.4 GHz Band Omnibus Variation 2018 (No.1) at Attachment I.
* **Option 3:** Under this option, the existing unacceptable interference determination and advisory guidelines that form the current 3.4 GHz band technical framework are left untouched (and hence, are not included with this paper). In addition to this, the unacceptable interference determination and advisory guidelines as proposed for Option 2 would be modified to only refer to the 3.6 GHz band. As the instruments for Option 3 would not be technically different in operation from those provided for comment under Option 2 (and discussed below), separate examples of instruments for this option have not been attached to this paper.

## Conditions on the spectrum licence

Each spectrum licence includes both core conditions and statutory conditions specified under relevant sections of the Radiocommunications 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 Radiocommunications 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, that 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).

As mentioned previously, three technical framework options are proposed. A high-level summary of key conditions proposed under options 1 and 2 is provided below. All proposed conditions for each option are included in the draft sample licences contained in attachments A and B. Due to the similarity between the licences proposed for options 2 and 3, discussion of this instrument for Option 2 can be considered to also apply to Option 3, with the provision it is limited to the 3.6 GHz band.

### Option 1: Licence conditions

Under Option 1, it is intended that the same licence conditions will apply to both the 3.4 GHz and 3.6 GHz band spectrum licences. The key conditions proposed are:

* Improved alignment with international standards for current and future mobile technologies; in particular, Long Term Evolution (LTE—also known as 4G) and New Radio (NR—also known as 5G). This includes:
* arrangements to allow the deployment of devices using active antenna system (AAS) technology, including:
* in-band and unwanted emission limits specified using a total radiated power (TRP), instead of a radiated maximum true mean power that is used in technical frameworks of other spectrum licensed bands
* an increased in-band emission limit in comparison to the current 3.4 GHz band limit
* separate unwanted emission limits for AAS and non-AAS devices. AAS devices will be provided with unwanted emission limits 9 dB higher than non-AAS devices
* amended frequency offsets for unwanted emission limits to align with international equipment standards for 5G devices.
* A stricter unwanted emission limit of -47 dBm/MHz within the 3100–3380 MHz frequency band to facilitate coexistence with adjacent band radiolocation services. It is noted that the Electronic Communications Committee is currently considering a stricter limit of -52 dBm/MHz in this frequency range. Should the Electronic Communications Committee adopt this stricter limit, the ACMA proposes to do the same in Australia. The ACMA will also work with the Department of Defence to determine if such a restriction is only needed at specific locations.
* In addition to the above, the following proposed changes are unique to Option 1:
* A mandated synchronisation requirement as a fall-back measure to manage adjacent-area and adjacent-band interference. Use of synchronisation will remove the need for strict out-of-band emission limits and/or the implementation of guard or restricted use bands.
* The proposed synchronisation requirements are included in the draft sample licence contained in Attachment A. The specific synchronisation approach identified as being acceptable to most participants of the TLG was a 3:1 ratio of downlink to uplink capacity. Option 1, as currently drafted, supports this network synchronisation ratio. The ACMA intends to continue working with stakeholders regarding appropriate wording for a synchronisation requirement, but expects that referencing to a 3GPP frame structure configuration will be the best way to proceed.
* Based on comments received during the TLG process, there may be restrictions on the ability of some existing 3.4 GHz bands licensees to synchronise their networks. Two sub-options have therefore been identified, which aim to ease the restrictions on existing 3.4 GHz band licensees by providing extra time to meet the synchronisation requirements.
* It should be noted that the two sub-options achieve the same technical and policy outcomes, with the key difference being the timing of when a 3:1 synchronisation is achieved, as outlined below. Other than the differences detailed below, the proposed technical framework for sub-options 1a and 1b are the same.
* **Sub-option 1a**: a 3:1 synchronisation requirement as detailed in Option 1, however, the start of the 3.6 GHz band spectrum licence term would be delayed (noting that this could be no later than the end of the 3.6 GHz band re-allocation period for Adelaide and eastern metropolitan Australia[[6]](#footnote-7)). In the interim period, early access to the 3.6 GHz band for successful auction bidders may be provided via apparatus licence arrangements that ensure coexistence with existing 3.4 GHz spectrum licensees in manner suitable for those licensees. At some point before or upon the commencement of the 3.6 GHz licences, the 3.4 GHz licences would be amended to adopt the new conditions. This sub-option is currently included in the sample licence at Attachment A.
* **Sub-option 1b**: two synchronisation requirements would be included in the licence, an initial temporary configuration (a 1:1 downlink to uplink synchronisation approach) would be in force until a set date, then following notification to affected users and period of transition[[7]](#footnote-8) (for example, 4 weeks/months), the 3:1 downlink to uplink synchronisation requirement—as detailed in Option 1, Attachment A—would be in force for the remainder of the spectrum licence term. It is noted that an earlier transition could occur where there is agreement from all affected licensees.
* The ACMA proposes that under this sub-option, the following text would replace sub-condition 11(e) of the synchronisation requirement:

*(e) no agreement can be reached on how to manage this interference; then the licensee is required to synchronise the operation of their radiocommunications device with that on the other licence. This includes; before [defined date], aligning the timing of uplink and downlink emissions with frame structure type 2, configuration 1, and employing configuration 6 for the special sub-frame, as specified in 3GPP TS 36.211.*

*On or after [defined date], the holder of this licence has a [4 week] period to work with other licensees to align the timing of uplink and downlink emissions with frame structure type 2, configuration 2, and employing configuration 6 for the special sub-frame, as specified in 3GPP TS 36.211.*

*On or after [defined date + [4 weeks]], aligning the timing of uplink and downlink emissions with frame structure type 2, configuration 2, and employing configuration 6 for the special sub-frame, as specified in 3GPP TS 36.211.*

* Preliminary input from one 3.4 GHz spectrum licensee indicates that a transition period of five years would be required to move from their existing synchronisation requirement of 1:1 to an ongoing 3:1 synchronisation ratio.
* The ACMA intends to continue working with stakeholders during this consultation process regarding appropriate wording and adoption of the synchronisation requirement for both sub-options. This includes consideration of an appropriate start date and transition period for sub-option 1b. The ACMA sees benefit in the five-year period under this sub-option commencing as soon as possible.

### Option 2: Licence conditions

Under Option 2, all proposed conditions will apply to licences issued in the 3.6 GHz band. Only those conditions that all existing 3.4 GHz band spectrum licensees agree to will be adopted in the 3.4 GHz band.[[8]](#footnote-9) The key conditions proposed for Option 2 are the same as detailed for Option 1 above, with the exception of the wording of the synchronisation requirement. A summary of the differences to Option 1 follows.

For 3.6 GHz spectrum licences only:

* A mandated 3:1 downlink to uplink synchronisation requirement as a fall-back measure to manage adjacent-area and adjacent-band interference (as detailed in sub-option 1a—noting licences could commence at any time before the end of the re-allocation period for Adelaide and eastern metropolitan Australia).[[9]](#footnote-10) The use of synchronisation will remove the need for strict out-of-band emission limits and/or the implementation of guard or restricted use bands between affected 3.6 GHz band spectrum licensees. The requirement has been drafted so that if in the future all 3.4 GHz band licensees agree to adopt the synchronisation requirement, any 3.6 GHz band licences issued do not need to be varied for synchronisation to apply in both bands.

The proposed synchronisation requirements are included in the draft sample licences contained in Attachments B. The ACMA intends to continue working with stakeholders regarding appropriate wording and adoption of the synchronisation requirement.

For both 3.4 GHz and 3.6 GHz spectrum licences:

* A stricter out-of-band emission limit at the frequency boundary between licences in the 3.4 GHz and 3.6 GHz bands where one or both of them do not have a synchronisation requirement on their licence. In effect, this maintains the status quo between existing 3.4 GHz band licences, and also defines how to manage adjacent band interference issues between 3.4 GHz and 3.6 GHz band licences.

For 3.4 GHz spectrum licences only:

There will be no changes to licence conditions on 3.4 GHz spectrum licences, other than those agreed to by all existing 3.4 GHz band licensees.

1. **The ACMA seeks comment from interested stakeholders on the draft spectrum licence for the 3.4 GHz band at Attachment A (for Option 1) and Attachment B (for Option 2).**
2. **The ACMA seeks comment on the proposed sub-options 1a and 1b, including wording for the temporary synchronisation configuration. If sub-option 1b is adopted, what would be an appropriate time frame for the temporary synchronisation configuration to apply? What would be an appropriate time frame for the transition period (when both the temporary and Attachment A configuration would apply)?**
3. **The ACMA seeks comment on the proposed stricter unwanted emission limit in the 3100–3380 MHz frequency range, including whether it is appropriate to follow the Electronic Communications Committee and adopt an even stricter limit should they decide to adopt one.**

## Unacceptable levels of interference

Spectrum licensees are required to register a radiocommunications transmitter in the Register of Radiocommunications Licences before the transmitter may be operated under the licence, unless the transmitter is of a kind exempt from registration under the licence.

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. The ACMA makes a determination under subsection 145(4) of the Act (section 145 determinations) that sets out the unacceptable levels of interference for each spectrum-licensed band.

The section 145 determinations set out the circumstances in which devices may cause unacceptable levels of interference. These circumstances include:

* if any part of the device boundary falls outside the licensed geographical area of the licence
* 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 the deployment constraints set for the band.

The existing section 145 determination for the 3.4 GHz band is the [Radiocommunications (Unacceptable Levels of Interference—3.4 GHz Band) Determination 2015](https://www.legislation.gov.au/Details/F2015L00727).

The ACMA is proposing to amend the existing section 145 determination for the 3.4 GHz band as detailed in this section. The same changes to the section 145 determination are proposed to apply for both Option 1 and Option 2. It is noted that the same changes are also proposed for Option 3, but would only apply to the 3.6 GHz band.

The proposed amended section 145 determination is available at attachments C, H and I. Some of the key proposed amendments to the existing determination are:

* Update the definition of the 3.4 GHz band to include the 3.6 GHz band.
* Make the following changes to the device boundary criteria:
* Change the level of protection from -111 dBm/MHz to -98 dBm/MHz, which will better support the registration of devices employing AAS, and also allow devices to be deployed closer to geographical boundaries.
* Increase the resolution of calculations from 500 m increments to 250 m increments.
* Exempt spectrum licensees from having to meet the device boundary criteria around the areas excised from consideration such as earth station protection zones and the earth station facility operating at Uralla. A requirement to protect earth stations at Uralla will be managed by the new RALI MS44, which will be incorporated by reference into spectrum licence conditions.
* Including a note guiding Accredited Persons on how to treat systems with beam-forming capabilities.

The TLG process also considered changes to the device boundary criteria to provide an automatic pass for any radials that extend beyond the licence area that only pass over water. In particular, the following changes were proposed:

* A device boundary criteria radial that:
* falls outside the licence area
* only crosses sea or ocean (and no land) outside the licence area
* is not deemed to cause an unacceptable level of interference.

The ACMA considers that such a proposal may have merit—noting that this issue could also be managed via agreements with adjacent area spectrum licensees. The main issue with adopting this proposal is the potential unintended consequences. For example, there is a strong risk of interference to and from services deployed in Adelaide and Yorke Peninsula, as well as, between Victoria and Tasmania due to frequent and long periods of ducting.

The text below is indicative of how such arrangements could be incorporated into the unacceptable interference determination:

* A level of interference is not unacceptable in relation to a part of the device boundary that:

1. lies outside the geographical area of the licence
2. is connected to a radial that:
   1. is mentioned in Part 1 of Schedule 2 (of the unacceptable interference determination)
   2. does not cross over land that is permanently above the Australian territorial sea baseline as defined by GeoScience Australia.

It should be noted that in order for the above change to be considered, an indication of support from all existing 3.4 GHz band licensees and prospective 3.6 GHz licensees is required, with the acknowledgement that unintended consequences may occur and it would be the responsibility of licensees to manage them.

The ACMA invites comment on this issue from stakeholders.

1. **The ACMA seeks comment from interested stakeholders on the proposed changes to the arrangements for unacceptable levels of interference in the 3.4 GHz band set out in the draft Radiocommunications (Unacceptable Levels of Interference – 3.4 GHz Band) Determination 2015 at attachments C, H and I.**
2. **The ACMA seeks comment on potential methods to improve the device boundary criteria for paths over water. Is the text proposed by the ACMA suitable?**

## Radiocommunications Advisory Guidelines

Further guidance on interference management with other 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 with these services.

Where a case of interference arises between a spectrum-licensed service and another service, the ACMA will refer to the provisions of the RAGs in resolving the matter.

Currently, there are two section 262 guidelines relevant to the deployment of services in the 3.4 GHz band:

* [Radiocommunications Advisory Guidelines (Managing Interference from Spectrum Licensed Transmitters - 3.4 GHz Band) 2015](https://www.legislation.gov.au/Details/F2015L00728)
* [Radiocommunications Advisory Guidelines (Managing Interference to Spectrum Licensed Receivers - 3.4 GHz Band) 2015](https://www.legislation.gov.au/Details/F2015L00729).

The ACMA proposes to amend these RAGs to include the 3.6 GHz band and to take into account new services/technologies that will soon be deployed.

### Managing interference from spectrum-licensed transmitters

The ACMA developed the [Radiocommunications Advisory Guidelines (Managing Interference from Spectrum Licensed Transmitters - 3.4 GHz Band) 2015](https://www.legislation.gov.au/Details/F2015L00728) (the SL-Tx RAG) to provide guidance on the protection of apparatus- and class-licensed receivers from interference caused by transmitters operating under a spectrum licence. The SL-Tx RAG identifies those apparatus-licensed services potentially affected by transmitters operated under a spectrum licence in the 3.4 GHz and 3.6 GHz bands. They also reference the protection criteria and coordination arrangements that apply to these services by reference to various RALIs, international standards and the ACMA’s technical studies.[[10]](#footnote-11)

The ACMA proposes to amend the SL-Tx RAG to reflect the outcome of the 3.6 GHz TLG. This includes consideration of changes in technology and the proposed deployment of new apparatus-licensed services in, and adjacent to, the 3.4 GHz and 3.6 GHz bands.

As mentioned previously, three technical framework options are proposed for consideration. A high-level summary of key changes that are proposed for the SL-Tx RAG under options 1 and 2 is provided below. All proposed conditions for each option are included in the draft SL-Tx RAGs contained in attachments D and H (for Option 1) and attachments E and I (for Option 2). Due to the similarity between the SL-Tx RAG proposed for options 2 and 3, discussion on this instrument for Option 2 can also be considered to apply to Option 3, with the added provision that it is limited to the 3.6 GHz band.

Option 1 SL-Tx RAG

Under Option 1, it is intended that the amended SL-Tx RAG will apply to both the 3.4 GHz and 3.6 GHz bands. The key amendments proposed are:

* update the definition of the 3.4 GHz band to include the 3.6 GHz band
* regarding coexistence with fixed satellite service (FSS) earth stations:
* updated coordination and notification requirements, including earth station protection requirements and filter specifications (based on the FCC filter mask defined in rule [96.17](https://www.gpo.gov/fdsys/search/pagedetails.action?collectionCode=CFR&browsePath=Title+47%2FChapter+I%2FSubchapter+D%2FPart+96%2FSubpart+B%2FSection+%26sect%3B+96.17&granuleId=CFR-2016-title47-vol5-sec96-17&packageId=CFR-2016-title47-vol5&collapse=true&fromBrowse=true))
* inclusion of new protection criteria for incumbent FSS earth stations operating in the 3600-3700 MHz band during the re-allocation period
* inclusion of guidance on the management of interference to defined ESPZ and the earth station facility located near Uralla (NSW). Additional coordination requirements will be included in a new RALI—named RALI MS44—which is currently under development. Consultation on RALI MS44 will be undertaken in a separate process.

In addition to the above, the following proposed changes are unique to Option 1:

* regarding coexistence with apparatus-licensed Broadband Wireless Access (BWA) services, including point-to-multipoint and public telecommunication service licences:
* clarification about who is responsible for bearing the cost for resolving interference issues
* removal of the additional emission mask requirement for spectrum licensed transmitters when coordinating with apparatus licensed BWA services.

Option 2 SL-Tx RAG

Under Option 2, it is intended that the amended SL-Tx RAG will apply to both the 3.4 GHz and 3.6 GHz bands. The key amendments proposed for Option 2 are the same as the non-unique changes detailed for Option 1 above, with the addition of the following proposed changes unique to Options 2:

* regarding coexistence with apparatus-licensed BWA services:
* clarification that the additional emission mask requirement for spectrum licences only applies when coordinating with point-to-multipoint and public telecommunication service licences in the 3400–3542.5 MHz band.

1. **The ACMA seeks comment from interested stakeholders on the draft Radiocommunications Advisory Guidelines (Managing Interference from Spectrum Licensed Transmitters – 3.4 GHz Band) 2015 at attachments D and H (for Option 1) and attachments E and I (for Option 2).**
2. **The ACMA seeks comment on the suitability of the updated coexistence arrangements for earth stations?**
3. **The ACMA seeks comment on the suitability of the proposed amendments regarding coexistence with apparatus-licensed BWA services?**

### Managing interference to spectrum-licensed receivers

The ACMA developed the [Radiocommunications Advisory Guidelines (Managing Interference to Spectrum Licensed Receivers - 3.4 GHz Band) 2015](https://www.legislation.gov.au/Details/F2015L00729) (the SL-Rx RAG) to primarily provide guidance on the management of out-of-band interference to receivers operating under a 3.4 GHz band spectrum licence. However, it also provides some guidance on the management of in-band interference.

A key part of the management of this type of interference is the specification of a notional receiver performance level and a compatibility requirement. This provides a base for the operators of radiocommunications transmitters to coordinate their services against. For this reason, the ACMA recommends that all receivers operating under a spectrum licence have a performance level at least equal to the notional performance level.

The ACMA proposes to amend the SL-Rx RAG to account for developments in mobile technologies that could be expected to be deployed during the next spectrum licence tenure period.

As mentioned previously, three technical framework options are proposed for consideration. A high-level summary of key changes that are proposed for the SL-Rx RAG under options 1 and 2 is provided below. All proposed conditions for each option are included in the draft SL-Rx RAGs contained in attachments F and H (for Option 1) and attachments G and I (for Option 2). Due to the similarity between the SL-Rx RAG proposed for options 2 and 3, discussion on this instrument for Option 2 can also be considered to apply to Option 3, with the added provision that it is limited to the 3.6 GHz band.

Option 1 SL-Rx RAG

Under Option 1 it is intended that the amended SL-Rx RAG will apply to both the 3.4 GHz and 3.6 GHz bands. The key amendments proposed are:

* update the definition of the 3.4 GHz band to include the 3.6 GHz band
* update clauses to include how in-band interference from apparatus licences is managed in the 3575–3700 MHz band
* provide new advice and guidance on managing interference from radiolocation services. The ACMA is also considering a possible review of section 3.10 of RALI MS39[[11]](#footnote-12), which relates to radiodetermination services. Any proposed draft updates will be provided to the TLG for consideration and subsequently for public consultation

amendment of the adjacent channel selectivity and blocking requirements of the notional receiver to account for wider channel systems.

In addition to the above, the following proposed changes are unique to Option 1:

* advice on how the synchronisation requirement can be used to manage in-band interference

removal of the additional out-of-band emission limits.

Option 2 SL-Rx RAG

Under Option 2, it is intended that the amended SL-Tx RAG will apply to both the 3.4 GHz and 3.6 GHz bands. The key amendments proposed for Option 2 are the same as the non-unique changes detailed for Option 1 above, with the addition of the following proposed changes unique to Option 2:

* includes advice on how the synchronisation requirement can be used to manage in-band interference, when there is one defined on both licences
* includes guidance on how to manage out-of-band interference with and without a synchronisation requirement

includes an additional out-of-band emission limit—which matches the ECC coexistence levels for AAS and non-AAS devices—to manage adjacent band interference when at least one licence does not have a synchronisation requirement

It is also proposed to adopt a common frequency offset of 10 MHz at which the additional unwanted emission limits apply for both 3.4 GHz and 3.6 GHz band licences. This will share the required 20 MHz guard band equally between adjacent band licensees. However, this arrangement requires the agreement from existing 3.4 GHz band licensees. In the event an agreement cannot be reached, the existing 3.4 GHz emission limit and the equivalent TRP limit will apply at a 5 MHz offset for 3.4 GHz and 3.6 GHz respectively—example 3.6 GHz band limits are provided below:

* For non-AAS transmitters:
* a radiated maximum true mean power of -25 dBm/MHz EIRP at a frequency offset of ≥5 MHz
* For AAS transmitters:
* a total radiated mean power of -47 dBm/MHz at a frequency offset of ≥5 MHz.

It should be noted that frequency offsets for the adjacent channel selectivity and blocking requirements of the notional receiver may also need to be adjusted depending on how the additional unwanted emission limits are ultimately specified.

1. **The ACMA seeks comment from interested stakeholders on the draft Radiocommunications Advisory Guidelines (Managing Interference to Spectrum Licensed Receivers – 3.4 GHz Band) 2015 at attachments F and H (for Option 1) and attachments G and I (for Option 2).**
2. **The ACMA seeks comment on the proposed additional out-of-band emission limit in cases where a synchronisation requirement does not apply. Is it appropriate to share the 20 MHz guard band equally between adjacent band licensees? If agreement cannot be achieved with all 3.4 GHz band licensees to share the 20 MHz guard band, are the proposed alternative limits suitable?**

## Standard trading units and minimum contiguous bandwidth

Spectrum licences give the licensee flexibility to use a parcel of spectrum space that incorporates a specific frequency band within a particular geographic area for up to 15 years. This spectrum space is divided into standard trading units (STUs) and specifies the minimum contiguous bandwidth (MCB) for the purpose of allocating and trading spectrum licences.

A spectrum licence may be traded in whole, or in part, by geographic area or bandwidth—or both. Section 88 of the Act permits the ACMA to determine the rules for trading of spectrum licences. These rules are set out in the [Radiocommunications (Trading Rules for Spectrum Licences) Determination 2012](https://www.legislation.gov.au/Details/F2015C00469) (Trading Rules Determination).

The Trading Rules Determination specifies a MCB that limits the smallest contiguous bandwidth that can generally be licensed, and reduces the potential for fragmentation in the band.

The ACMA proposes to maintain the existing STU and MCB for the 3.4 GHz band. Further, the ACMA proposes that the STU and MCB for the 3.6 GHz band be made the same as in the 3.4 GHz MHz band. Therefore, it is proposed to amend the Trading Rules Determination in the following way:

* amend the frequency range for item 13 in schedule 1 of the Trading Rules Determination from 3542.5–3575 MHz to 3542.5–3700 MHz.

1. **The ACMA seeks comment from interested stakeholders on the proposed amendment to the Radiocommunications (Trading Rules for Spectrum Licences) Determination 2012 to define a minimum contiguous bandwidth of 10 MHz for the 3.6 GHz band, as detailed in attachments H and I.**

It is further proposed that, since the 26.5–27.5 GHz (27 GHz) band is no longer subject to spectrum licensing, item 14 of Schedule 1 of the Trading Rules Determination (that is, the 27 GHz band MCB) be deleted.

1. **The ACMA seeks comment from interested stakeholders on the proposed amendment to the Radiocommunications (Trading Rules for Spectrum Licences) Determination 2012to remove the minimum contiguous bandwidth for the 27 GHz band, as detailed in attachments H and I.**

# Preliminary views

As detailed throughout this paper, the ACMA is seeking views on three technical framework options for the 3.4 GHz and 3.6 GHz bands. Each approach has its own pros and cons, as follows:

* **Option 1**, removes, or at least greatly reduces, the need for guard bands (or ‘restricted use’ blocks where low power systems, such as small cells, can operate) between licensees to manage co-frequency and adjacent band interference. This is achieved through the use of mandatory synchronisation of networks (a 3:1 downlink to uplink ratio is proposed) as a fall back in the event that agreements between licenses cannot otherwise be achieved. This assists in maximising utility of the available spectrum. A disadvantage is that the use of a synchronisation fall-back solution under Option 1 (that must accommodate both LTE and 5G systems) can affect the ability of licensees to deliver some of the benefits of 5G, such as low latency and some spectral efficiency improvements. It also removes the ability of licensees to implement different downlink to uplink ratios, or, dynamically change these ratios as demand requires. To implement this approach, agreement on which synchronisation structure to adopt is required. Agreement is also required from all existing 3.4 GHz spectrum licensees before their licences can be amended.

Alternative approaches to Option 1 have also been identified (referred to in the paper as sub-options of Option 1). These approaches would, ultimately, use the preferred synchronisation approach of 3:1 downlink to uplink ratio as the coexistence measure between 3.4 and 3.6 GHz spectrum licensees. These approaches accommodate the possibility that agreement can only be reached to implement an agreed synchronisation structure at a defined point in the future. These approaches, via various mechanisms, identify either:

1. a delayed start to 3.6 GHz band spectrum licences to align with the date that the 3:1 downlink to uplink ratio synchronisation structure would come into effect. Under this approach, apparatus licence arrangements would be developed to support early access to spectrum for successful 3.6 GHz band bidders. These early access arrangements would have conditions ensuring coexistence with existing 3.4 GHz spectrum licensees in manner suitable for those licensees.
2. adoption of an intermediate synchronisation arrangement, for example, a 1:1 downlink to uplink ratio, for a defined period. Following notification to affected users and period of transition, the generally preferred synchronisation arrangement of a 3:1 downlink to uplink ratio would come into effect.

* **Option 2** requires the use of guard bands (or ‘restricted use’ blocks where low power systems such as small cells can operate) between licensees to manage adjacent band interference between 3.4 GHz licensees, and at the frequency boundary between 3.4 GHz and 3.6 GHz band licences. The main benefit of Option 2 is the ability of licensees to optimise use of their spectrum as they see fit. Licensees are also free to change this when they want over time. The main disadvantages of Option 2 are the need for guard bands in the order of 20 MHz or more for large bandwidth 5G systems, as well as the increase in equipment costs associated with deploying non-standard equipment. This approach does not require the agreement of 3.4 GHz spectrum licensees to implement with respect to the synchronisation issue, but does need their consent to change the associated technical framework documents.

**Option 3** is a variant to Option 2, which could be used if 3.4 GHz licensees did not agree to *any* changes to the existing 3.4 GHz technical framework. This option would see existing 3.4 GHz licences and associated instruments left untouched. New technical framework instruments would be made for the 3.6 GHz licences. These 3.6 GHz specific instruments would be consistent, as otherwise proposed under Option 2, but modified to apply solely to the 3.6 GHz band. The disadvantages outlined for Option 2 also apply to this option. In addition, beneficial changes to use of the 3.4 GHz band identified in the TLG, which would have been possible through variations to technical instruments, would not be achieved. Though less attractive than options 1 or 2, Option 3 does not require the agreement of 3.4 GHz spectrum licensees to implement. This approach could permit licensing of 3.6 GHz to proceed in the absence of agreement to any changes to the existing 3.4 GHz technical framework.

On balance, the ACMA considers it desirable for coexistence between 3.4 GHz and 3.6 GHz spectrum licences to be achieved through a synchronisation approach acceptable to all parties. On this basis, the ACMA’s preliminary view is that Option 1 (or an approach that achieves this outcome over time) should be adopted, if all 3.4 GHz spectrum licensees agree, and there is general support from prospective 3.6 GHz licensees. If agreement on a synchronisation approach cannot be reached, the ACMA is of the preliminary view that Option 2 should be adopted. The ACMA is of the preliminary view that Option 3 would only be considered appropriate if no agreement can be achieved with 3.4 GHz spectrum licensees on any changes to the existing 3.4 GHz technical framework.

# Invitation to comment

## Making a submission

The ACMA invites comments on the draft allocation instruments and any other issue raised in this paper. Submissions should be made:

* [**Online submissions**](http://www.acma.gov.au/theACMA/Consultations/Consultations)—submissions can be made via the comment function or by uploading a document. The online consultation page provides details.
* **Submissions by post**—can be sent to:

The Manager

Spectrum Planning Section

Spectrum Planning and Engineering Branch

Australian Communications and Media Authority

PO Box 78

Belconnen ACT 2616

**The closing date for submissions is COB, Friday 15 June 2018.**

Electronic submissions in Microsoft Word or Rich Text Format are preferred.

Enquiries

* Consultation enquiries can be emailed to [freqplan@acma.gov.au](mailto:freqplan@acma.gov.au).
* Media enquiries can be directed to Emma Rossi on 02 9334 7719 or by email to [media@acma.gov.au](mailto:media@acma.gov.au).

Effective consultation

The ACMA is working to enhance the effectiveness of its stakeholder consultation processes, which are an important source of evidence for its regulatory development activities. To assist stakeholders in formulating submissions to its formal, written consultation processes, it has developed [*Effective consultation—a guide to making a submission*](http://www.acma.gov.au/theACMA/About/Corporate/Responsibilities/acma-evidenceinformed-regulation-and-effective-consultation). This guide provides information about the ACMA’s formal written public consultation processes and practical guidance on how to make a submission.

Publication of submissions

In general, the ACMA publishes all submissions it receives, including any personal information in the submissions (such as names and contact details of submitters). The ACMA prefers to receive submissions that are not claimed to be confidential. However, the ACMA accepts that a submitter may sometimes wish to provide information in confidence. In these circumstances, submitters are asked to identify the material (including any personal information) over which confidentiality is claimed and provide a written explanation for the claim.

The ACMA will consider each confidentiality claim on a case-by-case basis. If the ACMA accepts a claim, it will not publish the confidential information unless authorised or required by law to do so.

Release of submissions where authorised or required by law

Any submissions provided to the ACMA may be released under the [*Freedom of Information Act 1982*](https://www.comlaw.gov.au/Series/C2004A02562) (unless an exemption applies) or shared with various other government agencies and certain other parties under Part 7A of the [*Australian Communications and Media Authority Act 2005*](https://www.comlaw.gov.au/Series/C2005A00044). The ACMA may also be required to release submissions for other reasons including for the purpose of parliamentary processes or where otherwise required by law (for example, under a court subpoena). While the ACMA seeks to consult submitters of confidential information before that information is provided to another party, the ACMA cannot guarantee that confidential information will not be released through these or other legal means.

Privacy

The [*Privacy Act 1988*](http://www.comlaw.gov.au/Series/C2004A03712) imposes obligations on the ACMA in relation to the collection, security, quality, access, use and disclosure of personal information. These obligations are detailed in the [*Australian Privacy Principles*](http://www.oaic.gov.au/privacy/privacy-resources/privacy-fact-sheets/other/privacy-fact-sheet-17-australian-privacy-principles).

The ACMA may only collect personal information if it is reasonably necessary for, or directly related to, one or more of its functions or activities.

The purposes for which personal information is being collected (such as the names and contact details of submitters) are to:

* contribute to the transparency of the consultation process by clarifying, where appropriate, whose views are represented by a submission
* enable the ACMA to contact submitters where follow-up is required or to notify them of related matters (except where submitters indicate they do not wish to be notified of such matters).

The ACMA will not use the personal information collected for any other purpose, unless the submitter has provided their consent or the ACMA is otherwise permitted to do so under the Privacy Act.

Submissions in response to this paper are voluntary. As mentioned above, the ACMA generally publishes all submissions it receives, including any personal information in the submissions. If a submitter has made a confidentiality claim over personal information that the ACMA has accepted, the submission will be published without that information. The ACMA will not release the personal information unless authorised or required by law to do so.

If a submitter wishes to make a submission anonymously or use a pseudonym, they are asked to contact the ACMA to see whether it is practicable to do so in light of the subject matter of the consultation. If it is practicable, the ACMA will notify the submitter of any procedures that need to be followed and whether there are any other consequences of making a submission in that way.

Further information on the Privacy Act and the ACMA’s privacy policy is available at [www.acma.gov.au/privacypolicy](http://www.acma.gov.au/privacypolicy). The privacy policy contains details about how an individual may access personal information about them that is held by the ACMA, and seek the correction of such information. It also explains how an individual may complain about a breach of the Privacy Act and how the ACMA will deal with such a complaint.

1. The 3.4 GHz band is currently allocated via spectrum licences in metropolitan and regional areas of Australia and covers the 3425–3492.5 MHz and 3542.5–3575 MHz frequency ranges. [↑](#footnote-ref-2)
2. Synchronisation involves aligning the periods of time when different base stations transmit to user terminals (that is, the downlink (DL)) and receive transmissions from user terminals (that is, the uplink (UL)). [↑](#footnote-ref-3)
3. Membership of the 3.6 GHz band TLG consisted of representatives from existing 3.4 GHz spectrum licensees, prospective 3.6 GHz band spectrum licensees, incumbent apparatus licensees, adjacent band apparatus licensees, equipment manufacturers and accredited persons. [↑](#footnote-ref-4)
4. Consideration of new and updated RALIs is still ongoing in the TLG. [↑](#footnote-ref-5)
5. Synchronisation involves aligning the periods of time when different base stations transmit to user terminals (that is, the downlink (DL)) and receive transmissions from user terminals (that is, the uplink (UL)). [↑](#footnote-ref-6)
6. See [*Radiocommunications (Spectrum Re-allocation – 3.6 GHz Band for Adelaide and Eastern Metropolitan Australia) Declaration 2018*](https://www.legislation.gov.au/Details/F2018L00225)*.* [↑](#footnote-ref-7)
7. During the transition period either the temporary configuration (1:1 ratio), or the configuration in Attachment A (ratio of 3:1) could be used. [↑](#footnote-ref-8)
8. Sections 72 and 73 of the *Radiocommunications Act 1992* provide limitations and conditions on varying spectrum licences. [↑](#footnote-ref-9)
9. See [Radiocommunications (Spectrum Re-allocation – 3.6 GHz Band for Adelaide and Eastern Metropolitan Australia) Declaration 2018](https://www.legislation.gov.au/Details/F2018L00225). [↑](#footnote-ref-10)
10. A full list of RALIs currently in-force is available on the [ACMA website](https://www.acma.gov.au/Industry/Spectrum/Spectrum-planning/Current-APs-info-and-resources/frequency-assignment-requirements-spectrum-planning-acma). [↑](#footnote-ref-11)
11. Frequency Coordination and Licensing Procedures for Apparatus Licensed Public Telecommunications Services in the 3.5 GHz Band. [↑](#footnote-ref-12)