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Review of the 2.5 GHz band spectrum licence technical framework

Consultation paper

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Executive summary

We have undertaken a review of the 2.5 GHz band spectrum licence technical framework as part of the broader program of work first identified in the *Five-year spectrum outlook 2019–23* (FYSO). The 2.5 GHz band is a key frequency band for wireless broadband (WBB) services, but the existing technical framework is not optimised for the use of Advanced Antenna Systems (AAS) and 5G.

This paper outlines our proposed updates to the spectrum licence technical framework, aimed at enabling the efficient use of modern equipment while continuing to protect services operating in adjacent bands. Proposed changes include revisions for in-band emission limits, unwanted emission limits and amendments to the Radiocommunications Advisory Guidelines (Managing Interference from Spectrum Licensed Transmitters — 2.5 GHz Band) 2023 (RAG Tx).

These proposals have been informed by technical analysis and stakeholder engagement, including input from a Technical Liaison Group (TLG) convened in October 2025. The TLG brought together spectrum licensees, equipment vendors and other interested parties to consider potential improvements and provide recommendations.

Through this consultation paper, we are seeking feedback from industry and other stakeholders on the proposed changes to ensure the final framework achieves an appropriate balance between supporting technological advancement, promoting efficient spectrum use and managing interference.

Issues for comment

We invite comments on the issues set out in this consultation paper and Draft Radiocommunications Advisory Guidelines (Managing Interference from Spectrum Licensed Transmitters – 2.5 GHz Band) Variation 2026 (No.1) (the variation instrument):

1. Do you have comments on proposed changes to the 2.5 GHz band spectrum licence conditions in Proposals 1–10?
2. Do you have comments on the proposed change to the Radiocommunications Advisory Guidelines (Managing Interference from Spectrum Licensed Transmitters – 2.5 GHz Band) 2023?
3. Do you have comments on the effect the proposed changes to the 2.5 GHz band technical framework may have on incumbent services in and adjacent to the 2.5 GHz band?

Introduction

The review of the 2.5 GHz band (consisting of the paired frequency ranges 2500–2570 MHz and 2620–2690 MHz) spectrum licence technical framework is part of a broader work program. It was first outlined in the *Five-year spectrum outlook 2019–23* (the 2019–23 FYSO), to review existing spectrum licence technical frameworks to accommodate new technology developments such as 5G and Advanced Antenna Systems (AAS) technologies.

We have already completed updates to the technical frameworks in the 700 MHz, 850/900 MHz, 1800 MHz, 2 GHz, 2.3 GHz and 3.4 GHz bands to support 5G and AAS. The 2.5 GHz band is now the final band being considered under these technical framework reviews.

The 2.5 GHz band spectrum licence technical framework consists of the following elements:

- Conditions included on spectrum licences issued in the 2.5 GHz band.
- Radiocommunications (Unacceptable Levels of Interference - 2.5 GHz Band) Determination 2023 (the ULOI Determination).
- Radiocommunications Advisory Guidelines (Managing Interference from Spectrum Licensed Transmitters — 2.5 GHz Band) 2023 (the RAG Tx).
- Radiocommunications Advisory Guidelines (Managing Interference to Spectrum Licensed Receivers – 2.5 GHz Band) 2023 (the RAG Rx).

A more comprehensive explanation of spectrum licence technical frameworks is provided in the document *Spectrum licensees – know your obligations*.

The 2.5 GHz band spectrum licences were first allocated in 2013, and the current licences are issued to mobile network operators (MNOs) Optus and Telstra. In March 2023, the ULOI Determination, RAG Tx and RAG Rx were updated as part of the remaking of instruments for several spectrum licence bands.

Since the 2.5 GHz band technical framework was first developed in 2013, 3GPP standards have been developed for 5G and AAS have become commercially available in several frequency bands, enhancing network coverage and/or capacity. The current 2.5 GHz band technical framework is not optimised for such use, and spectrum licensees have indicated it will limit their ability to deploy, or prevent them from deploying, AAS in the future. Updating the technical framework would enable spectrum licensees to deploy AAS in the 2.5 GHz band and align regulatory settings with those applied in other spectrum licensed bands.

In October 2025, we convened a technical liaison group (TLG)[1] to provide advice on possible changes to the 2.5 GHz band technical framework, including those to accommodate AAS, while managing coexistence between spectrum licences and adjacent band services. The TLG concluded its work in February 2026, and the outcomes are detailed in the *Review of the 2.5 GHz band spectrum licence technical framework Technical Liaison Group* paper (2.5 GHz band TLG paper).

[1] A TLG is a short-term advisory body set up by the ACMA as an informal consultation forum between ACMA staff and stakeholders. TLGs consider and provide advice on the technical aspects required for the development or review of a technical framework, and related apparatus licensing frameworks, if needed.

This paper proposed changes to the 2.5 GHz band technical framework in consideration of the TLG outcomes. We are also considering some minor changes to align arrangements between different bands where it makes sense to do so. This will include reviewing changes and lessons learned from the development and review of technical frameworks for other spectrum licensed bands.

The 2.5 GHz band TLG

We convened a TLG for the 2.5 GHz band to provide advice on changes to the 2.5 GHz band technical framework to accommodate AAS technologies, while managing interference with other licensed services. The TLG also took the opportunity to review, where appropriate, other aspects of the 2.5 GHz band technical framework to align with recent updates made and lessons learned in other spectrum licensed bands. Membership of the TLG included:

- Australian Mobile Telecommunications Association
- Bureau of Meteorology
- CSIRO
- Ericsson
- Free TV Australia
- Nokia
- NBN Co
- Optus
- Open Spectrum
- Telstra
- TPG.

The TLG concluded its work in February 2026. The outcomes are detailed in the 2.5 GHz band TLG paper.

While the TLG reached agreement on a range of proposed changes, some TLG members suggested that a broader range of changes, to better align with relevant 3GPP specifications, could be considered as part of the forthcoming expiring spectrum licence (ESL) process. Current 2.5 GHz band spectrum licences are due to expire in September 2029, and we are aiming to commence consideration of the technical framework that would apply to renewed licences in Q1 2027.

Case for action

Since the 2.5 GHz band technical framework was first developed in 2013, 3GPP standards have been developed for 5G. 3GPP Band n7 (2500–2570 MHz and 2620–2690 MHz) has been identified as a 5G band and commercial 5G equipment is now available.

We have received representations from spectrum licensees that they would like to review several aspects of the 2.5 GHz band technical framework to better accommodate AAS and 5G technologies. This includes consideration of amended in-band and unwanted emission limits.

Reviewing and implementing possible changes would help with:

- Aligning technical criteria with international standards, where possible, helps to minimise costs so that manufacturers do not have to develop bespoke equipment to meet Australian requirements.
- Enabling support for 5G and AAS will also enhance an operator's network coverage and capacity. This will help to reduce network costs to meet the rising demand for additional capacity as well as improve the end user experience. 5G technologies will also enable licensees to support ultra-low latency applications (for example, remote control of critical infrastructure, vehicular automation and remote medical procedures), and massive IoT[2] as well as improve reliability for mission critical communications.[3]

In recognition of advice provided by the TLG, we are also considering changes to the RAG Tx to provide clearer guidance for coordination with existing radiolocation services.

When reviewing a spectrum licence technical framework, the effect any changes may have on other spectrum uses and users needs to be considered. While an aim of this review is to maximise the potential of the technical framework for spectrum-licensed services, coexistence and the spectrum utility of other spectrum uses and users are also key objectives.

[2] Massive IoT (Internet of Things) is the connection of a large number of devices embedded with sensors, processing ability, software and other technologies to exchange data with other devices. The aim is to facilitate the transmission and reception of small amounts of data from a large number of devices while providing low equipment costs and longer battery life.

[3] What is 5G | Everything You Need to Know About 5G | 5G FAQ | Qualcomm.

Proposed amendments to the technical framework

This section outlines the proposed changes to the 2.5 GHz band spectrum licence technical framework. Subsequent to the TLG, we are considering changes to in-band and unwanted emission limits (specified as core conditions on spectrum licences) and the RAG Tx. No changes are proposed to the ULOI Determination or the RAG Rx at this time. An assessment is also provided on the potential effect the proposed changes may have on services operating within and adjacent to the 2.5 GHz band.

For comparison purposes, copies of the existing 2.5 GHz band spectrum licences and the RAG Tx are available.

Proposed changes to the conditions on the spectrum licences

The proposed changes to licence conditions are intended to better support the operation of 5G and AAS and provide a closer alignment with 3GPP standards, where appropriate, while maintaining coexistence with other services. Alignment with 3GPP standards will provide licensees with access to a broader range of equipment, reduce costs and avoid bespoke solutions.

Metric used for defining in-band and unwanted emission limits

Currently, emission limits on spectrum licences in the 2.5 GHz band are defined in terms of either an equivalent isotropic radiated power (EIRP) or mean power (the power measured at the antenna connector, often referred to as 'conducted power'). However, these are not considered appropriate for AAS as:

- Due to the integrated nature of radio units and antenna elements in AAS, it is not possible to measure conducted power. For this reason, 3GPP standards define unwanted emission limits for AAS in terms of total radiated power (TRP). TRP is equivalent to the conducted power minus the antenna efficiency (typically ≤ 3 dB for AAS). Consequently, in practice, there is little difference between the use of TRP or mean power.
- In some cases, the use of TRP is considered to more accurately reflect and limit the risk of interference presented by AAS. Section 6.3.2.1 of ECC Report 281 provides a comparison on the use of TRP vs EIRP metrics to specify AAS emissions. 3GPP studies[4] state that the impact of unwanted emission on the adjacent mobile systems (in this context, spectrum-licensed services) is best represented and limited by use of TRP.

The European Conference of Postal and Telecommunications Administrations (CEPT)[5] and bodies such as the International Telecommunication Union (ITU) are moving to set unwanted emission limits in terms of TRP to support AAS. Use of TRP for AAS was also identified by the TLG.

Importantly, although using TRP (as opposed to EIRP) may be beneficial for spectrum-licensed services, we must also consider the impact upon other uses/users of the spectrum. Approaches that may benefit spectrum licensees may not be always appropriate for overall spectrum management. In this context, it is not intended that the adoption of TRP replaces

[4] 3GPP R4-168430, 'On NR BS ACLR requirement', Huawei, 3GPP TSG-RAN WG4 Meeting #80bis, October 2016.
[5] ECC Report 281.

the need for spectrum licensees to coordinate with other services using actual EIRP values. This requirement, along with the defined protection criteria for other services detailed in the technical framework, is not proposed to change.

The specific emission limits that we proposed to specify as a TRP, instead of an EIRP, are discussed further in the following subsections.

Level of in-band emission limits

The current in-band emission limit for 2.5 GHz band spectrum licences is 45 dBm/30 kHz EIRP. As discussed, defining the limit as TRP as opposed to EIRP would be more conducive to the deployment of AAS devices.

The proposed new limit is 50.2 dBm/5 MHz specified as a TRP, which is effectively equivalent to the existing EIRP limit. It was derived using the current EIRP limit and a typical non-AAS gain of approximately 17 dBi. That is, 45 dBm/30 kHz EIRP = 67.2 dBm/5 MHz EIRP -17 dBi = 50.2 dBm/5 MHz TRP.

Some TLG members requested an increased AAS limit to 53 dBm/5 MHz TRP. It was suggested that the increase to 53 dBm/5 MHz TRP would be in line with the lower end of limits provided in ECC Decision 05(05). However, the TLG ultimately agreed that the in-band emission limit should be set to 50.2 dBm/5 MHz TRP for all transmitters, given the primary aim of this review is to support AAS, and noting that a potential increase to this in-band limit could be explored as part of the expiring spectrum licence (ESL) process.[6]

Proposal 1

We have agreed to TLG's proposal to set the in-band emission limit of: TRP of 50.2 dBm/5 MHz for all radiocommunication transmitters.

Level of unwanted emission limits

This section discusses proposed changes to the unwanted emission limits for devices operating under 2.5 GHz band spectrum licence. The TLG identified that the current unwanted emission limits present a challenge for the manufacture of cost effective and compliant AAS equipment. We agree that some of the unwanted limits should be modified, both in terms of the actual limit as well as how the limit is specified (i.e. changing from EIRP to TRP). However, in some cases, we are of the view that some unwanted emissions limits should remain unchanged to maintain the existing interference environment with other services. The following subsections provide more detail on the proposed changes to the unwanted emission limits.

When reviewing the proposed unwanted emission limits in this paper, we note that:

- The term 'radiated maximum true mean power' is taken to mean the maximum EIRP of a device on a particular azimuth and elevation. It is the result of a measurement of the combination of all radiating elements of an antenna panel or individual device.
- The term 'total radiated power' is defined as the integral of the power transmitted in all different directions over the entire radiation sphere of a device. It is the result of a

[6] Current 2.5 GHz band spectrum licences are due to expire on 30 September 2029. Consultation on the proposed technical framework applicable for renewed 2.5 GHz band spectrum licences is expected to be undertaken in Q1 2027.

measurement of the combination of all radiating elements of an antenna panel or individual device.

- The term ‘mean power’ refers to the power delivered to an antenna port. It can be considered equivalent to the term ‘conducted power’, which is commonly used in radiocommunications.
- We also propose to remove the terms ‘spurious’ and ‘non-spurious’ from 2.5 GHz band spectrum licences for consistency with spectrum licences issued in other bands. Instead, unwanted emissions limits would be set for specific frequency ranges, with unwanted emissions being defined as emissions that fall outside the lower and upper frequency limits set out in Part 2 of Licence Schedule 1 of 2.5 GHz band spectrum licences.

Unwanted emission limits for devices operating in the frequency range 2620-2690 MHz (the upper 2.5 GHz band)

For the upper (downlink) segment of the 2.5 GHz band (2620–2690 MHz), transmitters are generally base stations with user equipment (UE) being the primary type of receiving station. The following subsections outline the proposed unwanted emission limits for upper 2.5 GHz band devices relevant to the following frequency ranges:

- for transmitters, unwanted emissions falling:
  - within 2620–2690 MHz
  - within 2690–2700 MHz
  - within 2615–2620 MHz
  - within 2490–2615 MHz and 2700–2800 MHz
  - outside 2490–2800 MHz
- for receivers, unwanted emissions falling:
  - outside 2490–2700 MHz.

Transmitter unwanted emission falling within 2620–2690 MHz

For unwanted emissions falling within the range 2620–2690 MHz, the TLG recommended adopting the limits specified in the 3GPP TS 38.104[7] for Category B Option 1. 3GPP TS 38.104 defines separate limits for non-AAS and AAS devices. Non-AAS limits are defined as conducted powers (i.e. mean power) per antenna port. AAS limits are defined in terms of TRP which means they apply to the aggregate emissions from all transmitters and receivers that are contained in a piece of equipment. This is consistent with the approach adopted in other spectrum licensed bands to support AAS.

Proposal 2

We have agreed with the TLG recommendation and the propose the limits for unwanted emissions falling within the range 2620–2690 MHz, for non-AAS and AAS transmitters in the upper 2.5 GHz band, as detailed in Table 1 and 2, respectively.

[7] 3GPP TS 38.104, available at: https://portal.3gpp.org/desktopmodules/Specifications/SpecificationDetails.aspx?specificationId=3202.

Table 1: Unwanted emission limits in 2620 MHz to 2690 MHz for transmitters operating in the upper 2.5 GHz band – non-AAS transmitters

Frequency offset (f_{offset})	Mean power (dBm) per transmitter port	Measurement bandwidth
0 MHz ≤ f_{offset} < 5 MHz	$-7dBm - \frac{7}{5}\left(\frac{f_{offset}}{MHz} - 0.05\right)dB$	100 kHz
5 MHz ≤ f_{offset} < 10 MHz	-14	100 kHz
10 MHz ≤ f_{offset}	-15	1 MHz

Note: f_{offset} is the frequency offset from the upper or lower frequency limits set out in Part 2 of Licence Schedule 1. The closest -3dB point of the measurement bandwidth to the upper or lower frequency limits is placed at f_{offset}.

Table 2: Unwanted emission limits in 2620 MHz to 2690 MHz for transmitters operating in the upper 2.5 GHz band – AAS transmitters

Frequency offset (f_{offset})	Total radiated power per cell/sector (dBm)	Measurement bandwidth
0 MHz ≤ f_{offset} < 5 MHz	$2dBm - \frac{7}{5}\left(\frac{f_{offset}}{MHz} - 0.05\right)dB$	100 kHz
5 MHz ≤ f_{offset} < 10 MHz	-5	100 kHz
10 MHz ≤ f_{offset}	-6	1 MHz

Note: f_{offset} is the frequency offset from the upper or lower frequency limits set out in Part 2 of Licence Schedule 1. The closest -3dB point of the measurement bandwidth to the upper or lower frequency limits is placed at f_{offset}.

Transmitter unwanted emissions falling within 2690–2700 MHz

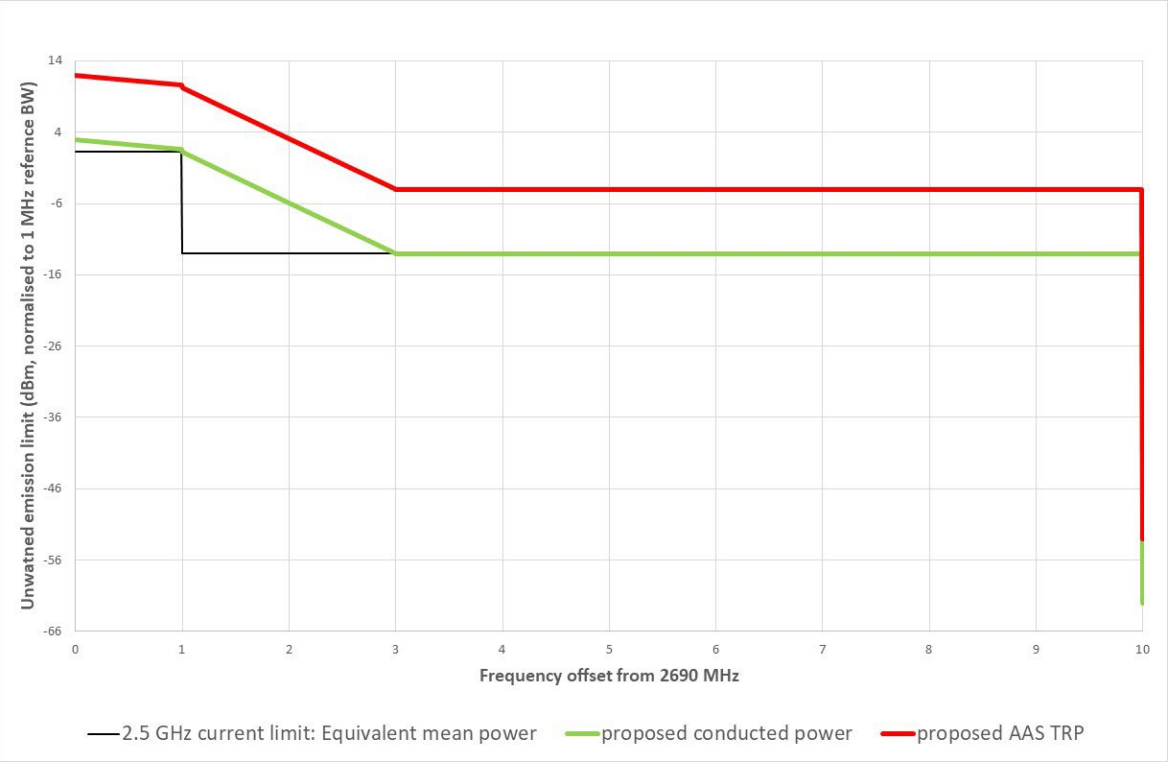
The TLG recommended the following unwanted emission limits in the frequency range 2690–2700 MHz, for transmitters operating in the upper 2.5 GHz band (at frequency offsets from 2690 MHz):

- adopt 3GPP Category B option 1 limits at frequency offsets of between 0 and 1 MHz
- adopt a slope transitioning from the 3GPP Category B option 1 emission limit at 1 MHz offset to the existing emission limits (-13 dBm/MHz[8]) at 3 MHz offset
- maintain the existing emission limits (-13 dBm/MHz) from 3 MHz to 10 MHz offset
- for AAS devices an additional +9dB will be added to the conducted emission mask.

These proposed unwanted limits in Figure 1 and compared against the existing limits that have been converted to a conducted limit and normalised to 1 MHz.

[8] For non-AAS transmitters, the conducted power is derived by subtracting the 17 dBi notional antenna gain from the current 4 dBm/MHz EIRP limit, resulting in a conducted power limit of -13 dBm/1 MHz.

Figure 1: Comparison of unwanted emission limits between 2690 MHz and 2700 MHz for upper band devices



We expect that these proposed modifications would have a negligible impact to the existing interference environment for incumbent services as they meet the existing limits at offsets greater than and equal to 3 MHz. We also expect that the proposed modifications would have a negligible impact incumbent services below 3 MHz. Further detail is provided in the Effect on incumbent services section. While the relaxations shown in Figure 1 are modest, they provide a closer alignment with 3GPP standards and are expected to aid in the deployment of 4G/5G equipment.

Proposal 3

We have agreed with the TLG's recommendations and propose the limits for unwanted emissions falling within the range 2690–2700 MHz, for non-AAS and AAS transmitters in the upper 2.5 GHz band, as detailed in Table 3 and 4, respectively.

Table 3: Unwanted emission limits in 2690 MHz to 2700 MHz for transmitters operating in the upper 2.5 GHz band – non-AAS devices

Frequency offset from 2690 MHz (f_{offset})	Mean power (dBm) per transmitter port	Measurement bandwidth
0 MHz ≤ f_{offset} < 1 MHz	$-7dBm - \frac{7}{5}\left(\frac{f_{offset}}{MHz} - 0.05\right)dB$	100 kHz
1 MHz ≤ f_{offset} < 3 MHz	$-1.66\ dBm - 7.12\left(\frac{f_{offset}}{MHz} - 0.05\right)dB$	100 kHz
3 MHz ≤ f_{offset} < 10 MHz	-13	1 MHz

Note: f_{offset} is the frequency offset from the upper band limit of 2690 MHz. The closest -3dB point of the measurement bandwidth is placed at f_{offset}.

Table 4: Unwanted emission limits in 2690 MHz to 2700 MHz for transmitters operating in the upper 2.5 GHz band – AAS devices

Frequency offset from 2690 MHz (f_{offset})	Total radiated power per cell/sector (dBm)	Measurement bandwidth
0 MHz ≤ f_{offset} < 1 MHz	$2dBm - \frac{7}{5}\left(\frac{f_{offset}}{MHz} - 0.05\right)dB$	100 kHz
1 MHz ≤ f_{offset} < 3 MHz	$7.34\ dBm - 7.12\left(\frac{f_{offset}}{MHz} - 0.05\right)dB$	100 kHz
3 MHz ≤ f_{offset} < 10 MHz	-4	1 MHz

Note: f_{offset} is the frequency offset from the upper band limit of 2690 MHz. The closest -3dB point of the measurement bandwidth is placed at f_{offset}.

Transmitter unwanted emissions falling within 2615–2620 MHz

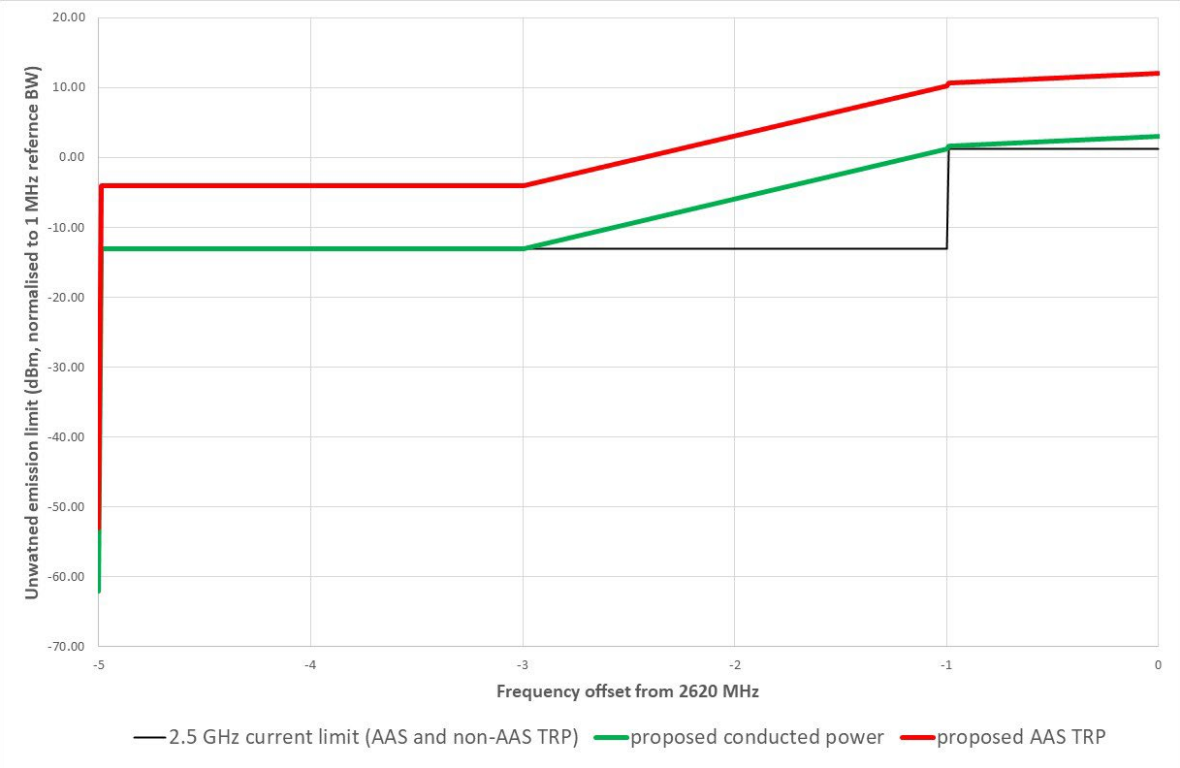
In the frequency range 2615-2620 MHz, the following unwanted emission limits were recommended by the TLG (at frequency offsets from 2620 MHz):

- adopt 3GPP Category B option 1 between 0 and 1 MHz offset
- adopt a slope transitioning from 3GPP Category B option 1 emission limits at 1 MHz offset to the existing emission limits (-13 dBm/1 MHz[9]) at 3 MHz offset
- maintain the existing emission limits (-13 dBm/1 MHz) from 3 MHz to 5 MHz offset
- for AAS devices, an additional +9dB will be added to the conducted emission mask

These proposed unwanted limits are illustrated in Figure 2 and compared against the existing limits that have been converted to a conducted limit and normalised to 1 MHz.

[9] For non-AAS transmitters, the conducted power is derived by subtracting the 17 dBi notional antenna gain from the current 4 dBm/MHz EIRP limit, resulting in a conducted power limit of -13 dBm/1 MHz

Figure 2: Comparison of unwanted emission limits between 2615 MHz and 2620 MHz for upper band devices



We expect that these proposed modifications would have a negligible impact to the existing interference environment for incumbent services as they meet the existing limits at offsets greater than and equal to 3 MHz. We also expect that the proposed modifications would have a negligible impact incumbent services below 3 MHz. Further detail is provided in the Effect on incumbent services section. While the relaxations shown in Figure 2 are modest, they provide a closer alignment with 3GPP standards and are expected to aid in the deployment of 4G/5G equipment.

Proposal 4

We have agreed with the TLG's recommendations and propose the limits for unwanted emissions falling within the range 2615–2620 MHz, for non-AAS and AAS transmitters in the upper 2.5 GHz band, as detailed in Table 5 and 6, respectively.

Table 5: Unwanted emission limits in 2615 MHz to 2620 MHz for transmitters operating in the upper 2.5 GHz band – non-AAS devices

Frequency offset from 2620 MHz(f_{offset})	Mean power (dBm) per transmitter port	Measurement bandwidth
0 MHz ≤ f_{offset} < 1 MHz	$-7dBm - \frac{7}{5}\left(\frac{f_{offset}}{MHz} - 0.05\right)dB$	100 kHz
1 MHz ≤ f_{offset} < 3 MHz	$-1.66\ dBm - 7.12\left(\frac{f_{offset}}{MHz} - 0.05\right)dB$	100 kHz
3 MHz ≤ f_{offset} < 5 MHz	-13	1 MHz

Note: f_{offset} is the frequency offset from the upper band limit of 2620 MHz. The closest -3dB point of the measurement bandwidth is placed at f_{offset}.

Table 6: Unwanted emission limits in 2615 MHz to 2620 MHz for transmitters operating in the upper 2.5 GHz band – AAS devices

Frequency offset from 2620 MHz (f_{offset})	Total radiated power per cell/sector (dBm)	Measurement bandwidth
0 MHz ≤ f_{offset} < 1 MHz	$2dBm - \frac{7}{5}\left(\frac{f_{offset}}{MHz} - 0.05\right)dB$	100 kHz
1 MHz ≤ f_{offset} < 3 MHz	$7.34\ dBm - 7.12\left(\frac{f_{offset}}{MHz} - 0.05\right)dB$	100 kHz
3 MHz ≤ f_{offset} < 5 MHz	-4	1 MHz

Note: f_{offset} is the frequency offset from the upper band limit of 2620 MHz. The closest -3dB point of the measurement bandwidth is placed at f_{offset}.

Transmitter unwanted emissions falling within 2490–2615 MHz and 2700–2800 MHz

The TLG recommended to maintain the existing unwanted emission limits within the frequency ranges 2490–2615 MHz and 2700–2800 MHz for non-AAS transmitters (which is a maximum EIRP of -45 dBm/MHz), and to adopt a TRP limit of -52 dBm/MHz[10] for AAS devices. Maintaining the non-AAS limit as an EIRP (instead of a TRP), will help ensure the interference environment from non-AAS transmitters is unchanged.

Proposal 5

We have agreed with the TLG's recommendation and propose the limits for unwanted emissions falling within the frequency ranges 2490–2615 MHz and 2700–2800, for non-AAS and AAS transmitters in the upper 2.5 GHz band, as detailed in Table 7 (unchanged from current licence) and 8, respectively.

[10] The TRP is derived by subtracting the 17 dBi notional antenna gain from the current -45 dBm/MHz EIRP limit and adding 9 dBi for AAS devices giving a TRP power limit of -53 dBm/1 MHz. However, TLG agreed to a 1 dB increase, bringing the TRP limit to -52 dBm/ MHz.

Table 7: Unwanted emission limits in the frequency ranges 2490–2615 and 2700–2800 MHz for transmitters operating in the upper 2.5 GHz band – non-AAS transmitters

Frequency offset (f_{offset})	Radiated maximum true mean power (dBm EIRP)	Measurement bandwidth
f_{offset} ≥ 0 Hz	-45	1 MHz

Note: f_{offset} is the frequency offset from 2615 MHz or 2700 MHz. The closest -3dB point of the measurement bandwidth is placed at f_{offset}

Table 8: Unwanted emission limits in the frequency ranges 2490–2615 and 2700–2800 MHz for transmitters operating in the upper 2.5 GHz band – AAS transmitters

Frequency offset (f_{offset})	Total radiated power per cell/sector (dBm)	Measurement bandwidth
f_{offset} ≥ 0 Hz	-52	1 MHz

Note: f_{offset} is the frequency offset from 2615 MHz or 2700 MHz. The closest -3dB point of the measurement bandwidth is placed at f_{offset}

Transmitter unwanted emissions falling outside the frequency range 2490–2800 MHz

The TLG also supported the current unwanted emission limits outside the frequency range 2490–2800 MHz, which is currently consistent with the 3GPP TS 38.104, however agreed to modify how these limits are specified, as follows:

- For non-AAS transmitters, the current unwanted emission limits would apply per port and be defined in terms of mean (conducted) power.
- For AAS transmitters, the unwanted emission limits would be 9 dB higher than the non-AAS limits and defined as a TRP, meaning the limits apply to the aggregate emissions from all transmitters and receivers within the device.

Proposal 6

We agree with the TLG's recommendation and propose the limits for unwanted emissions falling outside the frequency range 2490–2800 MHz, for non-AAS and AAS transmitters in the upper 2.5 GHz band, as detailed in Table 9 and 10, respectively.

Table 9: Unwanted emission limits outside 2490–2800 MHz for transmitters operating in the upper 2.5 GHz band – non-AAS transmitters

Frequency range (f)	Mean power (dBm) per transmitter port	Measurement bandwidth
9 kHz ≤ f < 150 kHz	-36	1 kHz
150 kHz ≤ f < 30 MHz	-36	10 kHz
30 MHz ≤ f < 1 GHz	-36	100 kHz
1 GHz ≤ f < 12.75 GHz	-30	1 MHz

Table 10: Unwanted emission limits outside 2490–2800 MHz for transmitters operating in the upper 2.5 GHz band – AAS transmitters

Frequency range (f)	Total radiated power per cell/sector (dBm)	Measurement bandwidth
9 kHz ≤ f < 150 kHz	-27	1 kHz
150 kHz ≤ f < 30 MHz	-27	10 kHz
30 MHz ≤ f < 1 GHz	-27	100 kHz
1 GHz ≤ f < 12.75 GHz	-21	1 MHz

Receiver unwanted emission falling outside the frequency range 2490–2700 MHz

The TLG recommended to maintain the current unwanted emission limits for receivers in the upper 2.5 GHz band, but to define them as a TRP instead of an EIRP.

Proposal 7

We have agreed with the TLG's recommendation and propose the limits for unwanted emissions falling outside the frequency range 2490–2700 MHz, receivers in the upper 2.5 GHz band, as detailed in Table 11.

Table 11: Unwanted emission limits outside 2490–2700 MHz for receivers operating in the upper 2.5 GHz band – all receivers

Frequency range (f)	Total radiated power (dBm)	Measurement bandwidth
30 MHz ≤ f < 1 GHz	-57	100 kHz
1 GHz ≤ f < 12.75 GHz	-47	1 MHz

Unwanted emission limits for devices operating in the frequency range 2500–2570 MHz (the lower 2.5 GHz band)

In the lower 2.5 GHz band (2500–2570 MHz), transmitters are generally user equipment (UE) with base stations being the primary type of receiving station.

The following subsections outline the proposed unwanted emission limits for lower 2.5 GHz band devices.

Unwanted emission limits for transmitters in the lower 2.5 GHz band

The TLG recommended to maintain the limits for unwanted emissions for lower 2.5 GHz band transmitters with a variation to the frequency offsets so that they are depended on the channel bandwidth of the transmitter. This provides closer alignment to 3GPP TS 38.101-1[11] and is consistent with spectrum licences issued in other frequency bands. The TLG also recommended to specify the limit as a TRP instead of an EIRP.

Stakeholder advice received after the conclusion of the TLG indicated that setting the offset range of *5 MHz ≤ f_{offset} < max(Channel BW, 6)* instead of 5 MHz ≤ f_{offset} < max(Channel BW, 5), as included in the 2.5 GHz band TLG paper, would provide a correct alignment with 3GPP TS 38.101-1. We agree with this clarification which is reflected in Table 12.

Proposal 8

We have agreed with TLG's recommendation and propose the limits for unwanted emissions falling within offsets of less than *max(Channel BW + 5, 10) MHz,* for transmitters in the lower 2.5 GHz band, as detailed in Table 12.

[11] 3GPP TS 38.101-1 is available at: https://portal.3gpp.org/desktopmodules/Specifications/SpecificationDetails.aspx?specificationId=3283.

Table 12: Unwanted emission limits for transmitters operating in the lower 2.5 GHz band at frequency offsets of max (Channel BW + 5, 10) MHz – all transmitters

Frequency offset (f_{offset})	Total radiated power (dBm)	Measurement bandwidth
0 MHz ≤ f_{offset} < 1 MHz	-15	30 kHz
1 MHz ≤ f_{offset} < 5 MHz	-10	1 MHz
5 MHz ≤ f_{offset} < max(Channel BW, 6)	-13	1 MHz
max(Channel BW, 5) ≤ f_{offset} < max(Channel BW + 5, 10)	-19	1 MHz

Note: f_{offset} is the frequency offset from the upper or lower frequency limits set out in Part 2 of Licence Schedule 1. The closest -3dB point of the measurement bandwidth to the upper or lower frequency limits is placed at f_{offset}.

For offsets of greater than or equal to *max(Channel BW + 5, 10) MHz,* the TLG agreed to maintain the current unwanted emissions limits but to specify them in terms of TRP rather than EIRP to be consistent with 3GPP TS 38.101-1.

Proposal 9

We have agreed with the TLG's recommendation and propose the limits for unwanted emissions falling at offsets of greater than or equal to *max(Channel BW + 5, 10) MHz*, for transmitters in the lower 2.5 GHz band, as detailed in Table 13.

Table 13: Unwanted emission limits for transmitters operating in the lower 2.5 GHz band at frequency offsets greater than or equal to max(Channel BW + 5, 10) MHz – all transmitters

Frequency range (f)	Total radiated power (dBm)	Measurement bandwidth
9 kHz ≤ f < 150 kHz	-36	1 kHz
150 kHz ≤ f < 30 MHz	-36	10 kHz
30 MHz ≤ f < 1 GHz	-36	100 kHz
1 GHz ≤ f < 12.75 GHz	-30	1 MHz

Lower 2.5 GHz band receiver unwanted emissions

Similar to the proposed unwanted emission limits for receivers in the upper 2.5 GHz band, the TLG recommended to align the receiver unwanted emission limits in the lower 2.5 GHz band with the limits specified in 3GPP TS 38.101-1.

The TLG members noted that for a radiocommunications receiver where the antenna or transceiver array boundary connectors support both a radiocommunications receiver and a radiocommunications transmitter, the limits for the transmitter's unwanted emission limits should be adopted.

Proposal 10

We have agreed with the TLG's recommendation and propose the unwanted emission limits for receivers in the lower 2.5 GHz band, as detailed in Tables 14, 15 and 16.

Table 14: Unwanted emission limits for receivers operating in the lower 2.5 GHz band – non-AAS receivers

Frequency range (f)	Mean power (dBm) per receiver port	Measurement bandwidth
30 MHz ≤ f < 1 GHz	-57	100 kHz
1 GHz ≤ f < 12.75 GHz	-47	1 MHz

Table 15: Unwanted emission limits for receivers operating in the lower 2.5 GHz band connected to Tx array – non-AAS receivers (same as Table 9)

Frequency range (f)	Mean power (dBm) per receiver port	Measurement bandwidth
9 kHz ≤ f < 150 kHz	-36	1 kHz
150 kHz ≤ f < 30 MHz	-36	10 kHz
30 MHz ≤ f < 1 GHz	-36	100 kHz
1 GHz ≤ f < 12.75 GHz	-30	1 MHz

Table 16: Unwanted emission limits for receivers operating in the lower 2.5 GHz band - AAS receivers (same as Table 10)

Frequency range (f)	Total radiated power per cell/sector (dBm)	Measurement bandwidth
9 kHz ≤ f < 150 kHz	-27	1 kHz
150 kHz ≤ f < 30 MHz	-27	10 kHz
30 MHz ≤ f < 1 GHz	-27	100 kHz
1 GHz ≤ f < 12.75 GHz	-21	1 MHz

Other conditions on the licence

It is proposed to retain all of the 'other' conditions (that is, those imposed under section 71 of the Act) that are currently contained in 2.5 GHz band spectrum licences, with the exception of editorial/formatting changes (for alignment with licences issued in other bands) and updating references to legislative instruments that have been updated since the licence was issued.

Question 1

Do you have comments on proposed changes to the 2.5 GHz band spectrum licence conditions in Proposals 1–10?

Radiocommunications advisory guidelines (RAGs)

The following RAGs are part of the 2.5 GHz band spectrum licence technical framework:

- Radiocommunications Advisory Guidelines (Managing Interference from Spectrum Licensed Transmitters – 2.5 GHz Band) 2023 (the RAG Tx)
- Radiocommunications Advisory Guidelines (Managing Interference to Spectrum Licensed Receivers – 2.5 GHz Band) 2023 (the RAG Rx).

The TLG discussed the necessity to provide additional clarification in the RAG Tx for coordination with radiolocation (RLS) services. It was recommended that the RAG Tx should state the actual protection level and offer detailed guidance on how coordination efforts should be managed.

We propose to repeal subsection 17(6) in the current RAG Tx and include the following text in a new subsection 17(6) in the RAG Tx:

> Protection is to be afforded to all licensed fixed receivers used for RLS, including weather radar operated by the Commonwealth Bureau of Meteorology, operating in the frequency band 2700 MHz to 2900 MHz, included in the Register before a fixed transmitter operating under a 2.5 GHz spectrum licence was included in the Register. Protection is achieved if the out-of-band emissions falling within a fixed receiver's licensed bandwidth do not exceed a maximum unwanted signal received level of -119 dBm/MHz at the input connector of the fixed receiver. Additional interference checks, including consideration of blocking or receiver overload, are not required.

We propose to implement this change via the draft Radiocommunications Advisory Guidelines (Managing Interference from Spectrum Licensed Transmitters – 2.5 GHz Band) Variation 2026 (No.1) (the variation instrument), available on the webpage for this consultation. If we come to implement the proposed change, we will also remove any definitions from the RAG Tx that are now contained in the Radiocommunications (Interpretation – Technical Framework) Determination 2024.

Question 2

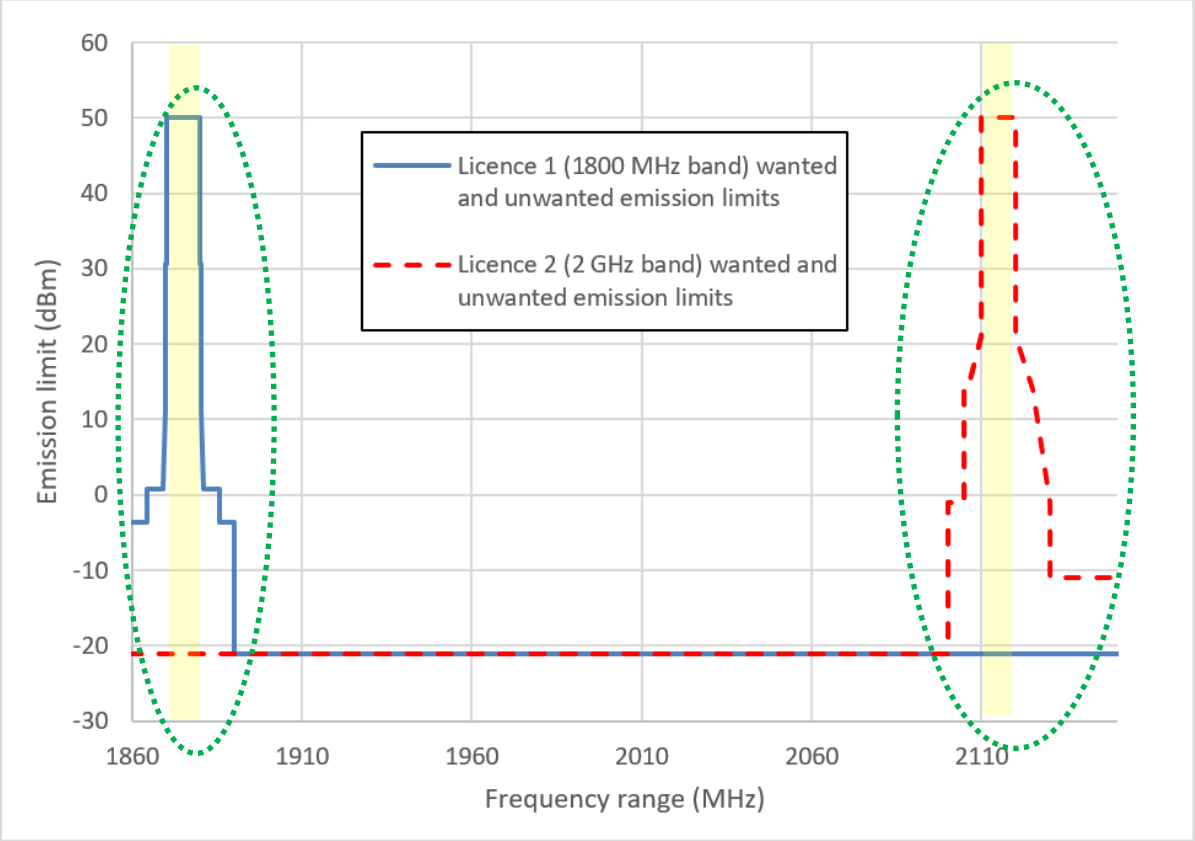
Do you have comments on the proposed change to the Radiocommunications Advisory Guidelines (Managing Interference from Spectrum Licensed Transmitters – 2.5 GHz Band) 2023?

No updates to the RAG Rx were proposed by the TLG. We are of the view the RAG Rx is fit for purpose, and we are not proposing any modifications as part of this process. However, we may consider changes, if required, as part of forthcoming ESL process

Provisions to support wideband amplifiers

We are aware of an increasing desire by stakeholders to deploy and operate base stations with wideband power amplifiers under spectrum licences. In simple terms, wideband amplifiers operate over more than one frequency band, with carriers in each operating band mapped to a single antenna connector. While operation could be permitted using spectrum licences held in the different bands, there is a regulatory conflict with how conditions are currently specified on licences. That is, the licensee would need to meet different (conflicting) wanted and unwanted emission limits, as specified on the separate spectrum licences, within the same frequency ranges. An example is illustrated in Figure 3.

Figure 3: Example of differing emission limits for spectrum licensees in different frequency bands (yellow indicates the frequency range authorised by either licence, green indicates frequencies that have different unwanted emission limits)



The ACMA recently applied conditional regulatory forbearance as a temporary measure to support the deployment of wideband amplifiers in certain situations until permanent arrangements can be considered and implemented.

The TLG considered some preliminary options about how the operation of wideband amplifiers could be implement under spectrum licences. In February 2026, after the conclusion of the TLG, we publicly consulted on the wideband amplifier arrangements in our *Review of the 850 MHz and 1800 MHz spectrum licence technical frameworks*. We released the outcomes paper for that review in May 2026, which finalised the condition that can be included on spectrum licences that would permit the operation of wideband amplifiers.

The condition is provided below – noting that Core Condition X and Y in the below condition refers to the limits and frequency ranges appliable to Tables 9 and 10 in this paper (specific Core Condition numbers will be provided when the condition is drafted into spectrum licences). As this condition has been subject to previous rounds of public consultation, we are of the view that it is fit-for-purpose.

Where a radiocommunications transmitter:

(a) is authorised to operate under both this spectrum licence and another licence (the other licence) in another frequency band (the other band); and

(b) the holder of this spectrum licence and the holder of the other licence:

(i) are the same person; or

(ii) are not the same person, and the holder of the other licence, by written agreement, authorises the holder of this spectrum licence to operate the transmitter under the other licence for the purposes of this condition

the radiocommunications transmitter, when operating under this spectrum licence:

(c) must comply with the unwanted emission limits in a particular frequency range that are specified in the other licence and that would be applicable to the transmitter's operation in the other band, to the extent that those limits differ from the unwanted emission limits described in Core Conditions X [*Table 9 of this paper*] and Y [*Table 10 or this paper*] of this spectrum licence for that particular frequency range; and

(d) may exceed the unwanted emission limits described in Core Conditions X [*Table 9 of this paper*] and Y [*Table 10 or this paper*] of this spectrum licence in respect of operation in frequency bands set out in the other licence.

Note 1: Under paragraph (c), operation of a radiocommunications transmitter must comply with the unwanted emission limits specified on the other licence if those limits are different to the unwanted emission limits for the same frequency range as specified in Core Conditions X and Y. This requirement only applies to frequency ranges for which unwanted emissions limits in Core Conditions X and Y apply. For the purposes of (c), the applicable unwanted emission limits in the other licence are those that apply to the particular frequency range that the transmitter is operating in.

Note 2: The purpose of paragraph (d) is to allow the radiocommunications transmitter to exceed the unwanted emissions limits in Core Conditions X and Y within the frequency bands authorised by the other licence.

Note 3: Under paragraph (a) "authorised to operate" also means that the radiocommunications transmitter meets the registration requirements as applicable for a transmitter operated under the other licence.

As the above condition needs to be included on all licences that would be used to authorise the operation of wideband amplifiers, we are intending to:

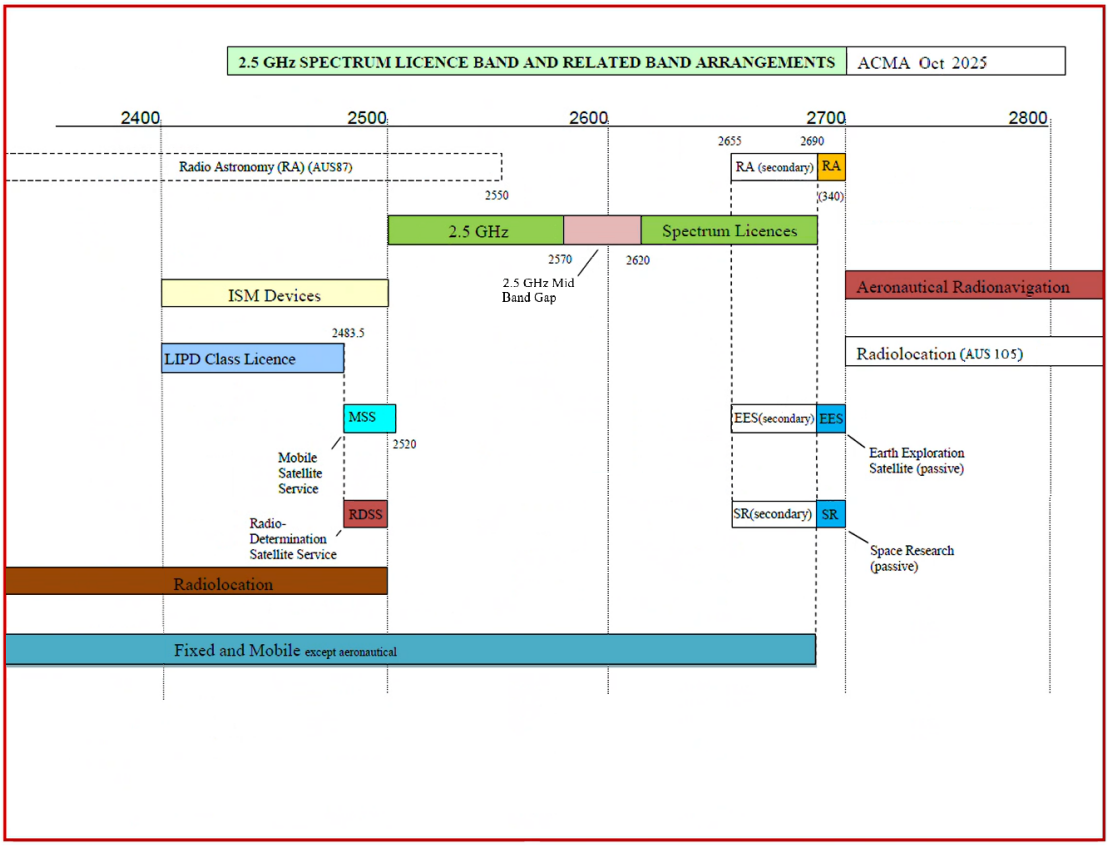
- Seek agreement from licensees to include this condition on spectrum licences currently issued in the 2.5 GHz band as well as spectrum licences issued in other frequency bands that are optimised for WBB services.
- In a separate process, consult on necessary changes to incorporate this condition into the technical frameworks for area-wide licences (AWLs) PTS licences in the 1800 MHz and 2 GHz bands, with the intention that wideband amplifiers could be authorised under a spectrum licence and AWL or PTS licence.

Effect on incumbent services

When reviewing a spectrum licence technical framework, the effect any proposed changes may have on other spectrum uses and users needs to be considered, as is the case when a spectrum licence technical framework is first developed. This is to ensure that there are adequate measures in place to manage interference and facilitate coexistence with other services. While industry standards, such as those developed by the 3GPP, are established to support wireless broadband services, we must also consider broader implications of adopting these standards without any changes. Where necessary, we may implement arrangements that differ from standards to better align with specific use-cases or Australian-specific conditions.

Figure 4 shows the current arrangements for the 2.5 GHz band and adjacent bands. The 2.5 GHz band (shown in green) uses a frequency division duplex arrangement, with the lower 2.5 GHz band as the uplink (base receive) and the upper 2.5 GHz band as the downlink (base transmit).

Figure 4: Current arrangements in the 2.5 GHz and adjacent bands (the 2.5 GHz spectrum licensed band is shown in green)



2.5 GHz band spectrum licensees

Any changes to in-band and unwanted emission limits have the potential to affect compatibility between current and future services deployed by spectrum licensees. We considered the advice and discussions from the TLG and agree that the proposed changes are acceptable and are supported by the existing spectrum licensees. Existing devices would not exceed any of the proposed new limits, so no modifications would need to be made to any existing operation under a 2.5 GHz band spectrum licence.

Radio astronomy

The spectrum plan recognises radio astronomy use in 2500–2550 MHz (AUS87), 2655–2690 MHz (secondary) and 2690–2700 MHz (primary). No changes are proposed for unwanted emission levels that fall in the range 2500–2550 MHz, and the proposed modest increase to the unwanted emission limits in 2620–2690 MHz remains far below in band emission levels. The only substantive change is in the range 2690–2700 MHz, where proposed limits would allow a higher unwanted emissions level than currently permitted.

Licensees must continue to comply with ITU R RA.769 2 protection criteria for receivers in 2690–2700 MHz, including those at the Paul Wild and Parkes observatories listed in AUS87. Historical ACMA studies indicate that coordination is typically required within 100 km of these

sites, with distances as close as 20 km possible where antenna height, direction, power and terrain are favourable. In addition, an area within 70 km of the Australian Radio Quiet Zone Western Australia (ARQZWA) has been excluded from 2.5 GHz band spectrum licences. These geographic and coordination protections remain unchanged. Therefore, the proposed changes are expected to have negligible impact on the existing interference environment for radio astronomy services.

Space services (EESS and SRS)

Radiocommunications receivers for the Earth exploration satellite service (EESS), mobile satellite service (MSS), radiodetermination satellite service (RSS) and space research service (SRS) operate in spectrum adjacent to the 2.5 GHz band. The spectrum plan allocates 2690–2700 MHz to EESS (passive) and SRS (passive), with EESS receivers located on satellites and SRS receivers implemented as fixed earth stations and allocates 2483.5–2500 MHz to MSS and RSS for space to Earth transmissions. No changes are proposed for unwanted emissions falling in the range 2483.5–2500 MHz, and the modest increase to the unwanted emission limits in 2620–2690 MHz remains well below the current in band emission limits. The only material change is in the range 2690–2700 MHz, where adopting proposed limits would allow a higher emission level than the current mask.

As detailed in the RAG Tx, a transmitter operating under a 2.5 GHz spectrum licence is not taken to cause interference to EESS, MSS or RSS receivers if it complies with all licence conditions. Protection requirements for licensed SRS space and earth receive stations are defined by ITU R SA.609, with further guidance on coordination distances and propagation models in Appendix 7 of the Radio Regulations. These protections remain unchanged, and the proposed changes to unwanted emission limits are not expected to materially alter the interference environment for the Space services.

Radiodetermination services

Radiocommunications receivers for the aeronautical radionavigation service (ARS) and radiolocation service (RLS) operate in the 2700–2900 MHz band, including air traffic control radars at major airports and meteorological radars used for weather observation. Radiodetermination receivers are also operated by the Department of Defence in this band.

No changes in emission limits are proposed for 2700–2900 MHz frequency range, and given the 10 MHz frequency separation between the 2.5 GHz band edge and the radiodetermination band, together with the continued application of protection criteria in the RAG Tx, we are of the view that proposed unwanted emission limit changes are not expected to meaningfully affect the interference environment for ARS, RLS or Defence radiodetermination receivers. The proposed additions to the RAG Tx discussed earlier are also expected to improve the coexistence between spectrum licensed transmitters and RLS by providing clearer guidance on how coordination between these services is expected to be undertaken.

Other services

The following services also operate adjacent to the 2.5 GHz band:

- industrial, scientific and medical (ISM) devices
- low interference potential devices (LIPD) class licence services
- television outside broadcast (ToB) services in the 2.5 GHz mid-band gap.

The proposed changes discussed in this paper are anticipated to have a negligible impact on the existing interference environment for these services, and we are of the view that the current arrangements for managing interference are considered sufficient. Therefore, no further adjustments to the 2.5 GHz band spectrum licence technical framework for managing interference to these services are proposed.

Question 3

Do you have comments on the effect the proposed changes to the 2.5 GHz band technical framework may have on incumbent services in and adjacent to the 2.5 GHz band?

Next steps

Subject to consideration of feedback received to this paper, we aim to release an outcomes paper in Q3 2026.

Invitation to comment

Making a submission

We invite comments on the issues set out in this consultation paper.

- Online submissions can be made by uploading a document. Submissions in PDF, Microsoft Word or Rich Text Format are preferred.
- Submissions by post can be sent to:

  The Manager
  Wireless Broadband Section
  Australian Communications and Media Authority
  PO Box 78
  Belconnen ACT 2616

The closing date for submissions is **COB, 8 July 2026**.

Consultation enquiries can be emailed to freqplan@acma.gov.au.

Publication of submissions

We publish submissions on our website, including personal information (such as names and contact details), except for information that you have claimed (and we have accepted) is confidential.

Confidential information will not be published or otherwise released unless required or authorised by law.

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View information about our policy on the publication of submissions, including collection of personal information during consultation and how we handle that information.

Information on the *Privacy Act 1988*, how to access or correct personal information, how to make a privacy complaint and how we will deal with any complaints, is available in our privacy policy.