



Public

---

**TELSTRA GROUP LIMITED**

# **Review of the 700 MHz band spectrum licence technical framework**

**Telstra public submission**

28 February 2025

# 1 Contents

1	Introduction .....	3
2	700 MHz band landscape.....	4
2.1	PC-3 devices with external antennas .....	4
2.2	Telstra testing with Free-TV Australia .....	5
3	Changes to the 700 MHz SLTF .....	6
3.1	We agree with, and support, the majority of proposed changes to the 700 MHz SLTF .....	6
3.2	Issue 1: Exemption from registration requirements in the lower 700 MHz band .....	6
3.3	Issue 2: Unwanted emission limit below 694 MHz .....	7
4	Other matters from the consultation paper .....	8
4.1	Out-of-band emission mask above 803 MHz .....	8
4.2	Changes to the 850 MHz and 900 MHz SLTF .....	8
4.3	Comments on changes to the Tx RAG .....	8
5	Other matters to be addressed.....	9
5.1	Imposition of filtering requirements on fixed PTP link receivers in RALI FX 22 .....	9
5.2	Remove obligation on 700 MHz SL to protect PMP arrangements in 804-806 MHz .....	9
5.3	Fixed PTP links in the 850 MHz mid-band gap under pre-transition arrangements.....	9
	Appendix 1: Answers to the ACMA's consultation questions.....	11
	Appendix 2: Test Report, Lane Cove Testing, Dec 2024 .....	13

# 1 Introduction

Telstra welcomes the opportunity to comment on the ACMA's *Review of the 700 MHz spectrum licence technical framework* (the **consultation**). The 700 MHz band is of critical importance to mobile network operators for mobile coverage in regional and remote parts of Australia, and for building penetration in urban environments. For Telstra, it is our primary “low-band” for 4G, and it is important the spectrum licence technical framework (SLTF) is modernised to cater for technology advancements such as Adaptive Antenna Systems (AAS) and has the capability to support Fixed Wireless Access (FWA) applications.

To this end, we thank the ACMA for running the Technical Liaison Group (TLG) over the past 18 months and for its willingness to accommodate the testing, research and reporting undertaken initially by Telstra, and then jointly with Free-TV Australia and BAI. This testing has provided concrete evidence that interference from mobile user equipment (operating in the lower 700 MHz sub-band) into broadcast TV reception can only occur in the rarest of circumstances, and therefore is not a threat to TV reception.

The result of the testing is that we are able to propose a fourth option, “Option A4” to Unresolved Issue 1. Option A4 proposes a registration exemption threshold for user equipment (UE) of 35 dBm EIRP per occupied channel. Option A4 has been agreed by the mobile and broadcast television industries, and we request the ACMA adopt this option as the registration exemption threshold.

Telstra sees a future opportunity to provide better communications capabilities for first responders (emergency services) during natural disasters (bushfires, floods, etc) and other emergencies in rural parts of Australia through the introduction of high-power user equipment (HPUE) that is compliant with 3GPP Power Class 1 (PC-1) standards. However, further collaboration between the broadcast TV and mobile industries is required to test and characterise the potential for interference from PC-1 devices into TV reception. As such, we are not proposing amendment of the Registration Exemption Threshold at this time to accommodate PC-1 devices.

In general, Telstra strongly supports the ACMA's initiative to amend the licence conditions on 700 MHz spectrum licences (SL) to support 5G and adaptive antenna systems (AAS), and the ACMA's efforts to align unwanted emission limits with 3GPP technical specifications. In this regard, we are aligned with AMTA in supporting the majority of the ACMA's proposed changes.

Our submission is structured as follows:

- **Section 2** provides information on use cases capable of generating an EIRP in excess of the registration exemption threshold for the 700 MHz band in support of lifting the registration exemption threshold for the lower 700 MHz band;
- **Section 3** proposes a new (fourth) option of 35 dBm EIRP per occupied channel for the registration exemption threshold;
- **Section 4** contains our response to other matters raised in the consultation paper, including: the OOB mask above 803 MHz; amendments to the Transmitter RAG and proposed changes to the Registration Exemption threshold in our 850 MHz band licences;
- **Section 5** contains our comments on other relevant matters not raised in the consultation paper; and
- **Appendix 1** contains our answers to each of the ACMA's specific consultation questions.

## 2 700 MHz band landscape

This section provides background information on some common user device scenarios that are active in Band 28 on our network today. In these use cases, the user equipment is compliant with 3GPP Power Class 3, however, due to the presence of a higher-gain external antenna, the user equipment is capable of generating an EIRP in excess of the registration exemption threshold.<sup>1</sup>

### 2.1 PC-3 devices with external antennas

While most user devices are a mobile handset form-factor that will not exceed 23 dBm EIRP, there are two types of devices in use on our network that are capable of exceeding the current 23 dBm EIRP registration exemption threshold:

- **4G Fixed Wireless (4GFW).** Telstra has [CIC Begins] [CIC Ends] on Band 28 as at 31 Dec, 2024. These devices are Power Class 3 (PC-3) devices, with an external antenna (generally mounted on the fascia board of a residential dwelling), that is of the order of 10-12 dBi gain. Where the unit is running at the maximum PC-3 power of 23 dBm permissible under the 3GPP standard, the system is capable of producing 33-35 dBm EIRP. However, in the majority of cases, the user equipment normally does not operate at its maximum power due to the standard 3GPP UE transmitter power control algorithms.
- **4G Router devices.** The potential for customers to add third-party supplied external antennas to many devices in the market. There are many third-party suppliers of external antennas, cable sets, adaptors etc that facilitate deployment of gain antennas attached to 700 MHz user equipment. We are unable to quantify how many of these installations exist as we have no network visibility of when an antenna is connected to a device.
- **Mobile devices such as CelFi Go** (by Nextivity). We understand there are [CIC Begins] [CIC Ends] across all three mobile network operators, all of which support Band 28. [CIC begins]

[CIC Ends]

These antenna kits are car-mounted omni-directional antennas, with between 4.5-6.0 dBi gain. These units could be producing up to 29 dBm EIRP.

- **Mobile Repeaters in Fixed Installations.** Repeater devices are also used on fixed installations, often with external directional antennas. In these cases, they are often used to extend a weak outdoor signal for indoor use by normal handsets. Again, as in the 4G router case, we cannot measure how many such installations are in use in Australia.

<sup>1</sup> As per Clause 4 of Schedule 3 (Statutory Conditions) of any of the 700 MHz band spectrum licences.

Based on the extent of PC-3 devices with external antennas (including higher-gain Yagi antennas) across Australia, if these devices were capable of causing interference to TV reception, then given the volume of devices involved, we would have expected reports of interference to be a “daily occurrence”. In particular we would expect to see numerous complaints of mobile and 4GFW devices causing interference to TV reception. However, we are not aware of any such complaints that have been directly traced to handset generated interference.

Given that the situation of people installing external antennas without our knowledge has existed now for nearly 10 years, we consider the use of user equipment with external antennas at the EIRP levels mentioned above poses minimal risk to television reception (based on an absence of complaints about interference to TV reception).

Supporting that position is the nature of the cellular network design:

- **Transmitter power control.** Cellular networks control the user equipment transmitter power so that only the least amount of power required to maintain a connection is used. This means that the transmitter power could be up to 50 dB less than the worst case.
- **Activity Factor.** The amount of time a given UE is transmitting is low. Measurements on the Telstra network in regional areas have shown that a network connected device is, on average, transmitting less than 25% of the time.
- **Devices in Idle Mode.** Of the total population of devices, many (especially in the IoT space) are idle and unconnected to the network for most of the time, such that the percentage of time the entire population of mobile devices (phones, modems, repeaters, fixed wireless, IoT, etc) is transmitting in a given location could be one or two orders of magnitude less than assuming devices are always active.

We consider this to be reasonable evidence that there is negligible risk of higher-powered devices (up to and including 35 dBm EIRP) causing interference to TV receivers operating up to and including Channel 51.

## 2.2 Telstra testing with Free-TV Australia

In December 2024, Telstra and Free TV Australia conduct joint testing at Freeview laboratory in Lane Cove. The purpose of the testing was to understand the modes of possible interference between mobile devices and TV receivers operating below 694 MHz. The testing is described in greater detail in section 3.2

A copy of the joint Test Report is attached as an appendix to our submission.

## 3 Changes to the 700 MHz SLTF

This section contains our views on the ACMA's proposed changes to the 700 MHz SLTF.

### 3.1 We agree with, and support, the majority of proposed changes to the 700 MHz SLTF

We support the ACMA's proposed changes to:

1. use total radiated power (TRP) instead of equivalent isotropic radiated power (EIRP) for the in-band emission limits;
2. align the unwanted emission limits for base station (BS) transmitters with 3GPP Category B Option 1 limits, and
  - for Non-AAS BS transmitters, use mean power per transmitter port; and
  - for AAS BS transmitters, use TRP per sector and add a 9 dB AAS margin;
3. for the unwanted emission limits for user equipment (UE) transmitters, align these with 3GPP limits and use TRP; and
4. use TRP instead of EIRP for the registration exemption requirements for 700 MHz upper band (nominally BS) transmitters and 850/900 MHz SL transmitters

### 3.2 Issue 1: Exemption from registration requirements in the lower 700 MHz band

In this section, we outline our proposal for a fourth option (beyond the three proposed by the ACMA) for the registration exemption threshold.

The ACMA proposes three options (A1, A2 and A3) in relation to the registration threshold, and cites its preference for option A2. We propose a fourth option, "Option A4" with a registration exemption threshold of 35 dBm EIRP.

To arrive at this proposal, two rounds of testing were conducted.

The first round occurred at Telstra's test laboratories in Melbourne in March and August 2024. The aim was to understand what level(s) of received LTE signal would directly lead to television reception disruption and whether a change to the user equipment (UE) registration exemption limits could be supported while maintaining quality TV reception.

Telstra sought to determine practically the "maximum" LTE interference level that could be applied to the TV receiver terminals without disrupting TV reception. The method used in the initial work at the Telstra laboratory considered the following:

1. determine the minimum TV receive signal level ("minimum discernible signal") was, where a picture could be received without pixelation for a given test TV receiver. This was done on TV Channel 51 (the closest channel to the LTE UE uplink band) without any LTE signal present. Telstra identified in this case that the minimum discernible (TV) signal without any noticeable breakup (and no LTE interference present) was -78 dBm.
2. inject an interfering LTE signal on the adjacent 703-713 MHz band and record the level of the LTE signal where TV interference began, then retreat from that level until interference stops. We found that a received LTE UE power of -33 dBm<sup>2</sup> was the limit before TV signal disruption would begin. In other words, -33 dBm in 703-713 MHz (as measured at the TV receiver input / antenna connector) was the level where the TV could not operate without pixelation at the minimum discernible signal of -78 dBm (as per point 1).

<sup>2</sup> i.e., -33 dBm is the power in 703-713 MHz, measured at the TV receiver input / antenna connector.

3. Converting these levels into a link budget and taking into account real world phenomena (e.g., free-space path loss), antenna coupling losses, etc, Telstra proposed that a level of 37 dBm EIRP per 10 MHz (total UE power) should be acceptable.

This proposed change to the UE Registration Exemption Threshold was then adopted by ACMA as the basis for Option A3.

Telstra then presented its findings to the ACMA TLG and entered into discussions with Free-TV Australia.

Subsequently it was agreed to conduct joint testing (second round) between Telstra, Free-TV Australia and BAI at the Freeview test laboratories in Sydney. The aim was to address concerns about the test methodology, an expanded range of TV receivers, and a more realistic TV broadcast signal configuration than was possible to create at the Telstra labs.

In the Freeview laboratory, a larger pool of sample TV receivers (11 units) was tested, and a more realistic test TV signal generation system was utilised that delivered three simultaneous transmissions on channels 49, 50 and 51 (as is more commonly found in a typical TV multiplex delivery site),

The same approach taken by Telstra was repeated in the Freeview labs with the following outcomes:

1. The 90<sup>th</sup> percentile minimum discernible signal level measured for the basket of test televisions was found to be -84.3 dBm. This was measured in accordance with the process defined in ITU-R BT.1368-13. This level is lower than the findings of the Telstra tests and is the result of a larger range of TV receivers being available for testing.
2. The testing showed that several TV receivers were in fact more susceptible than originally observed by Telstra. It was determined that the maximum LTE UE signal that could be presented to the TV receiver terminals without causing interference was 35 dBm EIRP (total UE power), which was 2 dB lower than the 37 dBm EIRP originally proposed by Telstra at the conclusion of the first round of testing.
3. At the conclusion of the testing, noting the improved TV reception minimum thresholds, and the corresponding reduction in the maximum tolerable LTE UE signal possible before impacts were observed, it was agreed that the proposed EIRP limit could be revised, but not to the original proposed level of 37 dBm EIRP

Telstra, in consultation with the other affected 700 MHz Spectrum Licensees through AMTA and in agreement with Free-TV, have reached a new joint position that:

- the 700 MHz exemption from registration requirement for equipment in the 703-748 MHz band could be increased to 35 dBm EIRP (total device power).

A copy of the report of the joint testing is attached as an appendix to our submission.

### **3.3 Issue 2: Unwanted emission limit below 694 MHz**

We agree with and support the ACMA's preferred position for Option B2.

## 4 Other matters from the consultation paper

### 4.1 Out-of-band emission mask above 803 MHz

We agree with and endorse AMTA's submission on the out-of-band emission mask above 803 MHz, including their proposed change to lift the OOBE mask to 806.6 MHz. See AMTA's submission for details.

### 4.2 Changes to the 850 MHz and 900 MHz SLTF

The consultation paper observes that the 700 MHz TLG has also reviewed the exemption from registration requirements for both the 850 MHz and 900 MHz bands, with a view to changing the measurement from EIRP to TRP. While the consultation notes<sup>3</sup> this is to align with the 700 MHz band, which will now proceed using an EIRP measurement rather than a TRP measurement, we still support the outcome of the TLG, which agreed to convert the registration exemption threshold in the 850 MHz and 900 MHz bands into TRP.

We will welcome s.72 variation notices to amend our 859-869 MHz band spectrum licence.

### 4.3 Comments on changes to the Tx RAG

We agree with and support the ACMA making both of the proposed changes to the Transmitter RAG (Tx RAG).

Because of the changes to Clause 9 of Part 3 of the Tx RAG, we consider the corresponding clause 9 in the Explanatory Statement<sup>4</sup> also requires amending, however, clause 8 in the Explanatory Statement does not require changing.

Finally, we consider the section titled "Consultation" in the main body of the Explanatory Statement also requires updating, as it refers to a previous consultation on changes to the SLTF.

---

<sup>3</sup> Consultation paper, p.11.

<sup>4</sup> Available at: <https://www.legislation.gov.au/F2023L00248/asmade/downloads>

## 5 Other matters to be addressed

### 5.1 Imposition of filtering requirements on fixed PTP link receivers in RALI FX 22

AMTA's August 2023 submission to the 700 MHz TLG expressed concerns about obligations on 700 MHz spectrum licensees (who bid for the spectrum licences as part of the digital dividend auction in 2013 completely unaware of these constraints) to protect first-in-time PTP link receivers as little as 1 MHz above the upper band edge. Regardless, the requirement to do so remains in both the *Radiocommunications Advisory Guidelines (Managing Interference from Spectrum Licensed Transmitters – 700 MHz Band) 2023* ("the 700 MHz SL Tx RAG") and in RALI FX 22 itself.

We agree with, and support AMTA's request that Table 3 (and the references to it) on page 13 of RALI FX-22 be replaced with the simple requirement that PTP link operators employ a filter with at least 50 dB of rejection below 804 MHz. Please see AMTA's submission for further details, including an explanation of why receiver blocking filters on the PTP link are a more effective and spectrally efficient interference mitigation solution, compared to forcing spectrum licenced 700 MHz base stations to move further away from the links.

### 5.2 Remove obligation on 700 MHz SL to protect PMP arrangements in 804-806 MHz

AMTA's August 2023 submission to the 700 MHz TLG also highlighted the constraints that point-to-multipoint (PMP) arrangements in 804-806 MHz could potentially impose on 700 MHz spectrum-licensed networks. Their submission to this current consultation revisits their 2023 request.

AMTA's submissions (both then and now) note the very low ongoing use of and demand for PMP links in 805.5-806 MHz, and poses the question as to whether new PMP licences could be issued on a "buyer beware" / best-efforts basis, operating on a no protection basis with respect to spectrum licensed 700 MHz base station transmitters, regardless of first-in-time status. Thus, if a new PMP licence is issued, and subsequently, 700 MHz base station(s) are deployed in the vicinity, the PMP licensee would have to "give way" to the mobile operator.

Removing the obligation on 700 MHz Spectrum Licensees to protect (new) PTP links that are first-in-time relative to a 700 MHz base station sends a signal to prospective PTP link operators that the band is not a preferential band for new PTP links, thereby encouraging the operators to consider other bands. It also mitigates the risk of eroding Spectrum Licensee rights to use their (very expensive) spectrum without having to work around (unknown) future PTP links.

### 5.3 Fixed PTP links in the 850 MHz mid-band gap under pre-transition arrangements

Despite having transition deadlines of 30 June 2021 (Milestone 3) and 30 June 2024 (Milestone 5) of *The ACMA's long-term strategy for the 803-960 MHz band: Decision paper*<sup>5</sup> there are several two-frequency and single-frequency (respectively) fixed PTP links which remain under pre-transition arrangements:

- Single-channel two-frequency fixed links (TFFL) in 852-854 MHz: 31 licences held by the Tasmanian State Fire Commission and Santos WA Energy
- Low-capacity TFFL in 854-857 MHz: 9 licences held by the Tasmanian State Fire Commission and Airservices Australia
- Single-frequency fixed links (SFFL) in 857-859 MHz: 16 licences held by the Tasmanian State Fire Commission and a number of other entities

Irrespective of the fact that these links are in spectrum that was not re-allocated for spectrum licensing, their requirement to migrate was part of ACMA policy as part of the long-term planning arrangements in

<sup>5</sup> ACMA, November 2015. Available at: <https://www.acma.gov.au/publications/2015-12/report/acmas-long-term-strategy-803-960-mhz-band-decision-paper>

the band, not solely due to the re-allocation declaration corresponding to 850/900 MHz. Furthermore, their presence in this part of the spectrum was not expected to continue in the development of the SLTF for the 850/900 MHz.

For example, 850 MHz spectrum licensees did expect to have to protect fixed link receivers when they participated in the spectrum auction of late 2021, but only below 851 MHz, not 859 MHz. This is reflected in section 12 of the *Radiocommunications Advisory Guidelines (Managing Interference from Spectrum Licensed Transmitters — 850/900 MHz Band) 2021* (“the 850/900 MHz SL Tx RAG”): “Fixed services receivers, including point-to-point links and point-multipoint link services, operate in the frequency bands 804 MHz to 806 MHz and 845 MHz to 851 MHz, adjacent to the 850/900 MHz band”.

As such, these fixed links should either be:

- a) cleared from the spectrum in the 852-859 MHz range; or
- b) have a special condition applied to them that they are not consistent with the 800 MHz band plan and therefore operate on a “no interference, no protection” basis with respect to 850/900 MHz SL services.

## Appendix 1: Answers to the ACMA's consultation questions

Appendix 1 contains our answers to the eight questions contained in the consultation paper.

### 1. We invite comments on the options proposed for the definition of devices exempt from registration

Our submission proposes a fourth option ("Option A4") of 35 dBm EIRP as the threshold for exempting devices from registration. See section 3.2 for details.

### 2. We invite comments on the options proposed for the unwanted emission limits below 694 MHz

We support the ACMA's preference for Option B2. See section 3.3 for more information.

### 3. We invite comments on the effects the proposed changes to the 700 MHz band technical framework may have on incumbent services in the 700 MHz (703–748 MHz and 758–803 MHz) band and adjacent bands

Question 3 canvasses views on possible effects the proposed changes to the 700 MHz band technical framework may have on incumbent services within, or adjacent to the band. The table below contains our response on each of the items in the ACMA's list.

Topic	Telstra Response
<b>700 MHz band spectrum licensees</b> In band power, and unwanted emissions on adjacent channel (in-band) spectrum licensed services.	The proposed changes are acceptable and are supported by Telstra.
<b>Digital terrestrial television services</b> UHF broadcast channels 49, 50 and 51 (Block E) are adjacent to the 700 MHz lower band.	We note the ACMA's comment in the consultation that proposed options A2 and A3 for the exemption from registration requirements issue have the potential to increase interference into Digital television broadcasting and retransmission services. We have collaborated with the Broadcast TV industry, and have agreed a fourth Option, "Option A4" of 35 dBm EIRP per occupied channel for the exemption from registration requirements issue is acceptable. See section 3.2 of our submission for details.
<b>Fixed link services</b> Fixed services operate in the 804–806 MHz frequency range, including: Fixed PTP services operating in 804–805.5 MHz (paired with 849–850.5 MHz) and Fixed PMP services in 805.5–806 MHz (paired with 850.5–851 MHz).	We agree with, and support, AMTA's proposal that the "first-in-time" status for new (future) PTP links in 804–806 MHz should now be removed from the obligations on 700 MHz licensees. See section 5.2 of our submission for details.
<b>Trunked land mobile services</b> Trunked land mobile services (TLMS) operate in the 806–809 MHz frequency range, paired with 851–854 MHz.	We agree with the ACMA that because no changes are proposed to the unwanted emission limits in 806–809 MHz for transmitters operating in the upper 700 MHz band, there will be no change to the interference environment for TLMS. There will be no need to modify existing arrangements for coexistence with TLMS.

Topic	Telstra Response
<b>Class-licensed services</b> The LIPD Class Licence includes arrangements for LIPD transmitters in and adjacent to the 700 MHz band. This includes wireless audio transmitters in the 520–694 MHz and ground penetrating radars in the 30–12400 MHz frequency range.	We agree with the ACMA that devices operated under the LIPD Class Licence operate on a ‘no interference, no protection’ basis and that no changes are required to the technical framework to manage interference to class-licensed services.
<b>Wireless audio devices (apparatus licensed)</b> RALI LM09 provides additional apparatus licence options for wireless audio devices that are not covered by the LIPD class licence. Frequency ranges for this use are 520–694 MHz with allowances for 694–703 MHz, 748–758 MHz and 803–820 MHz on an interim basis.	We agree with the ACMA that changes proposed for the 700 MHz SLTF will have negligible impact on the existing interference environment for apparatus licensed Wireless Audio Devices, and as such, no changes are required to manage interference to apparatus licensed wireless audio devices

#### 4. We invite comments on the proposed changes to the 700 MHz band spectrum licence conditions

We support the ACMA's proposed changes to the 700 MHz band spectrum licence conditions, including:

1. use total radiated power (TRP) instead of equivalent isotropic radiated power (EIRP) for the in-band emission limits;
2. align the unwanted emission limits for base station (BS) transmitters with 3GPP Category B Option 1 limits, and
  - for Non-AAS BS transmitters, use mean power per transmitter port; and
  - for AAS BS transmitters, use TRP per sector and add a 9 dB AAS margin;
3. for the unwanted emission limits for user equipment (UE) transmitters, align these with 3GPP limits and use TRP; and
4. use TRP instead of EIRP for the registration exemption requirements for 700 MHz upper band (nominally BS) transmitters and 850/900 MHz SL transmitters

We also propose an “Option A4” with respect to Outstanding Issue #1, and propose that the registration exemption threshold for UE operating in 703-748 MHz can be lifted to 35 dBm EIRP per occupied channel. See section 3.2 for further details.

#### 5. We invite comments on the proposed Radiocommunications Advisory Guidelines (Managing Interference from Spectrum Licensed Transmitters – 700 MHz Band) 2025.

We support the ACMA's two proposed changes to the Transmitter RAG. We also propose that in relation to one of those changes (the change to Clause 9 of the Transmitter RAG), the Explanatory Statement should also be updated. The section titled “Consultation” in the main body of the Explanatory Statement should also be updated. See section 4.3 for more information.

#### 6. We invite comments on the proposed changes to the exemption from registration requirements in the 850/900 MHz bands spectrum licences.

We support the ACMA's proposed changes to Statutory Condition 4 of Schedule 3 of existing 850/900 MHz spectrum licences, to include both of our licences in this band.



## **Appendix 2: Test Report, Lane Cove Testing, Dec 2024**

We have separately attached the Test Report from the joint testing conducted between Free-TV Australia, BAI and Telstra at the Freeview Test Laboratory in Lane Cove on 9 and 10 December 2024.