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AMTA Submission

Australian Communications & Media Authority

Review of the 2 GHz band spectrum
licence technical framework—
Consultation paper



About AMTA

The Australian Mobile Telecommunications Association (AMTA) is the peak industry body representing Australia's mobile telecommunications industry. Its mission is to promote an environmentally, socially and economically responsible, successful and sustainable mobile telecommunications industry in Australia, with members including the mobile network operators and service providers, handset manufacturers, network equipment suppliers, retail outlets and other suppliers to the industry. For more details about AMTA, see <http://www.amta.org.au>.



Introduction

AMTA appreciates the opportunity to comment on the review of the 2 GHz spectrum licence technical framework (SLTF), and the ACMA's initiative to undertake the review with a view to supporting active antenna systems (AAS) and 5G, as described in the "Case for action" section of the consultation paper.

In this sense, we support the ACMA's proposal to introduce new unwanted emission limits for AAS, specified in terms of total radiated power (TRP) and including the 9 dB AAS factor defined in 3GPP specifications. Other changes that support the introduction of 5G and AAS include changes to:

- the in-band emission limits to be in terms of TRP;
- the condition for exemption from registration to be in terms of TRP;
- a more relaxed Level of Protection (LOP) in the device boundary criteria (DBC) prescribed in the relevant s145 Determination to account for the dynamic nature of AAS beamforming.

We also support the move away from unwanted emission limits for the Non-AAS systems—which were already supported—being specified in terms of equivalent isotropic radiated power (EIRP) towards conducted power per port.

However, we note that some of the emission limits defined are not in line with 3GPP and this increases costs for the mobile industry to produce and source "Australian-specific" solutions. In particular, the unwanted emission limits below 2110 MHz applicable to base station (BS) transmitters operating in 2110-2170 MHz are particularly stringent and we believe it's unnecessary to apply them on a nationwide basis.

Impact on incumbent services

The changes to the in-band emission limits, unwanted emissions limits and the DBC only impact a limited number of services, noting that:

- SOS earth station transmitters have 30 MHz guard band above the 2 GHz lower band and, while they are immediately adjacent to base station transmitters above 2110 MHz, 2110-2150 MHz is only spectrum-licensed in metro areas, which earth station transmitters are located far away from (with a few exceptions at Adelaide, Canberra, Darwin, Melbourne). In any case, the interference mechanism is from the earth station transmitters to the spectrum-licensed receivers and therefore not impacted by the emission limits associated with spectrum-licensed transmitters.

- SOS earth station receivers have 30 MHz guard band above the 2 GHz upper band.
- Furthermore, new SOS earth stations are subject to Embargo 23 and typically prevented from operating in highly-populated areas with a view to protecting TOB services.
- Fixed links are limited in number and limited to remote areas. There are some adjacent-band links in regional SW WA and regional QLD, but none in spectrum-licensed areas. As noted by the ACMA, these legacy fixed links are protected by the coordination requirements in the Tx RAG, while demand for new links in the 2 GHz range has declined over time (and is restricted in a range of frequencies and areas by RALI FX 3).
- The band below 1920 MHz is currently under review and the new services in 1880-1920 MHz will be second-in-time and therefore should not constrain 2 GHz spectrum-licensed services.

This only really leaves Television Outside Broadcasting (TOB) services, mobile-satellite service (MSS) services operating immediately above each of the two 2 GHz sub-bands, and Public Telecommunications Services (PTS) licences operating in adjacent bands and areas.

TOB services will only operate long-term i.e. beyond 2026 in the spectrum allocated to broadcasters in 2010-2110 MHz and 2200-2300 MHz. These frequency ranges maintain at least 30 MHz guard band to the 2 GHz bands below them (i.e. 1920-1980 MHz and 2110-2170 MHz, respectively). The only shared frequency boundary is at 2110 MHz (discussed further below).

In adopting the Category B Option 2 limits applicable to the frequency range 2170-2180 MHz, the ACMA has considered the compatibility with future MSS earth station receivers. In the TLG Paper, the ACMA has referred to ECC Report 298 and its conclusion that wireless broadband services employing AAS and implementing 3GPP Category B Option 2 emission limits can coexist with MSS.

Any in-band services (e.g. PTS licences) could conceivably be affected by change in definition of the in-band emission limit from EIRP to TRP. However, because the antenna gain is considered the DBC, a transmitter radiating higher than what would be permitted by the current EIRP—by employing a higher-gain antenna—would be “pushed back” from the spectrum licence area boundary. The change in methodology for DBC calculations could in theory permit deployment of spectrum-licensed transmitters closer to apparatus licensed services than what would be currently be permitted, but since the changes represent an improvement in accuracy rather than an outright relaxation, the potential for interference does not increase in practice. This is because transmitters would only be able to be deployed closer to the boundary if there are actually terrain features which appear with the higher-resolution DEM and path profiles, and which would attenuate the signal in practice.

Lastly, we note that the ACMA has considered class-licensed services authorised by the *Radiocommunications (Low Interference Potential Devices) Class Licence 2015* (“the LIPD”). The only transmitters authorised by the LIPD that are within 100 MHz of the 2 GHz band are “Radiodetermination transmitters” in 30-12400 MHz (item 71A)—including ground-penetration radar, wall-probing radar and ultra-wideband (UWB) sensors used in crop harvesting—and “Building material analysis transmitters” in 2200-8500 MHz.

Unwanted emissions in 2100-2110 MHz

AMTA case for 3GPP-compliant emission limits

AMTA appreciates the adoption of TRP instead of EIRP for unwanted emission limits, and also the ACMA’s willingness to consider the “sloped” approach between 2105-2106 MHz. However, our view is that neither option is appropriate to adopt in the core conditions of 2 GHz spectrum licences.

We note that the main argument presented by TOB operators is that helicopter (down)links operate below 2110 MHz, which may operate closer to the minimum carrier-to-noise (C/N) threshold than other links using directional antennas pointing to the collection stations. We note that this is a design and deployment issue for the TOB operators to resolve, either by: (a) increasing the EIRP in the direction of the collection station (either by improving gain or increasing power) or (b) avoiding use of the top 8 MHz channel 2098-2106 MHz and use of the many other channels available below 2098 MHz—particularly for events where TOB operators pool their spectrum. If the ABC needs to operate a helicopter downlink in its allocated spectrum (2082-2106 MHz) for business-as-usual activities (e.g. news or traffic), they have another two 8 MHz channels available for use.

Other TOB operations (i.e. aside from helicopter downlinks) have shown to be compatible with Non-AAS BS subject to higher limits—3GPP Cat B Option 1 in the first 5 MHz—as confirmed by tests carried out at the 2300 MHz boundary.

The 9 dB margin for AAS should not be mistaken for an increase of 9 dB in the interference potential. Rather, it should be understood that this is the increase in unwanted power which would result in the *same/equivalent* interference potential as a Non-AAS transmitter, due to the dynamic nature of the AAS beamforming. The ACMA has recognised this concept in the adoption of the AAS margin in the Level of Protection (LOP) in the s145 Determination (albeit a slightly different value). As such, the AAS margin should be added to unwanted limits for AAS, in line with 3GPP standards.

As such, the unwanted emission limits below 2110 MHz should be compliant with 3GPP; if necessary with the (already stringent) 3GPP Cat B Option 2 limits, for both Non-AAS and AAS transmitters, with the 9 dB AAS margin added for AAS transmitters.

We believe that making spectrum-licensing arrangements fit-for-purpose should be a top priority for the ACMA, noting that spectrum licences provide holders with rights that dictate they be afforded a high degree of certainty and exclusivity over the use of their spectrum. Spectrum licences are valued highly and attract a commensurate price tag. To require spectrum licensees to incur high costs to adopt Australian-specific solutions is not consistent with our understanding of the priority afforded to spectrum licensees in ACMA policy, for example as outlined in the ACMA's paper *Our approach to radcomms licensing and allocation*. This is exacerbated by the fact that these costs would far outweigh the costs to TOB operators (and the associated benefits delivered by those services), particularly when the solution appears relatively straightforward and low-impact, i.e. avoiding the operation of helicopter downlinks on the top 8 MHz channel.

AMTA preferred fallback

If absolutely necessary to select between one of the two options presented by the ACMA in the consultation paper, we have a strong preference for Option 2 (based on a combination of 3GPP Category B Option 2 limits and the 2.3 GHz band limits) over Option 1 (based on the existing limits).

However, there are still a few inconsistencies with Option 2 that the ACMA should address:

1. Option 2 needs to include the 'step' of $(-26 \text{ dBm} + 9) = -17 \text{ dBm}/(30 \text{ kHz})$ for offsets between 1 and 1.5 MHz, to match Table 6.6.4.2.2.2-1 of 3GPP TS 38.104.
 - a. Note: this 'step' of $-17 \text{ dBm}/(30 \text{ kHz})$ should also be added to the unwanted emission limits in 2170-2180 MHz (Table 4).
2. We note a counter-intuitive discontinuity between the non-spurious emission limits applicable at 2100 MHz and the spurious emission levels which would apply immediately below 2100 MHz. Either the AAS BS non-spurious emission limit applicable between 2100 to ~2103 MHz should be no lower than $-21 \text{ dBm}/\text{MHz}$ (preferred), or, the AAS BS spurious emission limits should be limited to $-30 \text{ dBm}/\text{MHz}$ *but only within the frequency range 1980-2100 MHz*.
3. We still see no reason why the 4 MHz between 2106-2110 MHz cannot be aligned to 3GPP Category B Option 1, since it does not overlap the TOB spectrum at all. In practice the emissions won't be able to drop from $+6.4 \text{ dBm}/\text{MHz}$ (3GPP Cat B Option 1 @ 4 MHz offset) to $-4 \text{ dBm}/\text{MHz}$ (Cat B Option 2) at the 2106 MHz boundary, so not all that 'margin' provided by the relaxed emission limits will be used up. In other words, any transmitter needing to satisfy the $-4 \text{ dBm}/\text{MHz}$ limit at 4 MHz will not have emissions as high as those permitted by 3GPP Cat B Option 1 all the way down to the 2106 MHz boundary, in practice. However, adopting the 3GPP Cat B Option 1 limits provides maximum flexibility to spectrum licensee with no increase in the interference potential to TOB services below 2106 MHz.

4. Any adoption of unwanted emission limits not compliant with 3GPP should be limited to base stations in the vicinity of the collection stations that the TOB operators are concerned about protecting. Imposing these “Australian-specific” conditions on base stations in regional areas large distances from any collection stations is a completely unreasonable and undue constraint on spectrum licensees.

Changes to the three legislative instruments

We agree to the changes proposed to be made to the *Radiocommunications (Unacceptable Levels of Interference — 2 GHz Band) Determination 2016* (“the s145 Determination”), as summarised in Table 13 of the consultation paper.

We agree that no substantial changes are required to the *Radiocommunications Advisory Guidelines (Managing Interference from Spectrum Licensed Transmitters — 2 GHz Band) 2016* (“the Tx RAG”).

For the *Radiocommunications Advisory Guidelines (Managing Interference to Spectrum Licensed Receivers — 2 GHz Band) 2016* (“the Rx RAG”), we do propose that Schedule 1—Notional receiver performance level—be ‘modernised’ to support wider-bandwidth (including 5G) receivers, as was done for the 850/900 MHz Band. The 850/900 MHz Rx RAG also benefits from more clarity as to how each of the adjacent-channel selectivity (ACS), intermodulation response rejection and receiver blocking are defined.

Noting that the RAGs don’t sunset for over 3 years, we believe there is ample time to consider and implement these updates to the Rx RAG.

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