TELSTRA CORPORATION LIMITED

Apparatus licences in the 26 GHz and 28 GHz bands

Licensing, technical framework and pricing arrangements consultation paper

Public submission

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CONTENTS

EXECUTIVE SUMMARY

We welcome the opportunity to respond to the ACMA on proposed arrangements for allocating area-wide apparatus licences (AWL) in the 26 GHz (24.7–27.5 GHz) and 28 GHz (27.5–29.5) spectrum bands. We are comfortable with most of the proposed arrangements in the consultation package but do have some specific suggestions and concerns as explained below.

Administrative allocation and initial rounds

While we broadly support the proposed two-stage administrative allocation approach, we have some reservations about stage 2 (b). The "defined principles" used to consider competing applications can be better aligned with the Government's communications policy objectives such as "supporting the development of 5G" and "encouraging investment in infrastructure, including in regional Australia".

We strongly support the timing of the round 1 allocations prior to the auction as this will help inform potential bidders in the 26 GHz auction about who their frequency adjacent neighbours might be and any potential coordination issues that might arise.

Licence duration and renewal

Our preference is for AWLs to have the longest duration possible under legislation to maximise investment certainty. The round 1 AWL licence term of 5 years reflects what is permissible under the current Act but the amendments to the Radiocommunications Act that are currently being considered by Parliament could allow the term of round 2 licences (and those in subsequent assignments) to be as long as 20 years. We recommend the AWL licence duration and renewal arrangements be reviewed if the amendments to the Act are passed by Parliament.

Assignment priority

There is a risk that major 5G network deployments using spectrum licences will be compromised if technical incompatibility between spectrum licensed and adjacent AWL activities is not addressed. Winning bidders of spectrum licences in the 26 GHz auction need to be given an assignment priority for acquiring AWLs in adjacent geographic areas that have the same frequencies, and to preserve this priority for at least two years. In regard to adjacent geographic areas, we consider a distance of 50 kms adjacent to the spectrum licence boundary to be appropriate (or the median line between two spectrum licensed areas if the distance between the two licence boundaries is less than 100 km). This is necessary to ensure that after the auction, successful spectrum licensees have sufficient time to secure AWL's in additional geographic areas to prevent "dead zones" in their deployment plans. After the 2-year period has expired, those spectrum licensees should be offered a "first right of refusal" if some other applicant seeks an AWL that is geographically adjacent to their spectrum licence and overlaps in frequency with it.

Align AWL technical framework with the 26 GHz Spectrum Licensed Technical Framework (SLTF)

We are asking that changes be made to the AWL licensing technical framework, including amendments to TRP limits and elevation masks, to maintain consistency with our recommendations for the SLTF and maximise the utility of the AWLs for WBB operators.

01 Allocation process

1.1. Administrative allocation

We support the ACMA's proposal to issue the first area-wide apparatus licences (AWLs) through two allocation rounds with round 1 allocations (for the 24.7–25.1 GHz and 27.5–29.5 GHz ranges Australia-wide) to open in late October prior to the 26 GHz auction, and round 2 allocations to open in May 2021 (for the 25.1-27.5 GHz range outside of the areas being auctioned as spectrum licences). In particular, we support the timing of the round 1 allocations prior to the auction as it helps inform potential bidders about who their frequency adjacent neighbours might be and hence foreshadow any potential coordination issues that might arise. We note after these two initial rounds of apparatus licence allocations are completed, apparatus licensing will continue to be available in the above ranges on a first-in-time basis, consistent with the ACMA's current practice for apparatus licensing.

While we broadly support the proposed the two-stage administrative allocation approach, we have some reservations about stage 2 (b) i.e. when there is insufficient spectrum for all applicants in the bands and the geographic location. The application information pack (AIP) states "under this stage, the ACMA will take into account defined principles in considering licence applications" (p.11). In our view, the objects of the Act including promoting the communications objectives of the Commonwealth should be better reflected in these principles. We recommend that "supporting the development of 5G" and "investment in infrastructure, including in regional Australia" be also included in these principles in line with the Government's communications policy objectives for the allocation of the 26 GHz band.

1.2. Licence duration and renewal

The ACMA is proposing licence durations of up to five years, even if a longer duration becomes available as part of the proposed reforms to the Radiocommunications Act.[1] Furthermore, it is proposed that each AWL will be issued with an advisory note outlining that when renewing licences the ACMA will have regard to whether the spectrum has been used and if there is unmet demand in the bands. That is, the ACMA may decide not to renew a licence, or to renew the licence with different conditions.

While we understand the sentiment that the extent of demand for AWLs remains uncertain "reflecting the early development of business cases for service deployment"[2], all licence applications should be considered on their merit. In particular, more traditional users of spectrum such as MNOs and satellite operators should be able to take full advantage of the longer maximum term proposed under the draft Radiocommunications legislation amendment Bill given return on investment for a FWA or a FSS is likely to exceed 5 years. Our preference is for AWLs to have the longest duration possible under legislation to maximise investment certainty. The round 1 AWL licence term of 5 years reflects what is permissible under the current Act but the amendments to the Radiocommunications Act that are currently being considered by Parliament could allow the term of round 2 licences (and those in subsequent assignments) to be as long as 20 years. We recommend the AWL licence duration and renewal arrangements be reviewed if the amendments to the Act are passed by Parliament.

[1] *Radiocommunications Legislation Amendment (Reform and Modernisation) Bill 2020*, available at https://www.aph.gov.au/Parliamentary_Business/Bills_LEGislation/Bills_Search_Results/Result?bId=r6580.
[2] AIP; p12

1.3. Assignment priority

[c-i-c]

[c-i-c].

We note, in RALI [new] under section 4.3.3 an assignment priority has been proposed by the ACMA which states:

> *Unless the ACMA is satisfied that good reasons exist to do otherwise, the frequency range assigned to a licence will either:*
> - *align with any existing 26/28 GHz band licences held by the licensee (either apparatus or spectrum), if that frequency range is available; or*
> - *if the licensee does not already hold licences in the 26/28 GHz bands, the first frequency range available in the desired geographic area is to be assigned, following the assignment priority in Table 9.*

While we broadly support this proposal, including the arrangements in Table 9, we note that the frequency range assigned to a licence will only align with any existing 26/28 GHz band licences "if that frequency range is available". We strongly believe that the ACMA should be more proactive in preserving adjacent AWLs for winning bidders of the 26 GHz auction. To this end, we ask that the winning bidders of spectrum licences in the 26 GHz auction be given an assignment priority for acquiring AWLs in adjacent geographic areas that have the same frequencies, and to preserve this priority for at least two years. In regard to adjacent geographic areas, we consider a distance of 50 kms adjacent to the spectrum licence boundary to be appropriate based on device boundary calculations (or the median line between two spectrum licensed areas if the distance between the two licence boundaries is less than 100 km). This is necessary to ensure that after the auction, successful spectrum licensees have sufficient time to secure spectrum in additional geographic areas to prevent "dead zones" in their deployment plans.

While we acknowledge that this potentially means that spectrum is being left idle for a period of two years, in our view, the potential for loss of overall public benefit is greater from premature allocation to a small scale user if this allocation means the use of the adjoining spectrum licensee is heavily constrained i.e. the spectrum licensee is unable to fully utilise its licence to cover the population within its licence boundary and/or without having to incur unnecessary capital expense to operate at much reduced power levels. In other words, the immediate allocation of an AWL to a small-scale user is not necessarily the approach which yields the greatest public benefit. The fact that the spectrum is immediately being used, is not resolutive, on its own, of the public benefit calculation – it is also relevant how it is being used. Compared to immediate use of the spectrum by a small-scale user which may use the spectrum in a way which impacts the more valuable use of spectrum, the public interest is better served if a spectrum licensee acquires an adjacent AWL within a two year period in order to ensure that its spectrum licence

could be fully utilised (and/or additionally to also cover the population within the AWL boundaries with its network). Of course, the reservation cannot continue indefinitely, so the 2-year period puts in place an incentive for the spectrum licensee to determine whether or not it requires the adjacent AWL for coordination and/or coverage extension purposes. After that period has expired, we believe spectrum licensees should be offered a "first right of refusal" if some other applicant seeks an AWL that is geographically adjacent to their spectrum licence and overlaps in frequency with it. We suggest, this should also be strictly time-limited e.g. 30 days to ensure the correct incentives are in place and to prevent gaming.

Further, an AWL that is acquired by a spectrum licensee should be considered "used" and hence eligible for renewal even if it has no devices deployed or registered in it, provided the spectrum licensee can adduce technical evidence that the AWL has been acquired for the legitimate purpose of extending the device boundary of a device deployed within the adjacent spectrum licence.

1.4. Pricing and AWL tax calculator

We support the proposed apparatus licence tax of $0.0003/MHz/pop in the bands. We note the ACMA's acknowledgment that there is limited information about spectrum valuations for mmWave spectrum in the Australian market and it is proposing to review the pricing arrangements for AWLs in the 26 and 28 GHz bands as more information becomes available "such as after the spectrum auction" [3]. We request that initial prices for round 1 and round 2 to be fixed as currently proposed to provide potential licensees certainty about all licensing options available to them in the 26 and 28 GHz bands. We suggest a review would be appropriate 2 years after the conclusion of the 26 GHz auction at which point more information about spectrum demand in these bands will be available.

We agree with the methodology developed in the AWL licence tax calculator that the spectrum tax per HCIS L0 and L00 block be a fixed fraction of its umbrella HCIS L1 block, and not calculated on the basis of actual resident population within that block. First, as HCIS blocks get smaller in size, the ability to accurately calculate the resident population diminishes. Second, many L00 blocks, even in urban areas, would have a resident population of zero where they only cover parks, airports, large shopping centres or other non-residential locations. This would create an incentive for spectrum speculators to purchase a large number of urban HCIS L00 blocks with zero or very low population at very low prices for the purpose of 'staking out territory' to potentially block aspirant licensees in adjacent areas or for speculative only purposes.

[3] Consultation paper; p10

02 Technical Framework

This section contains our comments on the technical framework for AWLs in the 26 GHz and 28 GHz bands.

2.1. Alignment with the 26 GHz spectrum licence technical framework (SLTF)

In this section, we consider items from the 26 GHz SLTF that we recommend the ACMA should carry forward into the 26/28 GHz AWL technical framework for consistency between the two frameworks.

2.1.1. 3 dB power reduction for 27.0-27.5 GHz should only apply to areas immediately adjacent to a gateway footprint

Consistent with the proposed 26 GHz SLTF, the ACMA proposes[4] a baseline TRP limit of 37 dBm/200 MHz with additional flexibility to increase to an upper TRP limit of 42 dBm/200 MHz for AWL licensed transmitters operating in the range 27.0-27.5 GHz outside the gateway footprint areas. In our submission to the 26 GHz SLTF[5], we proposed this limit need only apply to geographies that have immediate adjacency to a gateway footprint area. The reduced TRP immediately adjacent to a gateway footprint area recognises the frequency range is shared with domestic satellite services and that high-power transmitters located near (but just outside) the gateway footprint areas will contribute to the aggregate interference level at the satellite receiver.

While we are comfortable with the 3 dB lower TRP limits in spectrum licensed geographies immediately outside a gateway footprint, we see no need for this to apply where an AWL licensed geography is immediately outside a gateway footprint. This is because the population densities are smaller in the AWL licensed regions and larger in the spectrum licensed regions (i.e. Perth and Hobart capital cities). Our calculations indicate that the Minister's designation determining the areas for the 26 GHz spectrum licensed geographies encompasses 86% of the Australian population and therefore only 14% of the population is in AWL licensed areas.

We instead propose that transmitters operating between 27.0-27.5 GHz can operate at a baseline TRP of 40 dBm/200 MHz and upper TRP limit of 45 dBm/200 MHz immediately outside a gateway footprint area other than the Waroona and Geeveston footprints. To implement this, the second row in Table 2 of RALI[NEW] will need to be amended to show the same TRP levels as conditions as the first row in Table 2, i.e. set to 40/45 dBm/200 MHz TRP.

4 Consultation paper, bottom of p.16 and RALI[NEW] Table 2, p.11.

5 Telstra submission to ACMA consultation on Draft Allocation Instruments for 26 GHz band, section 3.1.1, p.18.

2.1.2. Elevation masks should be redesigned to align with ITU-R requirements.

In the 26 GHz band SLTF, the ACMA proposed to introduce a set of three elevation masks[6] for base station transmitters from 25.1-27.5 GHz to protect Inter-Satellite Service (ISS), Data Relay Services (DRS) and FSS. These protection criteria have been developed to provide necessary protection and we consider there is no need to impose additional restrictions.

For convenience, our rationale for amending the elevation masks (originally contained in our submission to the 26 GHz consultation) is repeated in Appendix 3 of this submission. We recommend the same masks to be applied to AWLs for consistency with the 26 GHz spectrum licensed technical framework, which prevents the creation of unnecessary planning and deployment overhead arising from two frameworks if a single consistent framework is not implemented. Further, the elevation masks we proposed for the 26 GHz band meet ITU-R protection criteria to provide the necessary protection to satellite receivers operating in the band.

2.1.3. Fallback synchronisation

The fallback synchronisation requirement has been included as a final resort to resolve interference issues between licensees where they have been unable to reach a resolution of their own volition. Three permutations are possible: SL to SL; AWL to AWL; and SL to AWL. We support the ACMA defining a fallback mechanism for resolving interference disputes between two spectrum licensees or between two AWL licensees in the 26 GHz band.

However, we remain very concerned about the use of a fallback synchronisation requirement to resolve interference issues between a spectrum licensee and an AWL licensee, as this effectively treats the two licensee types as peers for the purpose of resolution of a stalemate in the negotiation of interference coordination. It remains our strong position that spectrum licensees must be able to operate free from interference or other encumbrances within the bounds of their licence conditions, including freedom from having to resolve interference stalemates with adjacent apparatus licensees (in this case, holders of AWLs). Further details can be found in section 3.1.4 of our submission to the ACMA's consultation on Draft Allocation Instruments for 26 GHz band.

In terms of resolving interference issues between two spectrum licensees or between two AWL licensees in the 26 GHz band, we support the synchronisation requirement uplink/downlink configuration and sub-frame pattern being specified in RALI[NEW], as this approach allows flexibility for the configuration to be updated in the future (through a consultation process). We support the FR2.120-1 UL-DL pattern described in Table A.1.3-2 of 3GPP TS 38.101-4 V15.4.0; we do not support the FR2.120-2 UL-DL pattern.

We also remain concerned that the concept of "fallback synchronisation" is meaningless in situations where geographically proximate licensees have entirely different use cases (e.g. FWA, FSS and P2P) or use entirely different communications standards (i.e. not all are transmitting 3GPP compliant signals). In such situations, it is impossible to "synchronise" because there is nothing to synchronise with.

6 26 GHz band Spectrum Licence Technical Instruments consultation paper, Figure 2.

This is a further reason why, in the event of an interference dispute that cannot be resolved through mutual negotiation, an AWL licensee must modify the operation of their transmitter in order to not interfere with the spectrum licensee.

2.1.4. Devices exempted from registration

We fully support the ACMA's proposed Exemption from Registration requirements as set out in paragraph 3(2)(c) of Schedule 1 of the AWL LCD (so called "low risk transmitters"). The proposed requirements facilitate the exemption of non-base station equipment (i.e. user equipment) up to 3GPP power class 1 fixed UE from registration. As we noted in section 3.1.5 of our submission to the ACMA's consultation on Draft Allocation Instruments for 26 GHz band, this is important from a privacy perspective. Publishing the address of a fixed wireless UE would reveal there is a wireless fixed broadband service operating at that address supplied by an identified service provider. Such details could be aggregated by third parties along with other information, for unsolicited marketing purposes or even to enable criminal activity such as identity theft.

In order to facilitate exempting low risk transmitters from registration, a definition for "Base Station" should be added to both the AWL LCD and to RALI[NEW]. See our commentary in section 3.1.6 of our submission to the ACMA's consultation on Draft Allocation Instruments for 26 GHz band for our proposed definition for the term "Base Station".

We also accept that by not registering a Fixed UE, there can be no claim for protection from interference arising from co-channel or adjacent channel operators, and the Fixed UE will not be permitted to cause interference to other co-channel or adjacent channel operations, and that operators do have the option to register a fixed UE should it require interference protection.

2.1.5. 3-second Digital Elevation Model (DEM)

We observe RALI[NEW] requires that for determining terrain propagation losses, "*all modelling must use a 9 second digital elevation model*".[7] We observe the same requirement in a footnote[8] in the existing RALI MS-38. We propose both should be changed to a 3-second DEM approach for consistency with spectrum licensed devices (as required under the Section 145 determination), given the same base-station transmitters can be licensed under either licence type.

2.2. 26 GHz and 28 GHz band AWL technical framework

In this section, we turn our attention to consider new technical items specific to the 26 GHz and 28 GHz band AWL technical framework.

7 RALI[NEW], section 3.3.1, p.19.

8 RALI MS-38, section 2.2.1, footnote 3, p.4.

2.2.1. No enforcement of pfd limits outside Australia's landmass

The first paragraph of section 3.3.1 of RALI[NEW] notes that a transmitter must not be entered into the RRL "*if the pfd at the geographic area authorised by the licence, caused by the proposed transmitter, would exceed the levels detailed in Table 4*." However, transmissions from WBB transmitters pointed towards the coast of Australia could result in transmissions that travel for many tens of kilometres out to sea before the free-space attenuation brings the power level below those required in Table 4 of RALI[NEW]. While one solution would be to require the licensee to then purchase the HCIS squares over the sea to comply with the boundary conditions, we propose a better solution would be to include an exception allowing devices to exceed the pfd limit at the edge of their licensed geographical area where that edge is outside the Australian territorial sea baseline as defined by Geoscience Australia. This would be similar to the exception to exceed Device Boundary Conditions (DBCs) in the draft Section 145 (Unacceptable levels of interference) determination for the 26 GHz band, Clause 9(4)(b)(ii) on p.7.

2.2.2. Mutual agreement to exceed DBCs and pfd limits

Under the ACMA's Lodgement Facility (ALF)[9], core condition agreements and interference impact certificate (IIC) agreements can be made, for example to exceed a licence core condition or device boundary condition. Mobile Network Operators commonly use these agreements where a spectrum licensed frequency range is licensed under two (or more) licences for adjoining geographic areas (very common in the 3.4 GHz band). While we can find nothing in the ALF that expressly prevents these agreements being reached between a spectrum licensee and an AWL licensee, we note that the language in clause 9.9 of the ALF is spectrum licence centric, through the use of terms like "core condition" agreement (noting that apparatus licences do not have "core conditions" per se, they only have "licence conditions"). This creates the impression that agreements can only be reached between adjacent spectrum licensees.

As a result of the comparatively small spectrum licensed geographies proposed for regional areas in the 26 GHz band, it is reasonable to expect there will be a requirement for agreements to be created between adjacent spectrum licensees and AWL licensees. We recommend the ACMA should revise the ALF to make it more explicit that agreements can be reached between spectrum licensees and AWL licensees (SL – AWL), as well as between pairs of AWL licensees (AWL – AWL) for the same purpose as is currently permissible between pairs of spectrum licensees (SL – SL).

2.2.3. Compatibility requirement discrepancy with 26 GHz Receiver RAG

RALI[NEW], §2.2.10 defined the compatibility requirement for receivers licensed under AWLs in the 26/28 GHz band. Amongst the requirements are the interference levels a receiver must be able to tolerate in the 50 MHz adjacent to the receiver channel, as well as the levels it must tolerate from

9 **ACMA Lodgement Facility** (ALF), clause 9.9, "Agreements for Device Registration", p.16. https://www.acma.gov.au/sites/default/files/2019-12/Final%20ALF%20User%20Guide%20docx.docx

frequency offsets greater than 50 MHz.[10] Specifically, RALI[NEW] calculates the maximum interference a receiver needs to be able to tolerate is -89.3 dBm/50 MHz in the adjacent 50 MHz channel, and -84.0 dBm/50 MHz at frequency offsets greater than 50 MHz.

However, we notice this does not line up with the calculations in Schedule 1 of the draft *Radiocommunications Advisory Guidelines (Managing Interference to Spectrum Licensed Receivers — 26 GHz Band) 2020* (Receiver RAG).[11] Note 1 to clause 2 of Schedule 1 says compliant receivers will be able to "*tolerate an interference power level of -66.3 dBm/50 MHz in the adjacent 50 MHz*". Note 2 to clause 4 then says a compliant receiver will be able to "*tolerate an interference power level of -61 dBm/50 MHz within the frequency offset of 50 MHz–1500 MHz*".

Interestingly, we observe the difference between the pairs of numbers is always 23, which is the assumed receive antenna gain in RALI[NEW] (i.e., 23 dBi). This appears to be the cause of the discrepancy, and we believe the Receiver RAG to be in error (i.e., RALI[NEW] has correctly included the receiver gain, whereas the Receiver RAG has missed this point).

2.2.4. Do not class licence Ka band ESIMs

The ACMA notes[12] one of the proposed use cases for satellite services in the range 27.5-29.5 GHz is ubiquitous earth stations, including earth stations in motion (ESIMs). The ACMA plans a subsequent consultation[13] on class licensing arrangements for the Ka Band. However, ahead of the consultation, we wish to make a few points for the ACMA's consideration.

In the range 27.5-28.1 GHz, FSS and FWA are co-primary inside the geographic areas defined by the 26 GHz spectrum licences. This means that subject to passing initial deployment coordination requirements, an FWA licensee operating in this range should be able to continue operation free from new sources of interference.

The ACMA plans to class licence Ka-Band ESIM transmitters in the range 27.5-28.3 GHz through a proposed amendment to the CSO class licence[14]. Previously[15], with regard to Ku-Band ESIM receivers we recommended that regardless of whether the ACMA decides to class licence Ku-Band ESIM receivers, it should require vendors of such receivers to make it clear they are not protected from interference:

> ***Managing uncoordinated earth receive station user expectations***. *… we recommend that [the ACMA] require all vendors selling such receivers to clearly publicise that they are not protected from any interference caused by other licensed users in the 10.7–11.7 GHz band. We also recommend that the ACMA undertake appropriate public education, e.g. in a format[4] like that in the ACMA's information for C-Band satellite TV Receive Only (TVRO) users. We make*

10 RALI[NEW], section 2.2.10, p.15.

11 26 GHz Receiver RAG, Schedule 1, p.11.

12 Consultation paper; bottom of p.2.

13 Consultation paper; footnote 15, p.12.

14 Consultation paper, footnote 15, p.12, where it says "*Expansion of regulatory arrangements supporting ubiquitous earth stations below 28.3 GHz requires amendment to the CSO class licence which will be subject to a separate consultation process*."

15 Telstra submission to IFC 23/2019, **Sharing between fixed point-to-point links and uncoordinated earth station receivers in 10.7-11.7 GHz**. p.4 Available at https://www.acma.gov.au/sites/default/files/2019-10/IFC-23-2019-Submissions.zip

these recommendations because investigations into complaints of interference by either unlicensed or class licensed receivers could result in significant cost incurred by apparatus or spectrum licensees to manage end user expectations.

There is an even greater imperative to set expectations for users of ESIM devices in the Ka Band, given these devices are transmitters in this band and there is potential for such devices to cause interference to terrestrial FWA systems operating in the 27.5-28.1 GHz range.

We agree with the ACMA's proposal[16] that ubiquitous FSS earth stations authorised under the CSO class licence have priority over AWL services operating in the range 27.5-28.1 GHz outside defined areas, and in the range 28.1-29.5 GHz. We agree with, and support the use of an advisory note to be included on all AWLs issued in the range 27.5-28.1 GHz outside defined areas or in the range 28.1-29.5 GHz

16 RALI[NEW], §2.2.7, p.13 and §4.3.4, p.28.

Appendix 1: Response to the ACMA's issues for comment

This appendix contains our responses to the four specific issues posed in the discussion paper.

1. The ACMA is proposing to use a two-stage administrative allocation for apparatus licences in certain segments of the 26 GHz band and in all of the 28 GHz band. Do stakeholders agree with this approach? If not, please explain why.

We support the ACMA's proposal to issue AWLs in two rounds with round 1 allocations (for the 24.7–25.1 GHz and 27.5–29.5 GHz ranges Australia-wide) to take place in late October prior to the auction, and round 2 to take place in May 2021 for the 25.1-27.5 GHz range outside of the areas being auctioned as spectrum licences. Holding the round 1 allocation prior to the auction helps inform potential bidders about who their frequency adjacent neighbours might be and hence be able to foreshadow any potential coordination issues that might arise

While we broadly support the proposed the two-stage administrative allocation approach, we have some reservations about stage 2 (b). The "defined principles" used to consider competing applications can be better aligned with the Government's communications policy objectives such as "supporting the development of 5G" and "encouraging investment in infrastructure, including in regional Australia".

Please refer to section 1.1 for more information.

2. Do stakeholders have any concerns with the licence duration and renewal policy for AWLs in the 26 GHz and 28 GHz bands?

All licence applications should be considered on their merit and more traditional users of spectrum such as IMT and FSS should be able to take full advantage of the reforms proposed under the Radiocommunications legislation amendment Bill.[17] Our preference is for AWLs to have the longest duration possible under legislation to maximise investment certainty. The round 1 AWL licence term of 5 years reflects what is permissible under the current Act but the amendments to the Radiocommunications Act that are currently being considered by Parliament could allow the term of round 2 licences (and those in subsequent assignments) to be as long as 20 years. We recommend the AWL licence duration and renewal arrangements be reviewed if the amendments to the Act are passed by Parliament.

Please refer to section 1.2 of our submission for more information.

3. The ACMA is proposing that AWLs be available for issue for the operation of FSS earth stations in the 27–29.5 GHz range. Do stakeholders support this proposal? If not, please explain why.

[17] *Radiocommunications Legislation Amendment (Reform and Modernisation) Bill 2020*, available at https://www.aph.gov.au/Parliamentary_Business/Bills_LEGislation/Bills_Search_Results/Result?bId=r6580.

We have no concerns in relation to the ACMA's proposal to use AWLs to licence FSS earth stations, other than the ability to contiguously licence 27.5-30.0 GHz, which we address in response to Question 4.

4. The draft technical framework is optimised for both wireless broadband and FSS earth stations. Fixed earth stations in the range 29.5–30 GHz are still authorised under a fixed-earth apparatus licence. We are seeking views on a proposal to authorise FSS in the 29.5–30 GHz range with AWLs. Do stakeholders have any comments about this proposal?

FSS-only AWLs will be required in the range up to 30.0 GHz to allow for contiguous spectrum to be licensed between 27.5-30.0 GHz. given the increasing number of Ka-Band FSS Earth Stations that straddle 29.5 GHz[18]. Without the extension to 30.0 GHz, it will be impossible to accurately record details of a single wideband (2.5 GHz) transmitter under a single licence (presumably, a second legacy FSS Earth Station licence would be required for 29.5-30.0 GHz), resulting in two licence entries in the RRL and making it very difficult for subsequent prospective licensees to conduct coordination obligations for new services.

5. Do stakeholders have any specific comments about the draft AWL LCD or RALI [new] or updated RALI MS 38?

We commend the ACMA on their work to compile the AWL LCD, RALI[NEW] and the update to RALI MS-38. Overall, they are comprehensive and well written. We have identified what we believe to be a few typographical errors in the draft AWL LCD, RALI[NEW] and the update to RALI MS-38, which we have included in Appendix 2 for the ACMA's consideration.

We have also identified three other high level issues for the ACMA's consideration in sections 2.2.1 through 2.2.3 of this submission, and note that these proposed changes may also require amendments to the 26 GHz Receiver RAG and to the ACMA's Lodgement Facility.

6. Do stakeholders agree with the proposed apparatus licence tax? As explained in Appendix A, at this time in Australia there is limited information about the value of the spectrum on offer for administrative allocation. The ACMA is open to reviewing the apparatus licence tax for AWLs in light of developments in domestic markets that have occurred or will occur over time. What considerations should the ACMA take into account?

We support the proposed apparatus licence tax of $0.0003/MHz/pop in the bands. We request that initial prices for round 1 and round 2 to be fixed as currently proposed to provide potential licensees certainty about all licensing options available to them in the 26 and 28 GHz bands. We suggest a review would be appropriate 2 years after the conclusion of the 26 GHz auction at which point more information about spectrum demand in these bands will be available. Please refer to section 1.4.

[18] A review of the RRL as at 10 Sept 2020 shows there are already 73 registered Ka-Band transmitters that straddle 29.5 GHz

Appendix 2: Typographical and other consistency errors

In this section, we provide a short list of items we believe to be typographical errors in the RALIs for the ACMA's consideration.

First however, we wish to make some observations on language consistency across documents in this consultation and the instruments developed in the 26 GHz consultation. For example, when describing the percentage of time that a base station may electronically steer its beam more than 5° above the horizon, the ACMA uses three different ways of describing how time is measured (yellow highlight), the definition of the horizon (blue highlight) and elevation (green highlight).

- **Tx RAG** (for 26 GHz Spectrum licensed transmitters), Part 4, Clause 11(5)(f) says: "*direct its antenna beam via electrical steering to an elevation greater than 5 degrees above the horizontal plane for more than 5 percent of the time in any 24 hour period*"; whereas
- **AWL LCD**, Schedule 1, Clause 9(9)(b) says: "*directs its antenna beam via electrical steering to an elevation angle greater than 5 degrees above the horizontal plane for more than 5 percent (whether or not consecutive) of any 24 hour period*"; and
- **RALI[NEW]**, §2.2.6, the second note under Table 2 says: "*direct the main beam (via electrical steering) to elevation angles greater than 5° above the horizon for more than 5% of time within a 24 hour period.*"

Document/Location	Error and proposed correction
AWL LCD. Top of p.5, under the heading for Schedule 1.	Delete the text ~~(paragraph 6(b))~~ immediately under the heading. It appears with no apparent reason.
AWL LCD. Title of Table 5, middle of p.13.	Delete the words as shown in green highlight from the table title: ***Table 5: Base station and earth station unwanted emission limits – outside the frequency range 23.6 GHz to 24 GHz~~, with frequency offset less than or equal to 0.1 x $BW_{occupied}$~~***. It makes no sense to talk about frequency offsets at 0.1x$BW_{occupied}$ when that would be nowhere near the range 23.6-24.0 GHz.
AWL LCD. Text in between Table 5 and Clause 14(7) of schedule 1.	Delete the subtitle ~~*Radiocommunications transmitters that are base stations – inside 23.6 GHz to 24 GHz*~~. Radiocommunications transmitters cannot be licensed in the EESS band, so it makes no sense to talk about base stations inside that frequency range. We observe that this sub-title is probably intended to mirror the title immediately preceding clause 14(5), which says "*Radiocommunications transmitters that are base stations or earth stations – outside 23.6 GHz to 24 GHz*". As such, another alternative to completely deleting the sub-title before clause 14(7) would be to reword it to say something like "*Radiocommunications transmitters that are base stations – ~~inside~~ Limits on emissions into the range 23.6 GHz to 24 GHz*". Something similar should be done to the subtitle before clause 14(5).
AWL LCD. Table 10 in Schedule 1, clause 14(11) (p.15).	The "-1" in the first row, column 2 should be "1" (i.e., positive 1, not negative 1) for user equipment in the range 24.7-27.5 GHz first operated before 1 Sept 2027.

RALI[NEW], §2.2.1, p.6.	Add the green highlighted clarification "… *co-ordinate with existing frequency-adjacent AWL receivers that are in co-primary frequency/geographic areas*" because new earth stations in sole-primary are not required to coordinate around existing AWL licensed FWA receivers. The same should apply to the last chevron of the geographic area boundary point. However, this comment does not apply to §2.2.3 on p.10, because that's in reference to spectrum licensed receivers. Don't copy the same changes into §2.2.3.
RALI[NEW], §3.3.1, p.19.	Make the green highlighted modifications to the following sentence "*Calculation of the pfd at the area boundary is only required when the distance from the proposed transmitter to the licence boundary is below ~~exceeds~~ the minimum distances shown in Figure 1.*"
RALI[NEW], §4.3.4, subpoint (a), top of p.29.	Delete green highlighted text "*~~that is~~ receiving radio emissions*…"
RALI MS-38, §2.2.1.2, Note 3 to Table 1, p.5.	Delete the green highlighted sentence, as elevation angles below 10 degrees are now permitted in highly-populated areas. "*Note 3: ε_{min} is the minimum elevation angle permitted for an Earth station. Article 21.14 of the ITU-R Radio Regulations defines a minimum elevation angle of 3° for transmitting earth stations. ~~The exception is within highly-populated areas specified in Appendix 4, where ε_{min} = 10° (see Section 3.3). ε_s, ε_h and $\Theta_{S1,S2}$ are all defined in Appendix 2.~~*"
RALI MS-38, §3.1, p.8.	Telstra regularly encounters instances where critical information about an FSS earth station is not reliably recorded in the RRL. We propose the following text is added to the end of the second paragraph: "*These details must also be recorded in the appropriate fields in the RRL, and where known, the specific satellite the earth station is in communication with should be recorded in the notes on the licence.*"

Appendix 3: Proposed amendments to the TRP limits and elevation masks

In section 2.1.2 of this submission, we recommend that the ACMA consider our proposed amendments to the elevation masks for AWL licensed transmitters operating in 24.7-29.5 GHz. These recommendations, originally contained in section 3.1.3 of our submission to the 26 GHz band spectrum licence technical framework, are replicated below for convenience.

3.1.3 Elevation masks should be redesigned to align with ITU-R requirements

The ACMA proposes to introduce a set of three elevation masks[19] for base station transmitters from 25.1-27.5 GHz to protect Inter-Satellite Service (ISS), Data Relay Services (DRS) and FSS. However, these satellite services are already adequately protected by ITU-R recommendations F.1249 (fixed point-to-point services and the ISS), F.1509 (fixed point-to-multipoint services and the ISS), SA.1155 (protection of the DRS), and more recently Resolution 242 resolves 2.1 and 2.2 at WRC-19 (for IMT services). These protection criteria have been developed to provide necessary protection and we consider there is no need to impose additional restrictions.

Despite the presence of these ITU-R recommendations, the ACMA has chosen to develop a further protection mechanism based on a mask developed in one of the TG-5/1 studies. The ACMA's proposed set of EIRP masks replicate the Russian Federation's Study in the TG-5/1 Chairman's Report[20] for protection of the ISS. The mask in Russian Federation's Study is simply based on generating an envelope around the EIRP pattern for an 8x8 AAS array operating at 25 dBm/200 MHz TRP. It appears that the ACMA has then created the set of three masks by adjusting the amplitude for the applicable baseline TRP limit.

There are several issues with using a single input study to create core licence conditions. Firstly, we consider that where the outcomes from studies are available, we should be relying on them and not specific input studies, as there may be other studies to the contrary. For example, in this case, the Australian study focussing specifically on 27.0-27.5 GHz within gateway footprint areas concluded the aggregate interference inside a gateway footprint area would be 20 dB lower than the permissible I/N ratio based on the modelling parameters sent to TG-5/1 by WP4A. Secondly, we note Russia is situated further north of the equator than Australia is south of the equator. This means satellites in the geostationary arc serving either particular country will appear lower in the sky (closer to the horizon) to Russia than they appear to Australia. As such, we consider that if the ACMA were to proceed with using the input study submitted by the Russian Federation, as a minimum the mask should be translated for Australian latitudes.

Given our proposal that the 3 dB reduction to the baseline and upper TRP limits should only apply to Greater Perth and Margaret River (as per section **Error! Reference source not found.**), a total of four EIRP elevation masks are required:

i. 27.0-27.5 GHz inside gateway footprints (all of Hobart plus parts of Greater Perth and Margaret River);

[19] Technical Instruments consultation paper, Figure 2.

[20] TG 5/1 Chairman's Report Annex 3 Part 4. https://www.itu.int/md/R15-TG5.1-C-0478/en

ii. 27.0-27.5 GHz 'just outside' gateway footprints (remaining parts of Greater Perth and Margaret River);
iii. 27.0-27.5 GHz 'further outside' gateway footprints (other spectrum licensed geographies *except* Hobart, Greater Perth and Margaret River); and
iv. 25.1-27.0 GHz.

We address each in turn below.

EIRP Elevation Mask for 27.0-27.5 GHz inside gateway footprint areas

For the frequency range 27.0-27.5 GHz inside gateway footprint areas (namely, all of Hobart plus parts of Greater Perth and Margaret River) Australian domestic satellites appear at elevations between 40-80 degrees to the horizon. As such, we propose that a more practical and implementable limit is to restrict the EIRP where the pointing angle of the main lobe is between 34 degrees and 86 degrees elevation. The values of 34 and 86 degrees are derived using the -3 dB beamwidth of a 23 dBi (8x8) antenna, which has a 12-degree beamwidth. Half this beamwidth is 6 degrees, and therefore, restricting the EIRP from base stations (including upper side lobes) at elevation angles above 34 degrees will limit emissions from base stations within the 3 dB beamwidth of any Australian domestic satellites. We propose the EIRP limit should be set to **34 dBm/200 MHz** for elevation angles above 34 degrees, consistent with the ACMA's proposed value for transmitters operating in the range 27.0-27.5 GHz inside gateway footprint areas at elevations between 15 and 25 degrees, as shown in Table 3 of the Technical Instruments consultation paper.

Below 34 degrees where there are no domestic Australian satellite receivers, we propose a downward slope for the EIRP elevation commencing at 42 dBm/200 MHz EIRP at 15-degrees above the horizon, sloping at a gradient of -0.43 dBm/degree of elevation down to 34 dBm/200 MHz at 34-degrees above the horizon (i.e., in the range 15 degrees ≤ *el* < 34 degrees, $EIRP_{MAX} = 42 - 0.43(el - 15)$).

The entire mask, from 15 degrees to 86 degrees need only apply in the direction of the geostationary arc.

EIRP Elevation Mask for 27.0-27.5 GHz 'just outside' gateway footprint areas

For the frequency range 27.0-27.5 GHz just outside gateway footprint areas (namely, the remaining parts of Greater Perth and Margaret River), we propose the same shaped EIRP elevation mask as that proposed for inside gateway footprint areas should be used, increased by 12 dB, corresponding to the 12 dB higher baseline and upper TRP limits compared to the limits inside gateway footprint areas.

The entire mask, from 15 degrees to 86 degrees need only apply in the direction of the geostationary arc.

EIRP Elevation Mask for 27.0-27.5 GHz 'further outside' gateway footprint areas

For the frequency range 27.0-27.5 GHz further outside gateway footprint areas (namely, all other spectrum licensed geographies *except* Hobart, Greater Perth and Margaret River), we propose the same shaped EIRP elevation mask as that proposed for inside gateway footprint areas should be used, increased by 15 dB, corresponding to the 15 dB higher baseline and upper TRP limits compared to the limits inside gateway footprint areas.

The entire mask, from 15 degrees to 86 degrees, need only apply in the direction of the geostationary arc.

EIRP Elevation Mask for 25.1-27.5 GHz

Resolves 2.2 of Resolution 242 of WRC-19[21] (the *output* of WRC-19) accommodates IMT stations with greater than 60 dBm/200 MHz EIRP by restricting the pointing angle of the main beam of the antenna to no closer than ±7.5 degrees separation angle:

> *2.2 As far as practicable, sites for IMT base stations within the frequency band 24.45-27.5 GHz employing values of e.i.r.p. per beam exceeding 30 dB(W/200 MHz) should be selected so that the direction of maximum radiation of any antenna will be separated from the geostationary-satellite orbit, within line-of-sight of the IMT base station, by ±7.5 degrees;*

The ACMA has set this as a mandatory requirement for IMT deployment, and we support this approach.

Conceptually, there is no reason why a GSO satellite at one elevation angle (say 40 degrees elevation) needs more protection than a GSO satellite at any other elevation because the variation in path loss is small compared to the total path loss, which is in the order of 210 dB. As such, there is no need to develop complex sloping masks that mirror an ITU-R M.2101 antenna. It is academic whether the 60 dBm/200 MHz comes from the main lobe, first lobe, second lobe or n^{th} lobe.

Compliance with the ±7.5 degree separation angle would require the development of site-specific geo-fencing algorithms with angles uniquely calculated for each base-station location. In addition to the complexity of calculating the angles unique to each site, the unique angle approach offers no substantial benefit over an elevation mask that simply limits power in the broad direction of the geostationary arc. A simpler mechanism would be to apply a 60 dBm/200 MHz EIRP limit to any energy directed above 15 degrees elevation for the range of azimuths that point towards the GSO arc in order to protect ISS and DRS. The application of the elevation mask to a broad range of azimuths offers greater protection to geostationary satellites compared to the ±7.5 degree separation from a point in the (3-dimensional) sky approach, as it limits emissions along the visible geostationary arc.

We also note that in order to comply with the ±7.5 degree separation required by Resolves 2.2, there will be some azimuths where the main beam must not go above 8 degrees below the horizon. This is because at any given point on the Australian landmass, there will be two azimuths where the geostationary arc is at the horizon (one just north of east and just north of west). For these azimuths, the beam cannot lift above 8-degrees below the horizon (technically, 7.5 degrees) or it will breach the Resolves 2.2 limit of avoiding the geostationary arc by a ±7.5 degree separation.

In order to protect ISS and DRS satellites, the mask should apply from very low elevation angles. We propose the mask should apply from 5 degrees above the horizon and need only apply in the direction of the geostationary arc.

Figure 1 below shows all four proposed EIRP elevation masks.

[21] https://www.itu.int/dms_pub/itu-r/opb/act/R-ACT-WRC.14-2019-PDF-E.pdf

Figure 1: Proposed EIRP elevation masks