TELSTRA LIMITED

Draft allocation and technical instruments for the 3.4/3.7 GHz bands auction

Public submission

29 March 2023

CONTENTS

EXECUTIVE SUMMARY

We appreciate the opportunity to comment on draft auction and technical instruments for reallocation of additional spectrum in the 3.4/3.7 GHz bands. This spectrum sits within the broader 3.3-4.2 GHz band that has been internationally harmonised for use by 4G and 5G wireless technologies. Making this spectrum available in a timely manner will improve the overall capacity, efficiency and utility of the spectrum across the 3400-3800 MHz frequency range, resulting in improved 5G performance for all Australians.

We urge the Australian Communications and Media Authority (**ACMA**) to commit to starting the auction as soon as possible, and no later than Tuesday 3 October 2023. We also request that the ACMA reconsider the need for fixed delay periods which it proposes to hardwire into the auction process.

We support the use of sequential ESMRA auctions

We support the proposed use of an enhanced simultaneous multiple round auction format (**ESMRA**) with sequential auctions of the 3.7 GHz band followed by the 3.4 GHz band.

When spectrum is substitutable, as is the case with the 3.4 GHz and 3.7 GHz bands, a simultaneous multi-round auction provides the greatest scope for an efficient allocation, as it allows bidders to switch between bands in response to price movements during the auction. However, given the complexities involved in applying allocation limits and the potential risks this could create for bidders, we agree with the ACMA's view that, for this specific process, use of sequential auctions is preferable.

Use of sequential auctions means more information should be provided in the 3.7 GHz auction

For the reasons discussed above, we are in favour of a sequential process. However, a sequential process will introduce risk to bidders: when bidding for 3.7 GHz spectrum, they will not know the level of competition in the later auction of 3.4 GHz spectrum. Unlike in a simultaneous auction, a switch from 3.7 GHz to 3.4 GHz is one way and cannot be reversed. To minimise this substitution risk and ensure an efficient allocation, bidders should be provided with the best possible information at the time at which they make the decision to switch. Aggregate demand for 3.7 GHz spectrum on its own is an insufficient metric to gauge potential competition in the 3.4 GHz auction. Bidders will be able to form more precise expectations of potential demand in the 3.4 GHz band if (a) they know the breakdown of aggregate demand during the 3.7 GHz auction by bidder for each product in each round in regional areas, and (b) the full results of the 3.7 GHz auction are then released to bidders before starting bidding for 3.4 GHz.

The usual rationale for only reporting aggregate demand rather than individual bidder demand is a concern that bidders might attempt to use the information to engage in coordinated demand reduction. In order to minimise any negative impact, we propose that this change to the information policy only applies to regions in which both 3.7 GHz and 3.4 GHz are available. This would therefore leave the metro areas unaffected, where we support the ACMA's proposal to only release aggregate demand information.

Stronger and more specific renewal statements are needed, especially for the 3.4 GHz licences

The proposed public interest statement for renewal of the 3.4 GHz licences is explained by the ACMA to be intended to encourage defragmentation within the band. However, the proposed public interest test focusing on whether the spectrum is being efficiently allocated and used, is ambiguous. If there is to be any industry led defragmentation by trading of spectrum licences before the 3.4 GHz licences expire in 2030, licensees will need to be confident all their licences will be renewed.

Doing no more than aligning the new 3.4 GHz licence terms as far as possible with the existing 3.4 GHz licence terms, does not of itself incentivise defragmentation. We submit the renewal statement should be more specific and contain objective outcomes for defragmentation which, if achieved, would trigger a high degree of certainty for licensees that renewal of spectrum licences would be offered for those that participated in trades or section 72 variations to achieve defragmentation.

Product order

We agree with the proposed product naming scheme but we propose a different product order which will place products in the same region next to each other on the list, making the auction system easier to use and reducing the risk of bid errors.

If an allocation limit is to be applied it should be 140/160 MHz and the 'insignificant' holdings population overlap threshold should be 50 per cent

It has been our long-held position that allocation limits are not necessary. Section 50 of the *Competition and Consumer Act 2010* provides an adequate remedy should any competition issues arise from a purchase of spectrum. However, if the ACMA determines allocation limits are necessary, we strongly support **option 2** of a 140 MHz limit in metro areas and 160MHz in regional areas. A higher allocation limit in regional areas mitigates the acquisition risk associated with the sequential 3.7 and 3.4 GHz auctions and reduces the likelihood of unsold lots in regional areas.

The currently proposed 'insignificant' holdings population threshold of 30 percent may deny a bidder from acquiring spectrum to serve 70 percent of the population in that licence area, which would effectively deny that population from receiving higher quality services or more competition from providers. We propose, as we have in previous submissions, that this threshold be 50 percent.

We strongly support the ACMA's proposal not to count spectrum leases (known as 'third party authorisations' under the *Radiocommunications Act 1992*) or spectrum sharing agreements towards allocation limits and that only licensed spectrum owned by that bidder counts.

Introduction of a statement of non-collusion should obviate the need for the associates disclosure process

We support the introduction of a statement of non-collusion and propose that this innovation be accompanied by the removal of the existing associates process which is not fit for its claimed purpose and has imposed unnecessary and burdensome red tape on participants in previous auctions. The significant penalties which would flow from a false statement of non-collusion make this new approach a far more efficient and effective way of ensuring bidders do not collude and are not acting to circumvent allocation limits via proxy bidders.

Given this would be the first time such a statement is used, we submit the ACMA should consult interested parties on the form and content of the proposed non-collusion statement.

We support the ACMA's proposed technical framework, with some suggested improvements

We strongly support the ACMA's proposed approach to coexistence with radio altimeters which imposes no long-term mitigations below 4000 MHz and only interim (time limited) mitigations between 3800-4000 MHz. This is a cautious approach that strikes an appropriate balance between existing and future uses of the spectrum. However, we believe there is opportunity to improve the efficient use of spectrum by aligning the end of the interim mitigations with the end of similar mitigations in the United States.

There is also an opportunity to improve efficient use of the spectrum by updating the filter requirements for fixed satellite service earth stations to align with those being introduced in the United States. Installing appropriate filtering to guard against strong adjacent frequency interference is the most practical means to achieve protection for fixed satellite services.

01 Draft marketing plan

1.1. Spectrum licences

Issue for comment 1: Licence commencement and duration

We agree with the proposed licence terms that 3.4 GHz licences should have 7-year terms expiring on 13 December 2030 (the same date as existing 3.4 GHz licences), and that licences should be issued as soon as possible after winning bidders pay their spectrum access charges.

We agree that 3.7 GHz licences should have a 20-year term, but advocate that these licences should also be issued as soon as possible after a winning bidder pays its spectrum access charges. We see no reason why the licence issuance process for 3.7 GHz needs to be any different to 3.4 GHz. We are concerned the proposed 8-week period before licence commencement unduly delays bidders from being able to access their spectrum, noting there is no 'early access' mechanism being proposed for any spectrum being sold at this auction.

The reason provided by the ACMA for setting an arbitrary 8 week delay is to set a common licence commencement date, in order that all licences issued in this band have a common expiry date. However there is no reason why the ACMA cannot adopt the payment mechanism proposed for 3.4 GHz licences for licences in the 3.7 GHz band.

The ACMA should set the licence commencement date for the 3.7 GHz licences as a date no more than four weeks after the date of publication of the auction results, and the licence expiry date as 20 years after that commencement date. The ACMA should then invoice successful bidders as soon as is practicable after the conclusion of the auction, with bidders given up to 8 weeks to pay the invoice. If a successful bidder pays it on or before the declared licence commencement date, they get to enjoy the full 20-year licence term. If they pay it after the licence commencement date but before the 8 week payment deadline, they enjoy a slightly shorter licence term (the licence would be issued as soon as practicable after the payment is made), but still pay the full amount. This approach would motivate successful bidders to pay sooner rather than later. If a bidder does not pay the invoice by the due date, that bidder has defaulted, and the usual provisions would apply.

The loss of a short period of licence term in this proposal is no different to the loss of some licence term faced by bidders in 3.4 GHz auction, where the expiry date is fixed but the commencement date of the licence is proposed to be entirely dependent on when that bidder pays their spectrum access charges. There is no change to the invoice amount paid by winning bidders depending on when they pay, even though different bidders will end up with slightly different licence terms.

Issue for comment 2: Licence renewal statements

The proposed renewal statements for the 3.4 GHz licences need to be stronger and more objective. The likelihood of renewal/reissue becomes a material factor in spectrum valuations when a licence term is as short as 7 years. Renewal statements need to have enough clarity to allow bidders to quantify the likelihood of renewal/reissue and hence attribute value to the prospect of renewal for the purposes of bidding in the auction.

The proposed 'public interest' statement for renewal of the 3.4 GHz licences is explained by the ACMA to be intended to encourage defragmentation within the band. Achieving the desired defragmentation will only occur if all parties are confident that all of their post defragmentation licences (which could be a mix of 'pre-existing' and 'new' 3.4 GHz licences) will be renewed.

Doing no more than aligning the new 3.4 GHz licence terms as far as possible with the existing 3.4 GHz licence terms, does not of itself incentivise defragmentation. In the recent 850/900 MHz band re-allocation process, the ACMA similarly did not sufficiently incentivise the desired downshift of the 850 MHz band, with the result that the current inefficient band structure may persist for five more years.

We submit the renewal statement should be more specific and contain objective outcomes for defragmentation which, if achieved, would trigger a high degree of certainty for licensees that renewal of spectrum licences would be offered for those that participated in trades or section 72 variations to achieve defragmentation.

We are also concerned that the proposed public interest test focusing on whether the spectrum is being efficiently allocated and used, is ambiguous. Efficient allocation and efficient use are not necessarily co-existent. Spectrum may be very efficiently allocated from a technical perspective but remain unused; alternatively, there may be intensive use by licensees of spectrum which has been allocated in a technically suboptimal manner. In fact, where licensees are artificially constrained from using their allocations to their full potential due to narrow and inefficient boundaries and refusal by other licensees to cooperate in defragmentation, they are more likely to be working their spectrum hard. The proposed test may also have the unintended consequence of rewarding licensees that are using their spectrum but block defragmentation for strategic competitive reasons. We agree that defragmentation of the 3.4 GHz band should be the objective, in which case the public interest test for renewal should clearly articulate and incentivise the achievement of that outcome prior to 2030.

1.2. Lot configuration

Issue for comment 3: Frequency lot configuration

We would have preferred 10 MHz lots as we advocated in previous submissions, but we accept 5 MHz lots provided there is an MSR option of 2 lots.

We agree the 2.5 MHz ‘leftover lots’ should be administratively allocated to the existing adjacent spectrum owner, with that acceptance being made at auction application time.

Issue for comment 4: Geographic lot configuration

We agree that 3.7 GHz metro (capital city) lots be independent products and have boundaries aligned with 3.6 GHz metro lots.

We agree that 3.4 GHz regional (non-capital city) lots be independent products and have boundaries aligned with 3.6 GHz regional lots.

We agree that 3.7 GHz regional (non-capital city) lots be offered using the ‘2 lot’ model with boundaries aligned with 3.6 GHz licence areas.

We agree that the Regional WA Central lot should not count towards the allocation limit, in order to avoid complexity in applying the limits in that area.

We agree that Regional 3750-3800 MHz be configured as RA2 + MRC1 in QLD and VIC, and all other regional areas as RA2.

1.3. Products

Issue for comment 5: Product naming

The proposed naming system is acceptable. However, we would propose a different product order be used in the auction system to the one that is currently included in the draft marketing plan.

The current order prioritises the 'type of region' which means that products in the same region (e.g. the rural and regional product) are not next to each other in the list. This will make it harder to use the auction system and creates the potential for bid errors. Our proposed product order for both the 3.7 GHz and the 3.4 GHz auctions is set out in **Appendix A**.

02 Draft allocation determination

2.1. Allocation methodology

Issue for comment 6: Sequencing

When two blocks of spectrum that are substitutes are to be allocated at the same time, it is generally preferable that they be sold in a single, simultaneous, multiple-round process. As demonstrated in theory and practice, a simultaneous multiple-round auction allows bidders to arbitrage across substitutable spectrum, which facilitates valuation-based bidding and promotes price discovery. In contrast, sequential awards are strategically challenging for bidders who must make switching decisions based on uncertain projections regarding price levels in each award, and a switch is one-way and irreversible. For this reason, we — like the ACMA — typically have a strong preference for a simultaneous award.

Nevertheless, in the unique context of the 3.4-3.8 GHz band in Australia, we recognise that running a simultaneous auction of the 3.4 GHz and 3.7 GHz bands would be highly complex. Specifically, we recognise that crafting rules necessary to manage switching and competition limits across the two bands in a single auction would be challenging and might involve rule compromises that would themselves generate risk for bidders. Therefore, given the specific circumstances of this award, there is a sound rationale for running sequential auctions, subject to the ACMA taking action to help bidders manage the strategic risk of making a one-way switch from the 3.7 GHz band to the 3.4 GHz band.

When awards are conducted sequentially, it is well understood that the superior substitute should be sold first. This improves price discovery and helps bidders manage risk. Accordingly, if the ACMA does proceed with a sequential auction, we consider it essential that the 3.7 GHz band be sold first (as is proposed by the ACMA).

The ACMA can and should go further in helping bidders manage risk in a sequential process. The best available method to do this is through changes to the information policy in regional areas where both 3.4 GHz and 3.7 GHz spectrum is available. In sequential auctions, bidders receive less useful information from aggregate demand than in one simultaneous process. To offset this weakness inherent in a sequential format, the ACMA should provide more detailed information about bidder demand in each 3.7 GHz auction round that bidders can use to help estimate competitive conditions in the 3.4 GHz auction. This will help them make more informed decisions about when and whether to drop 3.7 GHz demand and effectively switch to 3.4 GHz.

Specifically, for the reasons we set out in section 2.2 below, in the 3.7 GHz auction the ACMA should release a breakdown of aggregate demand by bidder for each product in each round in regional and rural areas (but not metropolitan areas, as these are not available in the second auction) and then release the full results of the 3.7 GHz auction (for regional, rural, and metropolitan products) to bidders before starting bidding for 3.4 GHz. The usual rationale for only reporting aggregate demand is concern that bidders might attempt to use the information to engage in tacitly coordinated demand reduction. However, the risk of such behaviour in the 3.7 GHz auction is less than it would be with a simultaneous process, as demand reductions in the 3.7 GHz phase could be more likely due to a desire to switch demand to 3.4 GHz and not to win 3.7 GHz spectrum at a lower price.

We do not support a fixed 5 working day gap between the two auctions

There is no need for a fixed 5 working day recess between the two auctions. A live spectrum auction is a major event for which we and other bidders dedicate significant resources, including team members travelling to join the bid room. It is inconvenient and wasteful to have unduly long pauses between auction stages. In this instance, our view is that a pause of 1-2 days between the two auctions should be more than enough for both bidders and the ACMA to analyse the results of the first auction and prepare for the second auction. However, we recognise that other bidders may have different views, and so some flexibility may be appropriate.

Accordingly, we propose that the ACMA clarify that it expects the recess should be **not more than** five working days, but the ACMA may commence the 3.4 GHz auction earlier with the consent of all bidders. For example, at the start of each day after the conclusion of the 3.7 GHz auction, the auction manager should use the auction messaging system to ask each bidder participating in the 3.4 GHz auction to advise by noon that day whether they are **not** ready for that subsequent phase of the auction to commence the next day. In absence of any participating bidder indicating they are not ready, the ACMA should advise bidders at 1.00 pm that day, that it will commence the 3.4 GHz auction the following working day.

Issue for comment 7: Commencement of auction

We urge the ACMA to commit commencing the auction no later than Tuesday 3 October 2023. There have already been many delays in this process. We believe making the spectrum available for use as soon as possible is consistent with the Ministerial Policy Statement[1] and the Government's Statement of Expectations for the ACMA.[2]

We do not support the proposal that the ACMA have the power to delay the start of the auction by '**at least** 10 working days' if any issues arise during the mock auctions.[3] In the unlikely event an issue arises in the mock auctions, the delay should be **the minimum time necessary** to address the issue, such that the ACMA can proceed with confidence in running the auction. Of course, we recognise that if there is a serious problem, a delay of 10 days or more may be required. However, a far more likely scenario is a minor issue is identified that can quickly be rectified without need for further mock auctions or any material delay to the timetable. Accordingly, we propose that any delay should be limited to **not more** than 10 working days, with allowance for additional delay to address serious and unexpected circumstances. Further, any delay should not be longer than reasonably necessary to address the issue that has been identified. We think this approach strikes the appropriate balance between the ACMA acting with appropriate urgency to proceed with the auction while allowing for more time if genuinely necessary to ensure the integrity of the auction.

Issue for comment 8: Auction stages and rounds

We support the proposed bidding stages, including the pre-bidding stage as used in the previous two auctions.

A difference this time is bidders will make their 'start demand' nominations for each product in the pre-bidding stage and not in their eligibility nomination form. Our understanding is that the eligibility

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1 Radiocommunications (Ministerial Policy Statement – 3.4–4.0 GHz) Instrument 2022

2 Michelle Rowland, Minister for Communications, *Australian Communications and Media Authority Statement of Expectations*, 7 December 2022.

3 Australian Communications and Media Authority, *Draft allocation and technical instruments for the 3.4/3.7 GHz bands auction: Consultation paper*, p.40.

nomination form will ask bidders only to nominate their total desired eligibility across both auctions as a total number of eligibility points.

We support any residual (unsold) lots being contiguous, and that the position of any unsold lots in the band is determined by the assignment bids of the successful bidders, and not by any predetermined rules (e.g. that any unsold lots be placed at one or other end of the band).

We propose one refinement to this approach. In the very unlikely event that more than one combination of assignment bids meets the criteria outlined in subsection 141(2) of the draft Determination, instead of having a pseudorandom tiebreak process as currently proposed in subsection 141(3), there should be a rule that the first tiebreak method is to position any unallocated lots at the highest valid frequency range in the 3.7 GHz band, or at the lowest valid frequency range in the 3.4 GHz band. If that resolves the tiebreak, the assignment bids for the remaining positions are processed as normal. If this method still results in a tie, then and only then should the pseudorandom tiebreak process be used.

Issue for comment 9: Allocation of leftover lots

We support Option D, with direct allocation prior to the auction of leftover lots to the frequency adjacent spectrum licence owner. We propose that the price be the starting price for 3.4 GHz lots (expressed as a $/MHz/pop unit price). If any leftover lot is not taken up, we support Option B as the fallback where it is automatically joined to the adjacent offered 5 MHz lot at the market price. All bidders will need to be informed prior to the pre-bidding stage of which leftover lots, if any, were not taken up so that this can be taken into account in their bidding decisions.

Issue for comment 10: Auction announcements

We support the proposal that the ACMA publish the names of all registered bidders prior to the commencement of the auction. This increases transparency of the auction process which will enhance public confidence in the ACMA.

2.2. Auction rules

Issue for comment 11: Minimum spectrum requirement (MSR)

While we would have preferred 10 MHz lots as we advocated in previous submissions, we accept 5 MHz lots provided there is an MSR option of 2 lots.

Therefore, we support the ACMA's proposal to offer all bidders the option of electing an MSR of 2 lots for all products, with such election being on a product-by-product basis.

Issue for comment 12: Information policy

We support the ACMA's proposal to share with bidders the exact excess demand for each product at the end of each auction round, as has been done in the previous two auctions. We believe this has worked well and that there has been no evidence whatsoever that sharing of this information has led to bidders engaging in strategic demand reduction. However, given the proposal for sequential auctions and the specific strategic risk this creates for bidders making a one-way switch from the 3.7 GHz band to the 3.4 GHz band, we believe the ACMA should go further.

For a simultaneous award, we broadly agree with the ACMA's assessment that providing the exact level of excess demand in an ESMRA strikes the right balance between addressing common value uncertainty and promoting price discovery, on one hand, and potential (but we believe unfounded) concerns over scope for strategic bidding including demand reduction, on the other hand. However, the ACMA is proposing two sequential auctions, not a single simultaneous auction. In this context, the ability of bidders to draw inferences from aggregate demand data alone in the first auction is diminished.

Accordingly, to address this concern, the ACMA should provide more granular information about demand in the regional areas to bidders in the 3.7 GHz award. For the reasons we explain below, this information will enhance price discovery and help bidders make more informed decisions about when and whether to drop demand at 3.7 GHz and pursue 3.4 GHz instead, which in turn should promote valuation-based bidding and efficient allocation.

This is an issue that is specific to the award of spectrum in the regional areas, where both 3.4 GHz and 3.7 GHz is made available and not the metropolitan areas, where only 3.7 GHz spectrum is available. Consequently, our proposal to increase transparency only relates to the regional and rural products areas and not the metropolitan products.

Specifically, we propose that the ACMA provide a breakdown of aggregate demand by bidder for each product in the regional areas in each round. Telstra's preference is for full disclosure of bidder identities. An intermediate step would be for the ACMA to publish a breakdown of demand by regional product on an anonymised basis, either with or without information linking demand from specific bands across products.

From a technical perspective, spectrum in the two bands is closely substitutable. While the licence durations are quite different, the two bands can be viewed as close substitutes in the short to medium term, and potentially in the long term too given the potential for renewal (especially if our proposal for more specific renewal criteria is adopted so that licensees have clarity on what they must do in respect of defragmentation, to secure renewal). In a sequential auction, bidders may therefore want to switch from 3.7 GHz to 3.4 GHz in response to rising prices for 3.7 GHz. At that point, however, bidders will not know what competition they may potentially face in the 3.4 GHz auction (which they would know if the auctions were held simultaneously) and what price they might pay if they are successful.

Had the ACMA proposed a simultaneous auction design, this dilemma for bidders could have been addressed through the adoption of an eligibility points regime that facilitates switching across the two bands to the greatest extent possible, ignoring the shorter initial licence duration in the 3.4 GHz band. Such an approach would enable bidders to switch unimpeded between the two bands to respond to changes in relative prices, ultimately leading to a set of prices that reflect the difference in market value between licences in the two bands, and an allocation that reflects bidder preferences. In this context, aggregate demand data provides rich information to bidders regarding the relative values of the band, because bidders can observe switching to and from 3.4 GHz. Consequently, further breakdowns of demand are not required to provide adequate price discovery.

In a sequential auction, however, a 'switch' is irreversible and needs to be made at a point at which the likely price for 3.4 GHz spectrum is unknown. This is a problem, as bidders make this decision based on two inputs: the relative value of the two bands and their expected relative price. As the price for 3.4 GHz is unknown, bidders will have to form expectations around the potential competition they may face in the 3.4 GHz band. In this structure, aggregate demand is much less informative. Bidders only see switches in one direction, and the number of observations may be greatly diminished because bidders cannot be observed switching back and forth. The quality of remaining observations is also diminished because bidders have less opportunity to learn and update their behaviour.

The ACMA has a simple option available to redress the reduction in the value of aggregate demand data: it can release more information. Bidder expectations for competition at 3.4 GHz will be far more precise if they know the exact composition of aggregate demand for 3.7 GHz at the time at which they make each switch the decision to switch. Given the value of contiguity and the position of the existing holdings, bidders would expect some of their competitors to be more interested in 3.4 GHz than others. Knowing exactly how many 3.7 GHz lots each competitor is still bidding for in the 3.7 GHz band will allow

bidders to make a more accurate assessment of the potential competition they will face in the 3.4 GHz band and thus the potential price.

Telstra proposes that the ACMA provides information about the exact number of lots that each bidder is bidding for in each regional product in the 3.7 GHz auction. The usual argument against such disclosure—that it might be used for strategic purposes—is greatly diminished in the case of a sequential award. Incentives for bidders to attempt to broker tacitly coordinated strategic demand reduction at 3.7 GHz are less in a sequential process, because reductions lead to an offsetting increase in eligibility at 3.4 GHz, so are not committing in the way they would be a simultaneous process. There is also less risk that bidders will bid out of region and/or attempt to drive some prices because the option for rivals to drop out of 3.7 GHz and switch to 3.4 GHz means a tactical bidder is less able to manage their exposure to winning unwanted lots. Further, our proposal only relates to the regional and rural products and not the metropolitan products, where we support the ACMA's proposal to only release aggregate demand information.

If, notwithstanding our comments, the ACMA remains concerned that releasing full information could lead to strategic behaviour, then there are intermediate solutions for releasing more information that it could consider. For example, the ACMA could publish a breakdown of demand by regional product on an anonymised basis (e.g. bidders A, B, C instead of Telstra, Optus, TPG etc.). This could be done either with or without information linking demand across products (e.g. bidder 'A' might be identically defined across products, providing more information, or bidder 'A' could potentially be a different bidder in each product, which provides less information). In this latter case, it would be most helpful if the ACMA could at least use the same identifying tags for bidders in related regional and rural products, as it will be beneficial for price discovery to be able to link such switches. For the avoidance of doubt, we suggest more information should be provided because we think this is necessary to offset the loss in price discovery associated with using a sequential format.

Information policy at the end of the 3.7 GHz auction

The ACMA currently proposes not to release any information about the spectrum won by individual bidders in the 3.7 GHz band before the start of the 3.4 GHz auction. We think this is an error and that the ACMA should instead provide full results to bidders. The ACMA has expressly proposed that these two auctions be held separately. Therefore, when the 3.7 GHz auction is completed, the results should be published in full to bidders. This is necessary both to promote price discovery and also to address informational asymmetries that would otherwise arise.

At the end of the 3.7 GHz auction, if full results are not disclosed, bidders will have private information about their own outcomes from which they can infer information about rivals. Given the difference in allocation limits and existing holdings, some bidders may be better able to narrow down the likely quantities won in the 3.7 GHz band by their competitors than others. This creates an informational advantage for these bidders that is not available to others and could be exploited strategically in the 3.4 GHz auction. To reduce information asymmetry for all bidders, the ACMA should provide information to all bidders about the spectrum won by individual bidders at the end of the 3.7 GHz auction.

We would accept the ACMA sharing the full results of the 3.7 GHz auction only to bidders in the auction that are continuing on to participate in the 3.4 GHz phase of the auction process, and not releasing those results publicly until that second phase completes. However, depending on the timing of when bidders in 3.4 GHz make their binding nomination of their start demand, there could be a number of days between the conclusion of the 3.7 GHz auction and the date at which the ACMA knows who is bidding in the 3.4 GHz auction. If the results of the 3.7 GHz auction are only revealed at that point, it is potentially too late for it to inform the bidding decisions of 3.4 GHz auction participants. Therefore, we believe the

results of the 3.7 GHz auction should be shared with all bidders as soon as practicable after the completion of that auction, with a reminder that all bidders must strictly abide by the ACMA's Deed of Confidentiality until the full auction results are publicly released by the ACMA.

Information policy in the clock stage of the 3.4 GHz auction

Once the 3.7 GHz auction is complete and if full information on the 3.7 GHz outcome is provided, then the 3.4 GHz becomes a standalone simultaneous auction. Accordingly, the arguments we have made above in favour of full demand disclosure for regional and rural products during the 3.7 GHz auction fall away. We would therefore advocate for a reversion to aggregate demand only data in the 3.4 GHz auction. However, if the ACMA is minded to apply the same information rules across both auctions, then we would strongly prefer full information in both auctions.

Information policy in the assignment stage of the 3.4 and 3.7 GHz auction

The ACMA proposes to provide bidders with all contiguous assignment options regardless of whether they are feasible or not. This is a significant deviation from past practice of only providing feasible options for bidders. The ACMA does not offer any rationale or justification for this change.

This proposed change significantly increases the amount of valuation work that each bidder will need to undertake before the assignment stage for no additional benefit. Given the number of lots (and thus lot positions), the amount of extra work is considerable in the context of this auction. As there is only limited time available before the assignment stage, we do not see any compelling rationale for expanding the option set and requiring bidders to value options that are not possible to allocate in practice.

However, a simple solution is to release allocation outcomes to bidders in full before the assignment round. Doing this for both bands would be consistent with our proposal to provide full results for the 3.7 GHz allocation to bidders before running the 3.4 GHz allocation. The fallback position should be for the ACMA to follow the same practice as in previous auctions and only offer bidders feasible assignment positions during the assignment stage.

Issue for comment 13: Pre-assignment of frequencies for unsold lots

We support the ACMA proposal that unsold lots will be contiguous within a given product, but that their position will be determined by the assignment bids of successful bidders. We propose one refinement to this approach, as outlined in our response to question 8, where in the unlikely event of a tie in the assignment bids, any unsold lots are first placed at one end of the band or the other in an attempt to break the tie.

We also support the ACMA adopting the second-price Vickrey core pricing rule for Assignment bids, as it has in previous auctions.

2.3. Allocation limits

Issue for comment 14: Allocation limits

It has been our long-standing position that allocation limits are not necessary. Evidence from prior spectrum auctions shows that mobile network operators do not seek to monopolise spectrum holdings and do not attribute value to keeping spectrum away from their competitors. Spectrum has gone unsold, with bidders not taking up the full quota of spectrum potentially available to them, in several auctions. We agree with the Productivity Commission's finding that the safeguards under section 50 of the *Competition and Consumer Act 2010* are sufficient and appropriate as the means to deal with any competition issues

arising out of the issue of radiocommunications licences.[4] Therefore we support the ACMA's **option 3** of imposing no allocation limits.

However, if an allocation limit is to be applied, our fallback position is to support the ACMA's **option 2** of 140 MHz in metro areas and 160 MHz in regional and rural areas. While our submission to the Australian Competition and Consumer Commission (**ACCC**) supported a limit of 175 MHz in both regional and metropolitan areas, we accept that option 2 is a reasonable compromise given the variety of views expressed to the ACCC. We strongly support the higher limit in regional and rural areas for the following reasons:

- A higher allocation limit in regional areas mitigates the acquisition risk of the sequential 3.7/3.4 GHz auctions (as outlined in section 2.1 above). Since switching between 3.7 and 3.4 GHz cannot be done during the auction if they are sequential, bidders should be able to manage their acquisition risk by potentially bidding in both bands, and this necessitates a higher allocation limit.

- A higher limit in regional areas also reduces the likelihood of unsold lots in those areas.

The insignificant holdings threshold should be increased to 50 percent of the population

The creation of new geographic areas that bear no resemblance to any previously allocated spectrum areas makes the setting of the insignificant holdings threshold crucial to ensuring existing licensees are able to acquire appropriate amounts of spectrum within the approved allocation limits. As advocated in previous submissions, we believe the most reasonable approach would be to deem an existing spectrum holding to be 'insignificant' if it covers less than 50 percent of the population of the spectrum lot being considered. The currently proposed threshold of 30 percent may deny a bidder from acquiring spectrum to serve 70 percent of the population in that licence area, which would effectively deny that population from receiving higher quality services or more competition from providers. Such an outcome would not optimally promote competition or be in the long-term interest of end-users.

The allocation limits tool should round down

Existing holdings that are not an integer multiple of 5 MHz should be rounded down to the nearest 5 MHz for the purposes of applying the allocation limit and calculating the maximum quantity of spectrum that a bidder can acquire in a given product. This was the approach the ACMA adopted in the 3.6 GHz auction in 2018, which we supported, and it should be adopted again in this auction.

Spectrum leases and spectrum sharing agreements should not be considered

We strongly support the ACMA's proposal not to count spectrum leases (known as 'third party authorisations' under the *Radiocommunications Act 1992*) or spectrum sharing agreements towards allocation limits and that only licensed spectrum owned by that bidder counts.

Often such leases, where they exist, are short in duration, or cover limited geographic areas, or both, and therefore are not material when compared to the proposed 20-year licence term for 3.7 GHz licences. It would be poor public policy for such leases to permanently prevent a bidder from acquiring spectrum rights that extend for a much longer duration or larger geographic extent, as it would result in spectrum denial to the end users whom mobile networks ultimately benefit.

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[4] Productivity Commission, *Radiocommunications Inquiry Report*, 2002, pp 288-289, available at http://www.pc.gov.au/inquiries/completed/radiocommunication/report/radiocomms.pdf

Issue for comment 15: Exclusions from allocation limits

We agree that the leftover lots should be excluded from allocation limits. We agree that the allocation limits should not apply to the Regional WA Central Middle product.

Issue for comment 17: Affiliations

We note the proposal to seek a statement from each applicant that the applicant has not colluded with another party[5] and we support such an approach. However, if this innovation is adopted, we see no benefit in continuing to impose the associates disclosure process on auction participants. We understand the purpose of the associates disclosure process as being to ensure allocation limits are not exceeded by preventing parties who are closely related from participating in the auction as separate bidders: in other words, to prevent proxy bidding being used to circumvent the allocation limits. While the proposed no-collusion statement would likely have the effect of automatically prohibiting proxy bidding, it could also incorporate an express statement to that effect. If any proxy bidding took place, the aggregation of that proxy's won spectrum after the auction would very quickly be detected — for example, through a licence trade or registration of transmitters — and the no-collusion statement could be invoked by the ACMA.

Falsely making a no-collusion statement would have serious consequences under Australian law, including potential criminal charges and the possibility of a custodial sentence.[6] We submit that requiring a no-collusion statement would be more effective and would incur far less administrative burden than the existing associates disclosure process. Such an approach would be consistent with the Minister's statement of expectations for the ACMA:

> *I expect the ACMA to pursue opportunities to simplify requirements or reduce burden, particularly for parts of industry with lower risk operations, and ensure that requirements are practicable for industry.* [7]

The existing associates disclosure process is highly burdensome for applicants, requiring disclosure of every related body corporate as well as every individual office-bearer of each of those related bodies corporate; and thereafter cross-checking every other applicant's disclosure for common associates; followed by continuous updating and re-checking throughout the auction process. Over a decade of experience in numerous auctions suggests this process is overboard and is not fit for its stated purpose. No material common associate who might be in a position to cause bidders to collude or act as a proxy for one another, has ever been identified in the process, to Telstra's knowledge. The ACMA appears to act only as a clearing house for exchange of the associates disclosures between bidders and does not itself seem to review the content of the disclosures for obvious errors or omissions. Telstra's view is that the mischief which this voluminous document generation, exchange and review by bidders is supposed to be addressing, could be adequately dealt with by the far less burdensome approach of all bidders being required to provide the no-collusion statement.

We also think it would be valuable for the ACMA to consult on the form and content of the proposed no-collusion statement. We anticipate that the ACMA will expect senior executives and/or directors of applicants to sign the no-collusion statement. Given the 'take-it-or-leave-it' nature of the application form package which the ACMA issues to aspirant auction applicants, it is important that stakeholders be given

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5 Australian Communications and Media Authority, *Draft allocation and technical instruments for the 3.4/3.7 GHz bands auction: Consultation paper*, p65.

6 See sections 136.1(1), 136.1(4) and 137.1(1) of the Criminal Code.

7 Michelle Rowland, Minister for Communications, *Australian Communications and Media Authority Statement of Expectations*, 7 December 2022.

adequate opportunity to provide input on the wording of the forms they are being expected to sign. These forms bind applicants in the same manner as the Auction Determination and should be subject to the same consultation opportunity. While the existing package of application forms is largely settled and known to industry, the no-collusion statement will be a new addition and we would like to see a draft of this form and provide our input before it is settled.

2.4. Application and registration process

Issue for comment 18: Application and registration process

We support the streamlined single application process, followed by a single eligibility nomination process, as described by the ACMA in the consultation paper, and that both auctions are covered by each of these two stages.

2.5. Lot ratings and starting prices

Issue for comment 19: Variation of prices

As we have argued in our submissions to previous auction consultation papers, the ACMA should not be able to vary the starting prices after applications close. This is because it creates financial exposure risks for bidders in the event the starting prices increase. Bidders go through rigorous corporate governance procedures and typically Board approvals in order to bid in auctions, and ad-hoc or late changes to starting prices creates corporate governance and financial risks for auction applicants. It is not simply a matter of giving applicants additional time to re-do their business cases – Board meetings cannot be called at a moment's notice if new approvals were required as a result, and Board meetings usually follow a strict calendar cadence which is incompatible with this proposed process.

The power to change auction pricing after applications close also seems to be a form of market manipulation based on asymmetric knowledge, namely the ACMA discovers how much demand there is for auction lots at the time applications close and adjusts market pricing (i.e. the start price) based on this 'inside' information.

Any changes to starting prices trigger a new application processes and additional timeframes and would substantially delay the auction. The auction has been delayed enough and there should be no further risks to the timetable.

2.6. Payment terms

Issue for comment 20: Payment terms

We support the ACMA's position that the full cost of the spectrum acquired at this auction be paid upfront before the licences commence.

Issue for comment 21: Radiocommunications (Spectrum Licence Tax) Determination 2021

We support the ACMA's proposed spectrum licence tax changes.

2.7. Other matters

In sub-section 99(5) of the draft Determination, it is not clear if bidders get to see the excess demand at the end of the pre-bidding stage, or only see it at the start of the first clock round of the primary stage. We strongly urge the ACMA to provide excess demand information for both the 3.7 GHz and 3.4 GHz auctions to all bidders at the end of the pre-bidding stage of each respective auction.

Sub-section 97(1)(d) suggests that bidders will be provided with information on excess demand for the lots of each product for the clock round. This is not possible as the round has not started yet. We

suggest sub-section 97(1)(d) should instead be included in sub-section 97(2) which sets out the information that is provided at the end of each round. The ACMA should also clarify that excess demand information is also provided at the end of the pre-bidding stage.

Sub-section 100(2) of the draft Determination says bidders cannot make more than one bid per clock round, but in practice bidders can change their bids as many times as they like during a clock round. In effect this is making more than one bid, but the bid retained in the auction system at the end of a clock round is the only bid that is counted as described in sub-section 100(5).

03 Draft technical framework

3.1. Sample spectrum licence

Issue for comment 22: Spectrum licence technical framework

We strongly support the ACMA's proposal not to include a new clause (the RAG Tx clause) in the final spectrum licence. We are concerned that inclusion of any such conditions to protect class licences could hinder a future 3.4-3.8 GHz spectrum defragmentation, as no such clause exists in current spectrum licences in this range. Any licences which contained this new clause could be considered an inferior substitute to licences which do not.

3.2. The Transmitter Radiocommunications Advisory Guidelines

We are concerned that the filtering parameters as currently outlined in the *Radiocommunications Advisory Guidelines (Managing Interference from Spectrum Licensed Transmitters — 3.4 GHz Band) 2015* (**Transmitter RAG**) are not fit for purpose. The consequences of adopting the ACMA's proposed filter mask will compromise the utility of the 3700-3800 MHz spectrum block compared to blocks below 3700 MHz, particularly if there are adjacent FSS licences above 3800MHz. This limits the ability to defragment spectrum holdings in the 3400-3800 MHz range and thus hinders both the ACMA and industry's joint goals of improving the efficient utilisation of this band. Any additional constraints on particular sub-bands within the spectrum licences should be avoided.

With the currently proposed ACMA filters, each FSS licence will have an exclusion zone around it due to adjacent channel blocking from IMT base stations. The size of the exclusion zone gets larger the closer the operating frequency is to the upper edge of 3800 MHz than it is at the lower end.

We reiterate our position expressed during the TLG process that the attenuation performance of the RF filter detailed in Table 1 of clause 4.3 (also in table 8 of RALI MS47 for AWLs) is inadequate. We strongly recommend that it be revised to an equivalent of the filter parameters that were proposed by the C-Band Alliance industry group in North America[8] and which were adopted by FCC in Docket No. 18-122 'Expanding Flexible Use of the 3.7 to 4.2 GHz Band'.[9]

The FCC filter (shown in Table 1) is a more realistic filter characteristic, and one which the satellite industry uses in practice. The ACMA filter is comparatively more relaxed. Use of the FCC filter will greatly reduce the size of exclusion zones towards the upper part of the band, improving the utility of the

[8] FCC 2-22 GN Docket No. 18-122 'Expanding Flexible Use of the 3.7 to 4.2 GHz Band', Report and Order of Proposed Modification Released: March 3, 2020. Refer to Section 31 (Page 6) of FCC Ruling https://www.govinfo.gov/content/pkg/FR-2020-04-23/pdf/2020-05164.pdf

[9] FCC 2-=22 GN Docket No. 18-122 'Expanding Flexible Use of the 3.7 to 4.2 GHz Band', Report and Order of Proposed Modification Released: March 3, 2020. See page 48 of the PDF version. https://www.federalregister.gov/documents/2020/04/23/2020-05164/expanding-flexible-use-of-the-37-to-42-ghz-band

spectrum in the 3750-3800 MHz range and aligning to best practice. References to the upper limit filter characteristic will not have any impact on spectrum licences below 3800 MHz when coordinating against FSS apparatus licences.

Table 1 - Proposed Filter Band-edge characteristics

Frequency offset from (lower and/or upper, as appropriate) edge of Earth station receiver from frequency F (MHz)	**Rejection (dB)**
< 15	0
< 20	30
< 100	60
≥ 100	70

Further technical detail on our assessment of the impact of this can be found in **Appendix C**.

3.3. Draft RALI MS47

Reference MS47 Section 4.7 Coexistence with earth station receivers

The filter characteristic change we propose for the Transmitter RAG above also needs to be reflected in RALI MS47 for consistency.

Reference RALI MS47 Section 4.10 Additional information on technical records

We continue to have concerns about the simplifications proposed by the ACMA around AWL station registrations. Section 4.9 of RALI MS-47 contains the statement:

> *"where:*
>
> *> there are multiple sectored antennas on a single site (used for example to achieve 360-degree coverage); and*
> *> all sectors are using the same frequency.*
>
> *it is not necessary to specify the azimuth of each sector antenna. Instead, the site can be recorded as a single registration (i.e., effectively registering the device as non-directional)."*

This approach would lead to additional artificial spectrum denial and would add coordination complexity through having to generate models of antenna coverage based on pseudo antenna patterns for site device registrations. Unlike PTS licensing, where this method has been used to protect the geographic territory around a registered site from potential interference from new transmitter registrations, the very nature of an AWL process followed by an individual transmitter registration against that AWL means that this approach is no longer required.

Greater spectral efficiency can be obtained by licensees registering what they will actually use (transmitters with a particular antenna pattern, orientation and tilt), as it will enable more accurate coordination checks between licensees. We request this text is removed from section 4.9 of RALI MS-47.

3.4. Coexistence with radio altimeters

Issue for comment 23: Coexistence of radio altimeters with wireless broadband

We support the ACMA's proposed approach which largely restricts mitigation measures to an interim period and to frequencies above 3800 MHz. While we accept the ACMA's rationale and proposed approach, the sole justification for the mitigation measures is the inability of radio altimeters to operate effectively within their licensed band (4200-4400 MHz) and reject signals from communications services legitimately operating in their licenced bands. Importantly, this inability to reject signals from other sources does not relate to sources in the adjacent band, as there is a 200 MHz guard band enforced between 4000-4200 MHz, meaning some radio altimeters are unable to reject signals from transmitters operating at over 200 MHz separation from the radio altimeter band itself.

The onus should be on the Australian aviation industry to correct this issue and ensure its equipment is operating within its licensed bands. While we acknowledge some radio altimeters operating today were designed and implemented decades ago, receiver filters have improved technologically and are relatively inexpensive compared to the cost of aircraft (even small craft for only a few passengers). There has also been longstanding use of C-Band for a range of purposes including satellite, microwave links, radar and more recently IMT.

The ACMA has shifted its proposed end date for interim measures between 3800-4000 MHz from 31 December 2024 to the 31 March 2025 to consider CASA's feedback. We note the US Federal Aviation Authority (FAA) has now set a date of 1 February 2024 as the deadline for the majority of aircraft in mainline commercial fleets to be retrofitted with receiver filters or replacement of their radio altimeters, where this is necessary.[10] It seems reasonable to expect the same cut-off date could apply to the Australian airline industry due to the much smaller size of the affected fleet of aircraft in this country.

In the same Notice of Proposed Rule Making, the FAA estimated the cost of updating the USA fleet at US$ 26m. The FAA estimated there are approximately 180 airplanes that would require radio altimeter replacement and a further 820 airplanes that would require the addition of radio altimeter filters to comply with the proposed modification requirement. The cost to the Australian aircraft industry of the retrofit program would be comparatively small compared to the USA. Therefore, we see no reason for the timeline for retrofit in Australia to extend past 1 February 2024.

3.5. Clarifications and typographical errors in the draft instruments

We draw the ACMA's attention to the following apparent error in the draft instruments:

- Radiocommunications Advisory Guidelines (Managing Interference from Spectrum Licensed Transmitters – 3.4 GHz Band), Part 6, Section 6.2: the note should reference Part 13.

- Radiocommunications Spectrum Marketing Plan (3.4/3.7 GHz Bands) 2023, Schedule 6, Sample Spectrum Licence, Licence Schedule 2, Table 4 (Page 42): Table 4 of the Sample Spectrum Licence shows that the unwanted emission limit that applies to the frequency range between 1 GHz and 19 GHz should not exceed -36 dBm / 1 MHz. We believe that this value should be -30 dBm / 1 MHz to align with the same limit that applies to both the current 3.4 GHz Spectrum Licence and the relevant 3GPP specification.

- Radiocommunications Advisory Guidelines (Managing Interference from Spectrum Licensed Transmitters – 3.4 GHz Band) 2015: subsection 4.3(4) subparagraph 4 (C) needs to be clarified: Subsection 4.3 (4) subparagraphs 4(C) and 4 (D) refer to filtering requirements "on or after 16 July

[10] FAA 14 CFR Part 39, https://public-inspection.federalregister.gov/2023-00420.pdf

2027" for earth receive licensees i.e. post the end of the reallocation period. The provision clearly does not apply to earth station licensees within the re-allocated spectrum bands and geographic areas, as all incumbent apparatus licences will be automatically cancelled at the end of the reallocation period. Therefore, we suggest that the drafting clarify this point by adding a note to the effect that earth station licensees are not permitted to continue operating or to establish new earth station operations in the re-allocated geography after 16 July 2027 (the end of the 5-year re-allocation period) in the relevant frequency range (up to 3800).

Appendix A: Proposed alternative product ordering

Table 2: Product order 3.7 GHz

Product ID	Product name
ADEL03	Adelaide Upper
BRIS03	Brisbane Upper
CANB03	Canberra Upper
MELB03	Melbourne Upper
PERT03	Perth Upper
SYDN03	Sydney Upper
TASM03	Rural Tasmania Upper
HOBA03	Hobart Upper
SWNS03	Rural SW NSW Upper
RNSW03	Regional NSW Upper
NNSQ03	Rural N NSW & S QLD Upper
RQLD03	Regional QLD Upper
SOAU03	Rural SA Upper
RSAU03	Regional SA Upper
VICT03	Rural VIC Upper
RVIC03	Regional VIC Upper
WEAU03	Rural WA Upper
RWAU03	Regional WA Upper
NQLD03	Rural North QLD Upper
CQLD03	Rural Central QLD Upper

Table 3: Product order 3.4 GHz

Product ID	Product name
ALBU01	Albury Lower
ALBU02	Albury Middle
CAIR01	Cairns Lower
CAIR02	Cairns Middle
HOBA01	Hobart Lower
HOBA02	Hobart Middle
LAUN01	Launceston Lower
LAUN02	Launceston Middle
ROCK01	Rockhampton Lower
ROCK02	Rockhampton Middle
CQLD01	Rural Central QLD Lower
CQLD02	Rural Central QLD Middle
TOWN01	Townsville Lower
TOWN02	Townsville Middle
NNSQ01	Rural N NSW & S QLD Lower
NNSQ02	Rural N NSW & S QLD Middle
NQLD01	Rural North QLD Lower
NQLD02	Rural North QLD Middle
SOAU01	Rural SA Lower
SOAU02	Rural SA Middle
SWNS01	Rural SW NSW Lower
SWNS02	Rural SW NSW Middle
TASM01	Rural Tasmania Lower
TASM02	Rural Tasmania Middle
VICT01	Rural VIC Lower
VICT02	Rural VIC Middle
RQLD02	Regional QLD Middle
RNSW02	Regional NSW Middle
RVIC02	Regional VIC Middle
RSAU02	Regional SA Middle
RWAU02	Regional WA Middle
RWAC02	Regional WA Central
WEAU01	Rural WA Lower
WEAU02	Rural WA Middle

Appendix B: Questions for comment on WBB and radio altimeter coexistence

General questions

1. **Are there current or potential future industry coordination mechanisms where WBB operators and the aviation community can coordinate and communicate regarding WBB deployments?**

We reiterate our response to the TLG which is to suggest that the requisite information is already provided by MNOs since the RFNSA database[11] provides a facility for interested parties to register interest in specific postcodes. In accordance with the Mobile Base Station Deployment Code,[12] the RFNSA must notify interested parties of upcoming deployments, along with details of public consultation. Operators of airports and heliports, and other aircraft operators are welcome to register locations of airports and heliports, which will provide them notification of forthcoming deployments, along with the opportunity to participate in the public consultation process.

2. **What are your views on any or all aspects of the recent Canadian consultation that would be relevant in the Australian context. What, if any, aspects of the revised mitigations should be adapted for use in Australia, and why?**

We acknowledge the work that the ACMA has done in summarising various overseas reports and consultations on the compatibility between Radio Altimeters and IMT in adjacent bands. It is important that Australia remains informed about global developments given 3400-4000 MHz is universally accepted as the key 5G mid-band spectrum. However, given that spectrum is a scarce resource, it is also important that Australia doesn't unduly limit 5G deployment based on overly conservative regulatory decisions.

Some aspects of the proposed Canadian approach[13] could usefully be applied in the Australian context. In particular, the Canadian proposal identifies the exclusion zones and restricted zones around designated airports to be smaller than those proposed by the ACMA. Since it is likely that these are areas where the demands for 5G services will be high, it is important to limit the size of these exclusion zones and restricted areas. We therefore agree with the Canadian methodology used to calculate the extent of these zones.

On the other hand, there are some aspects of the Canadian deployment rules that place limits on 5G services operating lower in the band below 3650 MHz. We take the view that this is exercising an abundance of caution, particularly since there is a 550 MHz guard band to the Radio Altimeter band. There is no evidence to support these restrictions and Telstra does not support this view.

Unwanted emission levels

Canada has proposed that the unwanted emission level from base stations that fall in the radio altimeter band should not exceed -33 dBm / MHz. We do not consider this necessary. Unwanted emission levels from base stations should not be mandated to be any more stringent than those specified by 3GPP. However, we believe that the Canadian example doesn't take into account the 3 dB difference between

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11 Radio Frequency National Site Archive. https://www.rfnsa.com.au/
12 The Mobile Base Station Deployment Code C564:2020: https://www.commsalliance.com.au/Documents/all/codes/c564
13 SRSP-520 — Technical Requirements for Fixed and/or Mobile Systems, Including Flexible Use Broadband Systems, in the Band 3450-3650 MHz

a TRP measurement (mixed polarisation), and a measurement made using a linearly polarised antenna. Thus, the Canadian emission limits are equivalent to a TRP of -30 dBm / MHz.

Other observations

- There was no interference or adverse effects to the operation of radio altimeters observed by flight crews during the qualitative OTA tests.
- The field-based OTA testing showed that there was no substantial advantage to be had by placing limits on the vertical beam scanning of AAS.

WBB deployment questions

3. Are the findings from the NTIA ITS report regarding 5G base station emission levels and pattern measurements applicable to Australian WBB deployments? If not, on what basis would equipment deployed in Australia have a materially different performance than the emission levels and pattern measurements outlined in the NTIA study? What are the implications and costs of using equipment that does meet the measurements observed by the NTIA study?

The measurements reported in NTIA TR-22-562 and summarised in the ACMA's RA report are based on base station hardware commercially available in the North American market. We understand that this equipment is therefore likely to have been designed to operate in the 3700-3980 MHz band, which is a sub-set of 3GPP Band n77 (3300-4200 MHz). It is reasonable to assume that any equipment supplied to the Australian market would be based on similar RF architecture and design principles, albeit optimised for the 3400–3800 MHz band. This band is a sub-set of 3GPP band n78 (3300-3800 MHz).

We would therefore expect that the equipment tested in NTIA TR-22-562 would have similar 'in-band' antenna characteristics as equipment being deployed in the Australian market. Since the RF filtering would be optimised for the frequency limits that apply to each market, it also seems probable that the OOBE products emitted in the RA band from an n78 transmitter would be at a lower level than those from the North American n77 radios, since they are 180 MHz lower in frequency.

4. What are the effects on WBB deployments if all WBB deployments were restricted to an EIRP of 62 dBm/MHz (rather than a TRP limit) on an ongoing basis (other than those in restricted cell segments with lower powers)? If any, what are the implications and costs of being restricted to this EIRP value, and is there an alternative that would be practicable and appropriate?

Both the current 3.4-3.7 GHz spectrum licence and the proposed 3.7 GHz spectrum licence specify that the maximum TRP should not exceed 48 dBm/5 MHz. As the ACMA observes, the majority of current Australian deployments currently operate below this figure. As noted in the NTIA report, some modern base stations have a TRP up to 320 watts (55 dBm). Assuming a 60 MHz wide 5G carrier, this would have a TRP equivalent to (55-10.79) = 44.21 dBm/5 MHz which is therefore under this TRP limit. For wider bandwidths, the value is proportionately lower.

If it is assumed that antenna gains of up to 26 dBi are currently in use, then this would mean that the static EIRP measured in each polarisation plane would be 44.21 + 26 -3 = 67.21 dBm/5 MHz, or 60 dBm/MHz

We do not believe there is any material advantage in specifying an EIRP limit, since 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[14] provides a comparison on the use of TRP vs EIRP metrics to specify AAS emissions. Based on 3GPP studies, it states that the impact of unwanted emissions on the adjacent mobile systems is best represented and limited by use of TRP. This has been the approach taken by the ACMA when reviewing the licence conditions that apply in other mid-band IMT allocations, and this band is no exception. Given that the reference technology for these mid-band frequencies is 5G NR where dynamic beam steering is associated with AAS, we believe that EIRP limits are unnecessarily restrictive.

5. **What, if any, are the implications if conducted unwanted emission levels are specified lower than the 3GPP TS. 38. 104 spurious domain Category B limits of -30 dBm/MHz (or a TRP equivalent) specifically considering possible ongoing limits of 33 dBm/MHz, 35 dBm/MHz, 40 dBm/MHz or 48 dBm/MHz? Where applicable, both equipment nominally designed for both band n77 and n78 band equipment should be considered, with spectrum allocations up to 3800 MHz for n78 equipment and 4000 MHz for n77 equipment assumed.**

As noted above in our response to Question 3, our experience is that there are significant economies of scale for base station equipment vendors to manufacture equipment to comply with global standards such as those developed by 3GPP. Any regional variations to those designs result in high costs, which ultimately impact the cost of deploying a mobile network. While the equipment that was tested in the NTIA report did appear to have OOBE products at levels significantly lower than 3GPP, it is important to note that the testing was limited to individual samples of each base station type. Normally a manufacturer would design in a certain margin to allow for component tolerances, environmental conditions and component aging. It is also important to note that one of the 'features' of an Active Antenna System (AAS) is that the beam-forming characteristics are optimised for the operating band of the antenna. Outside of the operating band, the beamforming does not allow the full array gain to be achieved, so one reason that an over the air (OTA) measurement such as that made by NTIA will likely be lower than expected might be due to the roll-off in antenna gain.

All of the analysis has identified the blocking performance of the RA receiver as being the limiting factor, rather an OOBE from WBB base stations. This can only be improved by designing receivers with robust high dynamic range devices and adequate preselection filtering in the RA. There seems little practical benefit in further reducing base station OOBE levels below those specified on the 3GPP Category B limits.

6. **Can WBB equipment comply with the ACMA proposed interim unwanted emission EIRP limits proposed in the RA report main body and Appendix D, in addition to the TRP and conducted per port limits proposed in the sample spectrum licence contained in the marketing plan? What, if any, are the implications if unwanted emissions are specified as an EIRP rather than a TRP or conducted limit on an ongoing basis?**

We defer to the expert comments provided by equipment manufacturers regarding the ability to comply with the proposed limits.

7. **What evidence is there for using lower maximum side-lobe gains, and what alternative value could be used? What would be a practical elevation pattern envelope that both non-AAS and AAS WBB base stations could reasonably implement and commit to, in order to manage grating lobes and beam pointing?**

We submit that the 18 dBi figure is being incorrectly applied, since the studies are referring to the radiated OOBE level. There is evidence to suggest that AAS forward gain (and thus also the side-lobe level) rolls off outside the operating range of the base station. This is because the phasing between the

[14] ECC Report 281 link https://docdb.cept.org/document/3360

individual antenna elements that is necessary for beam-forming is highly optimised for the operating frequencies of the base-station. For OOBE measurements, the value will approach that of a single antenna element (11 dBi in the main lobe), and will be 6 or more dB lower again at higher elevation angles.

The real-world levels are therefore likely to be much lower than those that have been calculated by the ACMA. The end result is that we believe the size of the 'mitigation' zones should be reduced accordingly: at least where the interference mechanism is thought to be due to the OOBE level received by the radio altimeter receiver.

8. Are there any technical limitations for WBB AAS base station systems that would make compliance with a requirement to not scan or point the main beam above the horizon impracticable to implement?

To our knowledge, the implementation of beam steering in AAS in this situation relies on using codebook restrictions which can be applied to a grid of beams to limit the vertical steering of the main antenna lobe.

Aviation spectrum use questions and interim radio altimeter retrofit questions

We have no comment in response questions 9-16, which are directed towards the aviation industry.

17. What are the expected impacts on WBB deployment plans, costs and business cases if interim mitigations cease on 31 March 2025? What are they if the interim mitigations period is extended?

The presence of any WBB mitigations in and around airports clearly reduces the utility of any AWL secured over the relevant aviation facility. If the interim mitigations cease on 31 March 2025, then the utility of any extant AWL licence in that area will obviously increase. Conversely, If the interim mitigations are extended beyond 31 March 2025, then the utility of any extant AWL licence in that area will remain compromised. It is difficult to quantify the business case impact of such changes as it will depend on exactly what services the business case contemplates, and where and when they are offered.

Appendix C: Adjacent channel interference issues

In the cases where an FSS service is operating on frequencies adjacent to WBB, one of the common causes for a coordination failure is due to the notional blocking threshold of the FSS receiver being exceeded by the receive level of the WBB transmitter. There are various ways to mitigate such blocking interference. However, the most practical and significant protection to FSS is achieved by installing appropriate filtering to guard against strong adjacent frequency interference.

Under the current arrangements prescribed in the draft Transmitter RAG, the total power received from a radiocommunication transmitter (operated under a spectrum licence in the 3.4 GHz band) at the input of an FSS Earth station receiver (i.e. after considering Antenna gain, radiofrequency (RF) filtering and other losses) must not exceed -65 dBm.[15] Spectrum licensees are currently able to assume there is a minimum RF filtering installed at the front end of the Earth receive station in accordance with Table 1 of the current 3.4 GHz Transmitter RAG. The filter characteristics are reproduced in Table 4 below and plotted in Figure 1 for reference.

Table 4 – Current FSS receive filter characteristics

Frequency offset from (lower and/or upper, as appropriate) edge of Earth station receiver (MHz)	Rejection (dB)
< 50	$0.5 + 0.6*f_{offset}$ (MHz)
<110	45.5
< 150	$30.5 + 0.25*(f_{offset}$ (MHz)-50)
< 200	55.5
≥ 200	70

The current filter's characteristics are based on what was referred to as the "FCC Filter" which in fact was a legacy filter specification used at the time the RAG was first drafted (2015). Demand for C band IMT spectrum has increased dramatically in recent years and the FCC have since adopted a new standard filter characteristic [16] after receiving feedback from the satellite industry.

There are many common challenges between those which are being faced in Australia and those in North America. In the US, the satellite channels are being 're-packed' into the upper 380 MHz of C-Band (3820 – 4200 MHz), thereby creating a 20 MHz guard band between the band segment being used by IMT services. To make this a success, the FCC use a band-edge filter mask with guaranteed performance below the edge of the FSS receive band.

Essentially, this approach demonstrates that a single filter with increased roll-off at the lower-band FSS edge provides substantially better protection for the FSS receiver than that which is currently specified in the Draft Tx RAG, where the filter is assumed to start rolling off at the exact channel edge (i.e. the lower frequency edge shown on the FSS licence), and has a much less aggressive roll-off characteristic. We note that this approach has been taken up by the satellite industry and suitable 'band-edge' filters are

[15] Transmitter RAG, Clause 4.3(4), p.8.

[16] FCC 2-=22 GN Docket No. 18-122 "Expanding Flexible Use of the 3.7 to 4.2 GHz Band", Report and Order of Proposed Modification Released: March 3, 2020. See page 48 of the PDF version. https://www.federalregister.gov/documents/2020/04/23/2020-05164/expanding-flexible-use-of-the-37-to-42-ghz-band

already available as a result of the work done in other larger markets such as India, Europe and the USA[17,18].

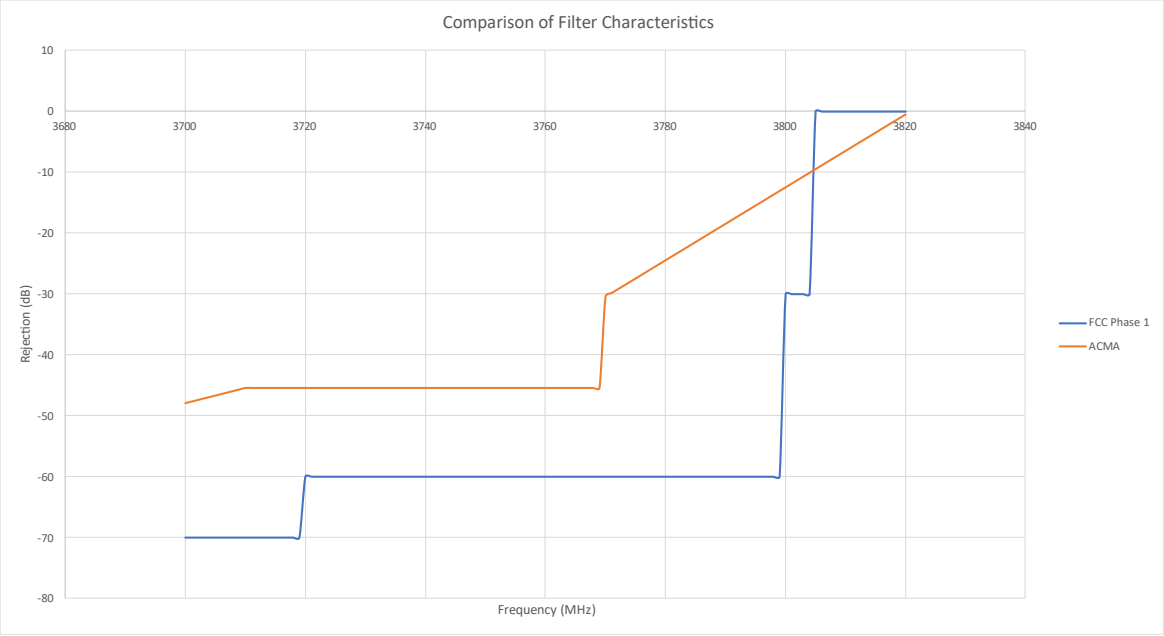
The characteristics of the new FCC filter are shown in Table 5 below. A comparison of this filter with the ACMA filter demonstrates there are advantages to using the fixed band-edge filter mask recommended by the FCC in their 2020 ruling.

Table 5 – Proposed Filter Band-edge characteristics

Frequency offset from (lower and/or upper, as appropriate) edge of Earth station receiver from frequency F (MHz)	**Rejection (dB)**
< 15	0
< 20	30
< 100	60
≥ 100	70

A plot showing the current the ACMA filter mask compared to the new FCC filter mask is shown in Figure 1.

Figure 1 – Comparison of ACMA and FCC Filter characteristics where F = 3820 MHz



17 https://www.microwavefilter.com/21000/
18 https://www.norsat.com/collections/microwave-components?pf_t_band=C-Band&pf_t_product_family=Standard+C-Band+BPF

The extra rejection that can be expected from the new FCC filter can be clearly seen by inspection of the two filter plots.

The difference between these two filter characteristics can be quantified by calculating the relative blocking interference from a notional 5G base station transmitter operating in the new 3700–3800 MHz spectrum licence band.

Table 6 below shows the calculated relative blocking interference[19] experienced by a FSS receiver operating at either 3820 MHz or 3850 MHz where the blocking interference is from a 5G transmitter operating with either a (1) 50 MHz bandwidth between 3700-3750 MHz, (2) 50 MHz bandwidth between 3750-3800 MHz, or (3) 100 MHz bandwidth between 3700-3800 MHz.

Table 6 – Relative Blocking Interference Levels

	FSS channel edge at 3820			FSS channel edge at 3850		
	ACMA	FCC	Improvement	ACMA	FCC	Improvement
3700-3750	-28.7	-44.9	16.2	-31.5	-44.9	13.4
3750-3800	-4.3	-43	38.7	-28.5	-43	14.5
3700-3800	-4.2	-40.9	36.7	-26.7	-40.9	14.2

The table shows that there is a clear advantage to be had by employing the fixed band-edge filter mask recommended by the FCC in their 2020 ruling. The result would be that the 'protection zone' around any FSS receiver site would be substantially smaller if the FCC filter characteristic were adopted, thereby increasing the utility of any spectrum licence, particularly those in the upper 50 MHz of the band proposed to be allocated for spectrum licensing.

The ACMA has asked for specific evidence and proposals for changes to these elements. Telstra provided an example of this in our TLG submission by referring to the white paper published by Intelsat[20]. Subsequently we have found that other major satellite industry companies such as AsiaSat[21,22], SES[23] and NorSat[24] have developed filter solutions to deal with this emerging global issue. As a minimum, these all have filter solutions that comply with the 'new' FCC filter characteristic. These filters are commonly available to satellite earth station operators. Telstra itself owns and operates Earth Stations that use C band frequencies and has taken pro-active steps to provision and prepare for the installation of such filters.

We therefore recommend Table 1 of clause 4.3 (as well as Table 8 of RALI MS47 for AWLs) in the Transmitter RAG be amended to specify a filter mask that is aligned with that detailed in the FCC 2020 ruling and that the filter mask should apply to frequencies below 3820 MHz similar to that proposed for the FCC Phase 1 Clearance Plan.

19 These values are calculated by considering the PSD of the interfering transmitter in each 1 MHz block, applying each filter mask, and then aggregating the power levels to calculate the relative level of RF energy from the base-station as seen by the FSS receiver.

20 www.intelsat.com/wp-content/uploads/2021/02/intelsat-C-band-whitepaper.pdf

21 https://www.asiasat.com/innovations/5g-initiatives

22 https://asiasat.com/news/whitepaper/considerations-selecting-right-5g-rejection-bandpass-filter

23 https://www.ses.com/company/c-band-transition-plan-us/faq#paragraph_30796

24 https://www.norsat.com/blogs/case-studies-whitepapers/5g-interference-immunity-app-note