Submission in response to ACMA Consultation Paper

Future use of the upper 6GHz band –

Options paper

July 2024

EXECUTIVE SUMMARY

1. Optus welcomes the opportunity to provide feedback to the Australian Communication and Media Authority's (ACMA) *Future use of the upper 6GHz band Options Paper – June 2024* (Options Paper).

2. The upper 6GHz (6425-7125 MHz) band is highly contested upper mid-band spectrum, with competing claims mainly from the Wide Area Wireless Broadband (WA WBB) and the Radio Local Area Network (RLAN) sectors. The band has been the subject of increased global attention, including recently at WRC 2023.[1]

3. Optus welcome the Options Paper as a sensible step towards providing greater clarity as to the future use of this important spectrum, which MNOs will need to deliver future high-capacity services. We support the ACMA's approach to gathering material to inform its planning decisions with a view to delivering on its desired planning outcomes for the band, namely, to optimise the use of the upper 6GHz band while maintaining arrangements for and co-existence with existing services to the extent possible.[2]

4. Of the four broad replanning options outlined in the Options Paper, Optus consider introducing arrangements to enable WA WBB access to the upper 6GHz band (Option 3) will best promote the long-term public interest to be derived from this spectrum. A key reason for this view is that the upper 6GHz band is the last mid-band spectrum available with sufficient contiguous bandwidth to meet future demand for data over public mobile networks and to support the deployment of 5G Advanced and eventually 6G (IMT-2030) services that will underpin Australia's economy, society and digital future.

5. Optus also submit that the RLAN sector does not face any imminent spectrum shortfall and is creating a "false sense of urgency" about their need for spectrum to deliver a "Gigabit connectivity target", particularly so soon after the ACMA's decision to make 500MHz of the lower 6GHz band available to RLANs.[3] Based on the public interest to be served, arrangements for WA WBB services will optimise the use of the upper 6GHz band to a greater extent than RLAN services. However, Optus considers that there is no immediate need to implement arrangements to give effect to this.

There is no urgency to progress the upper 6GHz band to the implementation stage

6. The ACMA's preferred view on the future arrangements for ESL spectrum will shape the future of the Australian mobile sector and the broader WA WBB industry. As such, it is a critical input to the ACMA's spectrum planning decisions affecting WA WBB services including any arrangements for future use of the upper 6GHz band.

7. We note that the ACMA has stated that the proposed Q3 2024 timeframe to determine whether to progress the band to implementation is dependent on "several factors" and Optus would add the ACMA's preferred view (Stage 4) on ESL spectrum to this list.[4] Optus recommend that the ACMA issue its preferred view on ESL spectrum prior to deciding on the future use of the upper 6GHz band.

8. The fact that technologies identified as supportive of co-existence with RLANs, such as Automated Frequency Coordination (AFC), remain unproven also lends weight to a considered and measured approach to implementation. To proceed without further evidence of the effectiveness of new interference management technologies risks

[1] The entire 700MHz was identified for IMT in Region 1 while 7025-7125MHz was identified for IMT in Region 3
[2] Options Paper, p.1
[3] Radio local area networks (RLANs) in the 6 GHz band - consultation 37/2021 | ACMA
[4] Options Paper, p.8

harmful interference to incumbent services, particularly if unregistered higher power RLAN devices begin to proliferate in the market. This will undermine co-existence objectives and the ACMA's desired planning outcomes.

9. Optus submits that, the risks to spectrum utility of seeking to accommodate too wide a range of use cases are clearly demonstrated by the ACMA's approach to 3.4-4.0GHz band, which has resulted in inefficient fragmentation of important mid-band mobile spectrum. This sub-optimal outcome lends greater weight to the need to ensure future arrangements enable the deployment of WA WBB services in the upper 6GHz band.

10. Optus strongly caution against rushing to implement arrangements that may lock in sub-optimal outcomes for this spectrum over the long term. Optus sets out its response to the ACMA's Issues for Comment below. Optus also refers the ACMA to the Australian Mobile Telecommunications Association (AMTA) submission with which we agree on all matters, other than to the extent that the AMTA submission may differ from our view concerning timing of the ACMA's decision on whether to progress the band to the implementation stage.

MOBILE SERVICES ARE THE OPTIMAL USE OF THE UPPER 6GHZ

11. Mobile networks and services have and will continue to deliver unrivalled public benefit with their wide area coverage and large customer bases enabling economies of scale and cost-effective national deployment.

12. The public benefits of mobile services to Australia are well documented and undeniable. Australian mobile networks are national critical infrastructure used to supply essential mobile services across the country, enabling access to emergency, education, banking, health, social, commercial and government services.[5] Mobile networks and services are critical to Australia's digital future and the realisation of key Government policy objectives for an inclusive, secure and prosperous Australia.[6]

13. Mobile services are predicted to increase Australia's wealth by $37 billion each year by 2030.[7] Increased digitisation offers potential improvements across health, manufacturing, transport, logistics and broader societal benefits. Mobile networks and services have and will continue to deliver unrivalled public benefit with their wide area coverage and large customer bases enabling economies of scale and cost-effective national deployment.

14. In order to do so, MNOs require access to sufficient mid-band spectrum to meet growing traffic demands and deliver sufficient bandwidth to support future use cases at a competitive price. Optus submit that introducing arrangements that enable WA WBB access to all of the upper 6GHz band will "…optimise the use of the upper 6GHz band" while continuing to enable co-existence with existing adjacent band services.[8] Optus provides further detail on key factors in support of this view below.

Future mobile networks support an array of uses with very high capacity, reliable services

15. The development from 4G (LTE) to 5G (IMT-2020) saw an expansion of requirements to cover a wide range of use cases and applications. While 4G can be thought of as a best

[5] Albanese Government to improve safeguards for telco consumers experiencing financial hardship | Ministers for the Department of Infrastructure

[6] See further Optus' submission to ACMA Stage 2 ESL consultation paper

[7] Deloitte 5G Unleashed; 2022

[8] Options Paper, p.6

effort mobile data service for smartphones, 5G addresses a wider range of use cases via new capabilities such as low-latency and ultra reliability. In the future, public mobile networks will evolve to become platforms for all use cases, solving local area problems.

16. A mature 5G network will facilitate enhanced mobility, coverage and performance, delivering increased uplink throughput to boost peak rates for new services (like XR). Standalone 5G networks will better cater to bespoke use cases via network slices, with specified levels of reliability, capacity and security. Future 6G networks will embed these capabilities further, incorporating the benefits of AI/ML into network management.

17. To date, WA WBB networks have been predominantly deployed via macro sites to provide coverage for both outdoor as well as indoor areas. Indoor usage increasingly generates the majority (70-80%) of mobile traffic,[9] and indoor mobile connectivity is an important point of service differentiation.[10] MNOs now invest considerable capital into in-building coverage (IBC) solutions via distributed antenna systems (DAS) and indoor small cells to extend coverage deeper indoors. Beyond mobile services, by 2025 half of all service providers offering Fixed Wireless Access (FWA) will offer the service over 5G, further supporting the need for arrangements to enable WA WBB use of upper 6GHz.[11]

More spectrum is needed to meet continuing growth in mobile data traffic

18. Global mobile data traffic has more than doubled on average every second year over the last decade, due to the ever-increasing demand for online digital services. Annual mobile data traffic growth rate is expected to continue and the share of mobile data traffic over 5G services is forecasted to increase from 25% in 2023 to almost 76% in 2029.[12] MNOs will need more spectrum to meet continuing growth in mobile traffic demand, particularly with accelerating uptake of 5G services and the future use cases contemplated by 5G-Advanced and then 6G (IMT-2030) services.

19. To meet these increasing traffic demands, the GSMA recommend an average of 2 GHz of additional mid-band spectrum to deliver 5G services at a performance consistent with the ITU's IMT-2020 (5G) requirements.[13] Coleago estimates Australian MNOs may require access to up to an additional 827 MHz mid-band spectrum to deliver 5G user experience in an economically and technically feasible manner.[14] Additional mid-band spectrum is therefore crucial to MNOs being able meet future data traffic growth. The GSMA recommends the upper 6 GHz be made available for 5G by 2030.[15]

International developments indicate growing recognition of the need for more IMT spectrum

20. International developments, including technical trials, recent ITU deliberations and the development of technical standards through bodies such as 3GPP indicate increasing recognition of the need to identify further mid-band spectrum for IMT. For example:

    (a) At WRC-23, members noted that harmonized worldwide frequency bands for IMT are desirable to achieve global roaming and the benefits of economies of scale in device ecosystems, encouraging the "ITU Radiocommunications

[9] GSMA | Optus boosts indoor 5G coverage - Networkshttps://www.gsma.com/solutions-and-impact/technologies/networks/latest-news/optus-boosts-indoor-5g-coverage/
[10] 5G value: Turning performance into loyalty - Ericsson, 2023, p.6
[11] Ericsson Mobility Report November 2023, p.20
[12] Ibid, p.12
[13] Estimating the mid-band spectrum needs in the 2025-2030 timeframe, GSMA and Coleago Consulting, 2021, p.1
[14] Ibid, p.2
[15] GSMA, 2022, The Socio-Economic Benefits of Mid-Band 5G Services, p.10

Sector" to develop harmonized frequency arrangements to facilitate IMT deployment within the 6425 – 7125 MHz band.[16]

(b) Standards bodies including 3GPP are contemplating ever increasing enhancements and functionalities from future mobile networks. Releases 17 and 18 promise new network architectures that enable interoperability and possible connectivity with all standard mobile devices – facilitating seamless connectivity between terrestrial and non-terrestrial networks.[17]

(c) While some countries have recently allocated the full 1200 MHz of 6 GHz band to RLANs, there has been criticism of this approach as a "missed opportunity" for 5G, particularly in the US.[18] More generally, GSMA research shows that there is no scenario where the allocation of the full 6 GHz band to unlicensed use generates the greatest public benefit.[19]

(d) Since last year there have been numerous successful trials in Europe and the MENA region (Middle East and North Africa) for 5G-Advanced utilising the upper 6 GHz band. These trials demonstrate the feasibility of existing network infrastructure utilising the wider channel bandwidths of up to 400 MHz in the upper 6 GHz band to achieve unprecedented performance with speeds exceeding 10 Gbps.

Cost effective and environmental 5G deployment requires access to the right spectrum

21. MNO's provide WA WBB services across a variety of outdoor and indoor contexts, from dense urban city centres to sub-urban, regional and rural areas. The propagation characteristics of "low", "mid" and "high" spectrum bands each hold unique value in different deployment contexts.

22. In general, mid-band spectrum, such as the 6GHz band, provides the best balance between coverage and capacity, as it is able to sufficiently penetrate buildings for indoor coverage, while allowing for larger channel bandwidths and effective higher order MIMO performance to cater for capacity requirements. This is highlighted in this diagram from Coleago Consulting:[20]

[16] Resolution 220 "Terrestrial component of International Mobile Telecommunications (IMT) within the frequency band 6 425-7 125 MHz"; World Radiocommunication Conference 2023 (WRC-23) Provisional Final Acts, ITU Publications, P.464 World Radiocommunication Conference 2023 (WRC-23) – Final Acts (itu.int)

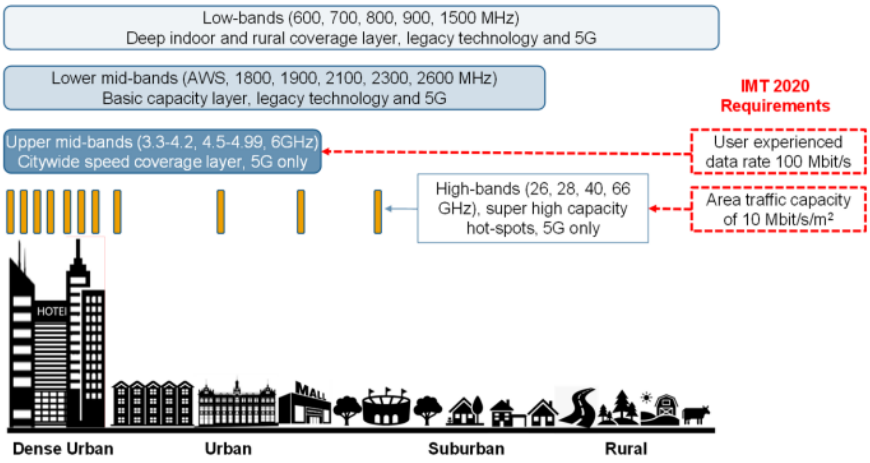
[17] 3rd Generation Partnership Project (3GPP) Release 17 (3gpp.org) and Release 18 (3gpp.org)

[18] Advancing U.S. Wireless Excellence: The Case for Global Spectrum Harmonization, CTIA, 2024, P.2 https://www.ctia.org/news/advancing-u-s-wireless-excellence-the-case-for-global-spectrum-harmonization

[19] 6 GHz in the 5G Era Global Insights on 5925-7125 MHz , GSMA, 2022, P.11 https://www.gsma.com/connectivity-for-good/spectrum/wp-content/uploads/2022/07/6-GHz-in-the-5G-Era.pdf

[20] Coleago; The 6GHz opportunity for IMT – 5G area traffic demand vs area traffic capacity supply; 2020 p.11

Exhibit 6: Mix of spectrum for 5G



23. The availability of large contiguous blocks in the upper 6GHz is important to realising the potential efficiency benefits of 5G use cases by enabling higher capacity and in turn greater service quality, reliability and network performance – ultimately, the wider the band in which services are deployed, the higher the spectral efficiency.[21]

24. In the absence of sufficient spectrum, network densification becomes the only alternative to meet traffic demand. However, densification comes with additional cost and in many cases, may not be practical due to interference and site acquisition challenges. The carbon footprint of future 5G mobile networks will also be lower if additional mid-band spectrum is made available to MNOs, by avoiding the need for site densification.[22]

25. By contrast, access to upper 6 GHz for RLANs would not translate into any reduction in the overall carbon emissions of Wi-Fi, given the fixed broadband connectivity targets of aggregated throughput exceeding 1 Gbps per premises can be met using spectrum already available for Wi-Fi use (2.4 GHz, 5 GHz and lower 6 GHz).

Coordination and cooperation underpin effective co-existence

26. It is well understood that coordination and cooperation between IMT and incumbent (satellite) services will be important to ensuring workable coexistence should the upper 6GHz band be allocated to WA WBB. To this end, Optus notes that existing spectrum management practices and technical frameworks provide tried and tested mechanisms for managing interference and delivering coexistence.

27. The fact that WA WBB use of the upper 6GHz band will be via apparatus or preferably spectrum licensing means that licensees will be obliged to comply with device registration requirements. The transparency this affords, coupled with the clarity as to dispute resolution provided by relevant technical frameworks, means that WA WBB services can and do coexist with other services in a clear and predictable manner.

28. We acknowledge that there are over 12,000 fixed point-to-point (Fixed PTP) links registered on the RRL, corresponding to ~3,000 bi-directional apparatus licensed fixed links in the upper 6 GHz band. We note that the most common deployment scenario for WA WBB use of the upper 6GHz band is expected to be providing capacity in the urban metro population centres.

[21] among the 20 plus countries that were examined, where the 5G Leader's category mainly comprised of Middle East region countries

[22] Impact of additional mid-band spectrum on the carbon footprint of 5G mobile networks: the case of the upper 6GHz band, Analysys Mason, June 2023, P.45

29. We submit that the public interest to be served by enabling WA WBB use of the upper 6GHz band militates strongly in favour of relocating the few Fixed PTP services in urban areas to other frequency bands. For areas outside the urban centres, usage can be expected to be less extensive, allowing for the two services to co-exist in many areas through site-specific coordination and geographic separation.

30. That said, we consider that the requirements identified by sharing studies under WRC-23 Agenda Item 1.2 for separation distances of up to 68 km and 10 km for the interference scenarios of main lobe and side lobe respectively, would be feasible via site-by-site coordination. Furthermore, we also note that almost 40% of the existing FS links in the band belong to the three MNO's (and another 38% with NBN) having interests directly aligned with IMT usage of the band.

31. Regarding radiodetermination systems, we agree with ACMA's comments that the potential for interference from WA WBB could be managed through geographic exclusion utilizing the available technical framework.

RLAN USE OF UPPER 6 GHZ IS SUB-OPTIMAL AND NOT URGENT

32. Optus welcomes the ACMA's emphasis on the need for proponents to substantiate their claims for access to the spectrum, including evidence of demand for services that may be supplied via the spectrum, to the extent available.

33. In Optus' view, there is a lack of substantial evidence supporting the claim that spectrum is or will in the near term become a constraint on RLAN/Wi-Fi's needs. In summary, Optus submit that the following considerations raise serious doubts about RLAN proponents claims for additional spectrum:

    (a) While there are billions of Wi-Fi devices in use, it is important to note that Wi-Fi only provides the "last hop" of connectivity from the available fixed broadband access. Therefore, as a threshold point, it is questionable to what extent spectrum is a bottleneck for Wi-Fi end user experience.

    (b) The claims are based on either an increase in the number of Wi-Fi devices, or the growth in fixed broadband data traffic as a reflection of future demand, neither of which provides a reliable basis for assessing Wi-Fi's future spectrum needs,

    (c) The claims do not reflect a considered view on the impact of the ACMA's recent decision to allocate 500MHz to RLAN in the lower 6GHz band, and in particular, whether the 500MHz is in fact insufficient to meet current and forecast demand over the near term of the ACMA's FYSO 2024-29.

34. For these and other reasons, Optus considers there remains very limited justification to make arrangements to enable RLAN use of any of the upper 6 GHz band, and certainly not any time soon. Indeed, we consider that RLAN proponents are creating a "false sense of urgency" about the imminent need for access to the upper 6GHz band, which if implemented, creates a real risk of sub-optimal outcomes for the spectrum over the long term. In the circumstances, Optus considers that the use of the upper 6GHz band will not be optimised by making arrangements for RLAN use of the band, certainly at the expense of future WA WBB services. Optus provides further explanation for this view below and refers the ACMA to the AMTA submission for detailed technical information in support of our and the wider mobile industry position.

RLAN proponents have created a "false sense of urgency" about spectrum demand

35. The RLAN sector's claims of a spectrum shortfall for Wi-Fi are often based on the proposed requirements of a "Gigabit connectivity" target for fixed broadband services, such as those outlined in the EU's Digital Decade Policy Programme 2030.[23] Optus is sceptical whether such a target actually reflects realistic usage trends. For instance, in Australia, 50Mbps remains the most popular NBN speed plan by a wide margin.[24]

36. Optus submits that the capacity bottleneck for gigabit connectivity is fixed broadband networks, and the maximum foreseeable requirement for Wi-Fi till 2030 is sufficiently addressed even without the lower 6 GHz band as demonstrated by validation tests.[25] Even if it is assumed that genuine spectrum need exists to meet current or future capacity requirements for unlicensed RLANs, it is crucial to consider whether access to 2.4 GHz, 5 GHz and the 500 MHz of the lower 6 GHz band can meet that need.

37. In this context, we note that Wi-Fi relies on channel re-use for implementing a cellular deployment with its access points (AP) and for keeping up its capacity performance. A report prepared by Plum Consulting for the Wi-Fi Alliance concludes that a minimum of ten (10) 160 MHz channels is required for "Gigabit connectivity".[26] Optus suggests that this figure was arrived at not because there is insufficient spectrum to deliver gigabit throughput, but rather to cater for reuse. In other words, RLANs spectrum "demand" is better explained as a result of inefficient spectrum use, rather than a lack of spectrum.

38. Optus also note a recent Coleago whitepaper, which describes a "Wi-Fi onload" phenomenon, where a mobile user stays connected to their mobile data network even when a free (public or enterprise) Wi-Fi access is available, either for convenience, customer experience and/or due to general usage restrictions of enterprise Wi-Fi (eg security/access etc). Coleago notes this trend even for home users, and in markets with developed wired-broadband infrastructures such as Finland, where many households are going mobile-only.[27] The effect of any Wi-Fi onload trend is to put demand pressure on IMT spectrum, while lessening the spectrum requirement for RLANs.

RLANs do not offer the wide area benefits or the reliability, quality and security of IMT

39. A typical RLAN deployment generally serves few tens of users in a relatively homogeneous scenario such as an enterprise, home or public hot spot. By contrast, WA WBB services a wide area with each base station connecting hundreds or thousands of indoor and outdoor users, with a variety of different demands for throughput, reliability, mobility, security and quality of service.

40. Optus submit that the superior performance capabilities of mobile (IMT) technology weigh heavily in favour of making arrangements for future use of the upper 6GHz band by WA WBB services. Optus considers that mobile technology is superior to Wi-Fi on numerous metrics, including:

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[23] White Paper - How to master Europe's digital infrastructure needs? European Commission, 2024, p.5

[24] ACCC Internet Activity Report, December 2023, p.8 https://www.accc.gov.au/by-industry/telecommunications-and-internet/telecommunications-industry-record-keeping-and-reporting-rules/internet-activity-record-keeping-rule/june-2023-report/documents

[25] See "Validate 802.11ax wireless throughput and validation testing", Cisco, 2024 https://www.cisco.com/c/en/us/support/docs/wireless-mobility/wireless-lan-wlan/212892-802-11ac-wireless-throughput-testing-and.html and "How fast is Wi-Fi 6? Here are our latest speed test results", CNET, 2020 https://www.cnet.com/home/internet/how-fast-is-wi-fi-6/

[26] Wi-Fi Spectrum Requirements, Plum Consulting, 2024, P.16 https://www.wi-fi.org/wi-fi-download/46968

[27] The 6 GHz opportunity for IMT, Coleago Consulting, 2020 https://www.slideshare.net/slideshow/the-6-ghz-opportunity-for-imt/237549027#47

(a) Coverage – mobile networks offer extensive coverage across a wide area in many different contexts while Wi-Fi is limited to the range of a router or access point, usually within a building.

(b) Mobility – mobile networks are far superior for users in transit, providing seamless handover between cells, while Wi-Fi offers limited mobility, with transition between access points often requiring re-authentication.

(c) Reliability – mobile networks typically offer higher reliability and performance, particularly in densely populated areas where Wi-Fi may be affected by interference from overlapping networks and services.

(d) Quality of service (QoS) – mobile technology provides advanced QoS mechanisms to prioritise traffic types, ensuring critical applications can receive the necessary bandwidth. Wi-Fi QoS capabilities are less robust and implementation is inconsistent.

(e) Security – Mobile technology offers stronger security protocols such as SIM-based authentication and encryption, while Wi-Fi security depends on the configuration of the network and is inherently more vulnerable to attack if not consistently updated.

(f) Spectrum management – Mobile networks are more efficient users of spectrum as mobile services are typically supplied under (spectrum or apparatus) licensed spectrum, which is managed to minimise interference risk and optimise performance. Furthermore, MNO access to spectrum requires significant upfront capital investment that must be justified by a viable business case, promoting efficient spectrum use.

(g) Capacity and scalability – Mobile networks are better equipped to support a high number of simultaneous connections over wide areas, while Wi-Fi performance can degrade with a higher number of connected devices.

(h) Advanced network features – While Wi-Fi 6/6E is evolving, it cannot match the enhanced capabilities of mobile networks support of network slicing, massive MIMO and edge computing among other features.

Proliferation of class Licensed RLANs present a potentially unmanageable interference risk

41. The feasibility of Wi-Fi coexistence with incumbent services is often taken for granted, largely on the basis that RLAN services will be authorised under a class licence arrangement (e.g LIPD Class Licence) and therefore supplied on a “no interference, no protection” basis. However, there are demonstrated interference risks from RLAN.[28]

42. As noted in the Options Paper, class licence arrangements risk device proliferation, thereby increasing the potential interference risk over the long term.[29] This risk is compounded by the lack of any device registration requirement for class licensed services, meaning that identifying the source of interference and resolving any disputes in a timely or lasting manner will be challenging for any incumbent operators.

[28] CEPT ECC Report 302 on sharing studies related to RLANs in the 6 GHz band; CEPT ECC Report 302 https://docdb.cept.org/document/10170

[29] Options Paper, p.14

43. This may prove particularly problematic in the event that support for RLAN services in the upper 6GHz band may lead to undetectable, though unintended, proliferation of standard power outdoor RLANs, thereby increasing the interference risk exponentially.

THE ACMA'S PREFERRED VIEW ON ESLS SHOULD INFORM DECISION-MAKING ON THE FUTURE USE OF THE UPPER 6GHZ

44. Optus does not consider that the ACMA needs to make a decision in Q3 2024, or in the rushed timeframes proposed by the RLAN sector, to progress any of the upper 6GHz band to the implementation stage. We note that the ACMA has also stated that the proposed Q3 2024 timeframe is dependent on several factors.[30] Optus suggest that the ACMA's "preferred view" on the future use of all ESL spectrum (Stage 4 – currently scheduled for mid-2025) should be added to this list.

45. As noted in Optus' submission to the ACMA's recent consultation on its draft Five Year Spectrum Outlook (FYSO) 2024-29, we consider that the ACMA's ESL process is the spectrum management priority for 2024-29. The ACMA's decisions on future use of ESL spectrum will have a profound impact on the shape of Australia's mobile sector over the long term. The ACMA should only reach a decision on future use of the upper 6GHz band once sufficient certainty about this significant aspect of the future spectrum landscape is sufficiently clear and transparent to all stakeholders, including the ACMA.

46. There are clear interdependencies between the ESL process and plans for the allocation of non-ESL spectrum. For example, a price for spectrum that supports industry sustainability will better enable MNOs to participate in any future price-based allocation of the upper 6GHz band. This in turn will better promote the long-term public interest to be derived from use of this spectrum.

47. Accordingly, Optus recommend the ACMA issue its "preferred views" for all ESL spectrum (currently scheduled for mid-2025) before deciding to implement its preferred approach to the upper 6GHz band. Optus notes that such an approach is also consistent with the ACMA's ESL process to the extent that the ACMA has invited stakeholders to highlight interactions between ESL and non-ESL spectrum.[31]

RESPONSES TO ACMA ISSUES FOR COMMENT

Overview of planning options

Issue for comment 1 – What are your views on the 4 broad planning options identified for the upper 6GHz band?

48. Optus support **Option 3**, that is, "the introduction of arrangements to enable WA WBB access to…*all* of the upper 6 GHz band, using apparatus and/or spectrum licensing, with no arrangements introduced for RLANs". This view is based on the arguments presented earlier in this submission, including the crucial requirement of this mid-band spectrum for 5G growth and evolution, the unmatched public interest served with its socio-economic benefits, and efficient utilization of the spectrum.

[30] Options Paper, p.8

[31] ACMA Stage 2 Consultation Paper, p.10; and Optus' submission to Stage 2 consultation, p.15

49. That said, Optus reiterates its view that the ACMA does not need to rush to implement its preferred arrangements for this band. Optus urges the ACMA to prioritise the issuance of its preferred view on ESL spectrum prior to progressing the upper 6GHz band to implementation. Based on the ACMA's current timeline for the ESL process, this approach would mean that the ACMA might issue its upper 6GHz outcomes paper, or potentially undertake further targeted consultation, in mid-2025. Such an approach will assist all stakeholders, including the ACMA, to holistically appraise the upper 6GHz spectrum, thereby promoting the long-term public interest to be derived from the use of the band, particularly when compared to any rushed process to make arrangements in response to RLAN's questionable claims of an urgent need for more 6GHz spectrum.

50. Optus submit that the importance for Australia of harmonising with global approaches lends further merit to continuing to take a measured and considered approach to planning for future use of the upper 6GHz band. To this end, Optus considers **Option 1 "***to maintain existing arrangements, with potential reconsideration at a later date*, also warrants consideration in the short term.

51. For reasons outlined above, Optus do not support **Option 2** and consider that any **Option 4** style sharing arrangements raise an unacceptably high risk of interference and ultimately sub-optimal use of important mid-band spectrum by both technologies.

Discussion of hybrid options

Issue for comment 2(a) – If we decide to divide the band into different RLAN and WA WBB segments, should the WA WBB segment be a multiple of 100MHz?

Issue for comment 2(b) – If we decide to divide the band into different RLAN and WA WBB segments, should the WA WBB segment align with the 160/320 MHz wifi-channel raster?

Issue for comment 3 – Of the segmentation options based on wi-fi channels (options 1–3 in this paper), what is the preferred option and why?

52. Based on our current understanding of the (lack of) spectrum shortfall facing RLAN services, we do not support the segmentation of the upper 6 GHz band to accommodate RLAN, nor any of the "frequency segmentation schemes" outlined in the Options Paper.

53. We acknowledge there are considerable efforts ongoing for identifying some mechanisms to share the upper 6 GHz band between WA WBB and RLAN. However, we reiterate that any shared usage with RLAN for the upper 6 GHz band must not put any form of restriction on WA WBB, but rather prioritize harmonization of the band for IMT. This view is based on several reasons, including:

    (a) The greater service performance and ultimately public benefit delivered over spectrum by WA WBB services compared to RLAN services;

    (b) The continuous improvements in spectral efficiency delivered by mobile services through regular refarming to latest generations of mobile technology and deploying latest hardware and antennas;

    (c) Supplying access to sufficient mid-band spectrum is critical to ensure MNOs can respond effectively to 5G usage demands, and smoothly pave the way to 5G-Advanced and 6G deployment;

    (d) Any restrictions such as limited transmit power will reduce the value and usability of the band for IMT;

(e) WA WBB uses licensed spectrum for which MNO's need to develop a clear business case, thereby imposing discipline on the amount of spectrum acquired. This fact means that WA WBB use cases are inherently more efficient than class licensed RLAN.

54. We agree that frequency segmentation may address the use of the 7100 – 7125 MHz range by television outside broadcast (TOB). However, our preferred approach would be to relocate existing licensees in this range to other frequencies to align with the general definition of the upper 6 GHz band considered by ITU and various other administrations.

Issue for comment 4 – Is it appropriate to limit our consideration of hybrid options for accommodating multiple services to frequency segmentation only? For example, should geographic segmentation or less traditional sharing models be considered when determining models for enabling access to the upper 6 GHz band by both WA WBB and RLAN services?

55. Optus endorses the ACMA's preliminary views on both issues and urges considerable caution in adopting untested and unverified "non-traditional" approach to sharing. We note that in our view, in combination with advances in technology, the objectives of non-traditional sharing regimes can be readily accommodated by way of other approaches to sharing (i.e., sharing agreements such as our MOCN services agreement with TPG).

56. We reiterate that any form of shared usage between WA WBB and RLAN for the upper 6 GHz band, must not in a way de-prioritize the harmonization of the band for IMT usage, or put any form of restrictions on WA WBB to accommodate RLAN. Frequency segmentation, while being the least complex with more predictable effects on the outcome, still presumes that the spectrum requirements for unlicensed RLAN to meet their traffic demands are not sufficiently addressed by available spectrum.

57. For all other hybrid sharing options, we acknowledge ACMA's consideration and agree to rule them out due to their complexity, unproven feasibility and high risks. Geographic segmentation, as observed by ACMA, has very limited scope as the requirement of both WA WBB and RLAN coincide on the capacity needs of dense urban population centres. Regarding the other less traditional models, the studies so far clearly demonstrate that such sharing might not be possible without some constraints on WA WBB. We agree with ACMA's view that hybrid sharing arrangements should not introduce high level of uncertainty as to spectrum access as that will negatively impact WA WBB deployment.

58. Traditionally, spectrum sharing frameworks for accommodating different services rely on utilizing some sort of existing fault lines such as non-overlapping usage providing certain level of isolation, which is implementable through power limits, favourable propagation characteristics or geographic separation. WA WBB and RLAN, however, contest for the same dense urban area, both having an overlapping target of indoor usage, and WA WBB has stringent transmit power requirements.

59. Any prospect of successful sharing is further complicated from interference management perspective given that RLAN is typically class licensed. We note that geographic segmentation will only work where all services are either spectrum or apparatus licensed as adherence to segmentation relies on licence boundaries being in place and the use of devices being transparent on a public register.

60. Until there is conclusive evidence for the net benefit gains, a wider consensus ensuring global standardization, and a proven usability of such ambitious sharing mechanisms, an allocation policy that makes a frequency band as valuable as the upper 6 GHz the testbed for such experimentation will risk jeopardizing the immense potential public benefit expected from this band.