TELSTRA CORPORATION LIMITED

Response to ACCC Consultation Paper

Allocation limits advice for the 26 GHz spectrum allocation

27 March 2020

NON-CONFIDENTIAL VERSION

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Executive Summary

Telstra welcomes the opportunity to respond to the ACCC's consultation on its allocation limits advice for the 26 GHz spectrum allocation (**consultation**). For Australia to remain at the 5G forefront, it is critical that our spectrum policy framework supports strong competition and investment in the supply of world class 5G networks and services, and the consultation seeks views on a range of matters relevant to these objectives.

The 26 GHz and 28 GHz bands are two of the spectrum bands at the forefront of the delivery of 5G services globally. Although other higher range millimetre wave (**mmWave**) bands may become available in the future, the 26 GHz spectrum licences will be important for early 5G mmWave mobile services in Australia, while the 26 GHz and 28 GHz apparatus licences are expected to enable licensees to support a range of non-mobile and localised use cases. The allocation of the licenced spectrum will therefore play a key role in maximising the prospects of pro-competitive outcomes enabling Australian consumers and businesses to enjoy the rich potential of 5G over the relevant licence terms.

In view of the policy objectives and applying the criteria set out in the consultation, we believe the ACCC should recommend the Minister set an allocation limit for the 26 GHz spectrum licensed band of at least 1 GHz (applicable in all defined areas). This approach will:

- **Promote competition, investment and innovation:**
    - There is industry consensus (e.g. from the GSA, GSMA) that the opportunity for operators to utilise at least 1 GHz of contiguous mmWave spectrum will best support the peak speeds and full range of use cases maximising the utility of this band as envisaged in the ITU's "IMT-2020" 5G vision.
    - An allocation limit of at least 1 GHz will promote the long-term interests of end-users and Australia's global competitiveness by facilitating competitive differentiation between operators which makes the optimal use of the available technology. Innovation and investment in differentiated markets is harmed when customers and suppliers cannot move up or down the "quality scale" and make quality and value trade-offs. This dynamic also leads to competition between suppliers to differentiate from one another, which is evident in the Australian mobile market. However, this innovation, investment, and competition is constrained where there is no MNO that can meet the demand for the very fastest and highest quality 5G services, with all MNOs limited to only offering lower quality. In the short term, giving operators the option to acquire at least 1 GHz of 26 GHz spectrum licensed spectrum is important to allow this differentiation and enable early 5G services in Australia to reach their full potential.
    - This approach will also maximise the potential for future product innovation over the 15-year duration of the licences, by providing important operator flexibility.
- **Support technology deployment:** Because mmWave technology is in a nascent stage, the investment risks and uncertainties are substantial. Largely, these new technologies are unproven under mass rollout conditions and although there is much promise, it is unclear which applications will ultimately drive commercial take-up. A low (sub 1 GHz) allocation limit which restricts operator optionality during the auction could therefore constrain or disincentivise future 5G deployment, investment and development. A higher (at least 1 GHz) limit reduces this risk. At the same time, in the longer term other mmWave bands may become available, expanding the range of potential 5G deployment options open to operators.
- **Maximise allocative efficiency:** A limit of at least 1 GHz will maximise allocative efficiency, by increasing the likelihood of competitive tension during the auction and price discovery. A lower limit risks aggregate demand being equal to or lower than supply, increasing the risk of allocative inefficiency due to unsold lots and/or spectrum underutilisation as a result of allocation to bidders who don't value it as highly.

- **Mitigate the potential risk of monopolisation:** Telstra is not aware of any evidence that any MNO is failing to deploy technology over their spectrum holdings in an efficient and competitive manner, nor are there any indications that MNOs are or may seek to hoard spectrum for anti-competitive purposes. Nevertheless, an allocation limit of 1 GHz (41.7% of the 2.4 GHz of spectrum available) would provide an appropriate protection against the ACCC's expressed concern regarding the risk of a single operator acquiring the majority of the spectrum. It would also be in line with limits designed to address such risks in comparable international auctions.

We also consider the allocation limit should only apply to holdings of spectrum licensed 26 GHz spectrum. Holdings of apparatus licensed 26 GHz or 28 GHz spectrum should not be considered. This approach will:

- **Promote competition and efficient use of spectrum:** The apparatus licenses are not a direct substitute for the 26 GHz spectrum licenses, due to the apparatus licence conditions, which limit use to fixed wireless and satellite only (no mobility) in the 28 GHz band[1] and restrict the number of base stations in the 26 GHz band[2]. While the apparatus licences are expected to enable licensees to support a range of non-mobile use cases, these restrictions mean that there is fundamentally different utility between these bands for traditional wide area mobile use, hence they serve different markets. A combined limit would therefore risk causing a distortive and constraining impact on competition in the downstream mobile market (especially if it caused carriers to have to use valuable 26 GHz mobile spectrum for non-mobile or localised use cases).

There are no other competition issues regarding the allocation of the apparatus licenses that need to be addressed through ex ante restrictions associated with the 26 GHz spectrum licence auction:

- Ex ante allocation limits should only be considered where there is a clear risk of harm to competition in a relevant downstream market (i.e. an SLC). That is not the case here:
    - Following its consultation process considering expected demand and available supply, the ACMA anticipates that an administrative process for allocation of the apparatus licences will be appropriate (rather than an auction). Prima facie, this suggests that excess demand is not anticipated to be a major concern.
    - By their nature, apparatus licences are designed to meet localised and targeted use cases, which do not raise the same potential competition concerns as allocations of spectrum licences across wide areas. Indeed, even for the new proposed "area wide licences" (**AWLs**), the ACMA is contemplating allocating the apparatus licences in areas as small as 500mx500m.
    - There are also alternative spectrum bands that can be considered for the types of technologies and applications for which the apparatus licences may be used.
- Any competition concerns which may arise from the administrative allocation of these apparatus licences can still be addressed through the use of the ACCC's ex-post competition powers under s 50 of the *Competition and Consumer Act* (**CCA**) as read with s 106A of the *Radiocommunications Act* (**RA**).
- Further, the ACMA has the necessary powers under the RA, having regard to the objects of the RA, to prevent the risk of a 'land-grab' scenario with apparatus licensing. The ACMA has exercised its administrative discretion to appropriately manage this risk using a 'prioritisation' approach in the past (as in the case of apparatus licences for remote areas in the 1800 MHz band, and for regional areas with 2100 MHz apparatus licences) and could adopt a similar approach in the case of the 26 and 28 GHz bands.

[1] In the range 27.5 to 28.1 GHz.
[2] In the range 24.7 to 25.1 GHz.

1. Introduction

The 26 GHz band is important for enabling the next phase of very high speed fifth generation (5G) mobile services for Australian consumers and businesses and is underpinning the delivery of mmWave 5G wireless broadband services globally. To date, Australia has been a world leader in delivering mobile network technology with some of the most advanced and fastest 4G networks in the world, and Telstra is excited to be supporting Australia to remain at the forefront of 5G leadership.

This submission addresses the key considerations we believe should be reflected in the ACCC's advice to the Minister on this important issue, and proceeds as follows:

- Section 2 sets out the technical context for the ACCC's competition assessment;
- Section 3 sets out the market context for the ACCC's competition assessment;
- Section 4 applies the criteria the ACCC intends to use in making its assessment; and
- Section 5 sets out some other relevant considerations to the ACCC's assessment.

2. Technical context for ACCC's competition assessment

The 26 GHz and 28 GHz bands are high-band spectrum (above 6 GHz), and are both identified internationally for 5G use:

- The 26 GHz spectrum band is one of the global pioneer bands for 5G, chosen as such in Europe as well as here in Australia, and with Africa, the Middle East, Asia, member countries of the Regional Cooperation Council and parts of the Americas also planning to use this spectrum for 5G.[3] Recently, the 26 GHz band was identified for IMT at WRC-19, and it forms part of 3GPP's n258 5G spectrum band (frequency range 24.25-27.5 GHz).[4]
- The 28 GHz band, while not identified for IMT through the WRC-19 process, forms part of 3GPP's n257 5G spectrum band (frequency range 26.5-29.5 GHz)[5] and will be used for mmWave 5G in the US, South Korea, Japan, India and Canada under an existing mobile allocation outside of the WRC-19 process.[6]

Below, we briefly discuss some of the key characteristics of these bands in terms of technical features, deployment requirements and current expected applications. We then explain the key differences between the spectrum and apparatus licences the ACMA proposes to allocate in these bands.

2.1. Technical features: speed, capacity, latency and propagation

mmWave spectrum is attractive for its potential to deliver very high speeds, high capacity, and low latency. To put these benefits in context, Figure 1 below illustrates the key technical differences between 4G and 5G in terms of latency, data traffic, peak data rates, spectrum and connection density.

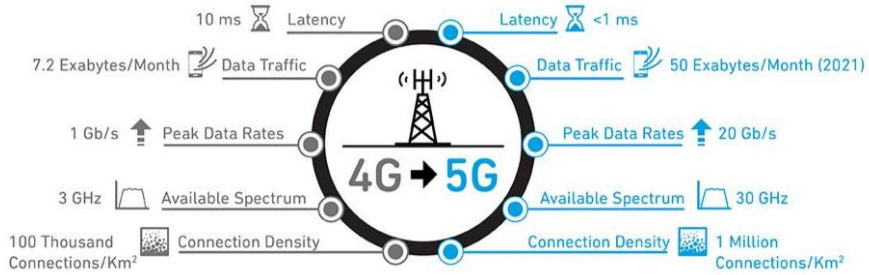

Figure 1: Key technical differences between 4G and 5G technologies[7]

Early 5G rollout in Australia uses mid-band 5G spectrum. Using this spectrum (3.6 GHz spectrum), in 5G enabled areas Telstra is currently able to provide 5G device users the potential to enjoy typical download speeds of between 10 Mbps and 1 Gbps (around twice as fast as typical 4G download speeds of 5 – 500 Mbps). However, the promise of 5G to reach theoretical peak speeds of around 10Gbps and higher requires the use of high band, mmWave spectrum.

mmWave spectrum offers the required quantity of bandwidth needed to reach these top 5G peak speeds. However, because mmWave technology currently has lower spectral efficiency than mid and low band 5G spectrum[8], it only provides these benefits if large amounts of contiguous bandwidth are used. The

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[3] https://www.gsma.com/spectrum/wp-content/uploads/2018/12/AI-1.13-Positions.pdf

[4] See 3GPP Technical Specification FR2 (mmWave) - 3GPP TS 38.101-2 V16.0.0 (2019-06), Table 5.2-1.

[5] Ibid.

[6] https://www.gsma.com/spectrum/wp-content/uploads/2018/12/AI-1.13-Positions.pdf

[7] Qorvo, Getting to 5G: Comparing 4G and 5G System Requirements - https://www.qorvo.com/design-hub/blog/getting-to-5g-comparing-4g-and-5g-system-requirements

[8] This is due to a range of technical issues, some of which may eventually be solved as the technology matures.

propagation characteristics of mmWave spectrum include small coverage footprints, and high signal losses due to obstacles such as walls, buildings, trees and terrain when compared to the lower frequency bands used for mobile networks. Due to these propagation characteristics, the relevant 5G technical standards specify the use of very large spectrum blocks (currently ranging from 50 MHz to 400 MHz wide)[9] in order to maximise its utility for delivery of 5G services and counteract the lower spectral efficiency of this band. Allocations of smaller and/or non-contiguous blocks of mmWave spectrum further reduce spectral efficiency (e.g. by creating overhead).[10] In Europe, CEPT has recommended a 200 MHz default block size for 26 GHz allocations.[11] However, in the Australian 26 GHz auction, the ACMA is proposing to auction the spectrum licences in 24 lots of 100 MHz.[12]

In order to support optimal peak and average user-experienced throughput and the full range of 5G NR capabilities,[13] it is widely acknowledged that, where possible, operators should have the option to access at least 1 GHz of mmWave spectrum. Statements in support of this position include those from the GSA, GSMA, AMTA, Ericsson and Nokia, with the technical requirements also recognised by the EC[14]:

> *"Spectrum for 5G should ideally be made available in contiguous blocks of 80-100 MHz from the mid bands and 1 GHz of spectrum from the high mmWave bands to ensure the most effective delivery of 5G services"* (GSA) [15]
>
> *"Regulators that get as close as possible to assigning 100 MHz per operator in 5G mid-bands and 1 GHz in millimetre wave bands will best support the very fastest 5G services."* (GSMA)[16]
>
> "*AMTA estimates that each mobile operator will need 100 MHz of mid band and 1 GHz of mmWave spectrum for initial phase of 5G deployments to reach their full potential and deliver on what it is designed to do. Further phases of deployment will require access to more spectrum in additional bands*" (AMTA)[17]
>
> "*In order to facilitate full scale 5G service provision, each 5G network will require contiguous mmWave bandwidths of up to around 1 GHz per network*". (Ericsson) [18]

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[9] See e.g. ACMA, *Wireless broadband in the 26 GHz band Options Paper*, September 2018, p 27 noting that the 3GPP technical standards for 5G New Radio (NR) beyond Release 15 are speculated to include larger bandwidth profiles, e.g. 800 MHz.

[10] See e.g. comments by Ericsson in response to Ofcom's 26 GHz consultation at https://www.ofcom.org.uk/__data/assets/pdf_file/0028/106795/Ericsson.pdf (response to Question 4.7)

[11] European Conference of Telecommunications and Postal Administrations (CEPT) Electronic Communications Committee (ECC) *Report 68 to the European Commission on Harmonised technical conditions for the 24.25-27.5 GHz ('26 GHz') frequency band*, July 2018, Annex 2.

[12] ACMA, *Draft spectrum reallocation recommendation for the 26 GHz band in cities and regional centres - Consultation Paper*, May 2019, p 28: https://www.acma.gov.au/consultations/2019-08/draft-spectrum-reallocation-recommendation-26-ghz-band-consultation-142019

[13] For a recent technical illustration, see GSA, Response to ACMA consultation on "Replanning of the 28 GHz band – Options paper": https://www.acma.gov.au/consultations/2019-08/planning-options-28-ghz-band-consultation-092019#submissions, pp 1-2.

[14] For example, a European Commission report prepared in 2019 by IDATE and Plum Consulting mentions a use case involving mm-wave bands called "outdoor hotspots and smart offices with AR/VR and media applications" finding that in this use case, spectrum at around 30 and 70 GHz would be used and the estimated need in terms of bandwidth would be up to 1 GHz.

[15] Global Mobile Suppliers Association (GSA), *Millimetre Wave Spectrum for 5G*, October 2019: https://gsacom.com/technology/5g/

[16] *5G Spectrum GSMA Public Policy Position*, July 2019: https://www.gsma.com › uploads › 2019/09 › 5G-Spectrum-Positions

[17] AMTA, *Submission to the ACMA - IFC 9/2019 Replanning of the 28 GHz Band – Options Paper (April 2019)*, 21 May 2019, p 2: https://www.acma.gov.au/consultations/2019-08/planning-options-28-ghz-band-consultation-092019#submissions

[18] Ericsson Australia, Submission to ACMA – Replanning of the 28GHz Band – Options Paper May 2019: https://www.acma.gov.au/consultations/2019-08/planning-options-28-ghz-band-consultation-092019#submissions, p 6.

> "*Large amounts of bandwidth are required in order to reach the low latency and high data rates of up to 20 Gbits/s envisaged in the 5G vision…1000 MHz bandwidth would be required to achieve the Peak data rate requirement*…" (Nokia)[19]

Recently, additional spectrum for mobile telecommunications (IMT) was identified at World Radiocommunication Conference 2019 (WRC-19). In addition to mmWave spectrum in the 26 GHz band (24.25 - 27.5 GHz), spectrum in the bands 37 - 43.5 GHz; 45.5 - 47 GHz; 47.2 - 48.2 GHz; and 66 - 71 GHz was also identified.[20] These newly designated frequencies are expected to be the focus of significant product and technology development in the coming years and the ACMA has stated it will continue to monitor these bands for possible replanning for 5G wireless broadband services. In particular, the ACMA has stated it will consider whether replanning for possible 5G in the 37–43.5 GHz band is appropriate – noting that spectrum in this band is of significant interest internationally such as in the US, where there are established arrangements supporting both terrestrial 5G and satellite broadband services.[21] It is expected that in due course the mmWave bands identified at WRC-19 will move through the Australian planning and allocation process. While the 26 GHz spectrum licences will be important for early 5G mmWave mobile services, over the longer term it is likely that operators will have further opportunities to acquire other mmWave spectrum to develop their value propositions in line with their own commercial strategies.

2.2. Deployment requirements

Because of the different technical properties of mmWave spectrum compared to mid and low band 5G spectrum, a 5G mobile service deployed over mmWave spectrum bands requires a different technology rollout to standard mobile networks. In high density population areas, we agree with the ACCC's observations in the consultation paper that this is likely to consist of a concentrated deployment of small cells.

Due to its technical differences, mmWave spectrum is generally expected to act as a complement to mid and low band 5G spectrum, and to be used for specific use cases or capacity requirements, rather than as a general substitute for other mobile spectrum bands. Deployment is also likely to be capital intensive. As stated recently by an industry commentator in the US where both Verizon and AT&T have announced plans for widescale mmWave 5G deployments:

> "*a widespread mmWave 5G network would require hundreds of thousands of new cell sites, each one plugged into a super-fast backhaul connection and topped with thousands of dollars of new transmission equipment*."[22]

In addition to the requirement for new small cell sites, the requirement for backhaul to support the ultra-fast speeds and low latencies mmWave spectrum can deliver in the access network is an important deployment consideration. Data-intensive enhanced mobile broadband services and other mmWave based applications will all drive demand for higher data speeds and larger mobile data volumes. To support this traffic in an affordable way, 5G networks will need to be able to deliver data at a much lower cost per bit compared to the networks of today. In this respect, the capabilities of mmWave spectrum for in-band wireless self-backhauling (Integrated Access and Backhaul or IAB) may prove to be important in reducing operator deployment costs and providing deployment flexibility to meet traffic demand. Although the technology is still at an infant stage creating uncertainties about the real capabilities and cost savings,

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[19] Nokia, Nokia Response to Wireless Broadband in the 26GHz band Option Paper, 2018, p 5: https://www.acma.gov.au/consultations/2019-08/options-wireless-broadband-26-ghz-band-consultation-322018#submissions

[20] https://www.itu.int/en/mediacentre/Pages/2019-PR24.aspx

[21] ACMA, FYSO 2019-23, p. 16. It may also be noted that in the US, FCC auction 103 for the 37-39 GHz band spectrum settled at roughly the same price as the 28 GHz auction (auction 101) and the 24 GHz auction (102). Together with the fact that AT&T and Verizon acquired substantial holdings in these auctions, the prices paid for 37 – 39 GHz spectrum in the US suggest it is seen as having significant potential as a viable band for 5G deployment.

[22] https://www.lightreading.com/mobile/5g/heres-why-it-might-be-time-to-worry-about-mmwave-5g/a/d-id/756706

IAB using mmWave spectrum may deliver these benefits by enabling faster and simpler small cell deployment without the cost and complexity of building wired backhaul (such as fibre).

Ultimately, operator investment incentives will be driven by the commercial opportunities presented by the available mmWave spectrum, which we now discuss.

2.3. Applications

Broadly, there are three commonly identified 'types' of 5G use cases — enhanced mobile broadband (eMBB), critical communications (sometimes referred to as ultra-low latency communications or ULLC), and massive machine type communications (mMTC). Figure 2 provides a high-level depiction of these types, highlighting the key technical requirements for each.

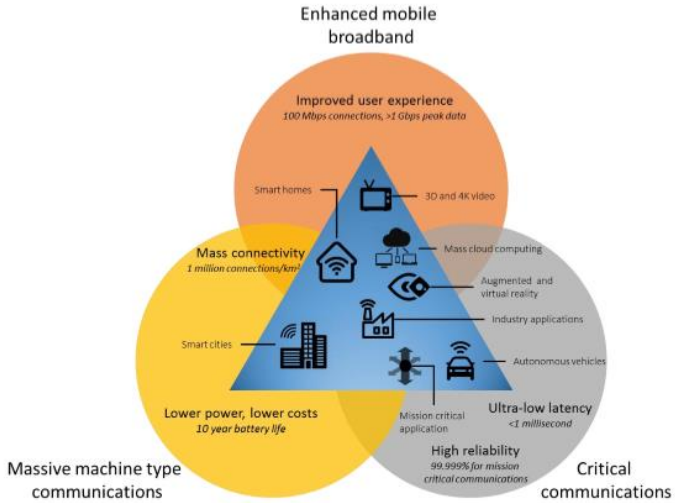

Figure 2: Primary types of 5G use cases and links to 5G technical attributes[23]

As shown, eMBB will be particularly reliant on 5G's peak data rates. For example, virtual reality video (which is proving to be a key early point of differentiation for 5G consumer services in South Korea[24]) requires a peak throughput of at least 1 Gbps, [25] and a virtual reality feed running in 4K definition supporting interactive inputs would require ~2.5Gbps of throughput[26]. Critical communications, on the other hand, will be reliant on reliability and ultra-low latency and mMTC will be reliant on 5G's mass connectivity attribute.[27]

Drawing on its technical attributes as described above, early mmWave deployments are expected to support applications including[28]:

– ultra-high definition video and gaming, virtual and augmented reality;

[23] 5G—Enabling the future economy, Australian Government 2017 (p.5).

[24] *Ericsson Mobility Report,* November 2019: https://www.ericsson.com/en/mobility-report, pp 6; 20.

[25] Huawei, *Huawei response to the Ofcom call for input: "5G spectrum access at 26 GHz and update on bands above 30 GHz":* https://www.ofcom.org.uk/__data/assets/pdf_file/0032/106799/Huawei.pdf, p 7

[26] VR is on the Edge: How to deliver 360^0 Videos in Mobile Networks", 2017.

[27] See also examples in Huawei's 5G applications and readiness matrix - available at: https://www.huawei.com/en/industry-insights/outlook/mobile-broadband/xlabs/insights-whitepapers/5g-applications-market-potential-readiness-matrix

[28] See, e.g. GSA, Millimetre Wave Spectrum for 5G, October 2019, pp 4-8.

- deployments in high traffic areas and high capacity arenas (e.g. sports stadiums and transport hubs)[29];
- indoor deployments complementing WiFi services on new device types such as tablets and always connected laptops;
- eMBB and URLLC usage scenarios for indoor hotspots in enterprises and factories (e.g. retail visual analytics, automated operational processes, data intensive applications such as video surveillance);
- FWA in suburban and rural scenarios; and
- capacity to support more widespread adoption of generous data plans.

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While the commercial opportunities represented by these applications, services and devices offer much promise, it is nevertheless important to recognise that the commercial deployment of mmWave spectrum for 5G services is still at a very nascent stage globally. In this dynamic and risky investment environment, it is vital operator investment incentives and deployment approaches are not inhibited by an overly restrictive regulatory approach, and that operators have the opportunity to acquire sufficient mmWave spectrum to support a wide range of commercial opportunities which fully explore 5G's potential benefits.

2.4. Spectrum and Apparatus licences offer different utility

Technical arrangements for apparatus licensing in the 26 GHz and 28 GHz bands are currently underway and we have contributed to that process through the relevant ACMA Technical Liaison Group (TLG). This work is expected to be finalised during April 2020. It is expected apparatus licences will be available for allocation by the end of 2020, with the 26 GHz spectrum auction scheduled for early 2021.

While this timing means that the apparatus and spectrum licences in the 26 GHz and 28 GHz bands will all become available at roughly the same time, there are a number of important features distinguishing the 26 GHz spectrum licences from the apparatus licences in the 26 and 28 GHz bands. These in consequence mean there is fundamentally different utility between the spectrum and apparatus licences for traditional wide area mobile use.

The 26 GHz spectrum licences will be auctioned in respect of 29 defined metropolitan and regional areas collectively covering approximately 80 percent of Australia's population (towns/cities with a population over 50,000 plus smaller town/cities expected to require deployment of high-density wireless broadband services due to being holiday locations or having university campuses)[30]. These 15-year spectrum licences will permit wide area mobile and fixed wireless services, with the ACMA expecting mobile broadband to provide its highest value use, driven by demand from the MNOs for deployment of mobile broadband networks.[31]

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[29] A recent example was the February 2020 Superbowl in the US – see https://www.speedtest.net/insights/blog/football-stadium-speed-2020/

[30] ACMA, *Future use of the 26 GHz band: Planning decisions and preliminary views*, April 2019, p 5.

[31] ACMA, *Consultation Paper: Draft spectrum reallocation recommendation for the 26 GHz band in cities and regional centres*, May 2019, p. 26: https://www.acma.gov.au/consultations/2019-08/draft-spectrum-reallocation-recommendation-26-ghz-band-

The 26 GHz and 28 GHz apparatus licences, by contrast, are anticipated to be issued by the ACMA according to an administrative process, for a licence term of up to five years. Importantly, in cities and major metropolitan areas, the 28 GHz apparatus licences[32] will limit use to fixed wireless and satellite only (no mobility) and the 26 GHz apparatus licences[33] will restrict the number of base stations that can be deployed. Consequently, the ACMA expects demand for this spectrum to come primarily from those seeking to provide a range of "type 2" smaller market/local subscriber-based networks and "type 3" uncoordinated ad hoc deployment,[34] with the ACMA listing as international precedent the use of the 28 GHz band in the US for 5G wireless broadband as deployed by WISPs, miners and other FWA operators.[35]

The differences between the spectrum and apparatus licences to be issued by the ACMA in the present case distinguish the situation from that which applied in respect of the 3.6 GHz auction, where NBN Co's existing holdings of apparatus licensed 3.4 GHz band spectrum were taken into account in the allocation limits (as well as spectrum licences held by NBN Co, Optus and Telstra in the 3.4 GHz band). In that case, NBN Co's PMTS Class B 3.4 GHz apparatus licenses were a close substitute for 3.6 GHz spectrum licences because they were effectively wide area licences providing exclusive spectrum access that could be used to deploy similar services to spectrum licenses, and there were no use case restrictions in either band, unlike those in 26/28 GHz[36].

Lastly, there are also important differences between the geographic scope of the 26 GHz spectrum licences and the apparatus licences in the 26 GHz and 28 GHz bands. Broadly speaking:

- apparatus licences authorise operations at identified geographic locations on specified frequencies; and
- spectrum licences are used to authorise large bandwidths of frequency across large geographic areas.

While we acknowledge the newly created AWL licence type provides additional flexibility and scalability within the apparatus licensing system, in the context of 26 GHz and 28 GHz bands, the ACMA has indicated that the AWL licence type will be conducive to small scale area-wide deployment and suitable for the Type 2 and 3 uses identified in the 26 GHz decision paper[37]. That is, typically AWLs will be smaller in geographic scope than spectrum licences[38].

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consultation-142019. See also the overview provided by the ACMA in *Future use of the 26 GHz band: Planning decisions and preliminary views*, April 2019.

[32] Those in the range 27.5 to 28.1 GHz.

[33] Those in the range 24.7 to 25.1 GHz.

[34] ACMA, Future use of the 26 GHz band: Planning decisions and preliminary views, April 2019, p16: https://www.acma.gov.au/consultations/2019-08/options-wireless-broadband-26-ghz-band-consultation-322018#consultation-documents

[35] ACMA, FYSO 2019-23, p. 57.

[36] Only NBN Co was able to access the ranges 3400-3425 MHz and 3492.5-3542.5 MHz, due to the conditions imposed by the Minister's determination in the *Australian Communications and Media Authority (3.5 GHz frequency band) Direction* 2014.

[37] ACMA, Area-wide licensing summary and response to submissions, p.8

[38] The ACMA is contemplating allocating the apparatus licences in areas as small as 500mx500m - see ACMA "Development of the 26/28GHz band apparatus licence technical framework - Technical Liaison Group Consultation Paper", November 2019

3. Market context for the ACCC's competition assessment

As the consultation identifies, there is likely to be a wide variety of business cases, deployment models, spectrum demand scenarios and service types supported by the 26 and 28 GHz spectrum and apparatus licences, especially considering the developments which may occur over the full 15 year term of the spectrum licences. Such heterogeneity, as well as the dynamic and still nascent state of global 5G development and deployment overall, makes it inherently difficult to isolate precise relevant downstream markets.

A purposive approach to market definition is appropriate in this context. Adopting this approach, the downstream national retail mobile services market is the most obvious and important market in which the allocation of the 26 GHz spectrum licences is likely to impact on the ACCC's assessment criteria[39].

Below, we offer some brief comments in response to the ACCC's observations and questions on this market, as well as in response to those on the other downstream markets the ACCC has identified.

3.1. Market for retail mobile services

We support the ACCC's proposed identification of the national retail mobile services market as a relevant downstream market. Previously in its mobile roaming inquiry and its advice to the Minister on the 3.6 GHz auction,[40] the ACCC came to the correct conclusion that there is a national retail market for mobile services. Telstra does not consider that there is any reason to depart from that market definition for the purposes of the present advice.

We also agree with the ACCC's observations in the consultation that this is a market for similar but differentiated services, and that MNOs compete over several factors including the extent, quality and depth of their network coverage, retail support and price and service inclusions. As 5G is not a set technology standard, different operators will likely make different decisions about the version of the service they offer — indeed, service differentiation is a well-recognised attribute of competitive markets. Australia's mobile market is competitive and open, with competition between the three major MNOs delivering strong benefits to consumers. These benefits include increased value in mobile plans and falling prices, high levels of ongoing investment[41] and ever improving coverage. While not every MNO will choose to supply every geographic area, use every spectrum band or target all different cohorts of customers, all MNOs have the same strategic options and choose their own areas of focus to best compete against one another.

While some ability for operators to differentiate through their spectrum holdings can promote competition by encouraging service and price differentiation in the market and promoting innovation, we agree with the ACCC that an operator's spectrum portfolio can be a significant determinant of its ability to compete effectively: impacting on network capacity and quality of service, as well as the geographic areas in which an operator can offer services. In the present case there is a level playing field between the MNOs in respect of high-band spectrum, with no operator benefitting from any existing holdings of mmWave spectrum. Furthermore, in respect of existing 3.4 and 3.6 GHz band spectrum holdings, the recent Federal Court decision on the VHA-TPG merger found that the combined holdings of the merger parties,

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[39] That is, the criteria set out in section 3.1 of the consultation, based on which the ACCC intends to conduct its competition assessment.

[40] https://www.accc.gov.au/system/files/ACCC%20advice%20to%20Minister%20Fifield%20on%203.6%20GHz%20allocation%20limits.pdf, p 2

[41] See e.g. the findings in ACCC, *Communications Market Report 2019-19*, December 2019 at pp 2; 5-7; 12; 31-41: https://www.accc.gov.au/publications/accc-telecommunications-report/accc-communications-market-report-2018-19 and the ACCC's comments on the ACMA's "Wireless broadband in the 26 GHz band – Options Paper", p 2: https://www.acma.gov.au/consultations/2019-08/options-wireless-broadband-26-ghz-band-consultation-322018#submissions

"*would be more comparable to the 5G spectrum holdings of Telstra and Optus … and enable MergeCo to better compete with Telstra and Optus on 5G services*."[42]

The decision on allocation limits may nevertheless have an important impact on competition in the Australian mobile market. In particular, as we explain further in Section 4, because the quality and range of service offerings over their 5G networks is one of the dimensions in which Australian MNOs are investing to differentiate themselves from each other, any 26 GHz spectrum licence allocation limit less than 1 GHz will potentially act as a regulatory constraint on the manner in which all MNOs can compete, by precluding the opportunity for any one of them to offer 5G services that make full use of the technical potential of mmWave spectrum in the near term. As identified in the ACCC's consultation, consumers could suffer the consequences of any uncompetitive or less competitive market, including poor service quality and lack of choice. Conversely, with an allocation limit of at least 1 GHz, every MNO will have the opportunity to buy that amount and make full use of the potential 5G offers. While not every MNO would be able to acquire 1 GHz, those that cannot have many opportunities to differentiate themselves in other ways to win customers.

3.2. Market for fixed services

In the present consultation, the ACCC has identified the fixed broadband market as a relevant downstream market. By contrast, in its advice to the Minister on the setting of allocation limits for the 3.6 GHz spectrum licences, the ACCC identified the relevant downstream market for fixed wireless services more narrowly, as a fixed wireless market.[43] Importantly, whichever way the downstream market for fixed wireless services is defined in the ACCC's advice, the allocation of the 26 GHz spectrum licences is likely to have a lesser impact on competition in this market than it is in the downstream mobile market, due to the wider availability of apparatus-licensed mmWave spectrum for non-mobile use.

In terms of its geographic dimension, the relevant downstream market for fixed services using the 26 GHz spectrum licences should be regarded as a national market. Commonly for any form of capital-intensive delivery of fixed services, operators may focus their investment and offerings on particular geographic areas. However, the ubiquity of NBN Co's national network and its uniform national pricing obligations favour a national market definition. In addition, the inclusion of regional population centres as defined areas and the potential for the geographic focus of bidders to differ according to a range of different market strategy and deployment plans may also make the attempt to estimate demand according to sub-national geographic boundaries (such as metropolitan vs regional areas) less reliable.

3.3. Market for enterprise services

The delivery of 5G services over mmWave spectrum is likely to lead to an increased number of use cases to meet the needs of enterprise and government customers. However, there is no fundamental difference in the relevant downstream markets from previous generations of mobile services, or from 5G services using mid-band spectrum. As such, any new 5G technologies should not be regarded as constituting a separate market, which is what the ACCC concluded in respect of its consideration of allocation limits for the 3.6 GHz band.[44] Relatedly, while we agree that an important use of the 26 GHz and 28 GHz spectrum is likely to be for the provision of connectivity to industry sectors covering use cases such as industrial automation, we have reservations about the identification of a separate, stand-alone, enterprise market, as proposed in the consultation.

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[42] *Vodafone Hutchison Australia Pty Limited v Australian Competition and Consumer Commission* [2020] FCA 117, at para 800.
[43] https://www.accc.gov.au/system/files/ACCC%20advice%20to%20Minister%20Fifield%20on%203.6%20GHz%20allocation%20limits.pdf, p 2
[44] Ibid.

To the extent that the ACCC does identify a separate downstream enterprise market, we consider there are three key features of this market pertinent to the ACCC's competition assessment: 1) its heterogeneity; 2) its nascent state; and 3) typically low barriers to entry.

On the first two factors we are aligned with the observations in the consultation that this market is likely to be one comprising enormous diversity, which is in a nascent and evolving state.

On the third factor, we agree that the combination of the first two factors makes it difficult to assess the state of competition. However, there is, so far as we are aware, no evidence of significant barriers to entry or actions of an operator to foreclose another from entering the market. To the contrary:

- While the use of mmWave spectrum is likely to be beneficial in supporting many enterprise use-cases, there are also alternative spectrum bands that can be considered for these types of technologies and applications.
- Just as in the case of the infant IoT sector, the relevant technologies for servicing the broadband connectivity needs of enterprise customers will continue to develop and compete - with each technology likely to have its own strengths and weaknesses and targeting different sectors and uses.[45]
- As found by the ACCC in respect of the IoT market, while spectrum availability will be an important enabler of competition and innovation in the supply of services to enterprise customers, there is unlikely to be a one sized solution in terms of spectrum for the various technologies and applications.[46] Indeed, the introduction of AWLs intended by the ACMA to provide licensees with 'building blocks' to support a wide range of spectrum uses, network types and service and technology uses will expand the range of options even further.[47]

[45] https://www.accc.gov.au/publications/communications-sector-market-study-final-report, p89
[46] Ibid.
[47] Area-wide licensing – ACMA approach to introducing area-wide licences
https://www.acma.gov.au/publications/2020-02/guide/area-wide-licensing-acma-approach-introducing-area-wide-licences

4. Application of the criteria identified by the ACCC

The ACCC intends to conduct its competition assessment based on the three criteria set out in section 3.1 of the consultation. These may broadly be categorised as 1) promotion of competition in downstream markets; 2) supporting deployment of 5G technologies and 3) promoting the economically efficient allocation and use of spectrum.

In applying these criteria, it is useful to apply a 'with' and 'without' test. The 'without' scenario should encompass a situation where the Minister does not apply any allocation limit in the 26 GHz auction. In the 'with' scenario, the ACCC should consider an allocation limit that is set to constrain the total amount of 26 GHz spectrum licences that an entity can hold, to deploy and sell wireless broadband services. The exact quantum and structure of this limit also needs to be considered, but this can be determined in the context of assessing whether the setting of an allocation limit would be consistent with the criteria. It is also useful to consider the 'with' and 'without' (allocation limits) scenarios in both the short term (when the 26 GHz and 28 GHz bands will be the only available mmWave bands in Australia) and long term (when more mmWave spectrum may become available).

Adopting this framework, in the rest of section 4, we consider whether the setting of an allocation limit on the 26 GHz spectrum licences is likely to further the policy objectives reflected in the ACCC's three assessment criteria, and if so what level of allocation limit is best likely to promote these.

In summary, we find:

- An auction allocation limit of at least 1 GHz of 26 GHz spectrum will promote competition and encourage investment in infrastructure and innovation in the long-term interests of end-users. It will do this by:
    - Allowing the market to pursue business cases to deploy the highest quality, highest capacity 5G services in Australia. A cap below 1 GHz would preclude the possibility that an operator can make the optimal use of the available technology, and this in turn may constrain competitive differentiation and future product innovation.
    - Reducing the risk of regulation restricting future 5G deployment, investment and development optionality – which is high, given the nascent stage of technology development in mmWave bands. A uniform limit of at least 1GHz in all defined areas is also likely to best incentivise investment in deployment of infrastructure in regional Australia.
    - Maximising allocative efficiency, by increasing the likelihood of competitive tension during the auction and ensuring price discovery. A lower limit (e.g. 800 MHz; 600 MHz) risks aggregate demand being equal to or lower than supply, increasing the risk of unsold lots and/or spectrum underutilisation as a result of allocation to bidders who don't value it as highly.
    - Providing an appropriate protection against the risk of monopolisation (41.7% of the available 26 GHz spectrum licenced spectrum), which is in line with international limits imposed for this purpose.[48]
- The allocation limit should only apply to holdings of spectrum licensed 26 GHz spectrum. Holdings of apparatus licensed 26 GHz or 28 GHz spectrum should not be considered. Given the fundamentally different utility between these bands for traditional wide area mobile use, a combined allocation limit would risk causing a distortive and constraining impact on competition in the downstream mobile market to the detriment of the long-term interests of end-users (especially if it caused carriers to have to use valuable 26 GHz mobile spectrum for non-mobile or localised use cases).

[48] Further details on relevant international approaches are provided in Section 5 and Appendix A.

4.1. Promotion of competition in downstream markets (for the long-term interests of end-users and to encourage investment in infrastructure and innovation)

Below we address the factors to be considered in seeking to set an allocation limit on the 26 GHz spectrum licences which, in turn, promotes the long-term interests of end-users in product choice and lower prices; and encourages investment in infrastructure and innovation.

4.1.1. Promoting competition which drives consumer product choice

5G draws together a diverse range of bandwidth blocks of various radio spectrum bands, each with different characteristics. There are a variety of spectral paths to 5G deployment, and it is not essential to use mmWave spectrum as an element of an MNO's competitive 5G offering.[49] However, the auction of 2.4 GHz of internationally harmonised pioneer band 26 GHz spectrum will provide Australian MNOs an important opportunity to provide the fastest, lowest latency and highest capacity 5G mobile services the technology can currently support. To the extent that MNOs seek to use this spectrum as part of their competitive differentiation strategy, any limits set on the allocation of this spectrum will thus have an important impact on the competitiveness of the 5G segment of the broader mobile market.

In this context, an allocation limit which allows operators to have the potential to bid for at least 1 GHz of 26 GHz spectrum in each defined area is likely to promote competition, enhancing customer choice between a full range of 5G services. A lower limit, by contrast, would constrain the potential 5G service offers of one or more competitors, and potentially result in no bidder being able to achieve a differentiated spectrum position.

Global industry survey evidence indicates consumers are willing to pay more for the performance improvements 5G will bring, but that they also expect a range of new services to be available.[50] The plans of early operators deploying mmWave based retail mobile services internationally reflect this. SK Telecom, for example, is investing in the provision of innovative new premium 5G services such as interactive VR, designed to make it obvious that these services bring new experiences compared to 4G.[51] Similarly, Verizon in the US is looking to implement the 5G standard's highest performance elements in order to provide a differentiated and better experience for its customers.[52]

Australian consumers are entitled to expect more from their 5G services than what they can get from 4G services today, and it is in their best interests to set an allocation limit which will provide Australian MNOs with the opportunity and incentives to invest and compete in providing choices that meet these expectations. As general propositions, MNOs need more spectrum to provide better services to customers, and they need more spectrum the more customers they have. Access to more spectrum also opens a greater range of commercial opportunities. As explained in Section 2, unique to mmWave spectrum is the additional requirement for access to at least 1 GHz of contiguous bandwidth in order to support optimal peak and average user-experienced throughput and the full range of 5G NR capabilities.

Looking at alternative potential allocation limits, the setting of a sub-1 GHz allocation limit could theoretically result in more firms competing using smaller amounts of mmWave spectrum. However, the competitive restraint exerted by a fringe of smaller, spectrum constrained, operators is unlikely to be as

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[49] By way of a recent international example, in Hong Kong one of the four MNOs, Hutchison 3, declined to apply for the administrative allocation of any 26/28 GHz mmWave spectrum, explaining that it considered there was sufficient spectrum available for 5G services in the lower bands, while the high range frequencies were also not suitable for providing indoor coverage – see TeleGeography, "Hutchison 3 abstains from HK 26GHz and 28GHz assignment", *Comms Update*, 25 Feb 2019: https://www.commsupdate.com/articles/2019/02/25/hutchison-3-abstains-from-hk-26ghz-and-28ghz-assignment/ and TeleGeography, "Hong Kong raises USD85m from 3.3 GHz licensing", *Comms Update*, 6 Nov 2019: https://www.commsupdate.com/articles/2019/11/06/hong-kong-raises-usd85m-from-3-3ghz-licensing/

[50] *Ericsson Mobility Report,* November 2019: https://www.ericsson.com/en/mobility-report p28 (citing results from a May 2019 Ericsson ConsumerLab survey on 5G consumer potential)

[51] *Ericsson Mobility Report,* November 2019: https://www.ericsson.com/en/mobility-report, p20.

[52] VentureBeat, "Verizon Interview: Our true 5G network will offer a better experience than rivals", 8 January 2019, https://venturebeat.com/2019/01/08/verizon-interview-our-true-5g-network-will-offer-a-better-experience-than-rivals/

effective as one or more rivals engaging in differentiation via “full strength” 5G competition based on access to at least 1 GHz of 26 GHz spectrum:

- Competition in differentiated markets is harmed when customers cannot make quality and value trade-offs between suppliers. On the supply side, providers must be permitted to move up or down the "quality scale" to compete against each other’s service propositions. This competitive dynamic is constrained where there is no MNO that can meet the demand for the very fastest and highest quality 5G services, with all MNOs limited to only offering lower quality.

- At the same time, the competition at the premium end of the mobile market made possible by giving operators the option to acquire at least 1 GHz of 26 GHz spectrum may also improve pricing and value in the lower quality segment. This is because the increased value that the premium service offers for the higher price will factor into the price and value trade-off made by consumers of the lower quality service.

- In contrast, under the scenario of a lower (sub 1 GHz) allocation limit, consumers of premium services are disadvantaged (as there is no MNO able to fully meet their needs) and so are consumers of lower quality services (the value of which would not be constrained by the possibility of substitution to premium services).

4.1.2. Encouraging investment in infrastructure, including in regional Australia

Allocation limits should be set to encourage the major investment required by network operators to make full use of the capabilities of mmWave spectrum, for the long-term benefit of consumers and the broader Australian economy. Ultimately, network operator incentives to invest in infrastructure will be impacted by the commercial opportunities presented by the available spectrum. Given the dynamic and evolving nature of 5G use cases, it is crucial that operators are not precluded the opportunity to pursue innovative use case development. It must also be recognised that ultra-high data rates require significant amounts of bandwidth, and the basic economics of network deployment mean that capacity is linked to bandwidths with costs otherwise relatively fixed.

For these reasons, along with the technical and market context explained in Sections 2 and 3, we believe that network operator investment incentives and opportunities will be maximised by setting a 26 GHz spectrum licence allocation limit of at least 1 GHz, combined with equitable operator access to the apparatus licences available in the 26 and 28 GHz bands. This balanced approach will ensure that MNOs and other operators have the opportunity and flexibility to acquire the spectrum they will need over the full term of the relevant licences to deploy a range of top quality wide-area 5G mobile broadband services, meet the expected growth in backhaul and network traffic demand requirements[53], and efficiently support emerging non-mobile and/or localised use cases.

Allocation limits should also be set with a view to enabling deployments of at least 1 GHz in regional areas to best promote investment and competition, and to reduce the risk of a 5G metropolitan/regional divide:

- While there are a range of different use cases, the capacity benefits of mmWave spectrum are typically regarded to be at their most valuable in densely populated environments. Some major regional towns generate as much traffic and load on a per-site basis as in metropolitan areas, but others are less populated. As subscriber density per cell decreases, average through-put can be achieved with smaller amounts of bandwidth.

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[53] 5G’s faster speeds and superior performance are driving much higher consumption rates than previously generations of mobile technology. For example, in September 2019, the average monthly data consumption of SK Telecom’s 5G subscribers was almost three times higher than that of its 4G subscribers (26.6GB/month versus 9.5GB/month) - *Ericsson Mobility Report,* November 2019, p 22.

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- A uniform auction allocation limit of at least 1 GHz in all defined areas will help ensure that all 26 GHz spectrum is sold and put to use for the benefit of regional customers, many of whom depend on remotely provided services[54]. Such a limit will help ensure that the spectrum is ultimately allocated to its highest value and economically efficient use, and that the highest quality 5G services can be provided nationally. Even if only one or two MNOs choose to buy 26 GHz spectrum in some defined areas in regional locations, competition for regional customers will be promoted. As discussed in the ACCC's mobile roaming inquiry, the outcomes associated with strong competition in metropolitan areas are passed on to regional customers because of national averaged pricing and the dynamics of national competition.[55] Further, investment incentives in regional areas would still exist as MNOs with regional spectrum would seek to expand the value of their regional coverage to metropolitan customers.

- An allocation limit of at least 1 GHz will ensure no one bidder can acquire the majority of the spectrum, thus preserving the ability for locally based wireless broadband providers to bid for spectrum licences, in addition for the option for all parties to have access to the apparatus licences according to the ACMA's administrative allocation processes, which we describe in section 5 below.

4.2. Supporting deployment of 5G technologies (having regard to future opportunities to acquire 5G spectrum and technical requirements for deploying 5G services)

While over the long term it is likely that operators will have further opportunities to acquire mmWave spectrum, the decision on allocation limits for the 26 GHz spectrum licences will have an important bearing on the ability and incentives for Australian MNOs to deploy early 5G mmWave services.

For the reasons explained in Section 2, operator deployment incentives will be maximised if operators have the opportunity to supply 5G services reaching their full potential according to current technical standards, using at least 1 GHz of contiguous 26 GHz spectrum licensed spectrum. Efficient deployment support for non-mobile and localised use cases will also require operators to have equitable access to the 26 GHz and 28 GHz apparatus licences.

Operator optionality in the auction to determine how much and which spectrum bands to use will also be important in setting the right deployment incentives, given the current nascent stage of mmWave based technology. Without this flexibility, the potential for technological innovation and innovative uses of the band could be constrained or undermined. Quite simply, as Ericsson states: "*The greater the allocations the more flexible the spectrum will be to meet multiple use cases."*[56]

In this regard, a non-rigid approach is needed not only due to evolving end-use cases, but also due to the nascent state of potential access models (e.g. supporting in-building access for enterprise customers). These currently involve many potential models and connectivity solutions and will in future also need to factor in complex considerations such as the ability for MNOs to guarantee end-to-end QoS to support network slicing.

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[54] Access to 5G's full capacity may be of substantial benefit to some of these remotely provided services - see e.g. https://www.gsma.com/spectrum/wp-content/uploads/2019/10/mmWave-5G-benefits.pdf, p 7, where the GSMA cites several use cases for mmWave 5G including increased access to education and healthcare which it advises "*generally require a large amount of data throughput in a small coverage area or face scarcity of spectrum in lower frequency bands*". See also further details at pp 44-45; 48-49.

[55] ACCC, *Domestic mobile roaming declaration inquiry: Final report*, October 2017, page 51.

[56] Ericsson response to Ofcom Question 4.4 at: https://www.ofcom.org.uk/__data/assets/pdf_file/0028/106795/Ericsson.pdf

By contrast, if more rigid allocation limits lower than 1GHz are set, there is a risk that these limits could substantially lessen competition by acting as a regulatory constraint capping the speed and capacity benefits any potential bidder would be able to offer its end-customers at a level below the technical potential of the 26 GHz band, and chilling the potential for future innovation.

As the FCC has observed in deciding not to adopt any bright-line pre auction allocation limits in respect of the recent US mmWave spectrum auctions, an overly restrictive approach risks constraining providers in their paths towards 5G deployment (given the myriad of potential use cases that may require varying amounts of bandwidth for providers to offer consumers innovative services), limiting operator incentives to invest in new services, and consequently delaying the realisation of related economic benefits.[57] In this respect, we echo Verizon's submissions to the FCC that:

> *…arbitrary spectrum aggregation limits undermine innovation and investment by preventing operators from acquiring the spectrum needed to support their operations. It is too early to know how much bandwidth operators will need to provide customers with innovative 5G services. The Commission should offer flexibility in these nascent millimeter wave bands, not artificially limit bandwidth, performance, and innovation through retention of arbitrary aggregation policies.*[58]

We also support the GSMA advice in its recent: *Public Policy Position on Auction Best Practice*, that:

> *Caps risk jeopardising an operator's ability to support growing consumer usage, deliver faster speeds and provide improved coverage. Regulators should define and set caps with care to balance giving operators sufficient freedom to pursue their particular business strategies and target spectrum portfolio while also preventing spectrum hoarding and the damage this can do to competition.* [59]

Predicting the 'with' and 'without' (allocation limits) scenarios is subject to considerable uncertainty, which bears on how the ACCC should balance the different effects of allocation limits. Standards, technology use cases and consumer demand are evolving rapidly. Uncertainty in predicting the 'with' and 'without' in the longer term raises the issue of regulatory risk. As the ACCC has itself acknowledged in the context of the 26 GHz band[60]:

> *The potential use cases for 5G, facilitated by its versatility, capabilities and efficiencies for operators, presents a challenge for policymakers and regulators to create flexible, yet fit-for-purpose, policy and regulatory frameworks.*

When it is difficult to predict the consequences of a regulatory action in the long run, it can be optimal from a policy perspective to not take that action. That is the case here. Further, in the longer term, MNOs are likely to have more spectrum available to them for 5G deployment and this choice of spectrum deployment options may reduce the competitive impact of any initial allocation of 26 GHz spectrum. If the ACCC is concerned about any competition impacts in the long term, these should be addressed as and when they emerge, using the alternative powers discussed in Section 5.

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[57] FCC, *Use of Spectrum Bands Above 24 GHz For Mobile Radio Services, et al., Third Report and Order, Memorandum Opinion and Order, and Third Further Notice of Proposed Rulemaking*, FCC 18-73 (2018) (**2018 Spectrum Frontiers Order**), paras 32-33.

[58] Verizon, *Verizon's Second Further Notice Comments in the Matter of Use of Spectrum Bands Above 24 GHz for Mobile Radio Services et al*, 23 January 2018, p 5.

[59] GSMA, *Public Policy Position on Auction Best Practice*, May 2019, p 8.

[60] ACCC, comments on the ACMA's "Wireless broadband in the 26 GHz band – Options Paper", p 2: https://www.acma.gov.au/consultations/2019-08/options-wireless-broadband-26-ghz-band-consultation-322018#submissions

4.3. Promoting the economically efficient allocation and use of spectrum (including to mitigate the risk of monopolisation, under-utilisation and very asymmetric holdings)

Below we address the factors to be considered in seeking to set an allocation limit on the 26 GHz spectrum licences which promotes economically efficient allocation and use of the spectrum, and which appropriately mitigates against the risk of monopolisation or very asymmetric holdings.

4.3.1. Promoting economically efficient allocation and use

An important factor in any decision on the setting of a spectrum auction allocation limit is whether the proposed limit will promote the efficient allocation and use of the spectrum in order to maximise the overall public benefit derived from the use of the spectrum.

In the case of the 26 GHz spectrum, the decision to allocate the spectrum via the proposed auction process in early 2021 will promote allocative efficiency by enabling use of the spectrum at the earliest opportunity. However, there is still the risk of inefficiencies in the form of unsold, or undervalued hence under-utilised spectrum, which does not represent a maximisation of public benefit.

Considering local market conditions in Australia, an allocation limit of at least 1 GHz would reduce the risk of an absence of competitive bidding during the 26 GHz auction and/or certain lots remaining unsold if, for example, one or more MNOs decide not to participate (at all, or in bidding for lots in particular locations). Without competitive tension in an auction, there is a risk the spectrum will not be put to efficient use by those who value it most, harming allocative efficiency.

By contrast, an allocation limit set below 1 GHz would very likely result in less competitive activity in the auction. This would not promote the ACCC's assessment criteria:

- This could create allocative inefficiency, and it could be a worse outcome for competition. No MNO would be permitted to fully participate in the high-quality segment of the mobile market (as set out in Section 2, requiring at least 1 GHz of mmWave spectrum to achieve the optimal speed and capacity). Rather, all operators would be forced to operate on less than optimal allocations, removing the opportunity for any bidder to meet potential demand for premium 5G services, which would be allocatively inefficient.

- With no competitive activity in the auction, bidders would likely pay less than their value for the spectrum. It could also mean one MNO acquires spectrum in defined licence areas at a price below what other MNOs value it, because the limits have been reached. If these outcomes arise, the spectrum would not be allocated to its most economically or socially efficient use.

4.3.2. Mitigating the risk of monopolisation or very asymmetric holdings

Telstra and other MNOs have strong incentives to acquire sufficient spectrum to maximise the service potential of their 5G networks. Spectrum is a finite, much sought after, costly resource for MNOs. Accordingly, it is in an MNO's interest to maximise spectrum utility and usage for any spectrum it does acquire. Telstra is not aware of any evidence that any MNO is failing to deploy technology over their spectrum holdings in an efficient and competitive manner, nor are there any indications that MNOs are or may seek to hoard spectrum for anti-competitive purposes. In fact, MNOs have passed up the opportunity to purchase available spectrum. For example, in the 700 MHz auction in 2013, spectrum remained unsold despite allocation limits allowing MNOs to purchase more, and in the Omnibus spectrum auction in 2017, no one bidder purchased all of the spectrum they theoretically could have acquired, even though there were no allocation limits in relation to the 2.1 GHz lots, the 2.3 GHz lots or the 3.4 GHz lots.

Given the current state of mmWave technology and the inherent economic fact that marginal value of additional lots declines as the amount of spectrum already purchased increases, we would not expect demand for the 26 GHz spectrum licences to materially exceed 1 GHz to 1.2 GHz per MNO. Thus, even without allocation limits, there would remain the potential for several bidders to win spectrum in the auction.

However, we appreciate that protecting against the potential for monopolisation or very asymmetric holdings is a common justification for spectrum allocation limits. We consider that setting an allocation limit of at least 1 GHz (representing 41.7% of the 26 GHz spectrum licenced spectrum) would provide an appropriate safety net against these risks. As explained in Section 5, this approach would be consistent with that of international spectrum authorities in seeking to address similar concerns in respect of overseas mmWave auctions. It would also be proportionate in preventing any one bidder from obtaining more mmWave spectrum than what is currently considered to be needed to operate an optimal 5G network given the current state of technology and potential for future access to additional mmWave bands.

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Any spectrum set aside for other, speculative new entrants deprives incumbents of additional capacity, which those incumbents have an incentive to utilise. Competition between incumbents to utilise that capacity can deliver better outcomes for customers than by setting it aside for a new entrant, particularly if that new entrant is slow to utilise it or is inefficient. Picking winners, particularly if done so speculatively and at the cost of allowing incumbents to invest in the best that 5G has to offer, is fraught with the risk of inefficient allocation of spectrum and poor outcomes for customers. As the GSMA has observed:

> *"…sometimes regulators help to "pick winners" by setting aside spectrum for certain applicants such as new entrants or industry verticals. This type of market manipulation is only appropriate after a formal market review finds evidence of market dominance, and then demonstrates that setting aside spectrum is an appropriate, proportionate action that will lead to long-lasting and sustainable market benefits…"*[61]

In the present case, there is no evidence of the nature referred to by the GSMA.

[61] GSMA, *Public Policy Position – Auction Best Practice*, May 2019, p 8.

5. Other relevant considerations

There are no competition issues raised by the proposed allocation of 26 GHz and 28 GHz apparatus licenses that need to be addressed through ex ante allocation limits associated with the auction. Any other competition concerns which may arise from the administrative allocation of the apparatus licences should be addressed through the use of relevant alternative ACCC and ACMA powers. Our views are explained further below.

5.1. The approach of overseas regulators supports a limit of at least 1 GHz in Australia

Internationally, more and more operators are launching commercial 5G services and/or announcing 5G launch plans. In January 2020 the GSMA reported that 17 operators launched commercial 5G services across 14 countries during Q4 of 2019, bringing the total number of operators with commercial 5G services to 53[62] across 28 different markets worldwide.[63]

While Australia will remain one of the leading countries to make mmWave spectrum available for commercial 5G services, there have already been several international mmWave allocations. To date, we are aware of five countries that have or will allocate mmWave spectrum for 5G mobile services according to a specified[64] auction process.

In respect of each such international mmWave auction, consideration has been given by the relevant spectrum authority to the potential risks of spectrum monopolisation and/or hoarding. As a result, in four of these countries pre-auction allocation limits have been set – ranging from 32 to 44.4 percent of the total amount of mmWave spectrum on offer[65].

The approach taken to international spectrum allocations will naturally differ according to factors including spectrum availability (this is currently more limited than in Australia in many countries, due to incumbent usage of the bands), national market conditions and national spectrum policy objectives. Nevertheless, as set out in Appendix A, looking at the current international picture as a whole, the setting of a 26 GHz spectrum licence allocation limit in Australia representing 41.7% of the available spectrum would in our view be a reasonable and proportionate regulatory response to address the potential risk of monopolisation (i.e. to ensure that no one bidder could obtain the majority of the spectrum licensed spectrum available).

5.2. Alternative means of addressing any future competition concerns

5.2.1. Alternative ACCC powers

The ACCC has several powers with which it can address anti-competitive behaviour in the relevant markets. Under the *Competition and Consumer Act* (**CCA**), the ACCC has s50 powers to deal with acquisitions of assets including the issue of licences to use spectrum (see s71A and s106A of the *Radiocommunications Act* (**RA**)), and more general CCA Part IV powers to remedy competition issues, as well as the telecommunications industry-specific CCA Part XIB powers.

As explained above, there is no evidence of spectrum holdings being very asymmetric or being hoarded today, particularly if operator market share is considered. Adopting an ex-ante approach to preventing the potential for anti-competitive conduct (beyond the setting of an appropriate safety-net spectrum licence allocation limit of at least 1 GHz), while no such evidence of it exists today, risks adverse consequences in

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[62] Mobile 5G was available from 46 operators in 24 markets with the delta being FWA networks.

[63] GSMA, Global 5G Landscape Q4 2019 report.

[64] While we have listed Finland's planned auction in the table below, the auction terms are still under consultation.

[65] As noted above, in the US, it was determined that investment and innovation would best be promoted if bids were unconstrained by rigid pre-auction limits, however the FCC retained an ex post screening threshold to address any competition concerns.

terms of the quality of services made available to customers. It is also likely, for the reasons set out above, to chill competitive activity.

An ex-ante spectrum licence allocation limit of anything less than 1 GHz therefore involves a high risk of discouraging competitive activity and service innovation for the sake of preventing the low risk of anti-competitive activity. By contrast, an ex-post approach provides a more sensible balancing of these risks, as it allows the competitive conduct to occur without preventing effective action against any anticompetitive conduct in the very unlikely event that is eventuates.

5.2.2. Alternative ACMA powers

Ordinarily, apparatus licences are issued 'over-the-counter' in accordance with Sections 99 and 100 of the RA. Whilst the ACMA's anticipated adoption of an administrative approach to the allocation of the new 26 GHz and 28 GHz apparatus licences prima facie suggests that excess demand is not an anticipated major concern, we recognise that there could be residual concerns about the potential for a 'land grab' by current and intending participants in relevant downstream markets (to obtain as many apparatus licences as possible).

The ACMA is not obliged to issue apparatus licences 'over the counter'. It must exercise its decision-making power under Section 104(4)(a) of the RA to have regard to all matters it considers relevant. In this regard, prevention of the risk of a 'land-grab' scenario would be consistent with the objects set out in Section 3 of the RA, particularly sub-sections 3(a), (d) and (g).

Previously, the ACMA has exercised its administrative discretion to appropriately manage apparatus licence allocation using a 'prioritisation' approach in the case of remote areas in the 1800 MHz band[66], and for regional areas with 2100 MHz apparatus licences [67]. The approach in respect of the 26 and 28 GHz apparatus licences could similarly consider policy approaches based on initial 'rationing' of apparatus licences to a limit of carrier bandwidth within a geographic region that would optimally support 5G fixed wireless, and prioritisation in the 26 GHz band geographies adjacent to spectrum licences to minimise guard-space requirements and 'dead spots'. If supply continues to exceed demand for a specified period of time, then the rationing could be relaxed or removed in order to ensure better utilisation of the available spectrum.

Telstra's view is that, for the reasons explained in Section 2, an allocation limit that includes the apparatus licences in the 26 and 28 GHz band is not workable and would be counterproductive. However, we think that the ACMA can appropriately manage the risks of apparatus licence issue using its existing powers under the Act (and additionally under the *ACMA Act*). The ACMA would need to consult on its proposed allocation approach and both the Department and the ACCC would be key contributors to that consultation. This would ensure that the method of issuing apparatus licences is subject to a transparent debate, which we think is more appropriate than shoe-horning this important administrative implementation process for licences which have significant differences to the 26 GHz spectrum licences, into the allocation limits direction.

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[66] RALI MS34 - *Frequency Coordination and Licensing Procedures for Apparatus Licensed Public Telecommunications Services in the 1800 MHz Band*, para 4.14 on pp 32-35, available at: https://www.acma.gov.au/publications/2019-08/publication/frequency-coordination-and-licensing-procedures-apparatus-licensed-pts-1800-mhz-bands

[67] See RALI MS33 – Sec 4.15 "Assignment Priority Order": https://www.acma.gov.au/sites/default/files/2019-08/RALI-MS33.docx

Appendix A – Overview of international approach to mmWave auction allocation limits

Country	Date	Spectrum Band	Allocation method	Quantity (mmWave)	Allocation Limit
South Korea	June 2018	28 GHz (combined with mid-band)	Auction	2400 MHz (24 x 100 MHz)	1 GHz per MNO [41.7%]
Italy	September – October 2018	26 GHz (combined with other 5G spectrum)	Auction	1000 MHz (5 x 200 MHz)	400 MHz (but with "club use" rules allowing use of the full 1GHz where not needed by the successful bidder(s)) [40%]
US	November 2018 – January 2019	28 GHz	Auction	850 MHz (2 x 425 MHz) in specified areas	None (but 1850 MHz combined threshold across 24; 28; 37; 39 & 47 GHz for case by case ex post review)
US	March – May 2019	24 GHz	Auction	700 MHz (7 x 100 MHz) in specified areas	As for 28 GHz
US	December 2019 – March 2020	37GHz, 39GHz and 47 GHz	Auction	3400 MHz in specified areas (10 x 100 MHz – 37 GHz 14 x 100 MHz – 39 GHz 10 x 100 MHz – 47 GHz)	As for 28 GHz
Taiwan	Dec 2019-Jan 2020	28 GHz (combined with mid-band)	Auction	2500 MHz (25 x 100 MHz)	800 MHz per enterprise [32%]
Thailand	February 2020	26 GHz (combined with other 5G spectrum)	Auction	2.7 GHz (27 x 100 MHz)	1.2 GHz (maximum of 12 x 100 MHz concessions) [44.4%]
Finland	Summer 2020	26 GHz	Auction	2.4 GHz (3 x 800 MHz, per consultation)	Auction terms still under consultation

Appendix B – Responses to consolidated list of issues for comment

1. **Do you have any competition concerns about the allocation of spectrum licenses in the 26 GHz band? If so, how do you think these concerns should be addressed?**

   Telstra is concerned about the potential negative impact on competition that could be caused by unduly restrictive limits on the allocation of spectrum licences in the 26 GHz band. To address these concerns, we recommend the adoption of an allocation limit that permits applicants to acquire at least 1 GHz of 26 GHz spectrum (in each of the 29 defined licence areas).

   See further Section 4 of our response and our answers to questions 2 and 3 below.

2. **Does this allocation impact your ability to compete effectively in relevant markets in the short and/or long-term? If so, please provide examples**

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3. **Do you have any competition concerns about the relationship between spectrum and apparatus licenses in the 26 GHz and 28 GHz bands? If so, how do you think these concerns should be addressed?**

   Because the 26 GHz and 28 GHz apparatus license conditions limit use to fixed wireless and satellite only (no mobility) in the 28 GHz band (27.5 to 28.1 GHz) and restrict the number of base stations in the 26 GHz band (24.7-25.1 GHz), there is fundamentally different utility between these apparatus licenses and the 26 GHz spectrum licences for traditional wide area mobile use.

   We are accordingly concerned that harm to efficient competition could be caused if, for example, a combined allocation limit effectively forced MNOs to use valuable 26 GHz wide-area, mobile spectrum for non-mobile or localised use cases. This could decrease, not increase, efficient spectrum utilisation (limiting the utility of those licences for maximising the benefits of 5G public mobile services).

We also believe that it will be important to healthy competition in the relevant downstream markets and the long-term interests of end-users for network operators including MNOs to have the option of accessing the apparatus licences in order to be able to efficiently support a range of non-mobile use cases in localised areas (e.g. to support enterprise customers with industry use cases which may integrate one or more private networks into the operator's public network; make use of 5G network slicing and/or leverage the operator's technology and infrastructure such as multi-edge computing processes).

4. **Do you view the apparatus licenses as complements or substitutes for the 26 GHz spectrum licences?**

As per our response to question 3 above, Telstra views the apparatus licences largely as complements to the spectrum licences. This is due to the technical and policy limitations on their substitutability for the provision of wide area mobile services.

The situation is different to the 3.6 GHz auction, where NBN Co's existing holdings of apparatus licensed 3.4 GHz band spectrum were taken into account in the allocation limits (as well as spectrum licences held by NBN Co, Optus and Telstra in the 3.4 GHz band). In that case, NBN Co's PMTS Class B 3.4 GHz apparatus licenses were a close substitute for 3.6 GHz spectrum licences because they were effectively wide area licences providing exclusive spectrum access that could be used to deploy similar services to spectrum licenses, and there were no use case restrictions in either band, unlike those applicable to the 26 GHz and 28 GHz apparatus licences in the present case[68].

5. **What are the likely intended uses of 26 GHz and/or 28 GHz spectrum in Australia? Do you expect these intended uses to change over the term of the licence/s?**

Telstra agrees with the observations in the ACCC's consultation paper that there is likely to be a wide variety of business cases, deployment models, spectrum demand scenarios and service types for the use of the 26 GHz and 28 GHz bands in Australia. Moreover, allocations and deployments in these bands are still at an early stage globally, creating uncertainty around how 5G will ultimately be deployed in the band over the term of the licences. Subject to these caveats, Telstra supports the initial views reached by the ACMA following its consultations on the allocation and planning for these bands that:

- the highest value use of 26 GHz spectrum licences is likely to be for the operation of 5G mobile broadband and related services; and

- the apparatus licences in the 26 GHz and 28 GHz bands are likely to be used for a wide variety of "type 2" smaller market/local subscriber-based networks and "type 3" uncoordinated ad hoc deployment 5G use cases by a range of different users including but not limited to the MNOs, where mobility and wide area coverage are not essential to the use case.

IoT is also a potential use, but mmWave spectrum is not critical in our view to support IoT. We expect that any standardised spectrum band will be able to be used for that purpose. Additionally, some IoT applications will tend to prefer the longer reach of low band spectrum (under 1 GHz).

See further Sections 2 and 3 of our response.

[68] Only NBN Co was able to access the ranges 3400-3425 MHz and 3492.5-3542.5 MHz due to the conditions imposed by the Minister's determination in the *Australian Communications and Media Authority (3.5 GHz frequency band) Direction* 2014.

6. **What do you consider is the optimal allocation of 26 GHz and/or 28 GHz spectrum to support your likely intended uses? What is the minimum allocation necessary?**

   As discussed in the body of our response, it is widely recognised that the full potential of 5G services can only be reached with access to large contiguous amounts of mmWave spectrum of at least 1 GHz. Telstra therefore considers that a 26 GHz spectrum licence allocation limit of at least 1 GHz is the minimum allocation required to support ongoing strong investment, innovation and differentiated competition in the supply of 5G services in Australia.

   For the reasons explained in response to questions 3 and 4 above, it is important that the 26 GHz spectrum licence allocation limit operates independently from consideration of any competition concerns which may arise in relation to the allocation of the apparatus licences.

   The ACMA's intention is that the apparatus licenses in the 26 GHz and 28 GHz bands will support a wide variety of 5G use cases, many of which are still in very nascent stages. It is therefore important that the approach taken to allocation of these licences caters for the flexibility applicants may require to have access to varying amounts of spectrum for various different use cases, as the relevant markets evolve. As explained in Section 5 of this response, in the event of any competition concerns such as land-grabs for mmWave apparatus licences emerging, it is preferable that these are addressed using relevant alternative avenues open to the ACMA, rather than by the imposition of rigid ex-ante allocation limits in the spectrum auction.

7. **How does this spectrum support the technical requirements for the deployment of 5G services?**

   The mmWave spectrum bands have different technical properties compared to mid and low band 5G spectrum. This includes much larger bandwidths, very high-speed data rates, small propagation footprints and poor building penetration. A 5G mobile service deployed over mmWave spectrum bands will also require a different roll out of technology as compared to standard mobile networks. In high density population areas, this is likely to consist of a concentrated deployment of small cells. The capabilities of mmWave spectrum to support in-band wireless self-backhauling (IAB) may also prove beneficial.

   Ultimately, operator investment incentives to engage in this capital-intensive deployment activity will be driven by the commercial opportunities presented by the available mmWave spectrum. A spectrum licence allocation limit of at least 1 GHz maximises these.

   Also, as explained in Section 4, because mmWave technology is in a nascent stage, heightening the risks around any investment case, a decision to recommend low (sub 1 GHz) allocation limits which limited bidder optionality during the auction could restrict or disincentivise future 5G deployment, investment and development by operators. A higher (at least 1 GHz) limit reduces this risk.

8. **Does your demand for spectrum differ across geographic areas, such as metropolitan and regional areas? If so, provide examples.**

   Telstra is rolling out a 5G mobile network across metropolitan and regional Australia. We are dedicated to bringing advanced connectivity to the far reaches of Australia. As part of our 3.6 GHz 5G roll out, regional centres such as (Dubbo[69] and Maitland[70] in NSW) are part of the first wave of 5G mobile network deployments. We advocate for the same allocation limit of at least 1 GHz to be applied across all geographic areas, enabling and incentivising operators to roll out a similarly

[69] https://exchange.telstra.com.au/regional-australia-5g-switch-on/
[70] Ibid.

high quality of service to both regional and metropolitan customers. We also note that some major regional towns generate as much traffic and load on a per-site basis as in metropolitan areas.

Telstra is committed to continuing to improve our mobile coverage and service across all of Australia. 5G presents a significant technological milestone, and we are eager to deliver the innovations that will be made possible through the 26 GHz spectrum licences to customers throughout Australia.

9. **What, if any, additional investment is required to deploy this spectrum for your likely intended uses? Please provide examples.**

   As noted above, the deployment of mmWave spectrum is likely to require mobile operators to make material network investments to support the deployment of additional small cells.

   At the same time, data-intensive enhanced mobile broadband services and other mmWave based applications such as video, video-on-demand, streaming and gaming will all drive demand for higher data speeds and larger mobile data volumes. To support this traffic, operators may seek to draw on the potential of mmWave spectrum for in-band wireless self-backhauling (IAB).

   Ultimately, Telstra's investment in infrastructure will be impacted by the commercial opportunities presented by the available 26 GHz and 28 GHz spectrum in Australia. For the reasons explained above, we believe that MNO investment incentives will be maximised if there is the opportunity to acquire at least 1 GHz of 26 GHz spectrum licensed spectrum, combined with equitable access to apparatus licenses in the 26 GHz and 28 GHz bands in line with the objectives of the RA.

10. **What are the relevant downstream markets for the purpose of advice on allocation limits for spectrum licences, noting that markets may have particular geographic dimensions? Please provide reasons for your view.**

    Adopting a purposive approach to market definition, we consider the downstream national retail mobile services market to be the most obvious and important market in which the allocation of the 26 GHz spectrum licences is likely to impact on the ACCC's assessment criteria. See further Section 3 of this response.

11. **What are the relevant downstream markets for the purpose of considering competition issues associated with apparatus licences, noting that markets may have particular geographic dimensions? Please provide reasons for your view.**

    Per our response to Question 5 above, the apparatus licences are likely to be used for a wide variety of "type 2" smaller market/local subscriber-based networks and "type 3" uncoordinated ad hoc deployment 5G use cases, where mobility and wide area coverage are not essential to the use case. As we explain in Section 3 of this response, we consider the downstream fixed market for these fixed wireless services should be considered national in scope. We also agree with the ACCC that there is a national retail mobile market.

    For the reasons explained in the body of this response, we do not believe that the allocation of the 26 GHz and 28 GHz apparatus licenses is likely to raise any competition issues in downstream markets that need to be addressed through ex-ante restrictions associated with the auction. Any competition concerns which may arise from the administrative allocation of these apparatus licences can still be addressed through the use of the ACMA's powers under the RA and the ACCC's ex-post competition powers under s 50 of the CCA (see further Section 5 of this response).

12. Are there likely to be future relevant markets that have not been identified?

For the purposes of the ACCC's advice to the Minister on the 26 GHz spectrum allocation, we do not believe that there are any additional relevant markets the ACCC should identify in its analysis.

13. Do you have any views on the state of competition in the relevant markets?

Australia's mobile market is competitive and open, with competition between the three major MNOs delivering strong benefits to consumers. These benefits include increased value in mobile plans and falling prices, high levels of ongoing investment and ever improving coverage.

Across all of the relevant markets, it is also important for the ACCC to keep in mind that competition in the supply of downstream services using mmWave spectrum is at a very nascent stage globally, and there is still a great deal of uncertainty as to how 5G will ultimately be deployed in the 26 GHz and 28 GHz bands. There is consequently a high risk that a restrictive approach to allocation limits could unnecessarily constrain providers in their paths towards 5G deployment using this spectrum, limiting their incentives to invest in new services and inhibiting their ability to innovate and compete in the long-term interests of end-users.

Further details on the state of competition on the mobile market and other relevant markets are set out in Section 3 of this response.

14. Do you have any concerns about future competition in the relevant markets as a result of the allocation of spectrum and/or apparatus licences?

Yes, see our answers to questions 2 and 3 above.

15. Do you consider that substitutable spectrum exists for the likely intended uses of the 26 and 28 GHz spectrum? To what extent are these fully effective substitutes?

As explained in the body of this response, Telstra views the 26 GHz and 28 GHz apparatus licences largely as complements to the 26 GHz spectrum licences. For mobile use, they are not substitutable.

Due to its technical differences, mmWave spectrum is generally expected to act as a complement to mid and low band 5G spectrum, and to be used for specific use cases or capacity requirements, rather than as a general substitute for other mobile spectrum bands.

In addition to mmWave spectrum in the 26 GHz band, spectrum in the bands 37 - 43.5 GHz; 45.5 - 47 GHz; 47.2 - 48.2 GHz; and 66 - 71 GHz was recently identified for IMT at WRC-19. These newly designated frequencies are expected to be the focus of significant product and technology development in the coming years. For example, the 37 – 43.5 GHz band has already received a 3GPP band designation and a small number of handsets already support this band.[71] It is already of significant interest in the US, where there are established arrangements supporting terrestrial 5G and satellite broadband services – including both AT&T and Verizon starting to deploy 5G networks in this band. The ACMA has stated it will continue to monitor these bands for possible replanning for 5G wireless broadband services. While the 26 GHz spectrum licences will be important for early 5G mmWave mobile services, over the longer term it is likely that operators will have further opportunities to acquire mmWave spectrum.

[71] Motorola Moto Z3 and Z4 when combined with 5G Moto Mod (39 GHz), LG V50 (28 GHz and 39 GHz), Samsung Galaxy S10 5G (28 GHz and 39 GHz), Samsung Galaxy Note10+ 5G (28 GHz and 39 GHz). https://www.verizonwireless.com/smartphones/samsung-galaxy-note-10-plus-5g/#specsHeading