



# Allocation limits advice for the 26 GHz spectrum allocation

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# 1. Background

## 1.1. Request for advice

On 25 October 2019, the Minister for Communications, Cyber Safety and the Arts (the Minister) on advice from the Australian Communications and Media Authority (ACMA) announced the allocation of spectrum licences in the 26 GHz band by auction.

The auction is scheduled to take place in early 2021. The ACMA plans to allocate a total of 2400 MHz of spectrum in the 26 GHz band across 29 defined areas. The ACMA also plans to allocate apparatus licences in various geographic areas in the broader 26-28 GHz band, which sit adjacent to the spectrum licences.

The Minister wrote to the ACCC seeking advice on competition issues associated with the planned spectrum and apparatus licence allocation of the 26 GHz and 28 GHz bands. The Minister is seeking our advice by 15 May 2020.

## 1.2. Rationale for intervention

Radiofrequency spectrum is a scarce and finite resource that is an essential input into wireless services markets. It is the means by which all wireless communications devices operate and is essential for services such as mobile telephony and broadband, and satellite communications.

Where demand for spectrum is likely to be greater than available supply, the traditional approach is to allow the market to determine the best allocation through price-based allocation methods, such as auctions.

The ACCC recognises that allowing the market to determine the price of spectrum through an auction process can promote allocative efficiency; that is, the price paid can ensure that the spectrum is put to its highest value use. Spectrum licences are also more likely to promote dynamic efficiency than other types of licences because licence holders may put the spectrum to a higher value use that emerges over time.

However, selling spectrum in an auction to the highest bidder can weaken competition in downstream markets by adversely affecting their efficiency. As noted by Cramton et al:

‘This is the great deficiency of an unrestricted auction when incumbents have rents to protect. Symmetric auctions among asymmetric bidders are prone to inefficient outcomes because the interests of consumers are not directly represented in the auction.’<sup>1</sup>

That is, when determining how much to bid for spectrum, companies with a strong existing position will value the bid based on both the value of the spectrum to them, and the value to be gained by keeping it from competitors.

As such, where appropriate, auction settings such as competition limits can help promote competition and allocative efficiency in markets that rely on spectrum by giving all operators an opportunity to acquire sufficient spectrum to compete effectively.

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<sup>1</sup> Cramton, P., A. Skryzpacz and R. Wilson (2007), ‘The 700 MHz spectrum auction: an opportunity to protect competition in a consolidating industry’, Submission to the United States Department of Justice, 13 November 2007. <http://www.cramton.umd.edu/papers2005-2009/cramton-skryzpacz-wilson-competition-in-700-mhz-auction.pdf>

### 1.3. ACCC approach to advice

The ACCC intends to conduct its assessment based on the following principles:

- promoting competition in downstream markets for the long-term interests of end-users, and to encourage investment in infrastructure and innovation,
- supporting deployment of 5G technologies, including opportunities to acquire 5G spectrum in the future and technical requirements for deploying 5G services, and
- promoting the economically efficient allocation and use of spectrum, to maximise the public value from spectrum, including mitigating the risk of spectrum monopolisation, under-utilisation and very asymmetric spectrum holdings.

These principles draw on the Minister's Communications Policy Objectives for the allocation of the 26 GHz band, which the Minister requested the ACCC have regard to in providing its advice.

## 2. Overview of allocation

On recommendation from the ACMA, the Minister for Communications, Cyber Safety and the Arts made the *Radiocommunications (Spectrum Re-allocation – 26 GHz Band) Declaration 2019* under subsection 153B(1) of the *Radiocommunications Act 1992*.

Under this declaration, there will be 2400 MHz in the 25.1 – 27.5 GHz frequency range made available for spectrum licensing in 29 defined areas. The defined areas reflect cities of more than 50,000 residents, or towns with significant seasonal populations.

Spectrum licences will be made available for a 15-year term and are planned to be auctioned in early 2021.

Both the 26 GHz and 28 GHz bands (24.25-27.5 GHz and 27.5-30 GHz) have been identified as some of the first high-band (or millimetre wave) spectrum bands capable of supporting 5G wireless broadband services.

To optimally deploy 5G networks, mobile network operators will require spectrum across a variety of bands to meet coverage and capacity requirements. High-band spectrum will provide for shorter-range, high capacity services.

As can be seen from the table below, the ACMA has designed the band with a mix of licences, including class, apparatus and spectrum licences. This mix is intended to both protect incumbent users and also provide for an appropriate mix of potential wireless broadband network types thereby ensuring that spectrum moves to its highest value use.<sup>2</sup>

The ACMA also proposes to allocate apparatus licences in various geographic areas in the broader 26-28 GHz band, which will sit adjacent to the spectrum licences in the 26 GHz band, as shown in Table 1.

In both these bands, the ACMA is proposing to make available a new licence type, referred to as an ‘area-wide apparatus licence’ (AWL). This new licence type shares some of the characteristics of spectrum licences as it licenses a geographic space and frequency in which a licensee can add multiple transmitters or receives. The ACMA has not yet determined when it plans to allocate these licences and is developing and consulting on a technical framework for AWL in the 26-28 GHz bands.

The Minister requested the ACCC’s advice on competition issues associated with these apparatus licences and whether restrictions on their allocation should apply.

**Table 1: Summary of licensing arrangements and available bandwidth**

Geographic area		Frequency range (GHz)		Bandwidth (MHz)	Licence Type
Australia-wide		24.7	25.1	400	Apparatus
Australia wide	<b>Defined areas</b>	<b>25.1</b>	<b>27.5</b>	<b>2400</b>	<b>Spectrum</b>
	Outside defined areas	25.1	27.5	2400	Apparatus
Australia wide	Defined areas	27.5	28.1	600	Apparatus
	Outside defined areas	27.5	28.1	600	Apparatus
Australia-wide		28.1	29.5	1400	Apparatus

<sup>2</sup> ACMA, *Future use of the 26 GHz band – Planning decisions and preliminary views* (April 2019), p.12.

### 3. Competition assessment

Our competition assessment focuses on the impact that the allocation could have on competition in relevant downstream markets. As spectrum is a wholesale input its value comes from its use in downstream output markets (such as the mobiles market) to deliver services to consumers and businesses.

This spectrum is important for 5G network deployment and as such, part of our assessment considers the ability of operators to deploy 5G with or without this spectrum.

#### 3.1. Identifying the relevant downstream markets

In order to formulate this advice, having regard to the principles identified, the ACCC has identified several relevant downstream markets for this allocation.

By defining the relevant downstream markets where this spectrum will be used, we are able to establish the relevant field of inquiry in which to assess the outcomes of the spectrum allocation and determine whether any intervention is required to achieve the objectives of the allocation.

The relevant markets are:

- the national retail mobile services market,
- the national fixed broadband services market, and
- the private wireless enterprise market.

#### **National retail mobile services market**

##### ***Views from submissions***

Submissions generally agreed on the relevance of the national retail mobile services market for the purposes of this allocation.

Telstra considers this market is the most obvious and important market in which the allocation of the 26 GHz spectrum licences is likely to impact the ACCC's assessment criteria.<sup>3</sup> Telstra considers that 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. For example, as subscriber density per cell decreases, the average through-put can be achieved with smaller amounts of bandwidth.<sup>4</sup>

Vodafone Hutchison Australia (VHA) agrees that **[c-i-c begins]** [REDACTED]

[REDACTED]  
**[c-i-c ends].**<sup>5</sup>

Submissions broadly considered the fixed broadband services market (retail or wholesale) was less relevant for the purposes of this advice. However, VHA submits **[c-i-c begins]** [REDACTED]

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<sup>3</sup> Telstra, *Response to ACCC Consultation Paper Allocation limits advice for the 26 GHz spectrum allocation* (Telstra submission) (March 2020), p. 12.

<sup>4</sup> Telstra submission, p. 17.

<sup>5</sup> Vodafone Hutchison Australia, *Allocation limits advice for the 26 GHz spectrum allocation – VHA submission* (VHA submission) (April 2020), p. 19.

[c-i-c ends].<sup>6</sup>

NBN Co has [c-i-c begins]

[c-i-c ends].<sup>7</sup>

Optus considers its 5G home wireless services will continue to be delivered on mid-band spectrum rather than mmWave due to the technical limitations of this spectrum and availability of supported equipment imposing constraints on the ability to deploy this spectrum.<sup>8</sup>

### **ACCC view**

The ACCC considers the fixed broadband market, including fixed wireless broadband services, is a relevant market for the purposes of this advice. This is due to the expressed demand from [c-i-c begins] [c-i-c ends] NBN Co to deliver fixed wireless broadband services using this spectrum, and that the propagation characteristics of this spectrum better suit fixed rather than mobile deployments.

As consumers do not tend to distinguish the access technology being used to supply their broadband service at home, we consider the fixed broadband market, rather than a more narrow, fixed wireless broadband market is most relevant for this allocation. This also recognises that operators supplying home broadband services now compete in the same market regardless of the underlying technology as mobile networks are now capable of delivering similar quality of service to fixed networks.

### **The private wireless enterprise market**

In the consultation paper, we proposed the enterprise market was a relevant market for the purposes of this advice. Following industry feedback and further consideration, we have refined this market definition to be the private wireless enterprise market.

### **Views from submissions**

Optus agrees the enterprise market is a relevant market for the purposes of this advice as current market expectation is that mmWave will enable services primarily designed for enterprise uses, and that incremental 5G revenue to be focused in the enterprise market.<sup>9</sup>

VHA submits [c-i-c begins]

[c-i-c ends].<sup>10</sup>

Telstra does not agree that a separate, standalone market for enterprise services is a relevant market for the purposes of this advice. Telstra agrees that an important use of 26 and 28 GHz spectrum is likely to be for the provision of connectivity to industry sectors and meeting the needs of enterprise and government customers, but does not agree that this

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<sup>6</sup> VHA submission, p. 11.

<sup>7</sup> NBN Co Limited, *Submission on allocation limits for the 26 GHz spectrum allocation* (NBN Co submission) (April 2020), p. 1.

<sup>8</sup> Optus, *Submission in response to ACCC Discussion Paper: Spectrum Allocation Limits – 26 GHz band submission* (Optus submission) (March 2020), p. 9.

<sup>9</sup> Optus submission, pp. 6-7.

<sup>10</sup> VHA submission, p. 19.

represents a fundamental difference in the relevant downstream markets from previous mobile generations.<sup>11</sup>

However, we note that in a 5G briefing in late 2019, Telstra's networks principal for mobile and innovation rollout said that Telstra expected mmWave to be the key spectrum for enterprise and industrial applications, while mid and low-band spectrum would be used to deliver enterprise and consumer mobility services.<sup>12</sup>

BAI Communications suggests that large system and IT integrators will be responsible for the implementation of many of the 5G mmWave deployments across the industry verticals. It suggests a future relevant market is the V2X market (vehicles-to-everything), where the mining industry is an early adopter for smart mining applications and warehouse environments.<sup>13</sup>

### **ACCC view**

The ACCC considers an important element of this allocation is providing early access to mmWave spectrum to enable operators to release the full potential of 5G networks and wider productivity benefits for the economy.

As such, we consider the private wireless enterprise market is a relevant market for the purposes of this advice as the nature and use cases for this spectrum are very different to existing spectrum bands used for existing 5G enterprise services, and will likely evolve further in the future.

We anticipate this market may also encompass other market participants, such as equipment vendors, who seek to deploy private networks directly rather than using a traditional carrier.

We consider this market is separate to the retail mobile services market (and fixed broadband market) as it will include a more diverse range of market participants, beyond the traditional mobile network operators (MNOs), and include a package of services rather than individual broadband service.

We consider it is important to distinguish this market, as the competitive dynamics differ to those in the retail (or wholesale) mobile services market.

Further, unlike previous mobile generations, 5G new radio (NR) (using mmWave spectrum) will be important to support ultra-reliable low latency communication (URLLC) and time sensitive networks (TSN) that will be required for certain industrial applications. Such applications cannot be supported by Wi-Fi (on fixed networks) or existing mobile networks, and reflect a change from previous mobile generations.

While some of these services will be offered by MNOs, other private wireless deployments will be completely owned and/or controlled by the business itself. In these cases, the business will interface with the carrier networks only for communications and ability to connect to the outside world (beyond the business domain).

Some computing and communications platform vendors, such as Nokia, may go directly to business customers with infrastructure and services to roll out private LTE and 5G networks. In this case, these vendors will be competing against the MNOs.

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<sup>11</sup> Telstra submission, pp. 13-14.

<sup>12</sup> <https://www.computerworld.com/article/3516557/telco-core-upgrades-mmwave-spectrum-to-unlock-5g-for-enterprises.html>

<sup>13</sup> BAI Communications, *Submission to the ACCC Consultation Paper: Allocation limits advice for the 26 GHz spectrum allocation* (BAI Communications submission) (April 2020), p. 4.



### 3.2. State of competition in relevant downstream markets

The ACCC uses the long-term interests of end-users (LTIE) test to consider if the potential outcomes of a spectrum allocation will promote competition for the benefit of consumers and end users. As part of this test, we consider the current state of competition in the relevant markets and how the allocation might impact the future state of competition to determine if any measures are required to safeguard competition.

A key question the ACCC considers in providing advice on whether allocation limits are required, is how the allocation of spectrum will impact the ability of operators to compete in relevant markets, and whether any operators will be unable to compete effectively as a result of the allocation. An additional question the ACCC considered for this allocation was the opportunity for new entry into relevant markets in the future as a result of this allocation in recognition that many of the services and applications using mmWave spectrum are yet to be developed.

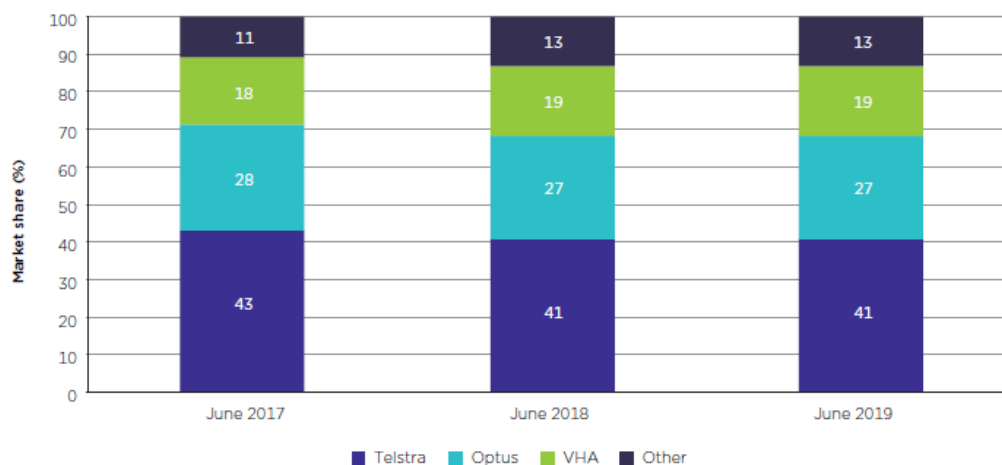
#### National retail mobile services market

The retail mobile services market is dominated by three mobile network operators (MNOs) – Telstra, Optus and VHA. The market shares of these operators have remained largely unchanged in recent years. The MNOs provide wholesale services to and compete with mobile virtual network operators (MVNOs) in the retail market.<sup>14</sup>

The MNOs and MVNOS compete on a range of factors including price, data and other inclusions, the extent of network coverage, the quality and depth of coverage and retail/customer service support.

The ACCC considers the retail mobile services market is a national market for similar but differentiated services, consistent with the views expressed in the Final Report for the Domestic Mobile Roaming Declaration Inquiry.

**Figure 1: Retail market share for mobile phone services from 2016-17 to 2018-19<sup>15</sup>**



Prices for mobile phone services overall declined from 2017-18 to 2018-19 when comparing similar plans. On average, prices fell by around 6.6 per cent over the period, in real terms.<sup>16</sup>

<sup>14</sup> ACCC Telecommunications Report 2018-19, p. 30.

<sup>15</sup> ACCC Telecommunications Report 2018-19, p. 31.

<sup>16</sup> ACCC Telecommunications Report 2018-19, p. 31.

Telstra and Optus have launched 5G networks using mid-band spectrum (3.5/3.6 GHz) in select geographic areas. VHA plans to commence its 5G rollout from mid-2020. End-users must have a 5G-compatible device in order to access 5G services.

### **Views from submissions**

Telstra expressed the view that [c-i-c begins]

[REDACTED]

[c-i-c ends].<sup>17</sup>

Optus does not expect mmWave spectrum to materially impact services supplied in the national retail mobiles market, as its propagation characteristics make it unattractive for mobile services. This is due to the small cells size, requiring frequent inter-cell handover and the very high investment costs to provide sufficient contiguous coverage. Optus considers that 4G/5G mobile services will continue to be delivered by sub-6 GHz spectrum. However, Optus notes that any dominance in the enterprise market as a result of this allocation could transfer to the mobiles market.<sup>18</sup>

VHA submits [c-i-c begins]

[REDACTED]  
[c-i-c ends].<sup>19</sup>

### **ACCC view**

The ACCC considers there is effective competition in the retail mobile services market at this point in time. We do not have sufficient information to comment on the potential competitive impact of this spectrum for retail mobile services in the future as it is unclear how much this spectrum can be meaningfully deployed for mobile services, beyond dense urban environments, given its poor propagation characteristics.

As such, we are not satisfied that failure to acquire spectrum in this allocation would significantly impede an operator's ability to compete outside of dense urban geographic areas.

### **National fixed broadband services market**

In the fixed broadband market there is increasing competition at the network infrastructure level with both fixed and wireless service providers competing in the consumer retail market.

Network improvements and technology advancements mean mobile networks are increasingly capable of delivering downstream voice and broadband services at a comparable cost and service quality to fixed networks, in terms of speed and reliability in areas where they have coverage. It is likely that this will strengthen with the advent of 5G.

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<sup>17</sup> Telstra submission, p. 25.

<sup>18</sup> Optus submission, p. 8.

<sup>19</sup> VHA submission, p. 20.

The fixed broadband market is currently undergoing structural change with the rollout of the NBN, which is nearing completion. The NBN is a wholesale only network, owned and operated by NBN Co, and uses various technologies to deliver broadband services to end-users including fibre, fixed wireless and satellite.

A number of retail service providers, including Telstra, Optus, TPG Group, VHA and Vocus Group offer retail broadband services to end-users on the NBN. Most of these providers are horizontally integrated in the retail mobiles services market as either MNOs or MVNOs.

There are also non-NBN network providers who tend to be vertically integrated and offer services in specific geographic locations. These operators may supply services over fixed wireless networks, or fibre networks.

As a result, the dominant fixed network operator NBN Co may now face competition not only from other fixed networks, such as non-NBN fibre networks, but also from wireless networks (such as mobile, fixed wireless or satellite networks).

### **Views from submissions**

Telstra considers the allocation of 26 GHz spectrum licences is likely to have a lesser impact on competition in the fixed broadband market due to the wider availability of apparatus-licensed mmWave spectrum for non-mobile (fixed) use. Telstra considers that for the purposes of this assessment, this market should be considered a national market as the ubiquity of NBN Co's national network and uniform national pricing obligations favour a national market definition.<sup>20</sup>

Optus considers that mmWave spectrum won't be a key driver in the fixed broadband market. Optus notes its 5G fixed wireless service will continue to be delivered by mid-band spectrum, such as 3.5 GHz. Optus also notes it is not clear that mmWave spectrum is required for this market as existing speeds using 3.5 GHz currently achieve an average download speed of around 150 Mbps, with a peak speed of 400 Mbps.<sup>21</sup>

VHA considers [c-i-c begins]

[REDACTED]

[c-i-c ends].<sup>23</sup>

### **ACCC view**

The ACCC considers competition in the fixed broadband market is evolving at the wholesale and retail level. With the rollout of 5G mobile networks, there will be an increase in infrastructure-based competition as mobile network operators compete with NBN Co where it is economical to do so. There is also likely to be an increase in competition at the retail level, with retail service providers having a greater choice of wholesale services (mobile or NBN) and may be able to compete more effectively with greater product differentiation.

In the event that an operator fails to acquire spectrum in this auction, it may be constrained in its ability to compete in the fixed broadband market where it intends to deploy services. The mmWave spectrum offers significant bandwidth for operators, which can enable the

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<sup>20</sup> Telstra submission, p. 13.

<sup>21</sup> Optus submission, p. 9.

<sup>22</sup> VHA submission, p. 20.

<sup>23</sup> VHA submission, p. 17.

delivery of ultra-high speed services, comparable to fixed networks. Without this spectrum, operators may not be able to offer competitive services (in terms of speed and quality of service), which could dampen the overall level of competition in this market in the future.

### **The private wireless enterprise market**

A key aspect of the enterprise market is the ability to provide connectivity to industry for delivery of a range of services and applications. There is an opportunity for existing MNOs and satellite operators to play a significant role in this market, as well as new entrants that can deploy private wireless networks on behalf of an enterprise or industry vertical.

While the products/services in this market may be heterogeneous, they could still be considered substitutes by the end-user if they meet a particular need. Products and services in this market are typically bespoke in nature, but likely have common elements.

We consider there are high barriers to entry in this market, given the network deployment costs associated with mmWave spectrum and Telstra's legacy and reputation advantage in the current enterprise market.

We acknowledge this market is nascent and still developing. However, as this spectrum is allocated with a 15-year licence, we consider it is important to think about future markets as this spectrum allocation could have a significant influence on the future market structure, and number of operators in the market as there are likely to be some services and/or applications that are only possible using this mmWave spectrum.

While there are apparatus licences available, some operators may prefer the long-term certainty and property rights offered by the spectrum licences, and as such, may place more value on these licences.

### **Views from submissions**

Optus notes that in the Government and Enterprise sector, Telstra is currently dominant, and holds approximately 90 per cent market share across several State Governments. Optus also notes that Telstra has a 74 per cent revenue market share compared to its rivals (Telstra has \$8.2 billion revenue, Optus has \$1.4 billion, TPG has \$758 million and Vocus has \$710 million). Optus considers Telstra's advantage in this market stems from its ownership of legacy monopoly ubiquitous fixed line network, with Telstra having the most extensive reach of fibre tail-ends into corporate buildings. Optus and others rely heavily on access to Telstra's wholesale business services to compete.<sup>24</sup>

Telstra submits that there is no evidence of significant barriers to entry or any action by an operator to foreclose another from entering such a market.<sup>25</sup>

### **ACCC view**

The private wireless enterprise market is a developing market and our observations are about the potential future nature of competition.

As such, we consider that failure to acquire spectrum in this action could lock out operators from participating in this developing market, and could see an operator benefit from a first-mover advantage if it obtains significantly more spectrum than its rivals. In this case, an operator could lock up the market for particular services or applications, leading to a quasi-monopoly, which could have poor outcomes for end-users.

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<sup>24</sup> Optus submission, pp. 7-8.

<sup>25</sup> Telstra submission, p. 14.

There is insufficient evidence in the public domain as well as from industry consultation about the nature of competition in a private wireless enterprise market. However, we anticipate there would be high barriers to entry such as the need to acquire sufficient spectrum and the ability to attract customers and develop bespoke solutions, requiring significant specialised expertise.

The existing enterprise market in Australia is dominated by Telstra, who likely benefits from its legacy monopoly fibre infrastructure, reputational advantage and high-switching costs for enterprise customers. While the private wireless enterprise market, enabled by mmWave spectrum differs from the existing enterprise market, this is an important opportunity to mitigate the risk of another dominant provider emerging as a result of this spectrum allocation and to promote a more competitive market structure from the early stages of market development.

### 3.3. Analysis of existing spectrum holdings

As part of our assessment, we considered the nature of existing spectrum holdings of key industry participants as spectrum is a significant determinant of an operator's ability to compete effectively in downstream markets.

Spectrum enables entry into new markets and can influence the network capacity and quality of service, as well as the geographic areas in which an operator can offer services.

This is the first opportunity for many operators to acquire high-band spectrum as it has typically only been used for satellite communications rather than mobile or fixed broadband. While there may be additional high-band spectrum available for allocation in the future, the timing of future allocations is uncertain.

Major industry participants such as the MNOs and NBN Co do not currently hold any high-band spectrum, and we do not consider that any existing spectrum bands are an effective substitute for 26 GHz spectrum.

#### Views from submissions

Telstra submits that additional mmWave spectrum has been identified for mobile telecommunications at the World Radiocommunication Conference 2019 (WRC-19) such as spectrum in the bands 37 – 43.5 GHz; 45.5 – 47 GHz; 47.2 – 48.2 GHz and 66 – 71 GHz. These bands are expected to be the focus on product and technology developments in the coming years, and are being monitoring for possible replanning by the ACMA.<sup>26</sup>

Telstra also submits that due to its technical differences, mmWave spectrum is generally expected to act as a complement to mid and low band 5G spectrum (and used for specific use cases or capacity requirements) rather than as a general substitute for other mobile spectrum bands.<sup>27</sup> Deployment is also likely to be capital intensive.<sup>28</sup>

VHA submits that **[c-i-c begins]**

[REDACTED]

**[c-i-c ends]**.<sup>29</sup>

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<sup>26</sup> Telstra submission, p. 8.

<sup>27</sup> Telstra submission, p. 29.

<sup>28</sup> Telstra submission, p. 8.

<sup>29</sup> VHA submission, p. 21.

## Ability to compete effectively in relevant downstream markets

A key issue that the ACCC has considered in providing this advice is the implications of existing spectrum holdings on competition in relevant downstream markets as a result of this allocation.

For example, an operator in mobile markets must have sufficient spectrum holdings to be a credible national competitor. Both the bands that are held and the amount of spectrum can affect an operator's ability to expand the capacity and coverage of its network and its end-users' experiences. The greater the spectrum holdings, the higher the capacity of the network and the better quality of service the end-user receives.

It is important to note that the amount of spectrum is not the only determinant of the quality of a mobile or fixed wireless network. Other factors, such as the number and location of base stations, network architecture, the quality of hardware and software and backhaul capacity, will also affect network quality.

**Table 2: Spectrum licence and wide-area apparatus licence holdings**

Band	Location	TELSTRA		OPTUS		VHA		TPG		Mobile JV		NBN Co	
		least quantity	most quantity	least quantity	most quantity	least quantity	most quantity	least quantity	most quantity	least quantity	most quantity	least quantity	most quantity
700 MHz	Australia-Wide	40	40	20	20	10	10	20	20				
800 MHz	Metro	20	20			20	20						
	Regional	30	30			10	10						
	Remote	30	30			10	10						
900 MHz	Australia-Wide	16.8	16.8	16.8	16.8	16.4	16.4						
1800 MHz	Metro	30	40	30	30	50	60		20				
	Regional	70	80	40	50		30		30				
2.1 GHz	Metro	30	60	40	40	20	50						
	Regional	20	20	10	10	10	10						
2.3 GHz	Metro			70	98								
	Regional												98
	Remote		98										98
2.5 GHz	Australia-Wide	80	80	40	40			20	20				
3.4 GHz - 3.7 GHz	Metro	60	62.5	65	100					60	60	75	75
	Regional	50	82.5		65					20	45		175

**Source:** ACMA. Spectrum holdings are spectrum licences or wide-area apparatus licences.

Our analysis of the MNO's current spectrum holdings shows:

- Telstra holds a large amount of spectrum across low and mid-bands. It does not hold any high-band spectrum. Telstra has significant spectrum holdings that can be used for 5G, however, without high-band spectrum it would likely be restricted in the types of services it could offer. Telstra may be limited in its ability to compete in some of the relevant markets if it failed to acquire spectrum in this allocation.
- Optus has a large amount of mid-band spectrum, and has limited low-band spectrum. Optus does not have any high-band spectrum. If Optus failed to acquire spectrum in this allocation, it may be limited in its ability to compete in some of the relevant markets.
- For the purposes of this analysis, we are assuming that the VHA/TPG Telecom merger proceeds and that VHA therefore has access to TPG's existing spectrum holdings. A combined VHA/TPG has some low and mid-band spectrum. Its ability to re-farm existing spectrum for 5G appears to be limited in the short-term, but may be bolstered by TPG's low and mid-band spectrum. If VHA failed to acquire spectrum in this allocation, it may be limited in its ability to compete in some of the relevant markets.

We also considered NBN Co's spectrum holdings as NBN Co may be interested in this spectrum, given its application for fixed wireless access.

NBN Co has mid-band spectrum in the 3.4 GHz and 2.3 GHz bands, which it currently uses for fixed wireless. If NBN Co intends to deliver services in the enterprise market (which may be outside its remit), it would likely be limited in its ability to compete in this market. In terms of the fixed broadband market, we do not consider NBN Co would be hindered in its ability to compete if it failed to acquire spectrum in this allocation.

We have also considered each MNO's holding in regards to its ability to deploy 5G networks, as set out in Table 3, as the 26 GHz spectrum to be allocated will play an important part in these networks.

### **Ability to deploy 5G networks in Australia**

In Australia, the MNOs are in the early stages of deploying 5G mobile networks, which are anticipated to deliver a variety of new and innovative services as well as broader productivity benefits for the economy.

Operators require a diverse spectrum portfolio to deliver 5G, including a mix of low, mid and high-band spectrum. An operator may cease to be an effective competitor in the long-term if it does not have a suitable path to 5G deployment.

A key principle of our assessment framework and a communications policy objective for the 26 GHz allocation is supporting the deployment of 5G. As such, we have considered each operator's spectrum portfolio for deployment of 5G, as set out in Table 3.

As the MNOs do not currently hold any high-band spectrum, depending on their intentions for 5G deployment and service offerings, it is likely that they will all require some of this high-band spectrum.

We understand the standards for mmWave spectrum are still being finalised (Release 16 of 3GPP 5G standards is due in June 2020), and that some aspects such as the maximum channel bandwidth for 26 GHz spectrum is yet to be finalised. VHA also

**[c-i-c begins]**

**[c-i-c ends].**<sup>30</sup>

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<sup>30</sup> VHA submission, pp. 10-11.

**Table 3: Analysis of MNO’s long-term route to 5G**

Operator	Spectrum available for early 5G deployments	Spectrum for long-term route to offer wide range of 5G services	Observations
<b>Telstra</b>	<b>Yes</b> – mid-band [3.4 GHz, 3.6 GHz]	<b>Low-band</b> – 700 MHz, 800 MHz, 900 MHz*  <b>Mid-band</b> – 1800 MHz, 2 GHz, 2.3 GHz (regional only) 2.5 GHz, 3.4 GHz, 3.6 GHz  <b>High-band</b> – nil	Telstra has large low-band and mid-band holdings, it appears to have plans to re-farm some existing holdings for 5G in the short term.
<b>Optus</b>	<b>Yes</b> – mid-band [3.4 GHz, 3.6 GHz]	<b>Low-band</b> – 700 MHz, 900 MHz*  <b>Mid-band</b> – 1800 MHz, 2 GHz, 2.3 GHz, 2.5 GHz, 3.4 GHz, 3.6 GHz (regional only)  <b>High-band</b> - nil	Optus has very limited low-band spectrum, but a large amount of mid-band spectrum that could be used for 5G. It is unclear when Optus would be able to re-farm some of its existing spectrum for 5G.
<b>VHA/TPG</b>	<b>Yes</b> – mid-band [3.6 GHz]	<b>Low-band</b> – 700 MHz, 800 MHz, 900 MHz*  <b>Mid-band</b> – 1800 MHz, 2 GHz, 2.5 GHz, 3.6 GHz  <b>High-band</b> – nil	VHA/TPG have some low-band spectrum, and some mid-band spectrum but less in regional areas. It is unlikely VHA/TPG will be able to existing re-farm spectrum for 5G in the short term.

In Australia, it is likely that residential use of high-band spectrum will be limited to home wireless broadband in the near future given the limited range of the spectrum and need to deploy significant numbers of small cell sites to support it.

We note the device and equipment ecosystem to support the 26 GHz band is still under development. Telstra submits that [c-i-c begins]

[REDACTED]

[c-i-c ends].<sup>31</sup>

### 3.4. Apparatus licences in the 26–28 GHz bands

The ACMA proposes to allocate apparatus licences adjacent to the spectrum licences in the 26 GHz band. An overview of the licensing arrangements is shown in Figure 1.

We understand the ACMA has been working with industry to develop the apparatus licence technical framework for the 26 and 28 GHz band. It is expected that apparatus licences will be available from the end of 2020.

<sup>31</sup> Telstra submission, p. 10.



The Minister asked the ACCC to provide advice on any competition issues associated with the apparatus licences and whether restrictions on allocation of apparatus licences should be applied. The Minister also asked for the ACCC to consider whether apparatus licensed spectrum holdings in the 26 and 28 GHz bands should be taken into account for any allocation limits on the 26 GHz spectrum licences.

### Views from submissions

Submissions agreed that the spectrum and apparatus licences were complements rather than substitutes given the different technical parameters of these licences.

Telstra notes that the conditions of apparatus licences in the 26 and 28 GHz bands are different, and limit use to fixed wireless and satellite only (compared to spectrum licences, which allow mobile use). This means there is different utility of these licences for traditional wide area mobile use. Telstra is concerned that competition may be harmed if MNOs are forced (by way of a combined allocation limit) to use valuable 26 GHz wide-area mobile spectrum for non-mobile or localised use cases.<sup>32</sup>

Optus submits that while there may be complementarities in the potential use and issue of apparatus licences across the 26 GHz and 28 GHz bands this is not the forum to discuss any future restrictions on the take up or award of these non-spectrum licence types. Optus acknowledges that while there is potential for a single licensee to 'hoard' significantly large bandwidths of available apparatus licences, there remains insufficient evidence to support the imposition of any allocation limits for these licence types at this stage.<sup>33</sup>

Communications Alliance Satellite Services Working Group expressed concerns that the ACCC was contemplating allocation limits across the entire 26 GHz and 28 GHz range, even though these bands are not direct substitutes for the 26 GHz spectrum licences.<sup>34</sup>

The Australian Radio Communications Industry Association (ARCIA) submits that with the potential for enterprise systems there will be a much higher demand for apparatus licence services as many of these will be within a defined area and not operating over large areas. ARCIA considers that significant spectrum should be held for enterprise systems.<sup>35</sup>

VHA submits that [c-i-c begins]

[REDACTED]

[c-i-c ends].<sup>36</sup>

### ACCC recommendation

The ACCC does not have any significant concerns about competition issues associated with the apparatus licences in the 26-28 GHz band at this stage. As such, we do not consider it necessary to take into account any spectrum licence holdings for future allocations of apparatus licences in the 26-28 GHz band.

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<sup>32</sup> Telstra submission, p. 10.

<sup>33</sup> Optus submission, p. 15.

<sup>34</sup> Communications Alliance Satellite Services Working Group (SSWG), *Submission to the ACCC's Allocation limits advice for the 26 GHz spectrum allocation* (Comms Alliance SSWG submission) (March 2020), p. 5.

<sup>35</sup> Australian Radio Communications Industry Association, *Submission to the ACCC's Allocation limits advice for the 26 GHz spectrum allocation* (ARCIA submission) (March 2020), p. 4.

<sup>36</sup> VHA submission, pp. 17-18.

As noted earlier, the ACMA has designed the band with a range of spectrum, apparatus and class licensing measures. This mix is intended to both protect incumbent users and also provide for an appropriate mix of potential wireless broadband network types thereby ensuring that spectrum moves to its highest value use.<sup>37</sup>

However, as both the spectrum and apparatus licences can be used to supply fixed broadband services, there may be potential for monopolisation of these licences, particularly given the likely administrative allocation of the apparatus licences.

We consider the risk of monopolisation across these licences to be low at this stage given the views expressed in submissions and, in particular, uncertain demand for apparatus licences. However, we note that this risk could be mitigated by administrative procedures available to the ACMA such as timing the release of apparatus licences until after the spectrum auction or by the ACMA imposing conditions on the apparatus licences to ensure the spectrum is put to immediate use.

These kind of provisions will support the underlying policy intent of the apparatus licence regime in the 26-28 GHz bands being to provide flexibility to operators to deploy services to meet specific needs in localised areas.

The ACMA also has powers to impose restrictions on the allocation and licences if any anti-competitive behaviour were to become apparent in the future. As the apparatus licences are issued for up to five-year terms, the licence conditions and allocation can be reviewed more periodically than the 15-year spectrum licences, and may be a more appropriate way to address any issues that arise in the medium-term.

## 4. Allocation limits

### 4.1. Should an allocation limit be imposed?

In making our assessment as to whether allocation limits should apply for this allocation, we have had regard to the following principles:

- promoting competition in downstream markets for the LTIE, and to encourage investment in infrastructure and innovation,
- supporting deployment of 5G technologies, including opportunities to acquire 5G spectrum in the future and technical requirements for deploying 5G services, and
- promoting the economically efficient allocation and use of spectrum to maximise public value from spectrum, including mitigating the risk of spectrum monopolisation, under-utilisation and very asymmetric spectrum holdings.

In an unrestricted auction, a bidder may have incentives to acquire spectrum in order to preclude its competitors from doing so in order to undermine its competitors' ability to compete in the downstream markets.

We acknowledge there is a large amount of spectrum available at this auction, however, we understand that to maximise the benefits of this spectrum each operator requires a sizeable holding.

There remains significant uncertainty surrounding this auction as demand from industry is tentative, device and equipment availability is nascent and localised, and end user services are yet to be widely developed.

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<sup>37</sup> ACMA, *Future use of the 26 GHz band – Planning decisions and preliminary views* (April 2019), p.12.

Submissions varied in the amount of spectrum considered necessary to support 5G deployments in mobile or fixed applications. For example, BAI Communications submits that 200 MHz was the minimum allocation needed to enable high-speed mobile wireless 5G, while 400 MHz was an optimal allocation.<sup>38</sup> VHA submits [c-i-c begins]

[c-i-c ends].<sup>39</sup>

For fixed deployments, VHA submits [c-i-c begins]

[c-i-c ends].<sup>40</sup> BAI Communications also considers 400 MHz is the minimum and 800 MHz is optimal for ultra-high speed fixed wireless services using mmWave spectrum.<sup>41</sup>

We have concerns that operators may be locked out of future markets or opportunities to provide new services, due to their failure to acquire spectrum in this allocation. We are also concerned about the potential for spectrum to be monopolised by an operator and very asymmetric spectrum holdings dampening future competition as operators look to ‘future-proof’ their spectrum portfolio given the uncertainty of future deployment business cases.

### Views from submissions

Optus supports the use of allocation limits to ensure no one MNO is able to acquire dominance in spectrum assets to the detriment of competition. Optus supports allocation limits for this auction to ensure the development of a competitive 5G market in Australia and prevent monopolisations of this band. The allocation of this spectrum would likely provide significant first mover advantages, especially in the enterprise market.<sup>42</sup>

NBN Co considers [c-i-c begins]

[c-i-c ends].<sup>43</sup>

Telstra submits that MNOs have strong incentives to acquire sufficient spectrum to maximise the service potential of their 5G networks. 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 of hoarding spectrum for anti-competitive purposes. Given the current state of mmWave technology and declining marginal value of additional spectrum lots, it does not expect demand to materially exceed 1 GHz to 1.2 GHz per MNO, hence even without allocation limits there would remain potential for several bidders to win spectrum in the auction.<sup>44</sup>

VHA supports [c-i-c begins]

[c-i-c ends].<sup>45</sup>

BAI Communications supports an allocation limit and submits that if the major carriers obtain the majority of the spectrum allocation in both the 26 GHz and 28 GHz frequency bands, then it will be very difficult for new competitors and application suppliers to enter the 5G mmWave market.<sup>46</sup>

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<sup>38</sup> BAI Communications submission, p. 4.

<sup>39</sup> VHA submission, p. 9.

<sup>40</sup> VHA submission, pp. 9-11.

<sup>41</sup> BAI Communications submission, p. 1.

<sup>42</sup> Optus submission, p. 9.

<sup>43</sup> NBN Co submission, p. 4.

<sup>44</sup> Telstra submission, p. 20.

<sup>45</sup> VHA submission, p. 10.

<sup>46</sup> BAI Communications submission, p. 3.

## ACCC recommendation

The ACCC considers that allocation limits should be imposed for the auction of 26 GHz spectrum licences.

In the absence of allocation limits, there is a risk of monopolisation and very asymmetric holdings in high-band spectrum as a result of this auction. Allocation limits should be imposed to safeguard future competition and ensure that all operators have the opportunity to acquire high-band spectrum. This will mitigate the risk that any one operator has a first-mover advantage given the uncertainty around future markets that will use this spectrum.

We want to ensure that any operator does not have a competitive advantage over others in the future due to the nascent nature of some relevant markets for this spectrum. We note that internationally many regulators are delaying the allocation of high-band spectrum or issuing shorter, temporary licences, in recognition that the equipment and device ecosystem, and end user demand is lagging for high-band spectrum.

### 4.2. What allocation limit should apply?

The ACCC has explored a number of options for different allocation limits.

Internationally, operators have been able to acquire between 200 MHz to 1200 MHz in high-bands such as 26 GHz and in the majority of cases, the operators have acquired less than the allocation limit.

#### Views from submissions

Submissions generally agreed that allocation limits should only apply to spectrum licences in 26 GHz, rather than a combined limit across the spectrum and apparatus licences. However, NBN Co submits **[c-i-c begins]**

**[c-i-c ends]**.<sup>47</sup>

Optus recommends a limit of 800 MHz to apply to all geographic areas, to support the opportunity for at least three operators to acquire spectrum in the auction. This limit will allow networks to deliver peak speeds greater than 20 Gbps, consistent with ITU 5G specifications.<sup>48</sup>

Telstra recommends a limit of at least 1000 MHz (1 GHz) to apply to all defined areas. Telstra considers that a limit of less than 1000 MHz would restrict an operator's optionality during the auction, which would constrain or disincentivise further 5G deployment, investment and development. 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.<sup>49</sup> Telstra suggests the same limit apply to all geographic areas to enable and incentivise operators to roll out a similarly high quality of service to both regional and metropolitan customers. Telstra notes that some major regional towns generate as much traffic and load on a per-site basis as in metropolitan areas.<sup>50</sup>

VHA recommends **[c-i-c begins]**

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<sup>47</sup> NBN Co submission, p. 4.

<sup>48</sup> Optus submission, p. 2.

<sup>49</sup> Telstra submission, p. 27.

<sup>50</sup> Telstra submission, pp. 27-28.

[c-i-c ends].<sup>51</sup>

BAI Communications recommends an allocation limit of 600 MHz is imposed for the 26 GHz band and a total limit of 1000 MHz is applied across all regulated spectrum and apparatus licensed bands, including the 26 GHz and 28 GHz bands (i.e. from 700 MHz to 30 GHz). Both limits should apply in any given geographic area.<sup>52</sup>

### **Recommended allocation limit**

The ACCC recommends that an allocation limit be set for this auction such that no bidder can obtain more than 1000 MHz of 26 GHz spectrum in any geographic area in the auction.

This allocation limit will promote competition and other communications policy objectives because it reduces the risk that spectrum will be monopolised as a result of the allocation, and provides an opportunity for a number of operators to acquire a sizeable contiguous allocation of spectrum to deploy an effective 5G services.

The recommended limit of 1000 MHz is based on the assumption that there are three large bidders in the auction (Telstra, VHA and Optus). If there were to be more bidders, we would likely recommend a more restrictive limit, such as 800 MHz. For example, if NBN Co were to participate in the auction and seek up to 800 MHz, this would lead to aggregate demand of potentially more than 3200 MHz, which would likely see some operators unable to acquire their desired spectrum holding.

Further, our analysis is based on a limited amount of information from a small pool of industry stakeholders who engaged in our consultation process and as such, we are hesitant to suggest that we have captured total demand for this spectrum. In particular, as this spectrum has wider applications and use cases than previously auctioned spectrum bands, there may be additional demand from other stakeholders, including from other industry sectors, in the auction.

We note the starting price will be important for this auction and should be considered in conjunction with the allocation limit. As there is a large amount of spectrum available at auction, the allocation limit combined with the reserve price may incentivise strategic bidding in some areas.

The Minister also asked the ACCC to consider what indicators of market change would be significant enough to warrant a review of allocation limits after they have been set.

The ACCC considers that allocation limits should be re-evaluated for appropriateness in the event that anyone other than the MNOs decide to participate in the auction, or if there are more than three bidders.

While this may be unlikely, allocation limits are extremely sensitive to demand, as witnessed in the 3.6 GHz spectrum allocation, and are based on an assumption about the number of bidders. In the event that the number of bidders changes, this can mean that the allocation limits may no longer be appropriate.

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<sup>51</sup> VHA submission, p 4.

<sup>52</sup> BAI Communications submission, pp. 1-3.