# Future use of the upper 6 GHz band

# TPG Telecom response to ACMA

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Public submission

## Introduction

TPG Telecom welcomes the opportunity to respond to the ACMA consultation on planning options for the Upper 6 GHz band.

The importance of this planning decision cannot be understated, as the Upper 6 GHz band potentially represents one of the last remaining releases of valuable C-band spectrum.[1] Spectrum in this frequency range is crucial in addressing the IMT industry's future capacity needs – the ample bandwidth, combined with reasonable propagation characteristics make this band ideally suited for a widely-deployed capacity layer.

Mobile connectivity is increasingly seen as a fundamental necessity and a gateway to accessing essential services. Ever-increasing user requirements will put a strain on mobile networks if capacity concerns are not addressed. By far the most effective way to bolster network capacity is by the addition of more spectrum bands (second to increasing existing spectrum bandwidth). Traffic demand will be further compounded as Fixed Wireless Access (**FWA**) transitions towards more mainstream technology use. Further, 6G-related traffic demand is anticipated to increase as we head into the next decade.

To fully realise the public benefits, both economic and social, from enhanced connectivity, we encourage the ACMA to consider an IMT / WA WBB allocation of the Upper 6 GHz band.

TPG Telecom firmly believes that any complexity associated with an WA WBB allocation is easily outweighed by the benefits enabled by enhanced mobile connectivity. Moreover, the proceeds from an WA WBB allocation will indirectly flow into public benefits. In contrast, an RLAN allocation would forego those proceeds. TPG Telecom is also open to a metro-only re-allocation, with the licence boundaries to be defined through further consultation.

TPG Telecom endorses the submission made by the Australian Mobile Telecommunications Association (**AMTA**). This submission supplements the points made in AMTA's submission.

## Preferred planning option: TPG Telecom strongly favours Option 3 i.e. to allocate the whole Upper 6 GHz band to WA WBB

For the past decade, annual mobile traffic growth has always exceeded 20%, even reaching highs of nearly 100% year-on-year in 2018.[2] Such figures are in excess of the corresponding figures for fixed broadband networks, which are around 10%.[3]

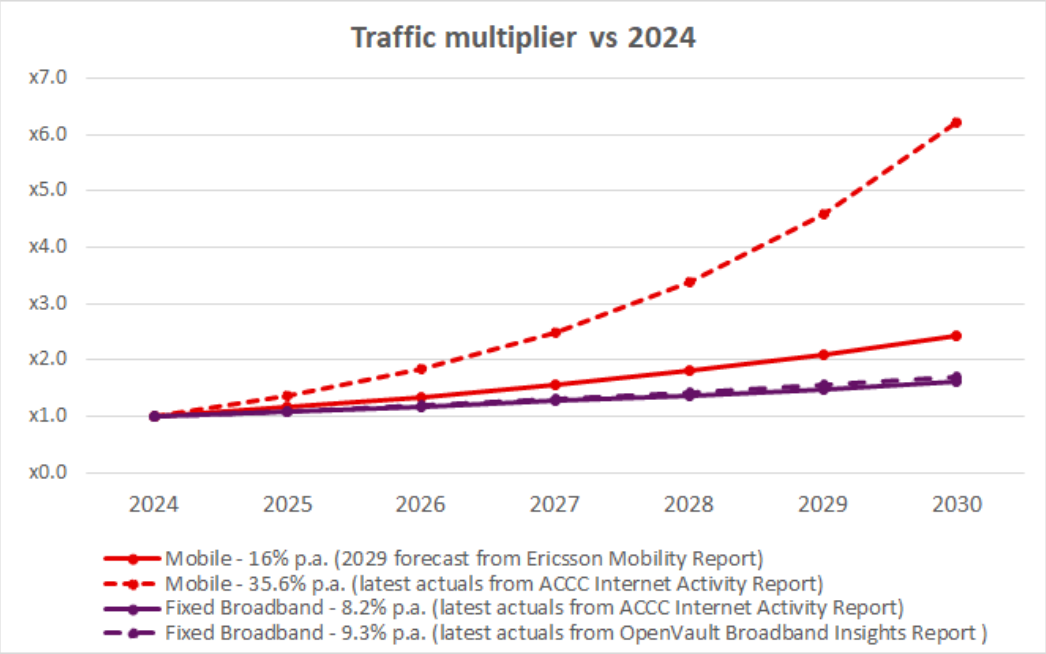
Data from the ACCC reflects this position, with the biannual Internet Activity Report showing a 35.6% year-on-year growth for mobile as of June 2023. In contrast the increase in data over

[1] C-band in this instance refers to frequences between 4 GHz and 8 GHz, but also includes the 3.5 GHz band, which is commonly referred to as C-band despite falling just outside of the IEEE-designated frequency range.
[2] https://www.ericsson.com/49e25e/assets/local/reports-papers/mobility-report/documents/2024/ericsson-mobility-report-june-2024.pdf
https://amta.org.au/wp-content/uploads/2021/12/Ericsson-Mobility-Report-November-2021-ericsson-mobility-report-november-2021.pdf
[3] https://openvault.com/wp-content/uploads/2024/02/OVBI_4Q23_Report_v3.pdf
https://openvault.com/wp-content/uploads/2022/03/OVBI_4Q21_Report_FINAL-1.pdf

NBN was only 8.2%.[4]

The compounding nature of annual traffic growth means that by the end of the decade, mobile traffic will have grown between 1.4 to 3.9 times more than that of fixed broadband traffic.

*Figure 1 – Traffic growth forecasts for mobile and fixed broadband traffic*




While the root causes of this growth rate discrepancy would require further analysis, the difference in user terminal types and divergent user behaviour is likely to play a part. For instance, mobile devices / smartphones tend to get upgraded more frequently, receiving more software updates than, for example, a TV which would only be replaced every 6 to 7 years on average[5] and would exhibit relatively static usage behaviour e.g. Video on Demand (**VOD**) streaming, mostly in the hours between 19:00 to 23:00. The advent of Artificial Intelligence (**AI**) is likely to further entrench this traffic growth discrepancy.

This illustrates why the requirement of IMT is so much greater than RLAN. In fact, the 2021 Coleago report on spectrum needs in Australia calculated that the IMT industry will need a further 527 MHz to 827 MHz of mid-band spectrum by 2030 in the two largest capitals.[6] Accounting for the 3.7 GHz auction in 2023, this still leaves a mid-band deficit of up to 727 MHz.

[4] https://www.accc.gov.au/system/files/internet-activity-report-june-2023.pdf. It is worth noting that these figures are not always directly comparable due to different reporting methods (eg. data timestamp, network-wide vs per-SIO, and so on) but they do provide a sense of the differing magnitude of data usage growth by technology.

[5] https://www.circana.com/intelligence/press-releases/2023/new-circana-report-reveals-first-signs-of-an-upcoming-tv-purchase-refresh-cycle/

[6] https://amta.org.au/wp-content/uploads/2021/12/Coleago-Report-Demand-for-mid-bands-spectrum-in-Australia.pdf

## Consideration of alternative options

In relation to the alternative options raised in the ACMA's paper, Option 4 is not a desirable option, with its utility heavily influenced by the frequency segmentation specifics. TPG Telecom's view is that any option that allocates less than 700 MHz to WA WBB would reflect a missed opportunity. TPG Telecom's perspective on segmentation is detailed later in this submission.

Option 1 is a prudent option. As outlined in the ACMA's consultation paper, ITU harmonisation of the Upper 6 GHz band is currently in progress. There is positive development, such as 3GPP band n104 being designated for this frequency. IMT identification in ITU-R Region 1 also bodes well for ecosystem development. Having said this, TPG Telecom sees Option 1 as reasonable interim option, as harmonisation efforts for Region 3, which includes Australia, are still under way.

TPG cautions against the adoption of Option 2. TPG Telecom considers Option 2 as a missed opportunity for the reasons outlined below:

1. **Wi-Fi vs backhaul capacity – NBN plans are the bottleneck, not spectrum**

   Performance improvement should be viewed as an end-to-end proposition. For any benefit on the access network to be realised there has be a corresponding performance capability in the transmission network (often referred to as 'backhaul').

*Table 1 - NBN SIO breakdown by plan*

| NBN plan | SIO | % |
|---|---|---|
| 12 Mbps | 644,975 | 7.3% |
| 25 Mbps | 1,640,657 | 18.7% |
| 50 Mbps | 4,303,867 | 48.9% |
| 100 Mbps | 1,552,869 | 17.7% |
| 250 Mbps | 214,090 | 2.4% |
| 500 Mbps | 1,620 | 0.02% |
| Home Ultrafast * | 137,944 | 1.6% |
| 1000 Mbps | 1,268 | 0.01% |
| Sky Muster Plus | 49,240 | 0.6% |
| Wireless Plus | 248,374 | 2.8% |

** Home Ultrafast = 1000MbpS*

*Source: NBN SIO RKR - Disclosure Tables - 31 March 2024*

As can be seen in Table 1, NBN 50 (i.e. a 50Mbps backhaul service) is the most popular NBN plan, and has been since 2018[7], indicating a lack of demand for very high-speed products.

[7] https://www.accc.gov.au/by-industry/telecommunications-and-internet/telecommunications-industry-record-keeping-and-reporting-rules/nbn-services-in-operation-record-keeping-rules

Admittedly, pricing also plays a part in this but the distribution of SIO numbers between the various speed tiers is self-evident. While it is also true that some of the fibre technologies, such as Fibre-to-the-Node (**FTTN**), struggle to achieve 100Mbps download speeds, NBN offers free upgrade to Fibre-to-the-Premise (FTTP) for customers who opt for high speed plans (i.e. greater than 100Mbps). Yet the uptake of that offers remains very slow, again underscoring the low demand.

To further illustrate the discrepancy between backhaul throughput and Wi-Fi technology, let's take an example based on Wi-Fi 4 (a 15-year old technology) with the smallest channel (20MHz) and a single stream (contrasting with the 16 MIMO streams that Wi-Fi 7 is capable of). This Wi-Fi set-up can achieve speeds up to 288Mbps, however a mere 1.6% of users can achieve such speeds (see Table 1).
This real-world scenario highlights the throughput differential between the backhaul and access network; thus creating a bottleneck that additional access spectrum will not solve.

2. **Wi-Fi upgrade cadence – an inefficient method of capacity increase**

   Wi-Fi hardware upgrades are an inefficient way to deliver capacity benefit and subsequent performance improvement to the end user. Wi-Fi terminals typically exhibit long upgrade cycles. This upgrade cadence for routers is commonly driven by change of service provider or hardware fault. A trend that continues for other connected devices in the home. For example, a laptop upgrade cadence of (3~5 years) is typical and smart televisions cadence of 10 years, commonplace. In contrast the upgrade cadence of mobile handsets is closer to every 2-3 years. This means that consumers do not typically see the benefits of new Wi-Fi technologies for many years.

3. **Wi-Fi is ill-suited to support emerging technologies**

   Many of the emerging technologies, such as connected cars for example require an access technology with high reliability, low latency connection. Others such as Mobile Private Networks (**MPN**), have to adhere to strict KPI's which can be supported by 5G. In contrast Wi-Fi is not bound to the same performance standards.

**Frequency segmentation**

TPG Telecom considers all 700 MHz of the available spectrum should be allocated to WA WBB. If this approach is not adopted, any frequency segmentation should be implemented in a manner which does not hinder IMT operators obtaining multiples of 100 MHz, as this ensures maximum spectrum utility.

Notwithstanding, TPG Telecom is cognisant of the fact the WA WBB segments being a multiple of 100MHz does not guarantee operators will end up holding whole 100 MHz multiples. This would depend on a multitude of factors, such as TOB re-allocation, any guard-band requirement, and also the minimum lot size decided on if there is to be an auction for the WA WBB segment.

In regard to the option of aligning to the Wi-Fi raster, TPG Telecom does not see an imperative to align with the larger channel bandwidths because:

- Larger channels can co-exist with smaller channels eg. 160/320 MHz below 6425 MHz and smaller above.
- Large bandwidths such as 320MHz are only likely to be usable in less common situations representing an ideal circumstance eg. user terminal in the vicinity of the Access Point (**AP**) and no neighbouring AP causing interference. This is because the low transmit power inherent in unlicensed use is further diluted by the large bandwidth and signal noise also increases with bandwidth – this combination of low power spectral density (**PSD**) and low signal-to-noise ratio (**SNR**) tends to limit coverage.
- The new Wi-Fi 7 standard can achieve high throughputs without resorting to 160/320MHz bandwidth:
    - Multi-Link Operation (MLO) allows different frequencies (2.4 GHz, 5 GHz, 6 GHz) to be used simultaneously to increase capacity.
    - Channels can be aggregated – contiguous and non-contiguous 80+160MHz and 160+160MHz will be introduced with Wi-Fi 7, while 80+80MHz is already supported by Wi-Fi 6.
    - Multiple MIMO streams will drastically increase throughput – up to 16 streams with Wi-Fi 7, up to 8 streams with Wi-Fi 6.

*Frequency segmentation will lead to ecosystem fragmentation*

Frequency segmentation is undesirable from an ecosystem point-of-view, potentially leading to higher costs for both Wi-Fi AP's and IMT radio equipment. Requirement for Australia-specific variants have often caused troubles for our company in the past.

**Other segmentation options**

*Geographic segmentation*

TPG Telecom agrees with the ACMA's characterisation of the geographic spread of RLAN and WA WBB, where demand will overlap too much for geographic segmentation to be viable.

However assigning Upper 6 GHz to WA WBB in metro areas only, while leaving incumbents in regional areas, could be a viable option. This would address the main demand coming from metro areas, but much easier to implement than a nation-wide reallocation given the heavy use of P2P links in regional Australia.

Another form of metro-regional split could be to allocate all of Upper 6 GHz to WA WBB, but have a much longer reallocation deadline for regional areas.

*Non-traditional sharing model*

TPG Telecom agrees with the ACMA assessment of other non-traditional sharing models. These models are still too experimental and complicated to be adopted and carry a high risk

of detracting from the individual benefits of each technology.

We trust this submission assists with the ACMA's consideration of the future use of the Upper 6 GHz band and welcome any further discussions with the ACMA in relation to the matters outlined in this submission.