



Submission in response to
ACMA Options Paper

**Future use of the 3.6Ghz
band**

Public Version

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Section 1. EXECUTIVE SUMMARY

- 1.1 Optus welcomes the opportunity to respond to the Australian Communication and Media Authority's (ACMA) *Future of the 3.6GHz band Options Paper* (Options Paper).
- 1.2 Optus comments are provided from the perspective of its mobile and satellite operations. As background, Optus holds apparatus licences for a satellite earth stations in the 3.6GHz band at Lockridge, Western Australia (WA) and the adjacent 3.7GHz band at Lockridge (WA), Regency Park South Australia and Oxford Falls (New South Wales).
- 1.3 Optus acknowledges the ACMA's view that the 3.6GHz band is a candidate band to provide early deployment of 5G.
- 1.4 Optus supports the ACMA's proposal to reallocate 125MHz of spectrum in the 3.6GHz band (3575 – 3700MHz) across metro and regional areas via auction for future wide-area broadband that is, mobile or fixed use.
- 1.5 To take account of developments in device and equipment eco systems and standards Optus suggests the auction for 3.6GHz band be held in late 2019.
- 1.6 Optus also supports:
 - (a) a three-year reallocation period from 2019 for incumbent satellite earth stations located in 3600-3700MHz band;
 - (b) a consistent approach to timing for reallocation of fixed and satellite incumbent users;
 - (c) the existing satellite protection zone at Mingenew; and
 - (d) identification of new satellite protection zones in both Eastern Australia and Northern Australia.
- 1.7 In terms of the format of allocated lots, Option 3(c) suggests lots be configured on a metro, outer metro and regional basis. Optus supports this proposal on the basis that it will provide bidders with the flexibility to acquire lots based on individual geographic demand.
- 1.8 Optus also supports the proposed early access regime so spectrum acquired at auction can be accessed as satellite and fixed incumbents vacate the band.
- 1.9 Optus does not support the proposals for dynamic spectrum sharing on the basis that current frameworks and processes lack maturity and pose a high potential risk of failure.
- 1.10 Optus is advancing its preparations of 5G including:
 - (a) turning on its 4.5G network at Macquarie Park, NSW in February 2017 that is expected to reach 70% of Optus' network in Sydney, Melbourne, Brisbane, Perth and Adelaide within 12 months; and
 - (b) completing a successful infield trial of massive MIMO technology. The trial achieved an eight-fold increase in cell capacity of what is currently being experienced through existing 4G cell sites.

- 1.11 Optus also recently announced its intention to spend \$1 billion to improve and expand its mobile network in regional Australia by the end of June 2018.¹ This investment builds on Optus' ongoing investment program which has directed more than \$3.6 billion into its mobile networks since 2015.²
- 1.12 Optus notes that the successful deployment of 5G in Australia will rely on significant commercial investment; and while Mobile Broadband (MBB) may be the highest value use for 3.6GHz, setting high valuation expectations at this stage could act as a barrier to commercial investment that in turn will impact 5G deployment in the near future.
- 1.13 While not in scope for this Options Paper, Optus reiterates its continued support for the 1.5GHz band to progress as soon as possible from the preliminary replanning stage to the re-farming stage in the ACMA's process for considering additional spectrum for 5G.

¹ <https://media.optus.com.au/media-releases/2017/optus-to-invest-1-billion-to-improve-regional-mobile-coverage/>

² Ibid

Section 2. RESPONSES TO ISSUES FOR COMMENT

Provided below is Optus' response to specific questions raised in the Options Paper.

1. Should the 3.6 GHz band be progressed from the preliminary replanning stage to the re-farming stage in the ACMA's process for considering additional spectrum for MBB services? Why/Why not?

Optus supports the 3.6GHz band being progressed from the preliminary replanning stage to the re-farming stage in the ACMA's process for considering additional spectrum for future wide area broadband services (mobile or fixed).

Optus' supports the ACMA's view that the highest value use for 3.6GHz is wide-area mobile and fixed broadband networks and acknowledges that the band has been flagged as a potential option for early 5G use.

Spectrum is a critical regulated business input and certainty over spectrum availability and timing to support future 5G networks remains a priority for Optus.

The road to 5G is occurring in step with unrelenting growth in demand for mobile broadband and broader economy-wide recognition its role in driving growth in productivity.

For example, Ericsson's June 2017 Mobility Report³ forecasts:

- 5G subscriptions will exceed half a billion by the end of 2022;
- 5 billion LTE subscriptions by the end of 2022;
- in 2022 there will be 9 billion mobile subscriptions and mobile broadband will account for more than 90% of all subscriptions;
- mobile video traffic is forecast to grow by around 50% annually to 2022, when video will account for around 75% of mobile data traffic;
- more than 90% of mobile data traffic will come from smartphones in 2022;
- Asia- Pacific, as the most populous regions, has the largest share of mobile data traffic and total mobile data traffic for the regions is expected to exceed 30 Exabytes in 2022;
- there will be 1.5 billion IoT devices with cellular connection by 2022; and
- in 2022, around 15% of the world's population will be covered by 5G.

AMTA's commissioned research by Deloitte Access Economics⁴) found that mobile telecommunications create significant benefits in terms of productivity and workforce participation. Specifically, the research showed that Australia's economy was \$42.9 billion (2.6% of GDP) bigger in 2015 than it would otherwise have been because of the benefits generated by mobile technology take-up.

³ Ericsson Mobility Report, June 2017, Mobile Traffic Q1 2017, page 11

⁴ <https://www2.deloitte.com/au/en/pages/economics/articles/mobile-nation.html>

Meeting and planning to meet such growth in demand requires significant commercial investment.

Optus recently announced its intention to spend \$1 billion to improve and expand its mobile network in regional Australia by the end of June 2018.⁵ This investment builds on Optus' ongoing investment program which has directed more than \$3.6 billion into its mobile networks since 2015.

Optus is also advancing its preparations for 5G. For example:

4/5GHz network

- In February 2017, Optus turned on its 4.5G network across Macquarie Park achieving testing throughput speeds of 1.03Gbps by utilising 4.5G technologies of 4CC/5CC Carrier Aggregation, 4x4MIMO and 256QAM. (*The area selected offers a wide range of infrastructure: a university, shopping centre, transport hubs and a strong cross section of residential and business customers across 10 square kilometres.*)
- Our 4.5G rollout is expected to reach 70% of Optus' network in Sydney, Melbourne, Brisbane, Perth and Adelaide within 12 months with customers experiencing higher throughput speeds now, which will accelerate as 4.5G capable devices are released into the market during 2017.⁶

Steps towards 5G

- On 26 February 2017, Optus and Huawei completed a successful infield trial of massive MIMO (128T 128R) technology. The trial achieved aggregate cell throughput of 665Mbps over a single frequency channel of 20MHz on Optus' 2300MHz frequency band, shared by 16 devices.
- The objective of the trial is to consider how to improve the capacity and efficiency of current spectrum assets in as a step towards 5G.
- The trial demonstrated an eight-fold increase in cell capacity of what is currently being experienced through existing 4G cell sites. These results will be used to inform Optus technical roadmap for 5G.⁷

Standard development for 5G.

Optus strongly supports the use of 3GPP standards for mobile networks to maximise the synergies with global developments and ensure more streamlined coordination with other systems. In developing its approach to 3.6GHz, from allocation format to technical frameworks, the ACMA should continue to engage with industry to factor in technology development for 5G and beyond. For example, advanced antennas, beam forming and the need for wider bandwidths.

⁵ <https://media.optus.com.au/media-releases/2017/optus-to-invest-1-billion-to-improve-regional-mobile-coverage/>

⁶ <https://media.optus.com.au/media-releases/2017/optus-launches-4-5g-network-across-macquarie-park/>

⁷ <https://media.optus.com.au/media-releases/2017/optus-and-huawei-take-another-step-towards-5g/print/>

2. Do the areas identified in this analysis cover the likely areas of high demand for access to the 3.6 GHz band? Would smaller or larger areas be more appropriate? Why?

Optus considers that the proposed metro and regional areas are likely areas of high demand for access to the 3.6GHz band. These are the geographic locations with the most-dense population and transport routes.

As noted in the AMTA submission:

“Metro and regional areas will likely benefit most from the ultra-reliable low latency communications (URLLC) and massive machine-type communications (mMTC) 5G use cases, for example for autonomous vehicles and smart agriculture.”.

3. If any part of the 3.6 GHz band is re-allocated for the issue of spectrum licences is seven years a suitable re-allocation period? If not, what period of time would be appropriate?

If any part of the 3.6GHz band is re-allocated for the issue of spectrum licences Optus considers that a uniform re-allocation period of 3 years apply commencing from 2019.

Committing to a firm re-allocation date will provide incumbents and prospective licensees with critical certainty to progress investment decision making processes.

4. Should different re-allocation periods be considered for different areas? For example, should a longer period be considered for services outside Area 1?

Please see response to Q3 above.

5. Are these guidelines appropriate? Why?

Optus supports the ACMA's Guidelines that propose to reallocate the 3.6GHz band via the spectrum licencing framework simultaneously, that is, in both metro and regional areas, assuming Option 3c is the approach adopted.

6. Are there any other issues that affect the usability of an area-wide licence that should be taken into account when defining the licence area?

Optus suggests that other issues that will affect the usability of an area-wide licence that should be taken into account when defining the licence area include:

- advanced antennas (*sufficient distance should be allowed from population centre to boundary to allow use of advanced antennas*);
- support for pre-5G and advanced LTE technologies to accommodate early access deployments;
- minimise spectrum licence boundary issues for TDD deployments. (*This would include consideration of appropriate lot sizes to avoid fragmentation.*);
- consideration of the location of existing 'Dead Zones' in other bands so that 3.6GHz band can be used as a solution; and
- consideration of high demand commuting corridors as well as population centres.

3.6 GHz licence areas should also consider the significant existing dead zones highlighted in the ACMA options paper (*for example, outer metro areas in the 2.3 GHz and 3.4 GHz bands*) so that 3.6 GHz will be a viable solution to address these dead zones.

7. If point-to-point licences are affected by replanning activities in the 3.6 GHz band, are the options identified for point-to-point licences suitable? Are there any alternative options that should be considered?

If point to point licences are affected by replanning activities in the 3.6GHz band, Optus supports the relocation of these services to the 3800 to 4200 MHz band rather than 3700 to 4200 MHz band.

8. Is the 5.6 GHz band a viable option for wireless broadband systems?

Optus does not have a view on whether 5.6GHz is a viable options for wireless broadband systems.

9. Under what circumstances should apparatus- and class-licensed arrangements be considered for the 5.6 GHz band?

Optus does not have a view on licensing arrangements for the 5.6GHz band.

10. If apparatus licensing arrangements are developed for wireless broadband systems in the 5.6 GHz band, are the notional arrangements proposed in Appendix 3 suitable?

Optus does not have a view on licensing arrangements for the 5.6GHz band.

11. If point-to-multipoint licences are affected by replanning activities in the 3.6 GHz band, are the alternative options identified suitable? Are there any alternative options that should be considered?

Optus does not have a view on alternative options if point-to-multi point licences are affected by replanning activities in the 3.6GHz band.

12. The ACMA seeks comment on the suitability of the current west coast earth station protection zone located near Mingenew, WA, for long-term satellite service use. Are the current regulatory arrangements effective?

Optus considers that the current regulatory arrangements for Mingenew, which provide protection for 3400 to 4200 MHz and other satellite bands, are adequate.

Optus does not support any reduction to the protection for satellite services at the west coast earth station protection zone.

13. In the event FSS earth stations are affected by replanning activities in the 3.6 GHz band, the ACMA seeks comment on:

- (a) any issues surrounding the development and establishment of an east coast earth station protection zone (particularly on what factors would be necessary to make it an attractive option for earth station operations);**
- (b) whether there are any views on potential candidate locations to consider;**
- (c) whether there should be more than one earth station protection zone on the east and west coasts of Australia; and**
- (d) if the identification of a central Australia earth station zone should be considered.**

Optus supports the early designation of an east coast earth station protection zone.

Optus appreciates the ACMA including population and other information in the Options Paper which might assist in determining a suitable location.

While Optus has not examined the data in detail, we observe that the establishment of such a protection zone would rule out indefinitely the use of the 3.5 GHz (and possibly other bands) from MBB type services in a radius of around 75 km from the zone centre using the conditions at Mingenew as a basis.

In response to 13(a) Optus suggests the following additional factors should be considered:

- site area to be adequate for a number of teleports by different operators. That is will be a need for several square kilometres in total designated area;
- connection to terrestrial broadband network preferably via diverse routes.
- reliable and adequate mains power electricity with possibility of diverse connections;
- all weather road access for vehicles with substantial and possibly out of gauge loads;
- visibility down to five-degree elevation for azimuths along the GSO arc (and maybe beyond the GSO arc to accommodate possible future NGSO networks in other frequency bands);
- review local rain microclimate to avoid 'storm fronts'. (This is not critical at 3.6 GHz but comes into play when addition bands at much higher frequencies are access through the teleport);
- no significant sources of RF interference in the vicinity; and
- whether there are any views on potential candidate locations to consider.

With regard to 13(b) while Optus has not completed any detailed work to assess potential candidate locations we note that while there are two Earth station facilities near Dubbo (NSW), such a location would not be suitable for 3.6 GHz services owing to the significant rural centre and its need for MBB services. Moree, site of the former OTC earth station, might be considered as it is not as large as Dubbo. Other possibilities are near Broken Hill, Bourke or Roma which are NBN gateway station locations.

In response to 13(c) Optus can see advantages in having at least two distinct earth station protection zones on east and west coasts. In the case of the west coast, Optus suggests a site in the Carnarvon area or an inland site possibly near Kalgoorlie.

With regard to 13(d) Optus supports the identification of a central Australia earth station zone. A central Australian location might offer some utility although Optus would alternatively propose an earth station protection zone in Northern Australia with a latitude North of about 15 degrees South. Such a location might be able to access regional beams covering SE Asia for satellites which do not cover the whole of Australia.

14. Are the approaches for amateurs, radiolocation services, class licensed devices and TVRO systems suitable?

Optus does not have a view on whether the approaches for amateurs, radiolocation services, class licensed devices and TVRO systems.

15. Are there any other options for incumbent services, not identified in this paper, which should be considered?

Optus supports the transition of incumbents from the 3.6GHz band via a defined reallocation timeframe. Optus does not have a view on whether there are other options for incumbent services not considered in the Options Paper.

16. Should any of the sharing arrangements discussed in this section be considered for implementation in the 3.6 GHz band? Why or why not?

Optus does not support the dynamic spectrum sharing arrangements proposed in the Options Paper. That is, permitting small localised users coexist with larger operators.

Optus also does not support the suggestion that this form of spectrum sharing be mandated in the 3.6GHz band.

Optus' concerns relate to the potential high risks of failure. For example, whether all parties would have the necessary resources and expertise to set up critical device technology and coordination centres for dynamic operation to manage the detailed level of information sharing or complex issues associated with synchronisation of information with multiple parties and live networks.

Optus notes that Institute of Electrical and Electronic Engineer (IEEE) is intending to publish a paper on 'Dynamic Spectrum Management for 5G' by October 2017 as input to the development of the 3GPP standard for 5G. Optus will consider the options proposed in the IEEE paper and whether they have practical application in the Australian market.

17. Are there any other sharing arrangements that should be considered?

Optus does not consider that any other sharing arrangement be considered.

18. Are there any other replanning options that should be considered?

Optus does not consider that there are other replanning options that should be considered.

19. Which replanning option should be implemented in the band? Why?

Optus endorses the ACMA's preference to proceed with replanning option 3(c), which proposes the 3.6GHz band in Area 3 (metropolitan and regional areas) would be re-allocated for the issue of spectrum licences.

20. In the event an area-wide licensing option is implemented, in which of the defined areas (that is, Area 1, 2, 3 and Australia-wide as defined in Appendix 6) should these arrangements be implemented? Are the current area definitions appropriate? If not, what area should be defined?

Optus will provide the ACMA with further advice on defined areas.

21. If Option 4a is implemented, what frequencies and areas should be re-allocated for the issue of spectrum licences? How much spectrum should remain subject to site-based apparatus licensing arrangements? Should different amounts be considered in different areas?

Optus does not support the implementation of Option 4(a).

22. If Option 4b is implemented, what frequencies and areas (that is, incumbent apparatus licence services) should remain subject to site-based apparatus licensing arrangements?

Optus does not support the implementation of Option 4(a).

23. Comment is sought on the ACMA's preferred option (Option 3c) for the 3.6 GHz band.

Optus supports the ACMA's preferred option, (Optus 3c) for the 3.6GHz band. Metro and regional spectrum licences should be allocated at the same time to avoid any metro/regional boundary issues or fragmentation.