



**Australian Mobile
Telecommunications
Association**

AMTA Submission to the ACMA:

15 August 2017

Future use of the 3.6 GHz band - Options paper

June 2017

Introduction

Importance and future use of 3.6 GHz

As identified by the Australian Communications and Media Authority (ACMA)¹, the 3.6 GHz band is an important option for early 5G use as it is suitable for providing a 'coverage layer' due to its propagation characteristics. In Australia, 3.6 GHz could be used in both urban and regional areas to deliver 5G services.

The Australian Mobile Telecommunications Association (AMTA) welcomes the opportunity to provide feedback to the ACMA regarding this next stage of the consideration of the future use of the 3.6 GHz band.

AMTA strongly supports the progression of the 3.6 GHz band to the *re-farming* stage. AMTA also agrees with the ACMA's conclusion in its 'Highest value use assessment: Quantitative Analysis' (HVVU paper) that MBB is unequivocally the highest value use of the 3.6 GHz band.

AMTA strongly supports re-allocation of entire 3.6 GHz band in metro and regional areas for MBB, through the issuing of spectrum licences, in line with the ACMA's preferred Option 3c.

Commencement of spectrum licences and access to the 3.6 GHz band

AMTA notes that the ACMA clarified in the 3.6 GHz Options Paper that spectrum licences would commence well before the end of the re-allocation period. As mentioned in the response to Question 1 below, AMTA stresses that the 3.6 GHz band should be made available for 5G networks as soon as possible. As such, AMTA would support the earliest commencement of licences following the completion of the auction provided that that access to the band is enabled in a way that is both timely and fair.

AMTA notes that there are several options available to the ACMA in terms of enabling access, for example, spectrum licences could commence earlier in areas without incumbent users; and later in areas where the spectrum is encumbered. The ACMA has considered these types of problems previously, for example, early access arrangements for 700 MHz spectrum, delayed access to the 2.5 GHz band in Perth, and early access arrangements for regional 1800 MHz spectrum combined with extended clearance times for some fixed link licences. AMTA requests that the ACMA consult further with industry specifically on this issue so that the best solution for the 3.6 GHz band can be identified and implemented.

Spectrum roadmap for 5G

In addition to progressing the reallocation of the 3.6GHz band for 5G, it is also important that other bands, such as 26 GHz, are progressed by the ACMA in a timely manner so that mobile network operators have a holistic view of what spectrum will be made available for 5G and when.

AMTA is keen to work with the ACMA and the Department of Communications and the Arts on a 5G roadmap, to drive the release of spectrum and a fit-for-purpose network deployment framework. We strongly believe this is needed to ensure ongoing demand for mobile broadband (MBB) can be met and Australia remains at the forefront of rolling out the next generation of mobile technologies

¹ Options Paper, Executive Summary, Page 2.

to enable transformative social and economic benefits across industries such as transport and logistics, health, education and the automotive industry.²

5G is the next generation of mobile technology and is anticipated to enable a fully and seamlessly connected society and economy. 5G will be an evolution that builds on 4G/LTE mobile networks. It will deliver substantial improvements in the speed, latency and reliability of mobile networks in order to meet the ever increasing demand for MBB.

The mobile industry is already preparing for 5G and conducting trials³. It is imperative that industry has certainty around the timing of the future availability of spectrum for 5G as this is a critical regulatory input to investment decision-making processes.

Benefits of 5G and MBB

MBB continues to play a key role in stimulating Australia's economic growth and productivity. It is a driving force in connecting people and businesses, stimulating innovation and technological progress, and transforming industries in both densely populated and remote regions. Future development of mobile technologies, such as 5G, the Internet of Things (IoT) and Machine to Machine (M2M) applications will re-shape the Australian economy and drive productivity improvements.

Recent research by Deloitte Access Economics⁴ found that mobile telecommunications creates 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 with an increase in:

- long term productivity of \$34 billion or 2% of GDP; and
- workforce participation of \$8.9 billion, or 0.6% of GDP.⁵

The research also found that 65 000 full-time equivalent jobs were supported by the increased GDP attributable to workforce participation (equivalent to 1% of total employment in the Australian economy).⁶

Further indication of what the path to 5G will entail is provided by Ericsson's Mobility Report (June 2017)⁷ which forecast (globally):

- 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;

² AMTA Mobile Minute – '[5G A connected future for Australia](#)' June 2017

³ [Telstra 5G trial](#); [Vodafone Hutchison Australia 5G trial](#); [Optus 5G trial](#); Optus [4.5 G trial](#).

⁴ Deloitte Access Economics, [Mobile Nation: Driving workforce participation and productivity](#), 2016.

⁵ Ibid

⁶ Ibid

⁷ [Ericsson Mobility Report, June 2017](#)

- 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.

The global demand for MBB continues to grow and the evolution of 5G and IoT services will place even greater pressure on the capability of industry to deploy networks to meet growing demand without timely and sufficient spectrum allocations.

Issues for Comment

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?

AMTA supports the progression of the 3.6 GHz band from the *preliminary replanning* stage to the *re-farming* stage in the ACMA's process for considering additional spectrum for MBB services.

Timely access to spectrum, removal of barriers to investment, and a fit-for-purpose network deployment regulatory framework will be critical to ensure the efficient roll-out of next generation networks to meet consumer demand and enable delivery of the productivity benefits of 5G and MBB.

Australia needs to progress its preparations for 5G to keep in-step with global developments, including global harmonisation of spectrum for 5G.

The particular urgency around the 3.6 GHz band is that it is the best candidate band for early deployment of 5G coverage layer networks, as acknowledged in the Options Paper by the ACMA and by the RSPG⁸ — with other bands below 6 GHz currently being used or re-farmed for today's 4G technologies. Higher frequency bands above 24 GHz that could become available in a similar timeframe are likely to provide services to targeted 'hotspot' locations rather than wide-area coverage.

The ratification of the 3GPP New Radio (NR) Phase 1 standard by the end of next year will likely result in the rapid proliferation of pre-5G equipment conforming to Phase 1 NR, especially considering that the Non-Standalone version of NR Phase 1 is being brought forward to be completed by mid-2018.

International standard developments create a sense of urgency for Australia to keep pace with other world-leading ICT nations.

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?

AMTA agrees that the areas of highest demand for MBB are covered within the metropolitan and regional areas proposed by the ACMA, as it includes major cities and regional centres with the highest population densities. These areas will create high demand for the enhanced MBB (eMBB) 5G use case—as they include heavily-used highways and agricultural areas that will likely benefit 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, respectively.

⁸ EC RSPG, 19 February 2015, RSPG15-595—*RSPG Opinion on a long-term strategy on the future use of the UHF band (470-790 MHz) in the European Union*, available at: <http://rspg-spectrum.eu/rspg-opinions-main-deliverables/>

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

AMTA members have provided their own views of preferred transition times.

Similarly in response to Question 4, AMTA does not have a view on whether shorter re-allocation periods in particular areas are appropriate, and its members have provided their own views on this matter.

5. Are these guidelines appropriate? Why?

“These guidelines” refers to those listed in the section titled *Geographical boundary issues associated with area-wide licences*, which aim to:

- set geographical boundaries around spectrum-licensed areas far enough away from areas of high demand such that both:
 - wide-area MBB networks can be deployed within [all] the desired areas of high demand; and
 - at the boundary, the emissions from wide-area MBB networks within the desired areas of high demand would fall to levels low enough such that adjacent-area licensees could operate services at a comparable distance from the boundary within their area
- allocate spectrum licences simultaneously across the entire area in which spectrum licensing is considered the most appropriate long-term outcome.

AMTA strongly supports the ACMA’s suggestion to allocate spectrum licences simultaneously in both metro and regional areas, assuming Option 3c is the approach adopted. AMTA’s support is partly based on the interference and guard band issues associated with geographical boundaries as noted in the ACMA Options Paper.

Primarily however, AMTA notes that simultaneous consideration of all relevant geographic areas together better informs potential bidders’ assessments leading into an auction, for example traffic forecasting and business case analysis. Post-auction, this approach maximises certainty required for developing plans for MBB network investments.

AMTA also supports the first two guidelines proposed by the ACMA. In terms of boundaries between spectrum-licensed areas and apparatus-licensed areas, the spectrum licensing of metro and regional areas together under Option 3c addresses the guidelines sufficiently.

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?

If the total area to be spectrum licensed is to be broken up into individual licensing areas, the same guidelines should apply with respect to the boundaries between adjacent spectrum-licensed areas. This would require some consideration of a notional/typical network deployment across the areas of high demand, along with the potential boundary limits, prior to setting the individual spectrum licence areas.

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?

AMTA notes that existing coordination requirements between cellular wireless technologies and fixed point-to-point links consider adjacent-channel compatibility. This may lead to significant spectrum denial around fixed point-to-point links even when these do not operate co-channel, which should be minimised to the greatest extent possible. While there is scope to achieve this through the development of the coordination requirements themselves, AMTA believes that limiting the number of microwave point-to-point links adjacent to 3700 MHz is also important. As such, AMTA proposes that any new fixed point-to-point licences in the 3.8 GHz band—whether for new links or links migrated out of 3590-3700 MHz—should be limited to the frequency range 3790-4200 MHz (i.e. Channels 6 and 7 of the 3.8 GHz band).

AMTA reserves comment on Questions 8-15.

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?

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

Spectrum sharing and lack of certainty

In its Options Paper, the ACMA has considered multi-tiered spectrum sharing approaches, whereby opportunistic use of a band by lower-tier users is granted on a no interference, no protection basis with respect to higher-tier users. The ACMA has provided the examples of the US Citizen Broadband Radio Service (CBRS) and the ECC Licensed Shared Access (LSA) schemes. In the Executive Summary of the Options Paper, the ACMA has stressed that—at least under the existing legislative framework—certainty cannot be provided to both lower-tier and higher-tier users through such schemes.

AMTA agrees with the ACMA’s conclusion, and confirms that a situation whereby wide-area MBB network users would be lower-tier users with respect to incumbent services would not be acceptable, since it would not provide sufficient certainty to make the necessary investments required for a large-scale network rollout. Furthermore, AMTA notes that wireless internet service providers (WISPs) have promoted tier-based sharing arrangements, but they are also seeking security/certainty⁹, which indicates that operation as lower-tier users does not satisfy their requirements either.

Spectrum sharing based on Dynamic Spectrum Access

AMTA notes that at the ACMA’s 3.6 GHz Tune-Up, WISP representatives promoted a dynamic spectrum access (DSA) scheme involving software-defined radios communicating with a live database.

⁹ Communications Day, 27/06/2017, *Wireless ISPs claim 200,000 users nationwide step up lobbying for spectrum consideration.*

AMTA observes that, it would not seem necessary for radios to have to react instantaneously to a change in the licence database, since there will likely be a delay between licensing/registration and any physical system switch-on which could lead to interference. Nor would it appear beneficial for the WISPs to provide services that could cease operation from one day to the next after detecting a nearby registration in the database or sensing a nearby higher-tier user's emissions. Furthermore, AMTA's view is that moving from an interference management approach based on proven coordination methods or commercial spectrum authorisation arrangements to one based on untested spectrum sharing methods should be approached with caution. Moreover, to contemplate such a radical change in licensing approach prior to the expected reforms to the spectrum management framework (of which licensing reform is a significant component) may lead to the implementation of changes that are inconsistent with the reform's intent or with future government policy post-reform. As such, AMTA is strongly opposed to the implementation of such a DSA scheme that would result in licensees being obliged to share their spectrum holdings.

Commercial third-party arrangements

AMTA believes that commercial agreements or third-party access arrangements could be mutually beneficial to both spectrum licensees (e.g. mobile network operators) and other users providing services in particular regional areas, and provides a greater opportunity for favourable outcomes as opposed to the dynamic spectrum sharing arrangements discussed above.

AMTA notes that the existing legislative framework already supports such arrangements and it does not believe that specific spectrum sharing arrangements need to be incorporated as a condition of acquisition of spectrum or the 3.6 GHz band.

Current arrangements create the incentive to share spectrum with other users if the licensee deems it feasible without an undue reduction in the useability or value of their spectrum holdings. In other words, sharing spectrum holdings with other users should be the domain of licensees to consider on a commercial basis as they deem viable and appropriate.

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

For spectrum space that is to be allocated for wide-area MBB networks, AMTA's preferred replanning approach is for that spectrum to be spectrum licensed—as per Option 3c—and so AMTA does not believe any other replanning options need to be considered.

AMTA notes recent suggestions in support of 'use-it-or-lose-it' conditions for spectrum licences at 5-year milestones. AMTA objects to the imposition of 'use-it-or-lose-it' obligations. Firstly, the access to a particular spectrum space—for example, through a spectrum licence allocated to a particular user by auction—is the result of market-based allocation which is an objective of spectrum reform¹⁰. The imposition of a 'use-it-or-lose-it' licence term is being sought, presumably, to result in the granting of access to another user or service upon its enforcement. However, another service which can be deployed more promptly, or another user which can deploy its service more promptly, does not automatically equate to the highest value use of the spectrum. While the provision of any type of deployed service may nominally have greater potential consumer benefits compared to no use at

¹⁰ Specifically, the *Spectrum Review Report* (March 2015) recommended that the new spectrum framework provide for greater market-based activity.

all, this may not entirely offset the re-farming benefits which are deemed to be at least comparable to the price paid at auction, as outlined in the ACMA's HVU assessment.

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

AMTA's preferred replanning option is for spectrum licensing of the entire 3.6 GHz band in metro and regional areas, aligned with the ACMA's preferred Option 3c.

AMTA is of the view that a 'first-in-time', 'over-the-counter' apparatus licensing approach would not lead to effective or efficient use of the band. As the ACMA notes, there are high risks in adopting this approach which could result in a 'gold rush' situation, fragmented spectrum holdings and high levels of uncertainty with respect to being able to plan a network across a wide area. If prices are too low, there is a further risk of speculators buying licences to sell-on to future bidders. However higher prices for over-the-counter licences would also be speculative rather than be determined by the market itself, and may lead to spectrum being unsold in particular areas.

AMTA notes that while apparatus licensing arrangements could be adjusted to address the above issues—as pointed out in the ACMA's Options Paper—such adjustments only result in apparatus licences that would emulate spectrum licences. Spectrum licences are already optimised for the wide-area broadband networks, which have been identified as the highest value use, and as such represent the optimum licensing approach under the existing regulatory framework.

In support of the above statement, AMTA highlights that any moulding of apparatus licensing arrangements would result in the same outcomes as those resulting from spectrum licensing:

- a) a geographical area would have to be defined;
- b) price-based allocation is used to grant exclusive access to particular users in particular frequency bands and areas; and
- c) incumbent services would need to migrate out of particular frequency bands and areas to facilitate the deployment of the highest value use within the same bands and areas.

Therefore, there are no benefits in contemplating an apparatus licensing approach over spectrum licensing. On the other hand, there are clear benefits of spectrum licensing over apparatus licensing. Under the latter, the exclusive access to licensees would be defined by the ACMA in policy documents—not the licences themselves—and the licence tenure would be maximum of 5 years, which significantly reduces certainty and impacts return on investment opportunities for prospective licensees.

For the reasons specified above, among others, AMTA's preferred replanning option is for spectrum licensing of the entire 3.6 GHz band in metro and regional areas, aligned with the ACMA's preferred Option 3c.

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?

AMTA agrees that the areas of highest demand for MBB are covered within the metropolitan and regional areas proposed by the ACMA. See response to Question 2.

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?

Wide contiguous bands are required to deliver 5G networks, which are spectrum-intensive applications requiring as much spectrum as possible. As such, AMTA believes that the full 125 MHz of spectrum should be spectrum-licensed.

While it could be argued that spectrum requirements may be lower in some regional areas due to lower population densities and hence lower area traffic capacity (bps/m²), it is exactly this characteristic that can impose a high demand for spectrum in these suburban and regional areas.

Network densification across Australia's vast regional areas would be prohibitively expensive, and therefore the reduced area traffic capacity is offset by the need for larger cell sizes. The larger cell sizes can in turn result in a need to employ less spectrally-efficient modulation and coding schemes to serve users that are further from the base station. Therefore, spectrum requirements are also high in these areas.

The 1800 MHz band provides an example of how the quantum of spectrum available in metro areas is also required in regional areas for the provision of mobile broadband coverage. Originally only 2 x 15 MHz was spectrum-licensed in regional areas compared to 2 x 75 MHz spectrum-licensed in metro areas. The 2 x 60 MHz that was not spectrum-licensed in regional areas was available for fixed point-to-point licences and also public telecommunication service (PTS) licences that authorise the operation of cellular mobile technologies such as W-CDMA (3G) and LTE (4G). The major mobile network operators were operating thousands of base stations authorised by PTS apparatus licences providing the same services that they were providing under spectrum licences in the metro areas; a similar situation persists in the 2 GHz band. Eventually, in accordance with advice from the ACMA, the 2 x 60 MHz were re-allocated for spectrum licensing by the then Minister for Communications Malcolm Turnbull in May 2015 with new spectrum licences issued in regional areas in 2016 and 2017.

Evidence of strong market demand for spectrum for mobile broadband in regional areas supports Option 3c. Supporting this option would effectively mirror the end result of spectrum licensing in metro and regional areas in the 1800 MHz band; while at the same time maximising clarity and certainty for both incumbents and prospective wide-area MBB network operators, by removing any period during which apparatus licensing is supported only to be re-allocated for spectrum licensing further down the track.

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?

AMTA does not agree with the excision of areas presented under Option 4b.

As explained above in the response to Question 19, the allocation of the 3.6 GHz band to MBB—determined to be the HVU of the band by the ACMA—and the eventual ‘clearance’ of the band by incumbents; is a policy outcome based on maximising the public benefit derived from the use of the radiofrequency spectrum. It is therefore not an unfortunate consequence of spectrum licensing.

As previously mentioned, the excision of areas around earth stations could prevent deployment of the HVU in many metro areas, while excision of areas around point-to-multipoint licences could prevent deployment of the HVU in regional centres. Outside of these areas of very high demand for MBB, where conceivably point-to-multipoint systems could continue to operate beyond the end of the re-allocation period, it would be far more flexible to do so through commercial arrangements. This would be preferable to having many rigid excision zones scattered throughout the country which would not be able to be easily removed if the relevant point-to-multipoint system ceased operation and could hinder spectrum trading due to the different spectrum licence areas across different channels.

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

AMTA’s preferred replanning option is Option 3c, aligned with the ACMA’s preference. See responses to Questions 19 and 20.

Other comments

Coordination with incumbents

AMTA members have provided their own views on the length of time the various incumbent users should be permitted to continue using the spectrum. Where incumbent use does persist and regulatory arrangements are required to ensure compatibility with new uses, AMTA stresses that in order to minimise spectrum denial for new services, coordination requirements should be based on detailed calculations rather than fixed-radius exclusion zones. AMTA notes that fixed-radius exclusion zones tend to be conservative (i.e. based on worst-case parameters) to provide adequate protection for incumbents, but are likely to cause undue spectrum denial in the majority of cases. For example, where potential interfering systems operate with parameters of lower interference potential than those assumed in the development of the exclusion zone radii. This is particularly important noting that advanced 5G technologies such as antenna beamforming will provide enhanced mitigation measures.