



Replanning the 2 GHz band: Review of the 2 GHz Television Outside Broadcast Frequency Band Plan (updated 7th Feb 2022)

Dear ACMA,

SkyFive, the global specialist in Air-to-Ground (A2G) communications, and Pivotel, operator of Australia's fourth in-service public mobile network are pleased to participate in the ACMA consultation on future options for the extended 2 GHz band (3GPP Band-65).

We are pleased to comment on the ACMA's draft plan to evacuate TOB services to create 2x 25 MHz FDD space in 2 GHz for MSS and/or CGC and DA2GC with a further 2x 5 MHz set aside for narrow band MSS. We note that ACMA *"have not made provision in the draft 2 GHz MSS band plan to allow for operation of CGC and DA2GC services"* and that arrangements for these services would be made closer to the licence allocation anticipated in mid-2023. We believe greater emphasis and priority should be given to reviewing these services before finalising the 2GHz band plan and establishing it as an MSS band. We note the goal to provide early access to the band for MSS services and provide certainty to existing and future licensees. We believe the same early access and certainty considerations should be provided to potential MSS/CGC and DA2GC licensees.

The ACMA is aware of Band-65 scientific licence issued to Pivotel and its planned demonstration of the Air-to-Ground (A2G) service in 2022. The provision of A2G services, through their various flavours, are well established in many regions of the world but is critically lacking in Australia. Band-65 services used in the European Aviation Network (EAN), operating as MSS/CGC, demonstrates the inherent capability and value of the ground component of the EAN. We believe the ability to operate such a ground-based service should not be restricted by the requirement to operate an MSS component where such a capability is not available or planned in Australia for the 2 GHz spectrum band.

We are aware of the interest in Australia to use the 2 GHz band for narrowband MSS services and support the set aside of 2 x 5 MHz spectrum for that technology.

We are also aware of ambitious plans by some companies to use the 2 GHz spectrum band to deploy direct to the handset 5G services. While the end goal is admirable, the path to success is fraught with many challenges not least being the ability to support high speed data rates to regular 5G smartphones. We understand these companies are seeking the full 2 x 30 MHz of paired spectrum in the 2 GHz band on a global basis, despite the existence of incumbents such as Inmarsat already using parts of the band. We do not support the allocation of 2 x 25 MHz of 2 GHz spectrum for such highly speculative satellite services.

In building and running the A2G demonstration, Pivotel and Skyfive, supported by well-respected industry players like Nokia, NEC, Flightcell, Lufthansa Technik (LHT), Thales, Axicom, are working hard to showcase

the benefits of A2G technology in Australia. Subject to a successful demonstration, including proving up demand, Pivotal and Skyfive have plans to roll out a 100-site network across two phases providing coverage from north Queensland to southern Victoria, and across to Adelaide, incorporating major regional centres along the east coast. This rollout could commence as early as 2023 if access to the required 2 x 15 MHz of 2 GHz spectrum, on a shared basis as described further below, was made available. Further expansion beyond the initial two phases will be driven by the success of the business.

Band-65 DA2GC technology is a fully developed, proven technology. The deployment of that technology in Australia would deliver on the benefits of economy of scale, an important objective in the international spectrum harmonisation sought by the ACMA. We believe DA2GC services should have access to 2 x 15 MHz of dedicated, exclusive spectrum. Should the ACMA form the view that dedicated spectrum cannot be accommodated, then DA2GC should be offered shared spectrum with DA2GC as primary. Should the ACMA form the view that shared spectrum with DA2GC as primary cannot be accommodated, then DA2GC should be offered shared spectrum with DA2GC as co-primary with an MSS service delivered by via geostationary satellites or a narrowband MSS satellite service.

The remainder of this document addresses several key questions we feel are relevant to the band planning considerations:

- Should the licensee have flexibility to use their allocation for MSS or DA2GC?
- Should access be allowed for MSS or MSS/CGC licensees only?
- Can DA2GC services be provided on a shared basis with TOB services during the transition period delivering greater use value from the spectrum?
- Can DA2GC services operate in other bands?
- Does the use of the 2 GHz spectrum for DA2GC services result in spectrum harmonisation with other countries?
- Are other countries moving towards DA2GC?

Pivotal and Skyfive had provided a response to the earlier 2 GHz band planning consultation. This document intends to elaborate further our concerns and recommendations.

Pivotal and Skyfive would welcome the opportunity to discuss further with ACMA.

Best regards



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Should the licensee have the flexibility to use their allocation for MSS or DA2GC?

Yes.

As noted in the ACMA's *Planning of the 2Ghz Band Discussion Paper* of August 2019, the 2 GHz (1980-2010, 2170-2200) band is "allocated to fixed, mobile and mobile satellite services on a primary basis in all three ITU regions." As a result, there is no single globally harmonised use of the spectrum band, and in many instances, the use of the spectrum and the economic value derived from it has been largely generated by ground-based mobile networks. Restricting the flexible use of the spectrum by the licensee will potentially lead to less than optimum economic outcomes and likely impede the emergence of high value, highly functional applications.

There are many use cases to provide wireless data to aviation mostly requiring high bandwidth and low latency. The current aviation solutions delivered using satellite services are limited in bandwidth, bulky in size and are expensive to run. As a result, the use of satellite services in aviation is largely restricted to:

- Military aircraft
- Limited deployments of in-aircraft passenger Wi-Fi services due to the high cost of the equipment and the satellite data subscription.
- Very limited public safety and First Responder organisations who predominantly use terrestrial LTE connectivity for their data needs and thus are limited to ground coverage.

With MSS solutions largely incapable of meeting the needs of large swathes of the aviation market that could be serviced by a DA2GC only solution, forcing DA2GC operators to offer a MSS component to the service, where there is no standard or global scale to be leveraged, will drive up equipment and service costs to the detriment of end users and potentially destroy the investment case for operators.

Should restricted access be allowed for MSS licensees only?

No.

SkyFive and Pivotal are not aware of any satellite service provider having concrete, proven and funded plans for providing MSS coverage in Australia that would require use of the full 2x 25 MHz of spectrum (setting aside the 2 x 5 MHz planned allocation to narrowband MSS).

The operation of mobile broadband services on a shared spectrum basis with one or more satellites is manageable when the base station radio signal is broadcast with a down tilt toward the ground – the originally envisaged MSS/CGC deployment. The operation of an A2G system in northern Australia, on a shared spectrum basis with a geostationary satellite operator, would be limited by the likelihood for interference with high look angle satellites and would require significantly more ground base stations with smaller cell radii to reduce the potential for interference. The operation would be virtually impossible anywhere in Australia where the spectrum is shared with a constellation of low earth satellites that have no fixed look angles and support different (not complementary) services. The cost and practicality of

operating a DA2GC system on shared spectrum with a MSS operator would likely render the service unviable unless geographic boundaries were established for each service.

We strongly recommend that restricted access to only allow MSS or MSS/CGC licensees should not be considered across the whole band.

Can DA2GC services be provided on a shared basis with TOB services during the transition period to deliver greater use value of the spectrum?

Yes.

The sporadic use of TOB services across regional Australia will allow for shared operation of the spectrum during the transition period. Further, base station locations can be designed to minimise interference with TOB services covering special events at sporting stadiums. This can be further supplemented with location and altitude geo-fencing allowing the DA2GC transmission to be automatically controlled (turned off) to eliminate any potential concerns of interference when flying close to TOB locations during take-off, landing and during emergencies, should the TOB service be designated as primary within the emergency zone.

We recommend DA2GC services be allowed early access to the spectrum during the TOB transition period.

Can DA2GC services operate in other frequency bands, or the services be provided using satellite only systems?

No

The DA2GC technology developed by Nokia and adopted by terminal providers has been designed to operate in Band-65 only, initially for the European market. The size of the European aviation market provided sufficient potential return on investment to justify the significant development costs involved in bringing the technology to market. Australia is one of the few developed economies which does not have an A2G service with satellite services being the primary form of in-flight connectivity servicing very large aircraft operating in the business market. The small scale of the Australian market does not justify the cost of developing the technology to operate in another frequency band, assuming another similar band was available.

DA2GC services offer the potential for small external aircraft antenna systems, lower cost and higher performance than is available with current satellite solutions. The terminals developed or in development for use with the Band-65 services are capable of delivering these system benefits and in so doing open up new or expand existing aviation markets including:

- First responders
- Regional airlines and FIFO aircraft operators
- Drones
- Enhanced aircraft telemetry and cockpit communications

First responders have traditionally accessed voice and low speed data communications over expensive satellite connectivity only. Terrestrial cellular mobile networks offer poor and patchy service in the rural and remote areas. At altitudes above 300 metres, the service becomes increasingly unreliable due to the terrestrial network 's radio antennas typically being down-tilted to minimise interference. The helicopters and smaller aircraft typically used by first responders are generally incapable of being fitted with antenna systems able to support higher speed data connections and in particular, helicopters suffer from rotor interference due to the antenna being installed on the topside of the aircraft. Where satellite systems can be fitted, the cost of using the service is often prohibitive.

Regional airlines and FIFO airline operators have shied away from installing satellite connectivity due to the physical size and performance limitations in addition to the high cost of providing the service.

With drones, the small size and often critical need to support high speed data for video streaming makes the installation of satellite terminals a virtual impossibility.

DA2GC technology is the only technology currently developed that can meet the size, price and performance requirements across a wide range of aviation markets. DA2GC technology operating in Band-65 is the only solution available for deployment, leveraging the scale of the European market, to deliver a commercially viable solution for Australia.

Does the use of the 2GHz spectrum for DA2GC services help or hinder in spectrum harmonisation with other countries?

Neutral to Help

The EAN (European Aviation Network) is already operational and provides the service to 41 countries for hundreds of aircrafts, albeit its use of the Band-65 solution is as a MSS/CGC system. The Court of Justice of the European Union recently ruled in favour of Inmarsat, the MSS satellite operator, that despite claims that the MSS/CGC service is being primarily delivered by the terrestrial network, there is no requirement for the MSS component to be the major provider of connectivity. This ruling in essence recognised the primacy of the A2G component of that service. A natural extension of the findings in the case is that the terrestrial component is the most valuable part of the service and makes the most efficient use of the spectrum. This view is further supported by the fact that the maximum data rates EAN offers, are up to 100 Mbps and only supported on the terrestrial component of the service. Quoted data rates using the satellite connection are difficult to find.

As noted in the ACMA's *Planning of the 2Ghz Band Discussion Paper* of August 2019, DA2GC services are already operating in the 1980-2110 and 2170-2200MHz frequency band in a number of countries,

without the requirement for an MSS component. Also noted in the same report “A number of Asia-Pacific countries indicated their intention to re-plan the 2 GHz band for terrestrial mobile broadband services”. Designating the 1980-2110 and 2170-2200 MHz bands as primary MSS would not be consistent with many jurisdictions around the world. In fact, many countries are considering supporting the use of DA2GC service in that frequency band without any requirement for a MSS component:

- In New Zealand a DA2GC trial network is currently running, it has been recognized that MSS cannot fulfill the aviation requirements that DA2GC can address.
- In PNG, an initial DA2GC network design is in place and work is underway securing the spectrum from NICTA. One of the main use cases is Medevac.
- In Korea and Japan, there are advanced discussions about implementing DA2GC for public safety and commercial aviation. A commercial launch is expected in 2023. Main use case is anticipated to be public safety.
- In Malaysia, work is underway to progress a DA2GC solution for trial/demo in 2022.
- In Saudi Arabia, a DA2GC trial network has been built with commercial launch planned for 2023. The lower 15MHz of band 65 spectrum is assigned for DA2GC¹. Assignment to the operator is expected before the end of the year. The commercial aviation is the driving force there.

Finally, it is worthwhile noting the ITU Radio Communication Study Group is currently updating a report - ITU-R M.2282-0, essentially a compendium of A2G approaches worldwide.²

The benefits of the DA2GC technology have been recognized by more and more countries. The ITU recommendations as well as many country spectrum licensing regulators are moving towards the use of the Band 65 spectrum fully or partially for DA2GC service.

Summary

It is our view that deviating from emerging international standards (and from similar activities in neighbouring countries) would inevitably lock out the opportunity to deploy DA2GC technology in Australia. Our recommendation is to allocate the lower 2x 15 MHz of Band 65 to DA2GC, with the next 2x 15 MHz allocated to MSS (including NB IoT).

¹ https://www.citc.gov.sa/ar/new/publicConsultation/Documents/PublicConsultationon_EN_144303.pdf

² https://www.itu.int/dms_pub/itu-r/md/19/wp5a/c/R19-WP5A-C-0359!N17!MSW-E.docx