

Boeing Australia Holdings

Response to the Australian Communications and Media Authority

Draft Five-year Spectrum Outlook 2021-2026

Boeing Australia Holdings appreciates the opportunity to respond to the ACMA's *Five Year Spectrum Outlook 2021-2026* draft consultation paper (FYSO). Our response focuses on key radio frequency bands of interest to our domestic, Asia-Pacific and global operations active in Australia.

About Boeing Australia Holdings

Boeing Australia Holdings (Boeing Australia) employs more than 3,800 people in 38 locations across Australia through a network of subsidiary companies. Boeing Australia has an extensive supply chain supporting our advanced manufacturing of commercial aircraft composite components, defence systems design and development, modeling and simulation, research and development, support and training, and unmanned systems.

Boeing Australia subsidiaries:

- Boeing Australia Holdings Limited
- Boeing Defence Australia
- Boeing Aerostructures Australia
- Aviall Australia
- Boeing Training & Professional Services Australia
- Insitu Pacific
- Jeppesen Australia

Our spectrum interests are many including, aeronautical, space, fixed and mobile satellite services, radiolocation, maritime, 5G, IoT and M2M applications.

We offer the following comments of direct interest to Boeing Australia based on radio frequency bands discussed in the FYSO.

1.5 GHz (1 427-1 518 MHz) L-Band Initial investigation

In June 2017 the ACMA released a 'consultation package' including [Future use of the 1.5 GHz and 3.6 GHz bands—Summary of and response to 3.6 GHz submissions](#). This paper detailed its decision to progress both the 1.5 and 3.6 GHz bands to the preliminary replanning stage for consideration of additional spectrum for mobile broadband services (IMT/5G).

Four years on, 3.6 GHz is settled yet the 1.5 GHz replanning has seen little progress towards primarily due to ongoing study across ITU and APT without useful resolution on how IMT can coexist in this frequency and (and the associated extended L-Band).

This high demand frequency band is presently allocated on a global and primary basis to fixed and mobile services with some parts of the band allocated to space operations (Earth-to-space) broadcasting and broadcasting-satellite services.

The IMT identifications introduced at WRC-15 across 1 427-1 529 MHz vary according to Regions via Radio Regulations footnotes **5.341A**, **5.341B**, **5.341C**, and **5.343**. These IMT arrangements do 'not establish priority in the Radio Regulations' over other allocated services in the frequency bands. It is noted aeronautical mobile services has priority over IMT in Region 2 in the frequency band 1 435-1 535 MHz (RR footnote **5.343**) and use of the frequency bands 1 429-1 452 MHz and 1 492-1 518 MHz in Region 3 is 'subject to agreement obtained under No. **9.21** from countries using stations of the aeronautical mobile service' (RR footnote **5.341C**).

Additionally, the possibility of introducing IMT into frequency bands in 1.5 GHz up to the 1 518 MHz limit will need to consider the impact on mobile-satellite services (MSS) allocated worldwide on a primary basis in the adjacent frequency band 1 518-1 559 MHz.

The 1 518 1 559 MHz frequency range is one of the most used by a wide variety of satellites worldwide (with its accompanying 1 626.5-1 660.5 MHz (Earth to space)). The L-band antennas have the advantage of portability, being small and lightweight, and are highly suitable for tactical and mobile operation.

L-Band is one of the lowest radio frequencies utilised by satellite communications. It has a longer wavelength and therefore, is not affected by external factors such as rain, which impacts larger parabolic antenna systems normally used in the Ku and Ka frequency bands. These important characteristics support stable global satellite operations, with minimal interruptions, and can facilitate broadband communications to users anywhere around the world.

With the WRC-15 identification of 1 427-1 518 MHz for use by administrations wishing to implement terrestrial IMT systems, and considering that there is a need to ensure the continued operations of the MSS in the frequency band 1 518-1 525 MHz, Resolution **223 (Rev.WRC-15)** invites the ITU-R to conduct the necessary compatibility studies of technical measures to ensure coexistence between MSS and IMT in adjacent frequency bands.

Subsequent to the WRC-15 decision Recommendation ITU-R M.1036 was updated to include frequency arrangements for the terrestrial component of IMT in the 1.5 GHz band.¹ Studies are still ongoing to ratify coexistence and compatibility arrangements for MSS with IMT. The key focus of these ITU-R studies is developing both an ITU-R Report and Recommendation to address coexistence between MSS and IMT. Compatibility studies developed for WRC-19 show serious potential for harmful interference from IMT to MSS operations above 1 518 MHz. MSS aviation terminals specifically require protection of aeronautical earth stations operating in 1 518-1 559 MHz from high powered IMT base stations near airports.

The APT Wireless Group (AWG) has a work plan to develop an APT/AWG Report on IMT frequency arrangements for the 1.5 GHz band. The Report has had difficulty in progressing in AWG due to the inability of stakeholders to agree an adequate guard band below MSS allocations at 1 518 MHz and appropriate pfd levels. This work plan has been in the AWG for five years and shows no sign of progressing. The Australian position has been simply to note the possible options within the Report and not favour any specific option. This approach should continue to be supported and the determination of a singular option should be opposed. Importantly, studies are underway in the ITU-R and there is no value seeing this work replicated in the regional group.

Given the unresolved matter of a guard band for MSS with IMT below 1 518 MHz, any potential identification of IMT/5G in the 1.5 GHz should initially be focused on the lower 1 427-1 452 MHz range, thereby minimising impact on MSS operations.

In the draft FYSO, ACMA references their decision to 'progress both the 1.5 GHz and 3.6 GHz bands to the preliminary replanning stage for consideration of additional spectrum for mobile broadband services.' While 3.6 GHz has progressed, 1.5 GHz still shows at the initial planning stage in the draft FYSO.

As coexistence with MSS above 1 518 MHz is a major consideration, the simultaneous review of the Extended MSS L-band and the 1.5 GHz L-band, proposed by AMCA, is appropriate. However, until there is clarity through ITU-R studies, it would be of little to no value to progress considerations of an IMT identification in Australia for L-Band and thereby a monitoring status should be reinstated.

The 1 429-1 518 MHz frequency band is used nationally and in other countries for defence flight testing and aircraft CNPC. The Australian Radiofrequency Spectrum Plan 2017 (ARSP) footnote AUS3 identifies use of the band 'by the aeronautical mobile service for telemetry has priority over other uses by the mobile service.'

Boeing Australia is heavily committed to development of aircraft communications in the frequency band. Any future determinations in this frequency band should, as a priority, retain the identification for flight testing as indicated in the ARSP footnote AUS3.

For L-Band planning Boeing Australia supports:

- Studies in ITU-R to develop an ITU-R Report and Recommendation to address coexistence between MSS and IMT.

¹ Recommendation ITU-R M.1036 'Frequency arrangements for implementation of the terrestrial component of International Mobile Telecommunications (IMT) in the bands identified for IMT in the Radio Regulations '

- Any consideration to expand IMT in this band should be focused on the lower 1 427-1 452 MHz range, thereby minimising impact on MSS operations in the adjacent frequency band.
- Not progressing an APT/AWG Report on coexistence of IMT with MSS in the frequency band in the Asia-Pacific region until results of ITU-R studies are known.
- Keeping planning status for 1.5 GHz at 'initial planning.'
- Under any future planning decisions retention of the ARSP footnote AUS3 to protect the priority of aeronautical mobile service for telemetry over other uses by the mobile service.

Extended L-band (1 518–1 525 MHz and 1 668–1 675 MHz) MSS Initial investigation

The mobile-satellite service (MSS) has a primary global allocation across 1 525-1 559 MHz (space to Earth) and 1 626.5-1 660.5 MHz (Earth to space), known as 'extended L-Band.'

The upper and lower frequency ranges have mobile and fixed allocations in the Radio Regulations, while the upper band has various meteorological, radio astronomy and space research service allocations.

ACMA is planning to review these bands 'to identify the spectrum use or uses that would maximise the overall public benefit and, if appropriate, vary spectrum management arrangements to support this use.' The intent of this review is assumed to be for further wireless broadband (5G/IMT) access.

On this basis it might be further assumed, also not stated in the draft FYSO, that WBB (5G/IMT) could be a consideration only in the 1 518-1 525 MHz frequency range, as in the 1 668-1 675 MHz frequencies IMT would not be compatible with the sensitive and passive array of allocated services.

As ACMA notes, MSS coexistence with potential 5G/WBB below 1 518 MHz is a substantial consideration (as discussed in the previous 1.5 GHz section), and consequently the ACMA is considering to undertake simultaneous review of the Extended MSS L-band and the 1.5 GHz band with an initial discussion paper in Q2 2022.

However, the introduction of WBB (5G/IMT) into L-band must follow the technical studies in the ITU-R to determine if coexistence with MSS is possible and then, if so - the mitigation requirements necessary to protect existing and future MSS operations in extended L-Band.

Until studies in the ITU-R which are protracted are settled, ACMA does not need to raise the priority of this planning.

For extended L-Band planning Boeing Australia supports:

- Not raising the priority of this planning above initial investigation.
- Studies in ITU-R to develop an ITU-R Report and Recommendation to address coexistence between MSS and IMT.
- A planning review, should it presently be necessary, should be undertaken in both L and extended L-Bands concurrently.

2 GHz (1 980–2 010 MHz and 2 170–2 200 MHz) Implementation

The frequency band is allocated globally to the MSS on a co-primary basis with fixed and mobile services.

In Australia the spectrum is predominately used for 3G and 4G mobile. Television outside broadcast (TOB) services are allocated on short-term, shared, non-exclusive basis. TOB was introduced in the 2 GHz band in 2012 on an interim basis.

In January 2021, the ACMA released the [Replanning the 2 GHz band \(1980–2010 and 2170–2200 MHz\) Outcomes paper](#) effectively raising this to preliminary planning stage.

The outcomes decision includes replanning the 2 GHz band for MSS, with:

- > 2 x 25 MHz (1 980-2 005 MHz paired with 2 170–2 195 MHz) replanned for MSS Australia-wide under apparatus licensing arrangements with:
 - o Arrangements to provide support for terrestrial applications where a MSS licensee wishes to supplement/extend its mobile-satellite service. For example, extending coverage of a satellite network with terrestrial-based complementary ground component infrastructure or direct air-to-ground communications services (involving ground-based wireless broadband links to aircraft) to provide inflight communication services.
- > 2 x 5 MHz (2 005–2 010 MHz paired with 2 195-2 200 MHz) dedicated for satellite IoT and narrowband services to be used on a shared basis between operators. This arrangement will provide spectrum access with a low barrier to entry for innovative satellite applications and will assist in growing the Australian space industry.

Boeing Australia welcomes these initiatives as a responsible and considered way forward in supporting new age satellite communications and IoT applications within Australia and the region.

There remains the matter of how to allocate the spectrum for MSS in Australia and the ACMA appears to be favouring an auction. As the ACMA notes, spectrum auctions for satellite services are an anomaly and Boeing Australia does not support this means of allocating spectrum for satellite services. Where satellite systems are global or regional as is frequently the case, it is impractical for an individual country to use an auction as the assignment mechanism. This approach appears contrary to the ACMA's principles for spectrum management that includes 'use the least cost and least restrictive approach to achieving policy objectives.' Imposing new auctions for satellite spectrum may disadvantage new smaller satellite startup companies competing against larger players thereby preventing best outcomes and value for spectrum.

Boeing Australia supports and welcomes the outcomes options for reforming the frequency band, but opposes the suggestion of an auction to the highest bidder as a means to allocate the spectrum to MSS.

3 GHz (3 300-3 400 MHz) Monitoring

The 3.3 GHz frequency band is globally allocated to radiolocation services on a primary basis. While there is IMT identification afforded for some countries via Radio Regulations footnotes, these applications specifically cannot claim protection from, or cause interference, to radiolocation services allocated in the frequency band.

The frequency band is subject to consideration at WRC-23 under agenda item 1.2 for possible further expansion of IMT identification and new mobile service allocations for Regions 1 and 2, but not Region 3 (which includes Australia).

In Australia ARSP footnote AUS100A applies and stipulates the frequency band is 'designated to be used principally for the purposes of defence and national security and the Department of Defence is normally consulted in considering non-defence use of this service.'

Boeing Defence Australia is heavily committed to providing equipment and services for the Department of Defence for radiolocation operations in this frequency band. It will be particularly important to monitor, and if necessary engage in the study of WRC-23 agenda item 1.2 to ensure developments in Regions 1 and 2 do not adversely affect the Department of Defence's radiolocation use, that at times may be required beyond Region 3.

Boeing Australia supports:

- the current ACMA position to 'monitor' this frequency band, and
- active participation in ITU-R studies on WRC-23 agenda item 1.2 to the extent that global radiolocation systems are properly accounted for in any possible outcomes that identify IMT applications in the frequency band.

4.5 GHz (4 400–4 500 MHz) Monitoring

The frequency band is allocated globally on a co-primary basis to the fixed and mobile services. In Australia, ARSP footnote AUS101 states the frequency band is 'principally for the purposes of defence and national security.' Also RR footnote **5.440A** identifies the frequency band for aeronautical mobile telemetry for flight testing by aircraft stations.

ACMA has noted some 'interest from domestic fixed and mobile wireless broadband users in pursuing this band for mobile broadband' (5G) in Australia.

Boeing Australia does not support a move to 5G in this frequency band primarily given its close proximity of the aviation radio altimeter allocation in 4 200-4 400 MHz.

Radio altimeters are an essential component of a commercial and military aircraft enabling precision approach, landing, ground proximity and collision avoidance functions to work properly. Recently industry studies have identified potentially serious inference into radio altimeter systems from the operation of 5G applications near the frequency band. Until this matter is resolved, it is in the critical interest of public safety this frequency band not be considered for identification of IMT/5G.

As points of clarification in the draft FYSO, ACMA states ‘Japan has made the 4400–4900 MHz band available for 5G.’ However, it is our understanding only the n79 frequency band 4 500-4 600 MHz has been allocated. It is important to recognise that while Japan’s regulator, the Ministry of Internal Affairs and Communications (MIC), has made 4 500–4 600 MHz available for 5G there are constraints in place to protect the radio altimeters operating in the frequency range 4 200-4 400 MHz. These protection criteria are still being studied for further validation by avionics experts. Also, the reference to ‘The MIC has also approved the 3.6-4.2GHz’ is similarly incorrect as the actual identification in Japan is only to 4.1 GHz. The draft FYSO also states ‘China is considering use of the band’ (i.e. 4 400-4 500 MHz) although evidence of this is not apparent. The frequency band 4 800-4 900 MHz was allocated for 5G in China in 2018.

RR footnote No. **5.440A** states that the frequency band 4 400-4 940 MHz may be used for aeronautical mobile telemetry for flight testing by aircraft stations and includes Australia and some countries of Region 2. It is imperative that any future planning preserves the integrity and intent of the footnote.

Furthermore, in the domestic preparations for WRC-19, in reviewing existing Radio Regulations Table of Frequency Allocation footnotes that include Australia’s name, it was noted for footnotes **5.440A** and **5.442**, that the frequency bands are ‘used by fixed and mobile stations operated by the Department of Defence, including for aeronautical mobile telemetry for flight testing by aircraft stations. Hence, this footnote should be retained.’ This was also the same position for WRC-15.

Boeing Australia supports retention of the planning status of ‘monitoring’ for this frequency band.

4.8 GHz (4 800–4 990 MHz) Monitoring

The frequency band is allocated on a primary basis for the fixed and mobile services in Australia, and principally for the purposes of defence and national security as denoted by ARSP footnote AUS101.

ACMA notes there ‘is some interest domestically from large MNOs as well as WISPs and other FWA operators in pursuing this band for wireless broadband in Australia.’

Importantly, RR footnote Nos. **5.440A** for the frequency band 4 400-4 940 MHz, and No. **5.442** for the frequency band 4 825-4 835 MHz identifies in Australia use of the frequency bands for aeronautical mobile telemetry for flight testing by aircraft stations in accordance with Resolution **416 (WRC-07)** while secondary to the fixed-satellite and fixed services. During the domestic preparations for WRC-19, in reviewing existing Radio Regulations Table of Frequency Allocation footnotes that include Australia’s name, it was noted for footnotes **5.440A** and **5.442**, that the frequency bands are ‘used by fixed and mobile stations operated by the Department of Defence, including for aeronautical mobile telemetry for flight testing by aircraft stations. Hence, this footnote should be retained.’ This was also the same position for WRC-15.



The 4.8 GHz frequency band has been identified for IMT by a number of countries at WRC-19, the closest to Australia being Vietnam, noting that such an identification does not establish priority (RR. footnote No. **5.441B**).

Boeing Australia agrees with the ACMA view that there is no interest to substantially reform this frequency band amongst regional intergovernmental groups such as the European Conference of Postal and Telecommunications Administrations (CEPT) and the Inter-American Telecommunication Commission, excepting the Russian Federation that is also listed in RR footnote No. **5441B**.

The frequency band is the subject of WRC-23 agenda item 1.1, which is studying protection (from 5G/IMT) of stations of the aeronautical and maritime mobile services located in international airspace and waters from other stations located within national territories. This is fundamentally the outcome from WRC-19 addressing concerns about compatibility of IMT in the frequency band and is covered in the revised Resolution **223**.

Boeing Australia encourages the ACMA to monitor, and participate as necessary, in ITU-R studies in WRC-19 agenda item 1.1 to protect the services within Australia (and our Region as appropriate) from the introduction of IMT in countries identified in RR footnote **5.441B**, and ensuring the retention of RR footnotes No. **5.440A** and **5.552**.

5 030–5 091 MHz UAS Initial investigation

At WRC-12, the 5 030–5 091 MHz frequency band was identified in the Radio Regulations for use by line-of-sight (LoS) and beyond line-of-sight (BLoS) remotely piloted aircraft systems (RPAS) CNPC links.

ACMA is considering a discussion paper in Q2 2021 on 'international trends' in the 5 030-5 091 MHz frequency band and will seek industry feedback on potential arrangements for LoS RPAS CNCP, but have discarded any consideration in the paper of BLoS usage.

Boeing Australia is encouraged to see ACMA after many years of a monitoring position, progressing planning to 'initial investigation.'

However, given government focus on UAS/RPAS and the vibrant local industry, ACMA needs to work quickly beyond discussion papers to establish radio frequency regulatory arrangements to support commercial medium to large UAS in Australia.

Spectrum regulators have a part to play to ensure access to the allocated frequency band can be utilised at the earliest opportunity and especially on an interim and experimental basis where appropriate, subject to air safety regulatory requirements. Technical and regulatory determinations such as these provide a basis for manufacturers to develop equipment in readiness for early access.

As these communications are critical for safe management of the controlled airspaces, especially in terminal approach areas with high density of aircraft, future ICAO standards are obviously mandatory and are being developed.



The Government's National Aviation Policy Issues Paper [Emerging Aviation Technologies](#) notes 'Spectrum management will be an enabler of safe, secure and efficient integration of drones into controlled airspace' and that 'this will be especially important for the integration of medium to large drones operating in controlled airspace: The ACMA is considering establishing a device licensing regime for these more robust non-payload CNPC systems in dedicated frequencies (5030-5091 MHz).' On the latter point this would suggest something more than a discussion paper on international trends.

Boeing Australia has previously advocated that the revision of the Australian Radiofrequency Spectrum Plan (ARSP) provides a timely opportunity to move forward with identification of spectrum for use by UAS/RPAS, via acknowledgement in a new Australian footnote to the Plan linked to the 5 303-5 091 MHz frequency band.

The ITU-R is presently developing a preliminary draft new Recommendation relative to the technical characteristics and protection criteria for UAS CNPC links in the 5 030-5 091 MHz frequency band, addressing both line-of-sight and beyond line-of-sight systems.

The ACMA is encouraged to take pre-emptive steps in establishing Australian technical characteristics UAS CNPC links, addressing both line-of-sight and beyond line-of-sight systems.

At a minimum, the ACMA should initiate and drive development of an Australian spectrum access strategy, or 'device licencing regime' for UAS/RPAS in the 5 030-5 091 MHz frequency band. This approach should address both LoS and BLoS spectrum needs for command and control communications. Additionally, but separate to this frequency range, spectrum for Detect and Avoid systems, sensor payload networks and commercial payloads must be considered.

Boeing Australia considers the frequency band 5 030-5 091 MHz is fully available in Australia to UAS/RPAS CNPC communications subject to clear radio frequency regulatory arrangements being developed by the ACMA.

Boeing Australia would welcome an opportunity to work with the ACMA to assist where we can in facilitating access to the frequency band as early as possible.

6 GHz Radio Local Area Networks (RLANs) Initial investigation

Given the significant interest in next-generation Wi-Fi (Wi-Fi 6)/ radio local area networks (RLANs), recent and international developments in the 6 GHz band (5 925–7 125 MHz), ACMA has moved to the initial investigation stage.

Parts of the 6 GHz band are also included in WRC-23 agenda item 1.2 to identify possible additional spectrum for IMT (including 5G).

Arrangements have long been in place in Australia for RLANs in the 5 150–5 350 MHz (low power indoor use only) and the 5 725–5 850 MHz (higher power outdoor use) frequency bands as class licenced low interference potential devices (LIPD).

ACMA have released a discussion paper on RLANs in the 5 GHz and 6 GHz frequency bands, and recent international developments in those frequency bands. Boeing Australia supports the introduction of Wi-Fi 6 into Australia.

Caution needs to be exercised to ensure established use and similar restricted power levels for 'indoor' use Wi-Fi remain where appropriate. Other administrations (China and Qatar) are considering reclassifying Wi-Fi usage on aircraft as an 'outdoor' application thereby potentially imposing additional operational constraints that adversely affects the viability of Wi-Fi on-board aircraft. Boeing has approached both administrations and highlighted the problem for aviation with introducing such a change.

New Wi-Fi applications across the lower part of the 6 GHz frequency band (500 MHz (5 925–6 425 MHz) on a class licenced basis will pose less problems for incumbent services, including the Department of Defence radar systems. Boeing Australia agrees with the ACMA view that there is little demonstrated demand to allocate the entire 6 GHz to extended Wi-Fi and such a determination may preclude other options being developed in years to come that may be more beneficial than a blanket Wi-Fi allocation.

Boeing Australia supports the ACMA initial view to consider 5 925–6 425 MHz for class licenced Wi-Fi/RLANs generally, subject to similar operational conditions already applied to LIPD Wi-Fi applications including no change to the established definition of Wi-Fi on aircraft as 'indoor' use. Support is also conditional on additional power or frequency range restrictions for protection of satellite earth stations if deemed necessary.

13 GHz (12.75–13.25 GHz) Monitoring

This frequency band is the subject of WRC-23 agenda item 1.15 to harmonise the frequency band (Earth-to-space) for earth stations on aircraft and vessels communicating with geostationary space stations in the fixed-satellite service globally. This is subject to protecting the provisions of the planned satellite bands of RR Appendix **30B**.

There is a recognised and increasing need for broadband services to be available to passengers on aircraft for Internet-based applications as well as non-safety aviation telemetry and data transfer that can be provided through earth stations in motion (ESIM) under FSS allocations.

The introduction of aeronautical and maritime ESIM operations in this frequency band would provide satellite operators ability to use existing and future capacity to meet growing needs in this sector. ESIM should be introduced in a manner that protects existing and future fixed service deployments and the integrity of the Appendix **30B** provisions.

As these applications are intended to operate globally, including across Australia, harmonised spectrum for ESIM would facilitate ESIM on aircraft registered outside of Australia entering our air space. ESIM Internet high-speed broadband connectivity to aircraft is also a development that can benefit industry and passengers flying domestically across the vast land mass of Australia.

Boeing Australia supports the minimum approach to monitor this development towards WRC-23 and to engage in ITU-R studies for WRC-23 agenda item 1.15 to the benefit of FSS ESIM operations across Australia.

40 GHz (37-43.5 GHz) Monitoring

There are a range of services in Australia with primary allocations allocated in this frequency band such as space research, fixed, mobile, mobile-satellite and fixed-satellite services.

Sections of the frequency band are the subject of a WRC-27 agenda item to harmonise the band for ESIM on aircraft and vessels (similar to 13 GHz above for WRC-23).

The WRC-27 agenda item aims to facilitate in-flight connectivity. The growing demand for Internet-based applications for the airline industry and passengers calls for capacity for such services.

ARSP footnote AUS101 states the 37-37.5 GHz frequency range 'is designated to be used principally for the purposes of defence and national security.'

At WRC-19, the 40 GHz band was identified globally for IMT.

A potential introduction of IMT/5G in the frequency range poses interference issues for ESIM and FSS.

Boeing Australia supports:

- Continuation of monitoring approach and ongoing protection of primary satellite operations.
- Protection of the 37-37.5 GHz frequency range for defence and national security use.
- Work toward a WRC 27 agenda item on ESIM in 37.5-40.5 GHz (space-to-Earth), 40.5-42.5 GHz (space-to-Earth), 47.2-50.2 GHz (Earth-to-space) and 50.4-51.4 GHz (Earth-to-space).

47 GHz (47.2-48.2 GHz) Monitoring

Primary allocations in the Radio Regulations are for fixed, mobile and fixed satellite services, yet ACMA note 'in Australia, there are currently no formal arrangements for any services in the band.'

At WRC-19, Region 2 and 71 other countries in Regions 1 and 3, including Australia, identified 47.2-48.2 GHz for IMT.

Sections of the frequency band are the subject of WRC-27 agenda item to harmonise the band for earth stations in motion (ESIM) on aircraft and vessels (see 40 GHz above).

These higher frequency bands (Q/V band) represent greenfield opportunities for new satellite technologies including next generation high throughput satellites and very high throughput satellites. Most major satellite operators have systems under development and some operational satellites have a Q/V band capability built in.

The introduction of IMT should not diminish potential satellite operations in the frequency band, consistent with RR footnote No. **5.553B**.

Boeing Australia supports:

- the ongoing spectrum planning monitoring approach,
- retention/protection for future global satellite operations, and
- work toward a WRC 27 agenda item on ESIM in parts of the frequency band.

Bands being studied under WRC-23 agenda item 1.2

WRC-23 agenda item 1.2 is focusing on spectrum harmonisation requirements for IMT/5G mobile broadband technologies across the frequency ranges:

- 3 300–3 400 MHz
- 3 600–3 800 MHz
- 6 425–7 025 MHz
- 7 025–7 125 MHz and
- 10.0–10.5 GHz,

including possible additional primary allocations in the Radio Regulations to the mobile service where none exist.

7 025-7 125 MHz

Only the 7 025-7 125 MHz frequency band is proposed globally for IMT identification, all other frequency bands in the agenda item are relevant to Regions 1 and 2 and not Region 3 (AUS).

The 7 GHz frequency band has a total of 785 assignments according to the ACMA Register of Radiocommunication Licences. The assignments include fixed-satellite service in both Earth-space and space-Earth directions, radiodetermination service operated by the Department of Defence and over 300 fixed point-to-point links.

China is lobbying for identification of 7 025-7 125 MHz, but there is little regional support. Given the current ongoing rollout and spectrum already made available for 5G in Australia, it is difficult to justify Australia allocating this frequency band to further IMT/5G identification.

Boeing Australia is of the view that any consideration of IMT/5G for 7 025-7 125 MHz in Australia would need to be thoroughly justified, and if so, incumbent services will need to be protected.

3 300-3 400 MHz

The 3 300-3 400 MHz frequency band is used by the Department of Defence for global radar operations. While this frequency band under the WRC-23 agenda item is only a consideration for Regions 1 and 2, the introduction of IMT in these regions will likely cause interference into radar operations. Defence is actively engaging in ITU-R to ensure radar technical characteristics are taken into consideration in IMT 5G compatibility and coexistence studies (also see 3.3 GHz above).

Boeing Australia supports the Department of Defence and Australia participating in ITU-R studies to have Australian radar system technical characteristics included in compatibility and coexistence studies with IMT for the 3 300–3 400 MHz frequency band.

Respectfully submitted,



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Abbreviations

APT	Asia-Pacific Telecommunity
ARSP	Australian Radiofrequency Spectrum Plan
AWG	Asia-Pacific Telecommunity Wireless Group
BLoS	beyond line-of-sight
CEPT	Conference of Postal and Telecommunications Administrations (Europe)
CNPC	control and non-payload communication
ESIM	earth stations in motion
FSS	fixed-satellite service
FWA	fixed wireless access
GHz	Gigahertz
IMT	International mobile telecommunications
IoT	Internet of Things
ITU	International Telecommunication Union
ITU-R	International Telecommunication Union - Radiocommunication Sector
LIPD	Low interference potential devices
LoS	line-of-sight
M2M	machine to machine
MHz	Megahertz
MIC	Ministry of Internal Affairs and Communications
MNO	Mobile network operators
MSS	mobile-satellite service
RLAN	Radio Local Area Network
RPAS	remotely piloted aircraft systems
RR	Radio Regulations
TOB	Television outside broadcast
UA	unmanned aircraft
UAS	unmanned aircraft systems
WBB	Wireless broadband
WISP	Wireless internet service provider
WRC	World Radiocommunication Conference