

Ms Aileen Chia
Director-General (Telecoms and Post)
Deputy CE (Connectivity Development & Regulation)
Infocomm Media Development Authority
10 Pasir Panjang Road
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Singapore 117438

10 March 2023

Subject: Consultation on Proposed Allocation of 6 GHz Band
Combined Industry Response

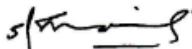
Dear Ms. Aileen Chia,

Amazon, Apple, Broadcom, Cisco, HPE, Intel and Meta (the “Companies”) hereby jointly submit our comments in response to IMDA’s consultation on the Proposed Allocation of 6 GHz Band in Singapore, dated 14 February 2023.

CONTACT INFORMATION ON BEHALF OF THE COMPANIES

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Sincerely yours,



Syed Ismail Shah

SUMMARY OF MAJOR POINTS

- 1) The Companies encourage IMDA to allocate the full 1200 MHz in the 6GHz band for RLAN/Wi-Fi use. This is particularly important to keep pace with the capabilities of 10G-PON and 5G for a seamless user experience and the best time to make this decision is now as outlined in the detailed comments.
- 2) The Companies have also suggested some modifications to the proposed technical requirements.

STATEMENT OF INTEREST

The Companies have various interests including in RLAN/Wi-Fi connectivity, consumer devices as well as in Access Points.

COMMENTS

The Companies thank IMDA for the opportunity to comment on IMDA's plans regarding 6 GHz in Singapore for RLAN/Wi-Fi use on a license-exempt basis in the 6 GHz band (5925-7125 MHz). We welcome IMDA's recognition of the continued increasing demand for Wi-Fi, and the need for Wi-Fi to keep pace with the capabilities of 10G-PON and 5G for a seamless user experience.

Part 1 – Comments on the proposed initial allocation of the lower 500 MHz of the 6 GHz band (i.e., 5925 MHz – 6425 MHz) for RLAN / Wi-Fi use.

We appreciate IMDA's plan to release the lower 6 GHz band (i.e., 5925-6425 MHz) to make RLAN/Wi-Fi available in Singapore as a starting point, especially, as noted by IMDA, given the readily available and mature eco-system for Wi-Fi 6E equipment that is already in the market. However, we believe it is in Singapore's best interest **not** to postpone a decision on the upper 6 GHz band (i.e., 6425-7125 MHz), and strongly encourage Singapore to make available the full 6 GHz band (i.e., 5925-7125 MHz) for license-exempt use.

Our reasons are as follows:

1. *The release of only the lower 6 GHz band will not bring about the jump in performance improvement of Wi-Fi in Singapore needed to sustain the level of innovation and digital transformation the country is striving for. There will not be sufficient number of wide channels available for the dense deployment of high performing Wi-Fi networks.*

Current Wi-Fi speeds available with just 2.4 and 5 GHz spectrum peak at sub-1 Gbps, typically at around 500 Mbps in an uncongested environments, utilizing 20 and 40 MHz channel sizes. At these speeds, a wireless device connected by Wi-Fi cannot attain the full performance afforded to a fixed local area network device in a network supported by a 1 Gbps fiber connection that is common place in Singapore.

The amount of spectrum in the lower 6 GHz band is not sufficient to provide a minimum of 7 wideband channels needed for a dense Wi-Fi deployment. As a result, networks deployed with Wi-Fi 6E will still need to fall back on 40 MHz channels. This leads to little improvement on the network performance.

In contrast, with the full 1200 MHz available in the full 6 GHz band, 80 and 160 MHz will become the default channel sizes. At this channel width, a client with 2x2 MIMO capability is able to achieve speeds of 2 Gbps readily. Such speeds, and the accompanying reduced latency from the current average of 100 ms down to 10 ms (as a result of the wider channels), will be able to supply new and innovative use cases, such as those with Mixed Reality/Augmented Reality/Virtual Reality (MR/AR/VR) capabilities.

2. *The release of only the lower 6 GHz band will create a legacy Wi-Fi problem in Singapore currently in the 5 GHz band that will become more pronounced with time and in dense deployments.*

One of the benefits of opening the 6 GHz band for Wi-Fi is to have a network with no legacy Wi-Fi devices which can become the bottleneck of the network performance. However, if regulators choose only to open the lower 500 MHz as a starting point, it can create a legacy problem which would be otherwise avoided by opening the full band from the start.

This problem arises due to the planning of networks deployment and upgrades based on client device availability. If only the lower 6 GHz band is permitted, equipment manufacturers will homologate products for the Singapore market only to support the 500 MHz bandwidth in the lower 6 GHz band. Such homologation would be obtained at least 6 months before launch. Enterprises introducing devices into their networks will similarly need to deploy products only capable of supporting the lower 6 GHz band, with networks designed based on the limited number of channels available.

With typical network planning cycles in enterprises, devices do not get replaced for at least 2-4 years. If a future regulatory decision to allow access to the upper 6 GHz band (making the full 1200 MHz bandwidth available) occurs 2-3 years later, there will be a period of several years where the early movers to Wi-Fi 6E will have to continue using devices that only support the lower 6 GHz band instead of leveraging the full 1200 MHz bandwidth in the whole 6 GHz band. Devices already homologated for only the lower 6 GHz band would not be re-tested for the upper 6 GHz as equipment vendors will focus on homologating new products that support the full 6 GHz band.

This uncertainty about the availability of the upper 6 GHz band puts enterprises in a very difficult position to plan their network designs and upgrades. Enterprises are forced to plan using only channels in the lower 6 GHz band for at least the first 2-3 years even after the regulation subsequently permits the use of the full 6 GHz band.

3. *WRC-23 agenda item 1.2 should not be a reason for Singapore to delay a decision on the upper 6 GHz band.*

Many countries within the Asia Pacific region have taken a two-phase approach to the 6 GHz band, opting to wait for the results of WRC-23 agenda item 1.2. One of the reasons for this delay is the uncertainty about the coexistence of IMT and incumbent services in the band.

While studies on this point are mixed, we note that most recently, UK Ofcom released a study on *Sharing and Compatibility of FSS and IMT*¹ which found that “unless a global beam is used and the satellite orbital slot is confined, a dense IMT deployment would exceed the protection criterion” for FSS uplink in many of the carrier/slot scenarios and “additional mitigations would be needed if widespread IMT deployments were to be permitted in the 6425-7125 MHz band”.

¹ <https://www.itu.int/md/R19-WP5D-C-1611/en>

Other sharing studies relating to FSS downlink have also shown that separation distances of up to tens of kilometres are needed between the IMT station and the FSS earth station. With fixed services, the studies also show that separation distances of up to 68 km (or 200 km in the worst-case scenario) are needed – an impossibility with Singapore’s landmass width of only 50 km east-west and 27 km north-south. These other sharing studies on downlink significantly influence the potential for IMT deployments around incumbent users.

Australia, in its 2021 consultation regarding 6 GHz² also stated that they “do not consider that WRC-23 agenda 1.2 is a sufficient reason to delay a decision on the upper 6 GHz band – indeed, how other major international jurisdictions choose to use the band will provide a better gauge than studies under/outcomes of that agenda item”. In relation to the upper 6 GHz band, Australia said that they “do not currently intend to wait for WRC-23 outcomes and any subsequent global adoption”.

4. *Singapore could lose its competitive edge in innovation compared to countries like South Korea and the United States where the full 6 GHz band is available for organizations, domestic and global, to truly create, experiment, and deploy next-generation applications and services.*

The ability for Singapore to remain a competitive player in attracting investments and development of innovative applications, systems and solutions in the digital sphere is contingent on the availability of a digital infrastructure capable of performing at the next level of capability beyond what is commonly available in most countries. With countries like South Korea already making available the full 6 GHz band that can allow high performance Wi-Fi networks to be deployed, companies and investors looking to create new innovations will be drawn to deploy such new solutions in environments that can support the performance characteristics needed.

² <https://www.acma.gov.au/consultations/2021-10/radio-local-area-networks-rlans-6-ghz-band-consultation-372021>

Part 2 – Comments on the proposed technical requirements.

The Companies would like to address the proposed technical requirements in Table 1 of Annex A. We support authorization of the LPI and VLP modes, but kindly request IMDA to consider the following changes to the proposed technical requirements:

1. Authorize maximum EIRP of 30 dBm for LPI devices.
2. Authorize maximum EIRP of 17 dBm for VLP Channel bandwidth of 320 MHz supported by IEEE 802.11be and targeted for Wi-Fi 7. The maximum EIRP of 14 dBm is primarily assuming a 160 MHz channel bandwidth and is not forward compatible for Wi-Fi 7 devices to be introduced to market soon.
3. Authorize Client-to-Client operation under LPI mode aligned with ECC decision for 6 GHz band³. More specifically, the Companies recommend adding the following text in the Remark Field of Table 1 for LPI mode: “An LPI client device is a device that is connected to an LPI access point or another LPI client device.”

At a later point in time, we also recommend IMDA consider authorizing Standard Power (SP) mode under supervision of Automated Frequency Coordination (AFC) in the next phase. Authorizing SP mode at maximum EIRP of 36 dBm for Access Points and 30 dBm for Clients for indoor and outdoor operation enables many key applications for outdoor usage and also improve coverage performance in indoor scenarios. The United States and Canada have already authorized SP mode and are currently developing certification process for AFC Systems. Many other countries including Brazil, Saudi Arabia, South Korea and Japan are studying authorizing AFC for Standard Power mode. Industry work led by Wi-Fi Alliance⁴ and WinnForum⁵ is very well underway and mature to develop recommended compliance specification for certification of AFC System and AFC devices.

CONCLUSION

The Companies encourage Singapore to enable RLAN/Wi-Fi access to the full 1200 MHz of the 6 GHz band (5925-7125 MHz) rather than release only the lower 6 GHz band (5925-6425 MHz). The needs of Singapore will be better served by such an approach. We also recommend a number of modifications to the proposed technical requirements for IMDA’s consideration for adoption.

³ ECC Decision (20)01, On the harmonised use of the frequency band 5945-6425 MHz for Wireless Access Systems including Radio Local Area Networks (WAS/RLAN) (20 November 2020)

⁴ <https://www.wi-fi.org/file/afc-specification-and-test-plans>

⁵ <https://6ghz.wirelessinnovation.org/baseline-standards>