



GSMA APAC
46/F, Lee Garden One
33 Hysan Avenue
Causeway Bay, Hong Kong
gsma.com

13 March 2023

Ms Aileen Chia
Director-General (Telecoms and Post)
Deputy CE (Connectivity Development & Regulation)
Infocomm Media Development Authority
10 Pasir Panjang Road
#03-01 Mapletree Business City
Singapore 117438

Consultation on Proposed Allocation of 6 GHz Band

Dear Ms Chia,

The GSMA would like to thank the Infocomm Media Development Authority (IMDA) for the opportunity to provide our views on this important topic of the proposed allocation of the 6 GHz in Singapore. The GSMA represents the interests of mobile operators worldwide, uniting more than 750 operators with almost 400 companies in the broader mobile ecosystem.

Below we provide a summary of the major points with further elaboration in the subsequent sections.

Summary of major points

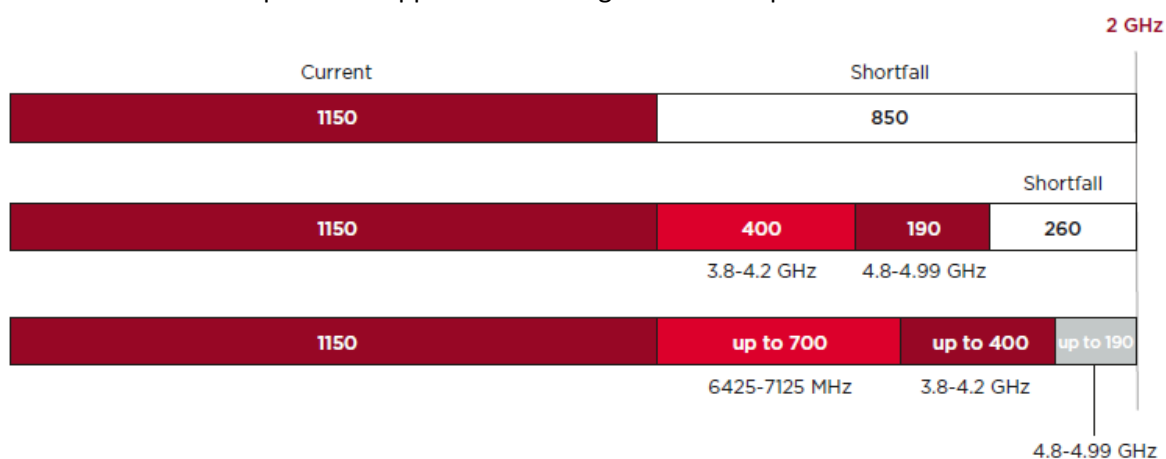
1. For the mobile industry, mid-band spectrum is vital to meet the growing demand for 5G services in the years ahead. In Singapore the supply of frequencies for IMT in the 1-7 GHz range is limited and thus the upper 6 GHz (6425-7125 MHz) represents the most viable and suitable option for future 5G expansion.
2. There are competing claims for use of the 6 GHz band (5925-7125 MHz) for IMT and Wi-Fi. Impact assessment by GSMA Intelligence shows that additional allocation of spectrum for licence-exempt use in Singapore, beyond the lower 6 GHz band (5925-6425 MHz), leads to sub-optimal outcomes. There is no additional socio-economic benefits from allocating the rest of the 6 GHz band (6425-7125 MHz) for unlicensed use.
3. GSMA recommends that licence-exempt usage in the 5925-6425 MHz band should be on a technology-neutral basis, allowing equal access for IEEE-based Wi-Fi standards and 3GPP-based 5G New Radio Unlicensed (NR-U). Furthermore, it is important that technical requirements for RLAN use in 5925-6425 MHz ensure the protection of existing and potential future primary services and applications in both the lower and upper 6 GHz bands.

Singapore is among the most advanced markets globally in terms of mobile connectivity, supported by the scale of its 5G rollout. Operators in Singapore have achieved over 90% coverage with their 5G SA networks, a much quicker rate of deployment than peers in other countries. This gives Singapore a good platform to address not just the needs of enhanced mobile broadband, but also those of the fast growing 5G enterprise sector and the associated ultra-reliable low-latency services and massive IoT applications.

The importance of the 6 GHz band for licensed IMT

The 6 GHz band comprises frequencies from 5925-7125 MHz and spectrum in this range will be crucial for the next phase of 5G development. As 5G evolves into 5G-Advanced and network quality improves throughout the decade, traffic volume will follow. Additional mid-band spectrum in the 1-7 GHz range will be critical for 5G expansion. By 2030 5G will be at the height of its impact on businesses, economies, and livelihoods, and around half the world’s mobile connections will be through 5G. Consequently, the greatest demand will be placed on mid-band spectrum by that time.

A total of 2 GHz of mid-band spectrum on average will be required per market to support the growth of 5G by 2030.¹ Today, around 650-750 MHz of mobile spectrum is typically available between 1-3 GHz. In the more mature 5G markets, 400-500 MHz of 3.5 GHz spectrum usually supports city-wide 5G, giving a total of around 1150 MHz as indicated below. In many markets however, the amount of mid-band assignments are lower. For example, in Singapore there is currently only 675 MHz of mid-band spectrum available for public mobile services² – a significant shortfall of more than 1300 MHz to the 2 GHz that is required to support the future growth and expansion of 5G.



If additional mid-band spectrum is not made available, operators would need to massively densify their networks across many locations, building new sites in both outdoor and indoor areas to an extent that will not be technically, practically or economically feasible, and would result in degradation in network quality and environmental impacts including increased energy consumption and carbon emissions.

There are very limited options available to make up this shortfall in mid-band capacity. The upper 6 GHz band (6425-7125 MHz) which is standardised as 3GPP Band n104, is the most viable and suitable mid-band frequency range to satisfy future demand for mobile. As shown above, it is difficult to meet future demand without it. Given the shortage of mid-band spectrum in Singapore, the upper 6 GHz spectrum (6425-7125 MHz) represents the most viable and suitable option for future 5G expansion in Singapore.³

¹ [GSMA. Vision 2030: Insights for Mid-band Spectrum Needs. July 2021.](#)

² IMDA. Spectrum Management Handbook 2022, June 2022.

³ While there may be some scope in Singapore to increase the amount of mid-band spectrum in bands such as 2.3 GHz and 3.5 GHz, only 6 GHz would be able to support wide contiguous bandwidths of 100 MHz or more for multiple operators.

Assessing options and impacts of 6 GHz allocation

There are competing claims for use of the 6 GHz band for IMT and Wi-Fi and the specific use of this band has clear implications on the socio-economic benefits that 5G can deliver. Thus, it is essential for policymakers and regulators to carefully consider the implications of allocation of this band.

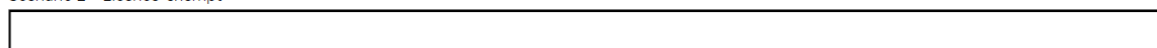
GSMA Intelligence has carried out a detailed study⁴ to assess the socio-economic impacts of different allocation options of the 6 GHz for 24 countries, including Singapore. The objective was to identify the optimal allocation policy for the period up to 2035 where 6 GHz spectrum will have its most productive use.

For each country three scenarios for 6 GHz policy were considered: (1) entire 6 GHz band (5925-7125 MHz) assigned to licensed use, (2) entire 6 GHz band given for Wi-Fi/licence-exempt, and (3) 700 MHz (6425-7125 MHz) assigned to licensed use and 500 MHz (5925-6425 MHz) assigned for unlicensed use.

Scenario 1 - Licensed 5G



Scenario 2 - Licence-exempt



Scenario 3 - Hybrid



5925 MHz

6425 MHz

7125 MHz

The study made two core findings:

- i. For all countries studied, the most benefit to society comes from assigning either 700 MHz or 1200 MHz of 6 GHz spectrum to licensed 5G.
- ii. For all countries studied, there is never a scenario where the allocation of the full 6 GHz band to unlicensed use (Scenario 2) generates the greatest benefit to society.

Even in countries with extensive FTTP penetration, allocating an additional 500 MHz of spectrum for unlicensed use in the lower 6 GHz band is sufficient to meet expected demand. This means that there are no additional gains from allocating the rest of the 6 GHz band (6425-7125 MHz) for unlicensed use.

Comments on proposed technical requirements

With regard to the technical requirements for RLAN use proposed by by IMDA, we believe that allocation of the lower 6 GHz (5925-6425 MHz) for licence-exempt usage should be on a technology-neutral basis, allowing equal access not just to IEEE-based Wi-Fi standards (e.g. Wi-Fi 6E) but also to 3GPP standards, such as 5G New Radio Unlicensed (NR-U).

Opening the lower 6 GHz band to both NR-U and Wi-Fi 6E will allow for:

- NR-U to use channel bandwidths in multiples of 20 MHz and the ability provide carrier aggregation functionalities with IMT.
- Wi-Fi 6E to use up to 6 additional 80 MHz channels or 3 additional 160 MHz channels (in addition to the 5 GHz adjacent band).

⁴ [GSMA Intelligence. The socioeconomic benefits of the 6 GHz band: considering licensed and unlicensed options, June 2022.](#)

Licence-exempt use of the lower 6 GHz band should also consider the appropriate protection for primary services in-band and in adjacent bands and be harmonised at wider regional level to allow achieving economies of scale for equipment and ecosystem.⁵

The use of higher power outdoor Wi-Fi may cause interference to existing and future licensed services such as backhaul links. Thus, we suggest that licence-exempt use in 5925-6425MHz should be indoor only. Outdoor deployment should be avoided to prevent potential interference to the other primary services in the band and in adjacent bands. This includes other potential radio communications services that could be licensed in this band or the adjacent 6425-7125 MHz band in the future such as IMT.

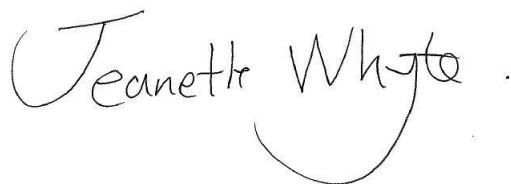
It is therefore suggested that IMDA consider regulatory measures that ensure protection of existing and potential future primary services and applications in both the lower and upper 6 GHz bands from unlicensed devices operating in 5925-6425 MHz. Examples of regulatory measures include certification tests and other technical requirements to ensure the device operating frequency is limited to the 5925-6425 MHz range.

Conclusion

Singapore has made a strong start to the 5G era. However, as 5G evolves and demand grows over the rest of this decade, sufficient mid-band spectrum supply needs to be made available to enable sustainable 5G expansion. The GSMA strongly believes that a balanced approach to the allocation of the 6 GHz band, comprising lower 6 GHz for unlicensed use and upper 6 GHz for licensed IMT services, is essential and represents the optimal approach for Singapore.

We trust that our submission will merit your kind consideration and we remain available for any questions and further information or clarifications on this matter.

Yours sincerely,



Jeanette Whyte
Head of Public Policy, APAC
GSMA

⁵ For example, Europe (EU/CEPT) has adopted harmonised technical conditions for RLAN use in 5945-6425 MHz. See [ECC Decision 20\(01\)](#). Several countries in Region 1 (MEA) and Region 3 (APAC) have adopted or are considering harmonised technical conditions in the 5925-6425 MHz range in line with the ECC Decision 20(01).