

6 GHz LICENCE-EXEMPT: WHY THE FULL 1200 MHz AND WHY NOW?

A summary of the White Paper by the Dynamic Spectrum Alliance

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Since the World Radiocommunication Conference 2003 decision to open spectrum in the 5 GHz range to licence-exempt wireless access systems and radio local area networks (WAS/RLAN), there have been revolutionary changes in technology, use cases, and demand. Wi-Fi has moved from an amenity that helps make broadband connectivity more useful to an essential part of broadband delivery and an essential element in enabling businesses to get work done and people to get online in urban, suburban and rural areas.

There are now more than 16 billion Wi-Fi devices in use and a further four billion are shipped every year.

Given this growth and the evolution to next generation Wi-Fi, there is an urgent need to consider making the full 1200 MHz in the 5925-7125 MHz (6 GHz) band available on a licence-exempt basis.

Why Wi-Fi needs 1200 MHz

New Wi-Fi standards need access to the full 1200 MHz to support current and emerging innovative use cases, now and in the future. Opening only 500 MHz of the 6 GHz band would mean Wi-Fi networks in dense deployments would have to continue to employ small channel bandwidths (as only one 320 MHz channel would be available). But with access to the full 1200 MHz, larger channel bandwidths of 160 MHz and especially 320 MHz could be more easily accommodated.

Wider channel bandwidths increase spectrum efficiency and deliver high-bandwidth application and services, while maintaining the ability to share spectrum with incumbents and other licence-exempt deployments. A lack of wider channels would have a detrimental impact on real-time video services and high-bandwidth immersive services, such as augmented reality and virtual reality (AR/VR) services.

Next generation Wi-Fi, known as Wi-Fi 7, will rely on up to 320 MHz channels to further improve latency, throughput, reliability and quality of service relative to Wi-Fi 6. The FCC, the regulator in the U.S., has said: "Making the entire band available for these unlicensed operations enables use of wide swaths of spectrum, including several 160-megahertz channels, as well as 320-megahertz channels, which promotes more efficient and productive use of the spectrum, and would also help create a larger ecosystem in the 5 GHz and 6 GHz bands for U-NII devices."

Subject to the results of appropriate sharing studies, it may be possible in future to use outdoor standard power (higher power) Wi-Fi operations to support use cases in manufacturing, logistics, agriculture, rural broadband, higher education, hospitality, healthcare, and other sectors. Standard power typically operates in conjunction with an automated frequency coordination (AFC) geolocation database capability, which is aware of incumbent user operations and can safely authorise licence-exempt use at a particular location while protecting the incumbents from harmful interference. In essence, the AFC approach involves blocking or protecting certain frequencies or channels at particular locations, while still yielding a sufficient number of wide-bandwidth channels.

The socio-economic benefits

Licence-exempt usage throughout the full 6 GHz band will yield many socio-economic benefits, such as helping to address the digital divide, improving rural connectivity, accelerating economic innovation, and delivering greater quality of service. With Wi-Fi embedded in a wide array of client devices, from laptops to tablets and smartphones, consumers can choose the right device capabilities and price for them. Assuming regulators open the full 6 GHz band to Wi-Fi, the US\$3.3 trillion of value Wi-Fi will add to the world's economy in 2021 will rise to US\$4.9 trillion in 2025, according to research by Telecom Advisory Services for the Wi-Fi Alliance.

Regulators have flagged the benefits of licence-exempt technologies, e.g., ISED in Canada has said: "Making the full 6 GHz band available for licence-exempt use as soon as possible will maximize the social and economic benefits that Canadians will derive from this spectrum... The additional licence-exempt spectrum will provide the improvements needed in Wi-Fi throughput for homes and businesses and reduce congestion between neighbors living in close proximity. The additional spectrum will also support the ability for small wireless Internet service providers to provide cost-effective enhanced broadband connectivity in rural and remote areas."

In rural areas lacking wireline or fibre backhaul, Wi-Fi can deliver rural broadband with fixed wireless links or satellite broadband connectivity providing backhaul.

Wi-Fi 6 GHz tech is ready now

The Wi-Fi 6 standards are complete; interoperability certification is open, and equipment is on the market today. The Wi-Fi Alliance has named Wi-Fi 6 products capable of operating in the 6 GHz band as "Wi-Fi 6E" devices and released a certification plan for global interoperability as of January 2021.

In December 2020, then-FCC Chairman Ajit Pai marked the availability of the first certified devices by noting: "We expect Wi-Fi 6[E] to be over two-and-a-half times faster than the current standard. This will offer better performance for American consumers at a time when homes and businesses are increasingly reliant on Wi-Fi." Vendors are rolling out Wi-Fi 6E devices that use 160 MHz channels and uncongested bandwidth in 6 GHz to deliver multi-gigabit, low latency Wi-Fi further dramatically improving the user experience and spectral efficiency.

The Wi-Fi Alliance projects that 338 million Wi-Fi 6E devices will be sold globally in 2021. Shipments of Wi-Fi 6E devices are set to ramp up very quickly in 2022 and beyond.

Failure to act means large opportunity costs

Reserving a portion of the 6 GHz band for a later decision on whether to allow IMT (or not) would forego the immediate economic gains that would have accrued from opening the full 6 GHz band to licence-exempt operations.

It should also be noted that there is no 3GPP 6 GHz New Radio (5G) specification and, therefore, there isn't any commercially available IMT equipment for this band.

There is currently an ITU-R study question on coexistence between IMT and incumbent fixed and satellite services at 6425-7025 MHz (Region 1), as well as another on 7025-7125 MHz (globally). Although no studies have been undertaken to date, the satellite community in Europe has stated: "IMT use of the band 6425-7125 MHz would not be compatible with current and future satellite use of the band".¹ Presenting at the Dynamic Spectrum Alliance Global Summit on 9 June 2021, Philip Marnick, group director of spectrum for Ofcom UK, noted: "IMT identification is being considered for region 1 at WRC-23. But coexistence between existing users and high power outdoor mobile is not possible - would require clearing incumbents".²

By contrast, licence-exempt services in the 6 GHz band, operating under appropriate conditions, enable incumbents to grow their operations, while protecting them from harmful interference.

For much of the past decade, the IMT community has called for 100 MHz per operator in the 3 GHz range to support 5G needs. As regulators globally have made the 3 GHz band available for 5G, a wide variety of compatible equipment is available on the market. The IMT community is now calling for the upper 6 GHz band to be identified for IMT, with the GSMA recommending regulators "support harmonised mid-band 5G spectrum". But with major markets, such as the U.S., Canada, South Korea, and Brazil, having already made 5925-7125 MHz licence-exempt, these frequencies won't be harmonised for licensed 5G.

¹ EMEA Satellite Operators Association (ESOA) presentation at the Forum Global WRC-23 Webinar on 6 GHz, 17 May 2021, (slide 5).

² <http://dynamicspectrumalliance.org/wp-content/uploads/2021/06/Session-3-Keynote-Philip-Marnick.pdf> (slide 6)

Many regulators believe that withholding the upper 700 MHz of the 6 GHz band for future consideration for IMT is inadvisable. ISED in Canada said such a move would “hinder access to affordable broadband services for Canadians in rural and urban areas and would negatively impact the opportunities for innovation”. In Saudi Arabia, the CITC has said that the 3 GHz band “will be sufficient to cover the mid-band spectrum needs of IMT for the foreseeable future. The existing mid-bands for exclusive IMT use have robust ecosystems already as well as superior propagation characteristics.”

Working with 5G

The best way to harness 6 GHz spectrum for the benefit of 5G is to authorise licence-exempt use throughout the entire 1200 MHz of the band. Such a move would allow for mobile offload, 5G backhaul, and possibly 5G NR-U operation should equipment become available. Licence-exempt technologies support a substantial amount of mobile traffic offloads for indoor environments, saving operator capital expenses and conserving licensed mobile spectrum. Further, even after permitting licence-exempt use, fixed link incumbents can remain in the 6 GHz band, meaning these fixed links will be available to support 5G networks.

Regulators globally have recognised the important and critical role that licence-exempt technologies, such as Wi-Fi, play in furthering the 5G market and cite this as a reason to allocate the entire 6 GHz band to licence-exempt use. Many of the companies supporting this paper have interests in both licensed and licence-exempt 5G technologies, and view both as necessary to deliver on future wireless demands. Spectrum allocations should be sufficient to support both.

⁴ Source: The Digital Economy and Society Index Figure 41