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THE FUTURE OF THE 6 GHz BAND: ISSUES TO CONSIDER

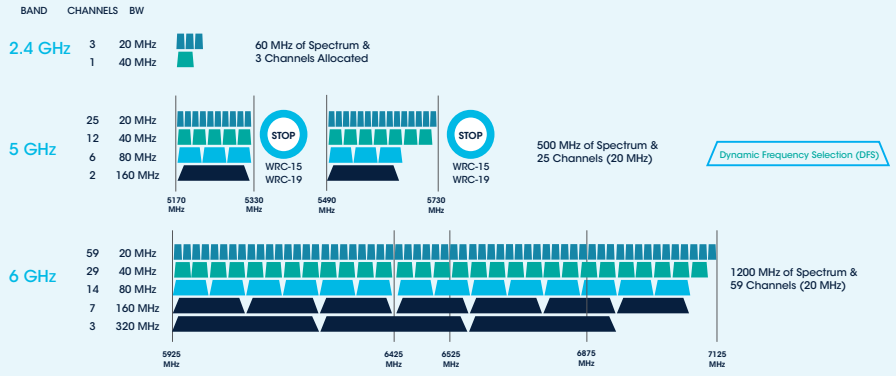
The upper 6 GHz band (6425-7125 MHz) is the subject of an agenda item at the World Radiocommunication Conference 2023 (WRC-23) in Dubai. This document is designed to help administrations make a fully informed decision on whether to identify this key tranche of mid-band spectrum for International Mobile Telecommunications (IMT). It carefully explains the case for opening the full 6 GHz band (5925-7125 MHz) for licence-exempt use, while protecting incumbent fixed satellite and fixed services, and allowing them to continue and even extend their operations without restrictions.

What is the evidence that Wi-Fi requires access to the full 6 GHz band?

Wi-Fi has become ubiquitous. More than 19.5 billion Wi-Fi devices will be in use in 2023 (390 times as many Wi-Fi devices as were in use in 2003), with 3.8 billion new devices shipped every year, according to research firm IDC. The vast majority of fixed-line traffic now reaches end-users via Wi-Fi. This traffic is growing rapidly. On the basis of forecasts made by Arthur D Little, the absolute growth in fixed data traffic looks set to be 3.75 times that of mobile data traffic in Europe between now and 2030. In the absence of sufficient licence-exempt spectrum, Wi-Fi will become a bottleneck, reducing a country's ability to deliver on its digital transformation agenda.

Studies by Quotient, Qualcomm and ASSIA have each pointed to major spectrum shortfalls for licence-exempt technologies, with ASSIA highlighting how congestion in both the 2.4 GHz band and the 5 GHz band has been impacting quality of service. From these studies, it becomes obvious that 480 MHz of licence-exempt spectrum in the 6 GHz band will not be sufficient to satisfy the mid- and long-term capacity needs. Given the important role that Wi-Fi plays for the broadband ecosystem and its continuing growth, there is a need to make the full 1200 MHz in the 6 GHz band available on a licence-exempt basis to support the ever-increasing demand and enable policymakers to meet their broadband goals and objectives for a digital society.

THE 6 GHz BAND CAN ACCOMMODATE MULTIPLE 160 MHz & 320 MHz CHANNELS



Source: Broadcom

Opening only 480/500 MHz of the 6 GHz band would mean that Wi-Fi networks in dense deployments would have to continue employing small channel bandwidths, as only one 320 MHz channel or three 160 MHz channels would be available. With access to the full 6 GHz band, a larger number of these wide channels could be accommodated (see graphic above), significantly improving the performance available to each user.

Wider channel bandwidths increase spectrum efficiency and deliver high-bandwidth applications and services while maintaining the ability to share spectrum with incumbents and other licence-exempt systems. A shortage of wider channels would have a detrimental impact on real-time video services and high-bandwidth immersive services.

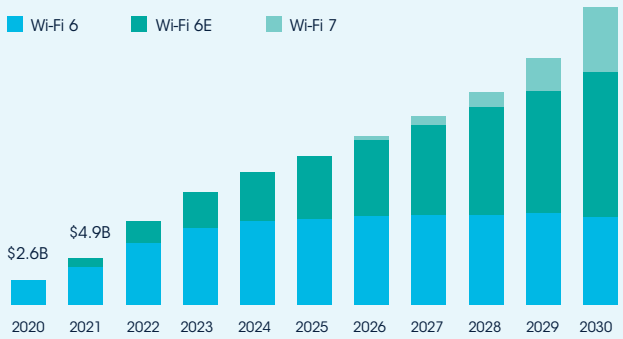
When will 6 GHz Wi-Fi equipment be available?

A wide range of 6 GHz Wi-Fi equipment (certified as Wi-Fi 6E) is already available. As of July 2023, there were approaching 2,000 different types of client devices and access points supporting Wi-Fi 6E, including more than 1,000 laptop models, 300 desktop PC models, scores of consumer and enterprise access points models, and more than 90 different models of smartphones, as well as 69 models of smart televisions, according to Intel.

As the market grows, economies of scale are kicking in, ensuring that Wi-Fi 6E will be highly affordable. IDC projects more than 473 million Wi-Fi 6E devices will enter the market in 2023. As with previous generations of Wi-Fi, the technology is set to be included in almost every phone, tablet and laptop, as well as other appliances, such as printers, televisions, cameras and wearables. Grand View

Research has forecast that the Wi-Fi 6E chipset market will grow rapidly (see chart). It projects that almost 4 billion Wi-Fi 6E chipsets will be shipped in 2028 globally, with an annual CAGR of 40.9% from 2021 to 2028. In 2024, the first certified Wi-Fi 7 products are set to arrive, further boosting the performance of Wi-Fi and increasing the options open to end-users.

NORTH AMERICA Wi-Fi 6, Wi-Fi 6E & Wi-Fi 7 CHIPSET MARKET
Size, by chipset type, 2020-2030 (USD Billion)



Source: https://www.grandviewresearch.com/industry-analysis/wi-fi-6-wi-fi-6e-chipset-market-report

Should WRC-23 identify the upper 6 GHz band (6425-7125 MHz) for IMT?

No, WRC-23 should adopt a No Change position. If WRC-23 were to identify the upper 6 GHz band (6425-7125 MHz) for IMT, the 6 GHz band will be fragmented. An IMT identification in 6425-7125 MHz, which typically aims at harmonising the use of the band around a specific ecosystem, cannot achieve this goal, as it would only concern Region 1. Even in Region 1, many countries have other priorities in the band (incumbent systems and support for licence-exempt technologies). Saudi Arabia, for instance, already opened the entire 6 GHz band for licence-exempt use, and on the request of several European countries, the conditions for potential licence-exempt operation in the upper 6 GHz band are being studied by the CEPT.

Given the enormous demand for Wi-Fi connectivity, it is important to make the upper 6 GHz band available on a licence-exempt basis today. Meanwhile, the growth in IMT traffic is slowing and much of the spectrum identified for IMT is under-used.

For WRC-23 Agenda Item 1.2, a No Change outcome would not necessarily preclude IMT use of the bands in future. Other bands have been used for IMT in Europe without the need for an IMT identification in the Radio Regulations.

To what extent can IMT coexist with incumbent services in the 6 GHz band?

Technical studies on the operation of IMT services in the upper 6 GHz band have shown that incumbent fixed wireless and satellite services in the band will need significant protection. While the required limits on transmission power would allow licence-exempt networks (e.g. Wi-Fi) to operate in the band, they would make deployments of IMT networks commercially unviable.

The satellite industry is very concerned about potential interference from IMT services. The Global Satellite Operators Association (GSOA) has said: "A geostationary satellite can 'see' around one third of the earth surface and hence would receive interference from potentially millions of mobile base stations and terminals. Experience in some other frequency bands used by satellite uplinks, such as the 2.5 GHz band, has shown that IMT systems can cause interference to satellites that effectively prevent all satellite operations."

Together, satellites and Wi-Fi bring connectivity to people and communities that are underserved by cellular and fixed-line networks. If the full 6 GHz band is licence-exempt, Wi-Fi networks will be able to harness the spectrum to enable people in underserved areas to share the broadband connectivity delivered by satellites.

What are the repercussions of introducing licence-exempt tech in the 6 GHz band?

Low power indoor (LPI) and very low power (VLP) licence-exempt equipment can coexist with incumbents without any further mitigation measures. In our view, the same regulatory conditions, relating to indoor and outdoor usage and power levels, can be applied across the whole 6 GHz band.

UK regulator Ofcom and CEPT are studying whether IMT and Wi-Fi services could coexist in the upper 6 GHz band through a concept called "hybrid sharing". While such research is welcome, it doesn't change the fact that WRC-23 should not identify the band for IMT. Hybrid sharing should not curb the performance of Wi-Fi 6E and Wi-Fi 7 or require any modifications to Wi-Fi devices. Any such frameworks should be introduced by first enabling Wi-Fi in the band, then gradually, where needed, allow IMT licensed deployment on a base station by base station basis, once the mechanisms for coexistence have been worked out.

How sustainable are Wi-Fi and IMT technologies?

France's regulator ARCEP has found that the combination of fibre and Wi-Fi is the most efficient connectivity solution in terms of energy consumption, performance, and flexibility. Energy efficiency will be particularly important in light of the ongoing energy crisis, while also helping countries to achieve their sustainability targets. Employing Wi-Fi, rather than IMT, in the 6 GHz band will require less power, helping to make better use of scarce energy resources.

A study by WIK Consult found that if Wi-Fi lacks sufficient spectrum, data traffic would shift from FTTH/Wi-Fi networks to 5G mobile networks. This shift would lead to more energy consumption and greenhouse gas emissions.

Employing the 6 GHz band to enable outdoor base stations to deliver indoor connectivity would consume much more energy than using low power Wi-Fi 6E, which is designed to provide connectivity indoors.

This document is an extract from a more detailed Q&A document, which is fully referenced and sourced. This and other documents to support the evidence base for licence-exempt access to the entire 6 GHz band is available at **6GHz.info**