

Response to Spectrum Roadmap

Introduction

Founded in 2003, Wireless Broadband Alliance (WBA) is continuing to deliver on its vision of driving seamless, interoperable service experiences via Wi-Fi across the global wireless ecosystem. WBA's mission is to enable collaboration between service providers, operators, technology companies and organizations to identify solutions to common problems and foster ease of use for consumers, enterprises and public entities. WBA undertakes programs and activities to address ecosystem issues, as well as green field opportunities for member companies.

WBA work areas include advocacy, industry guidelines, trials and certification. Key programs include NextGen Wi-Fi, 5G, IoT, Testing & Interoperability and Roaming, with member-led work groups dedicated to resolving standards and technical issues to promote end-to-end services and accelerate business opportunities. WBA's members include major operators and leading technology companies.. For a complete list of current WBA members, click [here](#).

WBA welcomes and appreciates the opportunity from Ofcom to provide feedback on Ofcom's roadmap for radio spectrum management strategy. Herein, WBA highlights importance of Wi-Fi and its potential role in current and future connectivity competitiveness in the UK, and to assist Ofcom realize this spectrum vision.

Current Projects Included in Ofcom's Plan of Work 2022/23

According to Wi-Fi Alliance, in 2022, nearly 18 billion Wi-Fi devices will be in use, and more than 4.4 billion devices will ship this year.¹ Wi-Fi Alliance highlights momentum building with four Wi-Fi trends expected in 2022.² 1) Increasing adoption of Wi-Fi 6 and Wi-Fi 6E in homes and enterprises fuelled by connectivity in phones, tablets, and access points (AP) 2) Industry advancements in Automated Frequency Coordination (AFC)³ development as the state of the art spectrum sharing mechanism for high performance Wi-Fi services in 6GHz 3) Meeting diverse set of requirements from consumer devices and industrial applications 4) Advancing in Wi-Fi network optimization to meet the requirements for growing number of devices and users relying on performance hungry applications such as video conferencing, voice-over-IP services, X Reality (XR) applications, and ultra-high definition (UHD) streaming at home and in enterprise networks.

In line with our past comments, WBA strongly urges allocation of the entire 6GHz band (5925-7125MHz)⁴ for license exempt operation in the UK and globally for full harmonization, and requests Ofcom to consider it in its current Plan of Work in 2022/2023 as well as going forward. With all the developments and new trends in 2022 and 2023, especially as a result of the ramp up of Wi-Fi 6E and the upcoming Wi-Fi 7, WBA believes that Wi-Fi is the single most impactful technology in UK's citizens' everyday lives encompassing personal, commercial and public service uses. Radio spectrum allocation of the entire 1200 MHz in the 6GHz band (5925MHz-7125MHz) will ensure sufficient high-capacity channels to further foster productivity.

Spectrum needs for Specialized Uses

For meeting the needs of other sectors than businesses, residential and public sector, as related to specialized requirements and industrial applications, WBA believes that new developments and features in Wi-Fi 6E (based on IEEE 802.11ax) and especially Wi-Fi 7 (based on IEEE 802.11be)

¹ <https://www.wi-fi.org/news-events/newsroom/wi-fi-alliance-2022-wi-fi-trends>

² <https://bit.ly/2022WiFiTrends>

³ Automated Frequency Coordination database system for permitting coexistence between licensed and license-exempt 6 GHz users at Standard Power

⁴ Some individual WBA members hold a different position on the U6GHz band

towards enhancements in determinism makes Wi-Fi technology a viable candidate for these applications. Wi-Fi connectivity is ubiquitous and it easily lends itself to different operating conditions. Advances in signal processing technologies are enabling new use cases such as motion sensing and gesture recognition on top of already proven, robust and low-cost connectivity technology. Wider channels increase detection accuracy, cut down on latency and reduce airtime. One can expect these advances to enable additional use cases, possibly including monitoring of the environment. Wi-Fi completely meets the 'general purpose' network technologies definition highlighted in the Ofcom roadmap, and offers a solid foundation for other specialized advances.

WBA would like to thank Ofcom for consideration of Wi-Fi in the target statement in Q2 2022/23. For flexibility in spectrum use to enable innovation in local indoor access in the upper 6GHz band, WBA believes that allocation of the entire 1200MHz in 6GHz band is the best choice to support multiple 320MHz wide channels to double the data rate and halve the latency, and further improve location and sensing capabilities. Other new and innovative technologies such as XR will enable new applications in enterprise, industrial operations, and other specialised fields.

Ecosystem Enhancements for Known Use Cases

WBA also recognizes Ofcom plan for fibre rollout (85% by 2025 and 99% by 2030) as key complement to local indoor access, but Wi-Fi is the mechanism that users get to experience this new high-capacity connectivity. Today, the most widely adopted mode of operation for 6GHz and Wi-Fi 6E is Low Power Indoor and expected to be the same for Wi-Fi 7. Considering Ofcom 2022/2023 plan of work timeline, it is useful to note that, today, most of the 6GHz enabled Wi-Fi chipsets and products are designed to support the entire 6GHz band (5925-7125MHz) and they can be easily reconfigured in most cases via software means to unlock the benefits of the entire 6GHz band should the regulatory rules are updated to include the entire 6GHz band. WBA believes that prioritization of Wi-Fi for upper 6GHz band for multi-gigabits per second local indoor access services is a good choice and it will strongly complement the UK's fibre roll-out plan.

Sustained Improvements

Sustained improvements in spectrum use efficiency for settings where licensed links may also exist, use of database systems to coordinate spectrum use increases efficiency and completes license exempt ecosystem. Database system, such as the Automated Frequency Coordination (AFC) in the US maximizes spectrum utilization. Both licensed and license exempt links can coexist and enable vital use cases, such as public Wi-Fi in open spaces.

WBA recognizes the importance of utilization of advances sharing mechanism utilizing databases in particular that of Automated Frequency Coordination (AFC) for 6GHz high performing indoor and outdoor Standard Power (SP) mode operation while protecting incumbent fixed services and other terrestrial wireless incumbent services. Use of AFC systems in indoor settings can opportunistically increase transmit power and increase connectivity coverage area. This capability can result in lower deployment costs by increasing minimum distance required between wireless Access Points (APs) and lowering the total number of APs that may be needed for a venue. Ofcom also highlighted the spectrum sharing and interference management technologies under supply of spectrum & opportunities for improved spectrum management, and WBA is fully supportive of an AFC approach.

WBA, along with 13 other organizations or companies, are operator candidates for the 6GHz AFC System operation in the US. It is expected that the US AFC System operators will also extend AFC services in other regions of the world as more countries offer Standard Power mode. For example,

Canada ISED published consultations on specifications⁵ and application procedures⁶ for AFC System operation in Canada in April 2022. Other countries and regions are considering the same path. Although a good level of harmonization is likely among various regulatory requirements across different regions, industry compliance specifications by Wi-Fi Alliance as well as the AFC query systems being developed are flexible to permit regional regulatory and operational/industry requirements. That is, parameters in these AFC Systems can be configured to comply with regulatory differences in interference protection criteria (for various fixed services and other terrestrial wireless incumbent services), target propagation models, sub-bands as well as incumbent receiver characteristics. With embedded design flexibility and advanced implementations in the AFC Systems, we believe that the systems can play an important role in future spectrum management and sharing in 6GHz and other bands while guaranteeing the continued operation and even expansion of incumbent systems -such as fixed services.

WBA believes that spectrum sharing through AFC System implementation could play a critical role in efficient spectrum utilization in 6GHz band taking into account efficiency through accommodation of both terrestrial incumbents and Wi-Fi services. Because AFC System automatically restrict Wi-Fi Standard Power operation in unused frequencies to avoid interference with incumbents, it is important to maximally allocate spectrum throughout the 6GHz band.

We appreciate Ofcom recognition of Importance of availability of multiple wide bandwidth channels to Wi-Fi to enable a greenfield space for the new generation of Wi-Fi technologies and innovative applications. More specifically, demand for new high-throughput, low latency applications, such as AR/VR/XR, remote or in-class learning, telehealth, gaming, remote office and cloud computing is rapidly increasing. The topic of Wi-Fi spectrum needs through analysis of key performance indicators for target application has been a subject of recent studies⁷. These studies specifically highlight the need for multiple 320MHz channels in 6GHz band for upcoming Wi-Fi 7 technology to be able to support scaling of applications in enterprise, commercial, and public venues.

Network Evolution and Convergence

One of the focus areas of Wi-Fi technology evolution is improved determinism to support wider set of applications and use cases in line with Ofcom interest in migration from dedicated to general purpose networks. More specifically, the path towards determinism started with Wi-Fi 6 and Wi-Fi 6E support for wider channel bandwidth of 160MHz in more reliable greenfield 6GHz band, scalability via up-link MIMO (UL-MIMO)⁸ and multi-user MIMO (MU-MIMO)⁹, longer battery life via Target Wake Time (TWT) and improved reliability through pre-ambule puncturing. The evolution is being accelerated in Wi-Fi 7 with additional reliability via redundancy through Dual Carrier Modulation (DCM) and Multi-link replication and improved determinism and low-latency QoS through Multi-AP coordination/scheduling and Multi-link QoS-based scheduling. Wi-Fi 7 will also enable channel puncturing, so that a transmitter can form a channel around a potential interferer that may be using some of the channel spectrum, permitting both to continue their respective transmissions.

⁵ [ISED Database Specifications, DBS-06, issue 1, May 2022 \(Draft\) – Automated Frequency Coordination \(AFC\) System Specifications for the 6 GHz \(5925-6875 MHz\) Frequency Band](#)

⁶ [ISED Application Procedures, CPC-4-1-01, issue 2, May 2022 \(Draft\) – Application Procedures for Dynamic Spectrum Access System Administrators \(DSASAs\)](#)

⁷ <https://www.intel.com/content/www/us/en/wireless-network/spectrum-needs-of-wi-fi-7.html>

⁸ UL-MIMO – technology to combine data from multiple users intended for upload into the cloud

⁹ UL-MIMO – technology to allow a Wi-Fi Access Point to communicate with multiple devices simultaneously. This decreases the time each device has to wait for a signal and dramatically speeds up the network

WBA welcomes and appreciates Ofcom's intention in monitoring and influencing the development of next-generation network technologies, especially, Wi-Fi standardisation process, capabilities, spectrum needs and timelines for Wi-Fi 7 and beyond.

Accelerating Innovation and Spectrum Sharing with Spectrum Sandboxes

Aligned with Ofcom's vision of transition to 'general purpose' networks, Wi-Fi industry has gone through multi-year effort in collaboration with regulatory bodies internationally to successfully develop a multimodal regulatory framework for Wi-Fi networks in 6GHz band. Low Power Indoor (LPI) with Client-to-Client (C2C), Very Low Power (VLP) and Standard Power (SP) modes are developed to support and enable various complementing segments of Wi-Fi industry including high performing connectivity and innovative applications of tomorrow, indoor and outdoor, while protecting all existing incumbent services. We believe that it is important to consider this multimodal approach in Ofcom's vision to develop spectrum toolbox. More specifically, each mode of operation requires its own set of tools to enable spectrum sharing and co-existence.

Although we believe that Ofcom has correctly identified AFC System designed for 6GHz as a candidate for spectrum toolbox, the use of AFC should be limited to Standard Power mode of operation and not LPI and VLP. As stated earlier in this response, the flexibility being built in AFC Systems makes these systems versatile tools not only for fixed Standard Power implementations (for both outdoors and indoors), but also scalable to mobile AFC. It is worth noting that the same is suggested in the US FCC Report and Order and FNPRM on 6GHz¹⁰.

We further support Ofcom's stated intention to evaluate higher power, outdoor WAS/RLAN use in the 6 GHz band; however, we believe a respective "spectrum sandbox" approach does not need to be limited to the lower 6 GHz band. As pointed out by Ofcom, equipment and database standards that support sharing with Fixed Links (Wi-Fi 6E with AFC) already exist in the US and can be utilized for trials.

For more information, please contact the WBA Program Management Office: pmo@wballiance.com

¹⁰ [FCC-20-51A1_Rcd.pdf](#)