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UPDATE ON COMMERCIAL AND REGULATORY DEVELOPMENTS FROM INDUSTRY ON LICENSE-EXEMPT USE IN THE 5925-7125 MHz FREQUENCY BAND

(Item on the Agenda: 3.2)

(Document submitted by the Dynamic Spectrum Alliance, DSA)

Impact on the sector:

License-exempt Wi-Fi connected devices are 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. New Wi-Fi standards such as Wi-Fi 6E and future Wi-Fi 7, need access to the full 1200 MHz of the 6 GHz band to support current and emerging innovative use cases, now and in the future. WRC-23 is an opportunity to help ensure that Wi-Fi can grow and meet the user requirements in terms of traffic, innovative applications, and lower costs through preserving economies of scale for the full band. With technology neutrality in mind, DSA encourages CITEL administrations to consider a no change for the 6 GHz band, as this provides the most flexible use of the mobile allocation.

Executive Summary:

The momentum for the deployment of license-exempt Wi-Fi 6E devices continue to grow. As of December 2022, there were more than 1200 different device models spanning laptop and desktop PCs, mobile phones, tablets, routers, access points, gateways, smart TVs, etc. available commercially.
Many recent large-scale Wi-Fi 6E deployments have been at public venues where there is a high-density of high-bandwidth users. In addition to low power indoor applications, different CITEL administrations have been advancing on standard power applications, that under the management of Automated.
Frequency Coordination systems provide a large number of use cases such as affordable fixed wireless access, and high density and industrial applications.

Introduction

The Dynamic Spectrum Alliance (DSA) is a global, cross-industry, not for profit organization advocating for laws, regulations, and economic best practices that will lead to more efficient utilization of spectrum, fostering innovation and affordable connectivity for all. Its membership spans multinationals, small-and medium-sized enterprises, as well as academic, research and other organizations from around the world all working to create innovative solutions that will benefit consumers and businesses alike by making spectrum abundant through dynamic spectrum sharing. A full list of DSA members is available on the DSA's website at www.dynamicspectrumalliance.org/members.

The DSA has long advocated for license-exempt devices, such as WAS/RLAN Wi-Fi devices, to share the entire 5925-7125 MHz with incumbent operations. Wi-Fi devices must protect incumbent operations from receiving harmful interference. Incumbent operations in the 6 GHz band can grow alongside growing Wi-Fi operations. Incumbents would not need to be relocated to other spectrum bands, which is likely the case if certain other technologies were authorized to operate in the upper portion of the 6 GHz band.

Three categories of license-exempt devices that have been authorized to date. They are very low power devices that can operate indoors and outdoors, low-power indoor devices and standard power devices that can operate indoors and outdoors under control of an Automated Frequency Coordination (AFC) system. Administrations that have adopted rules to authorize license-exempt devices to date, have authorized one or more categories of devices.

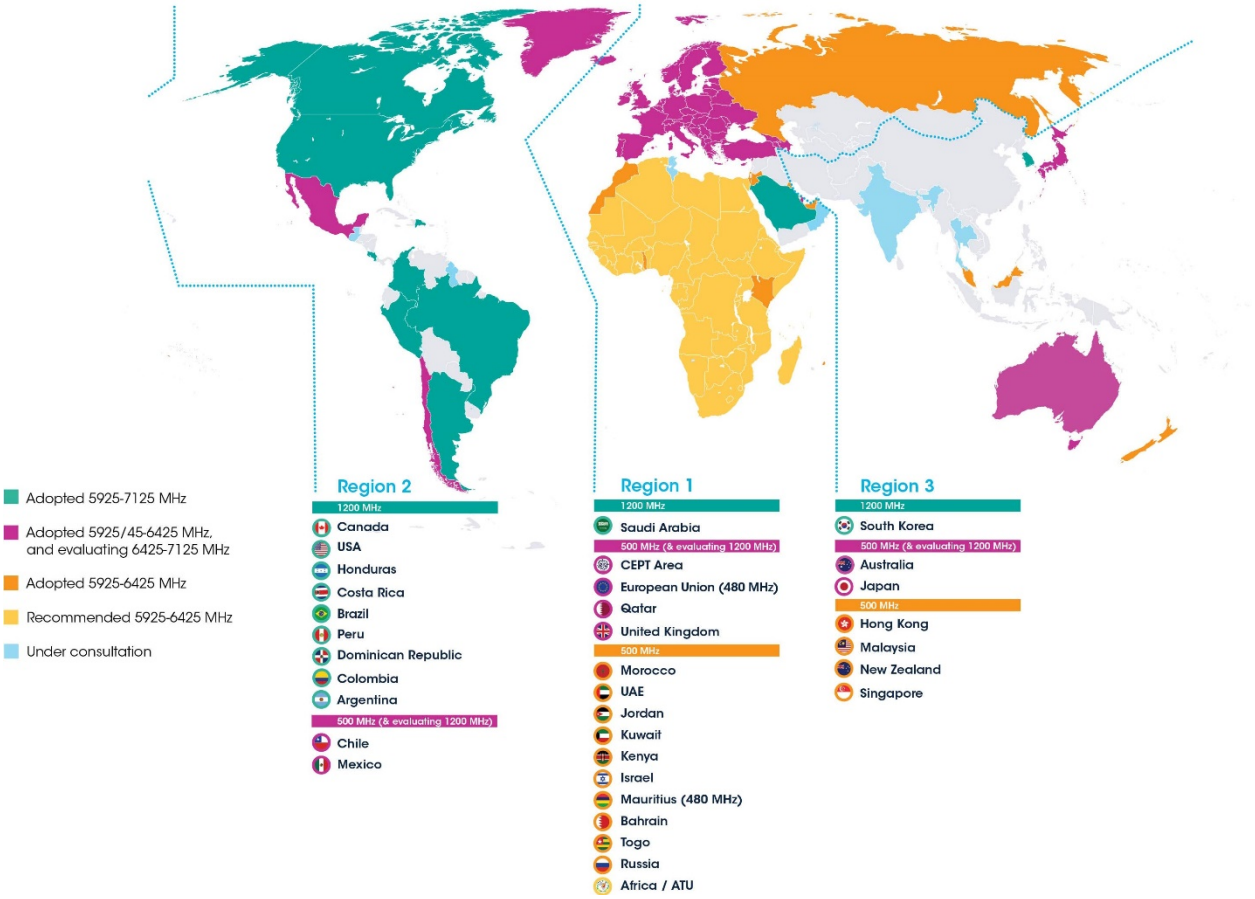
The technical conditions to protect incumbents from receiving harmful interference varies by category of device. For example, by establishing strict power spectral density requirements, very low power and low power indoor devices can coexist with incumbents. In contrast, high-power standard-power devices may not be able to operate in portions of the 6 GHz band in administrations where there are mobile incumbent operations. Additionally, and of great interest to DSA, standard power devices must be under the control of a cloud-based AFC system, to protect outdoor fixed link operations in the band.

Regulatory Update on License-Exempt Use in the 6 GHz Band

The image below shows the global progress toward license-exempt access to the 6 GHz band.[1]

It shows countries that have adopted rules for license-exempt use in all 1200 MHz of the 6 GHz band and those countries that have only authorized use in the lower 500 MHz of the band. As of March 2023, 62 countries have taken decisions to dedicate additional spectrum in the 6 GHz band for WAS/RLANs applications.

[1] www.6GHz.info



Countries representing more than 40% of the global gross domestic product (GDP) have opened, or have proposed opening, the full 6 GHz band for license-exempt use. This momentum is also a reality in the Americas region; just in the last nine months, Mexico decided to open the 5925-6425 MHz band, and Dominican Republic, Colombia and Argentina decided to open the 5925-7125 MHz band for unlicensed access. Currently in the region, Brazil, Canada, Colombia, Costa Rica, the Dominican Republic, Honduras, the United States, and Peru have already decided to designate the 1200 MHz of the 6 GHz band for unlicensed access.

Since the last fall, there has been much progress made in advancing AFCs. The United States Federal Communication Commission (FCC) announced conditional approval for 6 GHz band AFC Systems.[2]
In December 2022, Innovation, Science, and Economic Development (ISED) Canada released *DBS-06 — Automated Frequency Coordination (AFC) System Specifications for the 6 GHz (5925-6875 MHz) Frequency Band*[3]

[2] OET Announces Conditional Approval for 6 GHz Band AFC Systems | Federal Communications Commission (fcc.gov).
[3] DBS-06 — Automated Frequency Coordination (AFC) System Specifications for the 6 GHz (5925-6875 MHz) Frequency Band (canada.ca). ISED also approved *RSS-248 — Radio Local Area Network (RLAN) Devices Operating in the 5925-7125 MHz Band,* which sets out the certification requirements for licence-exempt Radio Local Area Network (RLAN) devices operating in the 5925-7125 MHz frequency band (the 6 GHz band). RSS-248 — Radio Local Area Network (RLAN) Devices Operating in the 5925-7125 MHz Band (canada.ca)

Additionally, in February 2023, Anatel Brazil closed a subsidy survey (one type of public consultation) to receive contributions on which should be the technical and operational parameters of the Automated Frequency Coordination systems and standard power equipment operating in the 6 GHz band, which will allow the use of Wi-Fi 6E outside the limits of buildings and coexisting with incumbent services. Anatel highlighted that this type of operation of Wi-Fi 6E networks is an option for the more than 19000 small broadband Wireless Internet Service Providers that couldn't access 5G frequencies in the last spectrum auction.[4]

Wi-Fi 6E Device Update

More than 18 billion Wi-Fi devices were in use in 2021 (360 times as many Wi-Fi devices as were in use when WRC-03 provided access to the 5 GHz band).[5] IDC predicts continued momentum for Wi-Fi 6E with 473 million Wi-Fi 6E devices expected to ship in 2023; more than 18% of all Wi-Fi 6 device shipments are predicted to be Wi-Fi 6E in 2023, growing to 32% in 2025.[6] Two thirds of shipments in 2023 will be Wi-Fi 6 or Wi-Fi 6E, and these will continue to expand into more IoT devices as more Wi-Fi 6 chipsets targeting IoT devices hit the market.[7] Still according to IDC, eight Wi-Fi-enabled product types will ship over 100 million units in 2023. This number will increase to 11 in 2027 with several more product types getting close to 100 million. Primary client devices – smartphones, media tablets, and PCs – are still a key driver of shipments with around 40% of Wi-Fi shipments in 2023.

As of the December 2022, there were **1262 license-exempt devices** capable of operating across the entire 6 GHz band.[8] These include **986** PC device models, **90** mobile phone models, **136** routers / access points / gateways, and **50** Wi-Fi enabled television receivers. Figure 1 below provides a detailed breakdown by category and manufacturer. Additional devices in each category are expected to be introduced during the second half of the year. Once an administrator puts in place rules to authorize license-exempt use across the entire 6 GHz band and updates its homologation process accordingly, its residents and businesses can take advantage of the increasing economies of scale.

The figure below shows that the Wi-Fi Ecosystem in the 6 GHz band is diverse and is growing rapidly.

[4] https://www.gov.br/anatel/pt-br/assuntos/noticias/anatel-realiza-em-outubro-tomada-de-subsidios-para-certificacao-de-equipamentos-em-6-ghz
[5] https://www.wi-fi.org/news-events/newsroom/wi-fi-alliance-2022-wi-fi-trends
[6] https://www.wi-fi.org/beacon/the-beacon/wi-fi-by-the-numbers-technology-momentum-in-2023
[7] IDC report, *Worldwide Wi-Fi Technology Forecast, 2023-2027* (Doc #US50019923)
[8] Source: Intel. Wi-Fi 6E device tracking summary is public information compiled by Intel from vendor websites, press releases, and third-party device reviews. Intel provides this assessment for informational purposes only, does not guarantee its accuracy, and it is subject to change without notice

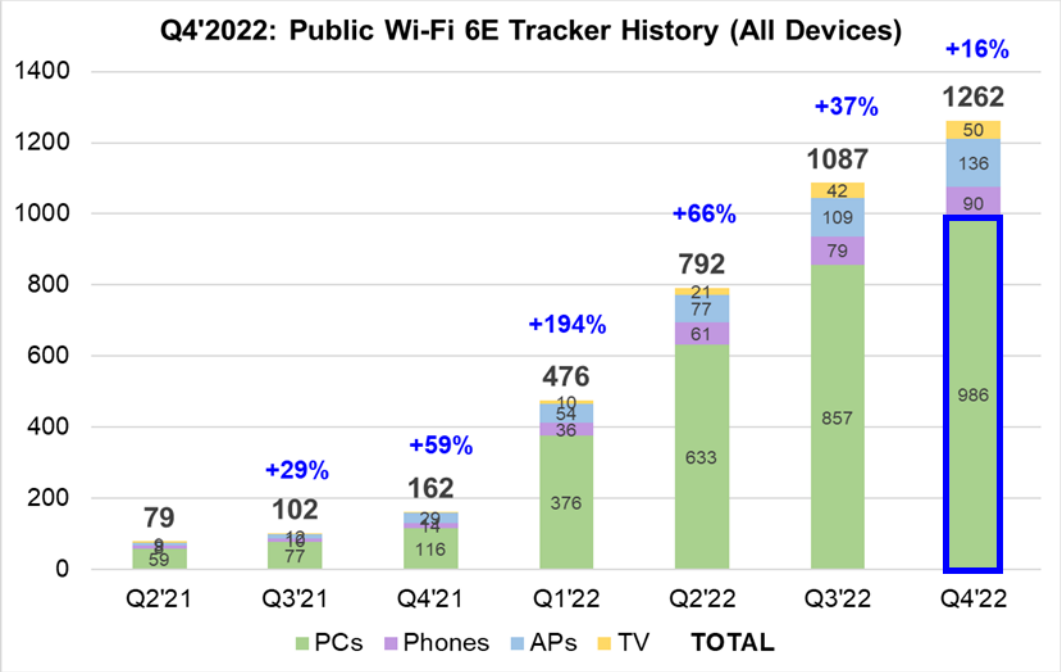


Figure 1: 4Q2022 Public Wi-Fi 6E Tracker History (All Devices)

The next figure illustrates the Wi-Fi unprecedented ecosystem development in the 6 GHz band, comparing the time it took to reach the limit of 500 Wi-Fi Certified products in the 2.4 and 5 GHz bands.[9]

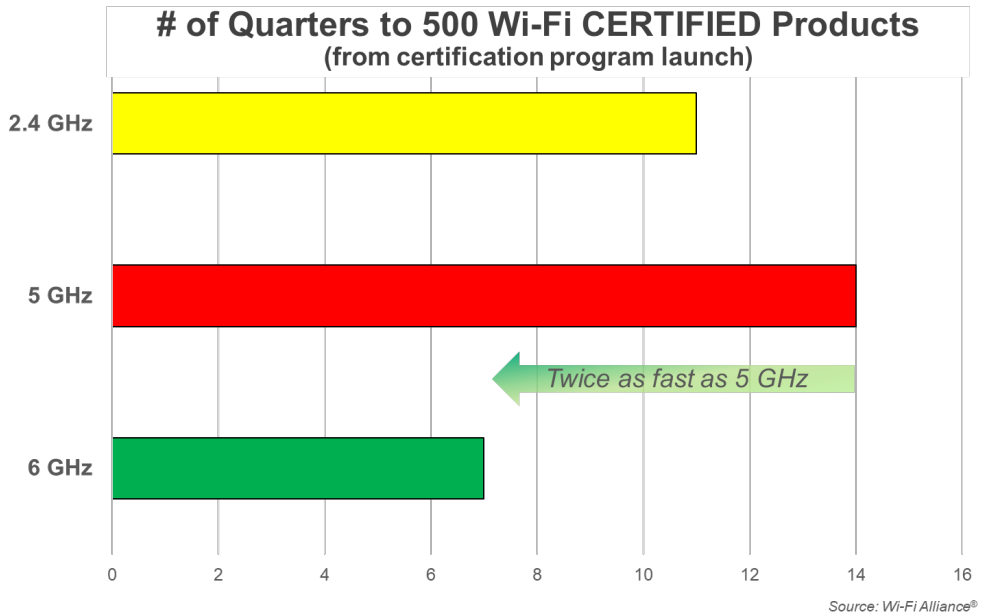


Figure 2: Number of Quarters to 500 Wi-Fi CERTIFIED Producs

[9] Source: HPE Aruba analysis.

Notable Recent Wi-Fi 6E Deployments

Experimental License Shows Promise of Standard Power Devices for Broadband Access in Brazil

In December 2022 started a project conducted under experimental license that showed the potential of Standard Power devices in Brazil. Qualcomm Brazil, in collaboration with the National Telecommunications Agency Anatel and the companies Cambium Networks, Ltd and Telium made the Wi-Fi 6E connection experience available to São Paulo's population, in Gabrielle D' Annunzio street, Campo Belo´s neighborhood. The initiative was the first Wi-Fi 6E in the 6 GHz band outdoor in Latin America.[10] At the beginning of the tests the trial demonstrated throughput of over 900 Mbps download speed and over 600 Mbps upload speed, and latency of 5.24ms.[11] Once AFC rules have been approved by Anatel, different internet providers, enterprises and local ISPs will have the ability to deploy the technology broadly throughout its service areas, providing affordable broadband connectivity.

[10] https://www.youtube.com/watch?v=9S4j7bKUtIM
[11] https://www.gov.br/anatel/pt-br/assuntos/noticias/wi-fi-6e-inicia-operacao-no-brasil