IEEE P802.18
Radio Regulatory Technical Advisory Group (RR-TAG)

Draft response to Czech CTU's consultation on draft Radio Spectrum Management Strategy				
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This document contains a proposed response to Czech Telecommunication Office (CTU)'s consultation "Call for comments on draft Radio Spectrum Management Strategy".

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Re: Consultation "Call for comments on draft Radio Spectrum Management Strategy"

Dear Respected Officer,

IEEE 802 LAN/MAN Standards Committee (LMSC) thanks Czech Telecommunication Office (CTU) for providing an opportunity to comment on the public consultation on the draft Radio Spectrum Management Strategy.

IEEE 802 LMSC is a leading consensus-based open standards development committee for networking standards that are used by industry globally. It produces standards for networking devices, including wired and wireless local area networks ("LANs" and "WLANs"), wireless specialty networks ("WSNs"), wireless metropolitan area networks ("Wireless MANs"), and wireless regional area networks ("WRANs"). Technologies produced by implementers of our standards are a critical element for all networked applications today.

IEEE 802 LMSC is a committee of the IEEE Standards Association and of Technical Activities, two of the Major Organizational Units of the IEEE. IEEE has about 400,000 members in over 160 countries and its core purpose is to foster technological innovation and excellence for the benefit of humanity. IEEE is also a major accredited standards development organization whose standards are recognized worldwide. In submitting this document, IEEE 802 LMSC acknowledges and respects that other components of IEEE Organizational Units may have perspectives that differ from, or compete with, those of IEEE 802 LMSC[1].

IEEE 802 LMSC follows the Czech Republic's regulatory activities regarding license-exempt short-range devices closely and applauds CTU for developing the latest version of the Radio Spectrum Management Strategy. Please find below the responses of IEEE 802 LMSC to this consultation.

The use of AFC technology for outdoor and indoor WLAN operations

Automatic Frequency Control (AFC) technology is a technique that is used to protect incumbent services during outdoor and indoor operation at standard power (SP) level for Wi-Fi operation. IEEE 802 LMSC believes that an AFC system can provide effective automated spectrum sharing to enable essential Wi-Fi technology applications and use cases not only for outdoor operation but also indoor operation for the SP level in the entire 6 GHz band (i.e., 5925 MHz to 7125 MHz).

The USA[2] and Canada[3] have already authorized SP operating mode and started certification of AFC systems. The certification process for AFC systems and devices is based on industry

[1] This document solely represents the views of IEEE 802 LMSC and does not necessarily represent a position of either IEEE or the IEEE Standards Association or IEEE Technical Activities.

[2] See Federal Communications Commission: OET announces approval of seven 6 GHz band automated frequency coordination systems for commercial operation and seeks comment on C3 Spectra's proposed AFC system, https://docs.fcc.gov/public/attachments/DA-24-166A1.pdf [accessed: 3 November 2024].

[3] See Innovation, Science and Economic Development Canada: List of designated Dynamic Spectrum Access System Administrators (DSASAs), Automated Frequency Coordination System Administrators (AFCSAs), issue 1 of DBS-06, https://ised-isde.canada.ca/site/certification-engineering-bureau/en/node/116 [accessed: 3 November 2024].

developed recommended compliance specifications[4,5]. Many AFC devices and fixed client devices are already certified.

IEEE 802 LMSC notes the presence of different types of incumbent services in the Czech Republic. Our understanding is that existing AFC systems are designed with flexibility built-in specifically to enable an AFC system to be customized based on local requirements. Therefore, with proper consideration of protection criteria for the existing incumbent services, we believe that AFC systems can properly implement the frequency coordination and maximum allowable power settings for AFC-enabled devices. As an example, in the USA, AFC systems determine frequency and channel availability and maximum permissible power levels for AFC devices considering incumbent fixed services and radio astronomy services. AFC systems already take into account neighboring country incumbent services at the country border.

AFC systems are designed to automatically calculate and make available, to AFC devices, available frequencies and corresponding permissible transmit power levels. AFC systems are required to use the updated incumbent system database to keep the calculations and frequency availability up to date as 6 GHz incumbent links are changed. This means that fixed services and broadcasting services are protected from harmful interference by AFC systems, and that any expansion of such incumbent services over time can be achieved without a need to redesign the AFC systems.

As we believe the indoor SP mode could be important in the Czech Republic because of extensive indoor WLAN facilities[6], IEEE 802 LMSC recommends that CTU include indoor SP mode for its proceedings related to AFC systems and SP regulation. AFC systems are designed not only to enable SP mode for outdoor operation but also to improve the performance of indoor WLAN systems. Considering this, IEEE 802 LMSC recommends CTU to consider authorizing indoor SP mode and allowing AFC systems to incorporate associated Building Entry Loss (BEL) in AFC system calculations. As an example, FCC already accepts requests for the inclusion of BEL through various waiver requests[7].

6425 MHz to 7125 MHz for license-exempt operations

IEEE 802 LMSC appreciates CTU's continuous effort on the harmonization of conditions for the use of the radio spectrum in the upper 6 GHz band (i.e., 6425 MHz to 7125 MHz). In considering further allocation of the upper 6 GHz frequency band, IEEE 802 LMSC respectfully asks CTU to consider the following points.

In January 2024, Wi-Fi Alliance introduced[8] Wi-Fi CERTIFIED 7™ based on IEEE Std 802.11be-2024 technology[9]. With Wi-Fi 7 products already on the market, Wi-Fi deployments are going

[4] See: Wi-Fi Alliance: 6 GHz AFC resources, Specifications, test plans, and training modules to enable implementation of the 6 GHz standard power devices under AFC system control, https://www.wi-fi.org/discover-wi-fi/6-ghz-afc-resources [accessed: 3 November 2024].

[5] See Wireless Innovation Forum: Specifications, https://6ghz.wirelessinnovation.org/baseline-standards [accessed: 3 November 2024].

[6] Some examples of deployment where indoor SP is beneficial are where propagation environment requires additional link budget, such as airports, sport venues, concert halls, and warehouses.

[7] See Federal Communications Commission: OET Announces Conditional Approval for 6 GHz Band AFC Systems, https://www.fcc.gov/document/oet-announces-conditional-approval-6-ghz-band-afc-systems [accessed: 3 November 2024]

[8] See Wi-Fi Alliance: Wi-Fi Alliance® introduces Wi-Fi CERTIFIED 7™, https://www.wi-fi.org/news-events/newsroom/wi-fi-alliance-introduces-wi-fi-certified-7 [accessed: 27 October 2024].

[9] See IEEE Approved Draft Standard for Information technology--Telecommunications and information exchange between systems Local and metropolitan area networks--Specific requirements - Part 11: Wireless LAN Medium Access Control (MAC) and Physical Layer (PHY) Specifications Amendment: Enhancements for Extremely High Throughput (EHT), https://standards.ieee.org/ieee/802.11be/7516/ [accessed: 3 November 2024]. With introduction of 320 MHz channel bandwidth, Wi-Fi 7 doubles throughputs relative to Wi-Fi 6E and significantly improves latency for Extended Reality (XR), bringing determinism through enablement of Multi-Link Operation (MLO) over multiple bands in 2.4 GHz, 5

through a second-generation upgrade supporting the entire 6 GHz band globally[10]. IEEE Std 802.11be-2024's global 6 GHz channelization is designed to accommodate multiple 160 MHz and 320 MHz channels throughout the 5925 MHz to 7125 MHz band, where available. CTU's current designation of 500 MHz of the lower 6 GHz band for license-exempt operation provides for only one 320 MHz channel, while the 5925 MHz to 7125 MHz band would allow an additional three such channels to fully utilize the advantages of the technology.

The ITU World Radiocommunications Conference 2023 (WRC-23) explicitly recognized that the upper 6 GHz band is used for the implementation of wireless access systems (WAS), including radio local area networks (RLANs). Many countries, including the USA, Canada, Argentina, Brazil, Saudi Arabia, and South Korea, have already allocated the entire 6 GHz band (i.e., 5925 MHz to 7125 MHz band) for license-exempt operation. Availability of the entire 6 GHz band for license-exempt use will create economies of scale and produce a robust equipment market, benefitting the Czech Republic's businesses, consumers, and economy, while supporting CTU's vision on providing significant societal benefits from the effective use of the radio spectrum.

It is an appropriate time to develop a strategic plan for Ultra-Wideband technology

Ultra-wideband (UWB) technology which CTU identified in 2015 support critically important use cases today. UWB is still extensively used for location tracking and material sensing in industrial environments. Over the past few years, the UWB market has significantly expanded. Following completion of ECC Report 278 and IEEE Std 802.15.4z-2020[11], UWB has become ubiquitous with many active UWB deployments. For example, UWB is now used to secure passive keyless entry systems in many vehicles and for premises access. Mobile phone manufacturers have also been integrating UWB into smartphones.

Sensing based upon UWB is another area of explosive growth. The ultra-low transmit power (at or below unintentional emissions limits) and very high dynamic response of impulse radio-UWB (IR-UWB) enables precise, fast, and accurate sensing for uses such as presence detection of children left in vehicles. UWB is also emerging as a leading technology for ultra-low power, ultra-low latency moderate data rate communications such as real time audio and real-time ultra-low latency human interface devices for gaming.

The next generation of UWB technology, being developed under IEEE P802.15.4ab[12], builds on IEEE Std 802.15.4z-2020. Projected future developments supported by this project include:

- Improved link budget and reduced air-time
- Enhanced sensing capabilities for presence detection and environment mapping
- Improved accuracy, precision, and reliability for high-integrity ranging
- The use of interference mitigation techniques to support greater device density and higher traffic use cases
- Improved coexistence with other services
- Reduced complexity and power consumption

GHz, and 6 GHz bands. Wi-Fi 7 also provides higher efficiency, relative to Wi-Fi 6E, through offering of 4096 QAM. In addition, spectrum puncturing improves flexibility in utilizing spectrally efficient wide channel bandwidth, e.g., 160 MHz and 320 MHz, while protecting incumbent operation in the band.

[10] See Wi-Fi Alliance: Wi-Fi 7 market momentum: Wi-Fi 7 is here – is your network ready?, https://www.wi-fi.org/beacon/chris-hinsz/wi-fi-7-market-momentum-wi-fi-7-is-here-is-your-network-ready [accessed: 3 November 2024].

[11] "IEEE Standard for Low-Rate Wireless Networks--Amendment 1: Enhanced Ultra Wideband (UWB) Physical Layers (PHYs) and Associated Ranging Techniques," in IEEE Std 802.15.4z-2020 (Amendment to IEEE Std 802.15.4-2020), vol., no., pp.1-174, 25 Aug. 2020, doi: 10.1109/IEEESTD.2020.9179124.

[12] See IEEE P802.15.4ab, https://www.ieee802.org/15/pub/TG4ab.html [accessed: 3 November 2024].

- Enhanced support for ultra-low power, low latency streaming
- Support for emerging applications such as high-definition audio

In summary, while it may have appeared in 2015 that UWB had not lived up to its original expectations, UWB deployments are now cumulatively consisting of over a billion devices and continue to grow[13]. The UWB adoption timeline is consistent with that of the other popular license exempt technologies from first rulemaking to mass market adoption.

Conclusion

IEEE 802 LMSC thanks CTU for the opportunity to provide this submission and respectfully requests that CTU consider the use of AFC for outdoor and indoor WLAN operations, the allocation of the upper 6 GHz band for license-exempt operation, and the development of a strategic plan for UWB.

Respectfully submitted,

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[13] See FiRa Consortium: Unleashing the Potential of UWB: Regulatory considerations, August 2022, https://www.firaconsortium.org/sites/default/files/2022-08/Unleashing-the-Potential-of-UWB-Regulatory-Considerations.pdf [accessed: 3 November 2024]. The introduction of IEEE 802.15 UWB-enabled devices in smartphones and laptops puts forecasts at more than 1 billion devices shipped annually worldwide by 2025.