IEEE P802.11
Wireless LANs

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Abstract

R0 Initial draft IEEE 802 Comment on FCC 6 GHz Notice of Proposed Rulemaking 18-295

**Before the
Federal Communications Commission**

**Washington, D.C. 20554**

In the Matter of )

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Unlicensed Use of the 6 GHz Band ) ET Docket 18-295

**COMMENTS OF IEEE 802**

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1. Introduction

IEEE 802 is pleased to provide comments in the above-captioned proceeding.

IEEE is a leading consensus-based industry standards body, producing standards for wireless networking devices, including wireless local area networks (“WLANs”), wireless specialty networks (“WSNs”), wireless metropolitan area networks (“Wireless MANs”), and wireless regional area networks (“WRANS”). We appreciate the opportunity to provide these comments to the Commission.

IEEE 802 is a component of the IEEE Standards Association, one of the Major Organizational Units of the Institute of Electrical and Electronics Engineers (IEEE). IEEE has about 420,000 members in about 190 countries and supports the needs and interests of engineers and scientists broadly. In submitting this document, IEEE 802 acknowledges and respects that other IEEE Organizational Units may have perspectives that differ from, or compete with, those of IEEE 802. Therefore, this submission should not be construed as representing the views of IEEE as a whole.[[1]](#footnote-1)

1. IEEE technologies and 6 GHz

On October 23, 2018, the Commission adopted a Notice of Proposed Rulemaking (Notice) to evaluate new opportunities for unlicensed use in the 5.925-7.125 GHz (6 GHz) band. Among the many benefits the Commission cited in its Notice is the ability for manufacturers to migrate unlicensed devices that today operate in the 5 GHz band into the 6 GHz band.[[2]](#footnote-2) The Commission recognized the enormous benefit consumers have derived from unlicensed devices in the 5 GHz band.[[3]](#footnote-3) It noted that the popularity of unlicensed technologies is continuing to grow, and that Congress has specifically tasked the Commission to find additional unlicensed spectrum. Moreover, the Commission stated its view that unlicensed technologies are key to enabling broadband connectivity available to all Americans, including those in rural and underserved areas.

The benefits of unlicensed devices that the Commission cited stand on the shoulders of the decades of work of IEEE 802 work groups promulgating the standards that are a critical foundational element of the market for unlicensed devices. Not only do standards-based technologies attract market participants, standards provide an important forum for innovation and evolution of technology over time. However, wireless standards require regulators allocate spectrum that the standards-based devices can utilize.

In our 2017 filing on the Notice of Inquiry (NOI) on mid-band spectrum,[[4]](#footnote-4) IEEE 802 called attention to the difficulties in securing sufficient spectrum for Wireless Local Area Networking (“WLAN”), commonly known as “Wi-Fi” devices. As we reported in that comment, the popularity of Wi-Fi, steeply rising demand, and changing technology (e.g., in particular the use of wider radio channels of 80 or 160 megahertz in size) is creating a spectrum shortage that the Commission needs to address.

This comment seeks to highlight the existing IEEE 802 standards and current work of the relevant IEEE 802 work groups, task groups and study groups on future technology standards that will take advantage of existing and proposed technical rules for unlicensed devices in the 6 GHz range. In doing so, IEEE 802 also wishes to acknowledge the Commission’s critical role in setting spectrum policy in order to provide opportunities for IEEE 802 technologies.

1. IEEE 802.11 Standards

IEEE 802.11 promulgates Wireless Local Area Network (WLAN) standards, commonly branded as “Wi-Fi”. As the Commission has recognized, the consumer appeal of WLAN has reached unprecedented levels, and continues to grow as consumers network more devices to their WLAN modems. Similarly, in the enterprise segment, WLAN has become more than just a technology allowing employees to log on to the enterprise network; it is rapidly becoming embedded in how businesses generate revenue or accomplish their mission, whether in agriculture, banking, retail, education, healthcare and more.

The IEEE 802.11 task group has produced an evolving set of standards for WLAN, each one more capable than the last, and similarly, today an active Task Group is working to promulgate IEEE 802.11ax which improves upon the current IEEE 802.11ac technology. The Task Group is presently in the phase of recirculating ballots to attract sufficient voters, and appears to be on track to publish “ax” in 2020, approximately six years after work began. Significantly, in December 2017, the IEEE 802 Executive Committee approved a revision to the scoping document for the “ax” standard to permit WLAN devices to utilize spectrum in the 5925-7125 MHz range, in addition to spectrum presently available in the 5 GHz range.[[5]](#footnote-5)

For spectrum policy purposes, there are several aspects of IEEE 802.11ax that are important to understand. First, the standard utilizes the same channel raster as IEEE 802.11ac – namely, channels that can be 160 MHz wide, and that can operate in channel widths of 80 MHz, 40 MHz, or 20 MHz. Like its predecessors, “ax” is deployed using an access point and associated stations, sometimes known as “clients”. While the access point is ordinarily deployed in infrastructure, it can also be deployed in a mobile device.

There are, however, important differences between “ax” and its “ac” predecessor. One difference that separates 802.11ax from its predecessors is that it can operate using Multi-User MIMO and OFDMA channels. The “ax” technology also will allow devices to differentiate transmissions in their own network from transmissions in neighboring networks. Spatial reuse is further supported by Adaptive Power and Sensitivity Thresholds to allow transmit power and signal detection to be dynamically adjusted, with attendant power savings. Networks can also schedule access, reducing transmission overhead and reducing collisions. Data carrier modulation increases by a factor of four relative to 802.11ac, to 1024-QAM. As a result of these and other innovations, the technology has been designed to be multiple times more efficient than 802.11ac. Yet for all the improvements available in the standard, there is insufficient radio spectrum in the existing unlicensed bands to enable innovation to stay ahead of rising consumer demand.[[6]](#footnote-6)

As the work on IEEE 802.11ax enters its final stages, IEEE members are already in the process of forming a Study Group tentatively known as 802.11EHT for “extremely high throughput.” Study Groups exist to determine member interest in forming Task Groups which ultimately write standards. A 802.11EHT Study Group scoping conversation is underway that could be voted in 2019. Pending approval, work would likely include the bands IEEE 802.11 standards address below 60 GHz. While not much can be ascertained at this time about the precise scope of work to be recommended by this Study Group or the innovations that would be developed for the eventual standard, the fact that a new Study Group is forming even as 802.11ax begins to wind down is itself illustrative of the intense interest in furthering the uses of WLAN to solve future networking needs.

1. IEEE 802.15 standards

In addition to WLAN, IEEE 802 members also contribute to standards for ultra-wideband (UWB) technology and part 15.250 wideband devices that are deployed in the 6 GHz band. These 802.15.4 devices typically transmit at a lower data rate and are capable of high precision ranging.

At present IEEE 802.15 Task Group 4z is working on the next generation of technology, in order to enhance the capabilities of the current standards that were published in 2007 and 2012 in 802.15.4a and 802.15.4f respectively to add increased security, higher data rates, and improved ranging capabilities. [[7]](#footnote-7)

 The focus of this technology are devices with no battery or very limited battery consumption requirements. Thus, there is a complimentary relationship between the high data rate, and relatively high power WLAN devices and the very low power short message UWB/ FCC part 15.250 devices.

The applications for these devices include IOT and Industry 4.0 uses which require highly accurate ranging capabilities, such as inventory management, sports tracking, indoor and outdoor geofencing, as well as new consumer applications such as smart retailing which improves the effiency of picking, and user experience in store and malls with the addition of these capabilities to smart phones

The typical range for this technology is up to 100 meters.[[8]](#footnote-8)

1. IEEE 802 based technologies and band sharing in the 6 GHz band

As IEEE 802 said in its comment to the Notice of Inquiry, IEEE 802 devices have a strong history of band sharing both between devices of the same class and with incumbent licensed systems. This rulemaking will provide a useful platform for discussion of how the introduction of WLANs into the 6 GHz band might impact existing users of the band, including technologies promulgated by IEEE 802.15.[[9]](#footnote-9) IEEE 802 urges the Commission to evaluate carefully the benefits of opening 6 GHz to WLAN devices, along with the likely impacts it predicts could be felt by existing technologies. Given the demand for wireless networking, the Commission has an obligation to ensure that spectrum bands are being used as efficiently as possible.

1. Conclusion

As discussed in the Notice of Inquiry comments, IEEE 802 has developed wireless networking standards that have become essential to consumers and businesses alike. The WLAN standards have supported the highest performing wireless link between the Internet and its endpoints. With the demand for greater and greater speeds, for business and advanced wireless applications, IEEE 802 continues to support the demands with new standards, such as IEEE 802.11ax. IEEE 802 therefore supports the Commission’s examination of the 6 GHz band for expanded use by new unlicensed technologies.

IEEE 802 members from 802.15.4 are concerned about the ability of the new high power broadband devices to coexist with the low power devices that use the current UWB and part 15.250 rule set. At this time there is no obvious resolution to the difference in power levels in the same band and IEEE 802 is aware that resolution to this problem must be determined.

1. This document solely represents the views of the IEEE 802 LAN/MAN Standards Committee and does not necessarily represent a position of either the IEEE or the IEEE Standards Association. [↑](#footnote-ref-1)
2. Unlicensed Use of the 6 GHz Band, ET Docket No. 18-295, released October 24, 2018 at para. 19. [↑](#footnote-ref-2)
3. Unlicensed Use of the 6 GHz Band, ET Docket No. 18-295, released October 24, 2018 at paras. 3-7. [↑](#footnote-ref-3)
4. Comments of IEEE 802 in GN Docket No. 17-183, filed October 2, 2017 (hereinafter “NOI Comments of IEEE 802”) (https://ecfsapi.fcc.gov/file/1002043724729/Comments%20of%20IEEE%20802%20in%20GN%20Docket%2017-183.pdf) [↑](#footnote-ref-4)
5. <http://www.ieee802.org/11/PARs/P802.11ax.pdf> [↑](#footnote-ref-5)
6. Comments of IEEE 802, at Sections V and IX. [↑](#footnote-ref-6)
7. Per FCC regulations the technology being promulgated here would fall under Section 15.250 of the Commission’s rules, qualifying it as “wideband” technology. <http://www.ieee802.org/15/pub/TG4z.html> [↑](#footnote-ref-7)
8. <http://www.ieee802.org/15/pub/TG4z.html> [↑](#footnote-ref-8)
9. Comments of IEEE 802, at Section VIII. [↑](#footnote-ref-9)