

**Before the
Federal Communications Commission
Washington, D.C. 20554**

In the Matter of)	
)	
Amendment of Section 15.255 of the)	ET Docket No.21-264
Commission’s Rules)	

Reply Comments of IEEE 802

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The IEEE 802 LAN/MAN Standards Committee (LMSC) is pleased to submit the following reply comments in response to the Commission’s NPRM proposing to allow greater flexibility for radar operations in the 57 to 64 GHz band while continuing to ensure that this unlicensed band continues to support multiple communications technologies, such as IEEE 802.11ad, IEEE 802.11ay, and IEEE 802.15.3c (“IEEE 802-based 60 GHz technologies”)¹ without harmful interference.

IEEE 802 LMSC 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 reply comments to the Commission.

IEEE 802 is a committee of the IEEE Standards Association and Technical Activities, two of the Major Organizational Units of the Institute of Electrical and Electronics Engineers (IEEE). IEEE has over 400,000 members in over 160 countries in order to advance the mission and vision of securing the benefits of technology for the advancement of society. In submitting this document, IEEE 802 acknowledges and respects that other components of 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.²

¹ See *Amendment of Section 15.255 of the Commission’s Rules*, Notice of Proposed Rulemaking ET Docket No. 21-264, FCC 21-83 (rel. July 14, 2021) (“NPRM”).

² 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, the IEEE Standards Association or IEEE Technical Activities.

SUMMARY

IEEE 802 supports the FCC's objective to provide greater flexibility of use in the 57 to 64 GHz band by proposing to allow radar use at higher power levels while ensuring coexistence with other unlicensed services³. To promote coexistence, the current proposed rules impose a duty cycle restriction of 10% on radar operation, as originally accepted by Google as a condition to obtain a 60 GHz waiver⁴ for higher power operations and accepted as a condition by other radar providers in waivers thereafter⁵. As others have noted on the record⁶, the 10% duty cycle limit for radar operation has not been shown to be sufficient by itself to prevent harmful interference to the operation of IEEE 802-based 60 GHz technologies. IEEE 802 agrees that the FCC must provide adequate coexistence measures.

IEEE 802 agrees with others on the record that implementing the "2 ms condition," as it has in its most recent waiver decisions,⁷ is one approach that holds the prospect of effectively ensuring coexistence with IEEE 802-based 60 GHz technologies. IEEE 802 also agrees with others on the record⁸ that, in the interest of providing flexibility to radar manufacturers, the FCC may consider establishing emission limits tailored to radar operations at specific bandwidths and/or to specific applications, such as vehicle in-cabin radar operations. Furthermore, the FCC may also consider requiring radar devices to employ a contention-based mechanism such as listen-before-talk (LBT). In the latter case, the Commission must ensure that the contention-based mechanism is effective in providing the same level of coexistence as exists between unlicensed communications devices such as IEEE 802-based 60 GHz technologies today.⁹

³ IEEE 802 supports the Commission's proposal to limit higher-power unlicensed field disturbance sensor ("FDS") devices to the lower portion of the 57-71 GHz, specifically to 57-64 GHz. As the Commission notes, already-approved proposals were restricted to that band. IEEE 802 also agrees with others on the record that there is no evidence that more spectrum is needed in order to support additional or future FDS applications, and that the use of FDS in only the 57-64 GHz band would also align operations and devices with international standards.

⁴ See Google LLC Request for Waiver of Section 15.255(c)(3) of the Commission's Rules Applicable to Radars used for Short Range Interactive Motion Sensing in the 57-64 GHz Frequency Band, Order, 33 FCC Rcd. 12542 (2018).

⁵ See, e.g., Vayyar Imaging Ltd. Request for Waiver of Section 15.255(c)(3) of the Commission's Rules for Radars used for Interactive Motion Sensing in the Frequency Band 57-64 GHz, Order, 36 FCC Rcd. 7218 (2021); Leica Geosystems AG Request for Waiver of Section 15.255 of the Commission's Rules Applicable to Radars used on Unmanned Aerial Vehicles in the 60-64 GHz Frequency Band, Order, ET Docket No. 19-350, 35 FCC Rcd. 7929 (2020).

⁶ See Comments of Wi-Fi Alliance In the Matter of Amendment of Section 15.255 of the Commission's Rules, ET Docket No. 21-264 (posted September 20, 2021); see also Comments of Facebook, Intel, and Qualcomm In the Matter of Amendment of Section 15.255 of the Commission's Rules, ET Docket No. 21-264 (posted September 21, 2021).

⁷ See FCC OET Letter Granting Petition of Faurecia Clarion Electronics North America regarding 47 CFR § 15.255, ET Docket No. 21-288, DA 21-811 (rel. July 9, 2021); see also FCC OET Letter Granting Request by Texas Instruments Incorporated for Waiver of 47 CFR § 15.255(c)(3), ET Docket No. 21-290, DA 21-813 (rel. July 9, 2021); FCC OET Letter Granting Request by Amazon.com Services LLC for Waiver of 47 CFR § 15.255(c)(3), ET Docket No. 21-289, DA 21-813 (rel. July 9, 2021); FCC OET Letter Granting Request by Vayyar Imaging Ltd. for Waiver of 47 CFR § 15.255 rules, ET Docket No. 20-15, DA 21-815 (rel. July 9, 2021); Request by Hyundai Mobis Co., Ltd. for Waiver of 47 CFR §§ 15.255(a)(2) & (c)(3), ET Docket No. 21-287, DA 21-816 (rel. July 9, 2021). For narrow pulse radio radar devices, the IEEE 802 supports the technical parameters in the recent OET Letter Order to Acconeer. See FCC OET Letter Granting Request by Acconeer AB for Waiver of 47 CFR § 15.255(c)(3) rules, ET Docket No. 21-48, DA 21-814 (rel. July 9, 2021).

⁸ See Comments of Wi-Fi Alliance In the Matter of Amendment of Section 15.255 of the Commission's Rules, ET Docket No. 21-264 (posted September 20, 2021)

⁹ See supra note 8.

DISCUSSION

The 10% Duty Cycle Proposal Has Not Been Shown to be Sufficient on Its Own to Ensure Coexistence of Radars with IEEE 802-based 60 GHz Technology

IEEE 802 believes that the duty cycle definition in the Commission's NPRM is not sufficient by itself to ensure coexistence. Specifically, the duty cycle definition in the proposed rule permits a radar device to meet the 10% duty cycle limit with, for example, a 10 μ s transmission 'on-time' and a 90 μ s 'off-time,' which would effectively block or corrupt communications in a wireless network from a closely spaced radar. This is because the short radar transmission 'off-time,' which is of the order of a fraction of a millisecond, will effectively prevent communication devices from accessing the medium for longer periods of time, or repetitively interrupt and corrupt the communication sequences that generally require certain minimum time to complete. As a result, devices that utilize IEEE 802-based 60 GHz technology would experience an increase in latency, which would be particularly harmful to highly immersive AR/VR/XR applications. It should be noted that this impact is most significant when a Frequency Modulated Continuous Wave (FMCW) radar is operating over the entire 57 to 64 GHz band and transmits without any form of channel sensing. Therefore, additional, appropriate coexistence mechanisms should be considered for radars.

To address the issue identified above, IEEE 802 agrees with commenters that one such mechanism is to define the duty cycle in terms such that any transmission gap below a given transmission off-time limit is deemed to be part of the transmission 'on-time,' i.e., any radar 'off-time' period between two successive radar pulses that is less than 2 ms shall be considered 'on time'. The FCC already imposed this additional "2 ms condition" in its most recent waiver grants¹⁰.

IEEE 802 also agrees with commenters¹¹ that the FCC should consider other spectrum sharing approaches for some radar operations and applications. For instance, greater radar duty cycle can be permitted for operations using narrower bandwidth¹² or limited to specific installations (e.g., fixed outdoor or in a vehicle).

To ensure that radar and IEEE 802-based 60GHz technologies can coexist, IEEE 802 requests FCC to require that a radar implement at least one of the below coexistence mechanisms:

1. The additional "2 ms condition" included in the most recent waiver grants¹³ (b below) on any higher power radar system permitted within the 57 to 64 GHz portion of the band, as set out in (b) below:
 - a. A radar device may operate in the 57 to 64 GHz band at a maximum +13 dBm EIRP, +10 dBm transmitter conducted output power, and +13 dBm/MHz power spectral density, so long as the radar device does not exceed a transmit duty cycle (i.e., on-time/[on-time + off-time]) of 10% in any 33 ms interval (i.e., the device will not transmit longer than a total of 3.3 ms).

¹⁰ See supra note 7.

¹¹ See supra note 8.

¹² See supra note 8.

¹³ See supra note 7.

- b. Any radar transmission off-time period between two successive radar pulses that is less than 2 ms shall be considered transmission on-time for purposes of computing the duty cycle.
2. Emission limits for radar operations at specific bandwidths such that radar devices that do not occupy the entire 7 GHz may operate under more flexible rules. Specifically,
Radar devices that operate between 57 and 59.4 GHz can be allowed higher transmit power and duty cycle.
3. Emission limits tailored to radar operations in specific applications in which more flexible rules can be adopted. Specifically,
Radar devices that operate between 57 and 61.5 GHz and that are restricted to vehicle in-cabin use should be permitted to operate with relaxed duty cycle limit and transmission off-time period definition.
In this case, IEEE 802 notes that further technical study is required for the Commission to confirm that the considered flexible rules can effectively ensure coexistence.
4. More flexible rules for radar devices that implement a contention-based mechanism such as LBT. At the same time, IEEE 802 agrees with comments submitted by the Wi-Fi Alliance¹⁴ that the Commission must ensure that the LBT implementation is effective in providing the same level of coexistence between unlicensed communications devices such as IEEE 802-based 60 GHz technologies today. IEEE 802 also agrees with comments submitted by Facebook, Intel, and Qualcomm¹⁵ that adequately implementing LBT requires a sufficiently sensitive sensing level, a measurement bandwidth, and integration period. In addition, the radar should perform LBT at sufficient frequency and, when the LBT system detects an active medium, a back-off scheme (*i.e.*, the amount of time the radar waits before attempting to retransmit) to ensure spectrum coexistence with other users in the band. IEEE 802 notes that further technical study is required for the Commission to confirm that LBT can effectively ensure coexistence.

¹⁴ See *supra* note 8.

¹⁵ See also Comments of Facebook, Intel, and Qualcomm In the Matter of Amendment of Section 15.255 of the Commission's Rules, ET Docket No. 21-264 (posted September 21, 2021).

CONCLUSION:

IEEE 802 thanks the Commission for providing an opportunity to submit these reply comments on the NPRM ET Docket 21-264. IEEE 802 supports the FCC goal to expand the use of the 60 GHz spectrum band by allowing other technologies and applications in the band such as the radar use at higher power levels while ensuring coexistence with IEEE 802 communication technologies.

In order for the above communication technologies to coexist with higher power radars, IEEE 802 strongly recommends that the 10% duty cycle restriction alone is insufficient to protect communications applications and the FCC should implement the “2 ms condition” as outlined above. IEEE 802 also agrees with commenters that the FCC may consider establishing emission limits tailored to radar operations with specific bandwidths and/or to specific applications, or radar devices employing a contention-based mechanism such as listen-before-talk (LBT) as outlined above.

Regards,

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