

**Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, DC 20554**

In the Matter of)	
)	
Use of Spectrum Bands Above 24 GHz For Mobile Radio Services)	GN Docket No. 14-177
)	
Establishing a More Flexible Framework to Facilitate Satellite Operations in the 27.5-28.35 GHz and 37.5-40 GHz Bands)	IB Docket No. 15-256
)	
Petition for Rulemaking of the Fixed Wireless Communications Coalition to Create Service Rules for the 42-43.5 GHz Band)	RM-11664
)	
Amendment of Parts 1, 22, 24, 27, 74, 80, 90, 95, and 101 To Establish Uniform License Renewal, Discontinuance of Operation, and Geographic Partitioning and Spectrum Disaggregation Rules and Policies for Certain Wireless Radio Services)	WT Docket No. 10-112
)	
Allocation and Designation of Spectrum for Fixed-Satellite Services in the 37.5-38.5 GHz, 40.5-41.5 GHz and 48.2-50.2 GHz Frequency Bands; Allocation of Spectrum to Upgrade Fixed and Mobile Allocations in the 40.5-42.5 GHz Frequency Band; Allocation of Spectrum in the 46.9-47.0 GHz Frequency Band for Wireless Services; and Allocation of Spectrum in the 37.0- 38.0 GHz and 40.0-40.5 GHz for Government Operations)	IB Docket No. 97-95

COMMENTS OF WI-FI ALLIANCE

Wi-Fi Alliance^{1/} submits these comments in response to the Notice of Proposed Rulemaking (“NPRM”)^{2/} in the above-referenced proceedings in which the Commission proposes

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rules for mobile radio services in the millimeter wave bands. Wi-Fi Alliance appreciates the Commission’s commitment to expanding the spectrum available for unlicensed uses, and especially applauds the Commission’s proposal to permit Part 15 unlicensed operations in the 64-71 GHz band. In addition to making that spectrum available for unlicensed use, the Commission should revisit its decision not to allow Part 15 operations in the 71-76 GHz and 81-86 GHz bands and to only permit indoor Part 15 operations in the 92-95 GHz band. Taking these actions will help meet the rapidly growing need for additional spectrum to accommodate applications that use unlicensed bands.

I. INTRODUCTION

Wi-Fi Alliance is a global, non-profit industry association of approximately 700 leading companies from dozens of countries devoted to seamless interoperability. With technology development, market building, and regulatory programs, Wi-Fi Alliance has enabled widespread adoption of Wi-Fi® worldwide, certifying thousands of Wi-Fi products each year. The mission of Wi-Fi Alliance is to provide a highly effective collaboration forum for Wi-Fi matters, grow the Wi-Fi industry, lead industry growth with new technology specifications and programs, support industry-agreed standards, and deliver greater product connectivity through interoperability, testing, and certification.

As explained in Wi-Fi Alliance’s comments in response to the Notice of Inquiry (“NOI”) in this proceeding,^{3/} in 2013 the Wireless Gigabit (“WiGig®”) Alliance, which developed and

^{2/} See *Use of Spectrum Bands Above 24 GHz For Mobile Radio Services, et al.*, Notice of Proposed Rulemaking, GN Docket No. 14-177, *et al.* (rel. Oct. 23, 2015) (“NPRM”). The deadline for submitting comments in this proceeding was January 26, 2016 – a day when the Commission was closed for weather. These comments are being submitted on the next business day pursuant to Sections 1.4(e)(1) and (j) of the rules. 47 C.F.R. §§ 1.4(e)(1),(j).

^{3/} See *Use of Spectrum Bands Above 24 GHz For Mobile Radio Services; Amendment of the Commission’s Rules Regarding the 37.0-38.6 GHz and 38.6-40.0 GHz Bands; Implementation of Section 309(j) of the Communications Act – Competitive Bidding, 37.0-38.6 GHz and 38.6-40.0 GHz Bands; Petition for Rulemaking of the Fixed Wireless Communications Coalition to Create Service Rules for the 42-435 GHz Band*, Notice of Inquiry, 29 FCC Red. 13020 (2014) (“NOI”).

promoted communications technologies, principally for the 57-64 GHz band, united with Wi-Fi Alliance, thereby consolidating 60 GHz technology and certification development in Wi-Fi Alliance.^{4/} In this proceeding, the Commission proposes rules to accommodate a wide variety of mobile services in the millimeter wave bands, including expanding the spectrum available to unlicensed operations from 57-64 GHz to 64-71 GHz.^{5/} Accordingly, Wi-Fi Alliance has a strong interest in this proceeding.

Through innovation in unlicensed spectrum Wi-Fi has enabled anyone, anytime, and anyplace to set up an affordable network that simply works — and this utility has benefited the world and delivered hundreds of billions of dollars of economic value. About two and a half billion Wi-Fi devices were sold in 2014 alone, and more than four billion are expected to be sold in 2020.^{6/} Today, Wi-Fi hotspots number more than five million worldwide and are expected to reach 10 million by 2018, while more than 725 million households around the world are expected to have a Wi-Fi connection this year.^{7/} The ubiquity of Wi-Fi connectivity has spurred substantial benefits for the economy, with the combined value of future proliferation of current Wi-Fi technologies amounting to more than \$547 billion in economic value and nearly \$50 billion in contribution to the gross domestic product.^{8/}

^{4/} See Comments of Wi-Fi Alliance, GN Docket No. 14-177, *et al.*, at 2-3 (filed Jan. 15, 2015) (“NOI Comments”). See also *Wi-Fi Alliance® and Wireless Gigabit Alliance Finalize Unification*, Wi-Fi Alliance (Mar. 5, 2013), <http://www.wi-fi.org/news-events/newsroom/wi-fi-alliance-and-wireless-gigabit-alliance-finalize-unification>.

^{5/} See NPRM ¶¶ 4, 58.

^{6/} Wi-Fi Alliance News Release, *Wi-Fi Alliance® Celebrates 15 Years of Wi-Fi®* (Sept. 8, 2014), <http://www.wi-fi.org/news-events/newsroom/wi-fi-alliance-celebrates-15-years-of-wi-fi>.

^{7/} See Wi-Fi Alliance, *Wi-Fi Alliance, Connect Your Life: Wi-Fi and the Internet of Everything*, at 4 (Jan. 2014), available at http://www.wi-fi.org/system/files/wp_Wi-Fi_Internet_of_Things_Vision_20140110.pdf; see also ABI Research News Release, *Global Wi-Fi Hotspots Will Grow to 7.1 Million in 2015 as a Method to Offload Traffic* (May 8, 2014), <https://www.abiresearch.com/press/global-wi-fi-hotspots-will-grow-to-71-million-in-2>.

^{8/} See Telecom Advisory Services, LLC, *Assessment of the Future Economic Value of Unlicensed Spectrum in the United States*, at 9 (Aug. 2014), available at <http://www.wififorward.org/wp-content/uploads/2014/01/Katz-Future-Value-Unlicensed-Spectrum-final-version-1.pdf>.

The ubiquity and economic impact of Wi-Fi will be extended as WiGig technologies continue to be implemented in the millimeter wave bands. As the next frontier in unlicensed technologies, WiGig makes use of unlicensed spectrum in the millimeter wave bands to support very high data rates of up to 7 gigabits per second.^{9/} Enabling much higher speeds than even the latest Wi-Fi technologies and with very low latency, WiGig applications extend from the familiar (*i.e.*, networking) to instant wireless synchronization and docking between personal devices, ultra-high-definition video streaming, and cordless computing.^{10/} Indeed, “WiGig-enabled devices will be able to instantly wirelessly connect PC devices and peripherals . . . ushering in the age of a truly wireless office.”^{11/} In addition to these indoor applications, WiGig may facilitate outdoor point-to-point and point-to-multipoint systems for backhaul links and other uses well-suited to the millimeter wave bands.^{12/} International standards organizations are actively developing use cases for the next generation of WiGig, such as the mobile use of high-end augmented or virtual reality headsets and other wearables, backup inter-rack connectivity for data centers, and mass video or data distribution to devices in classrooms, exhibition halls, or airplane or train cabins.^{13/}

Wi-Fi Alliance therefore generally endorses the Commission’s proposals and particularly supports making additional millimeter wave spectrum available for unlicensed use. In addition to making additional spectrum available, Wi-Fi Alliance agrees that the Commission should generally apply to the 64-71 GHz band the same technical rules that govern unlicensed use of the

^{9/} See Wi-Fi Alliance, *WiGig ® and the Future of Seamless Connectivity*, at 2-4 (2013), *available at* <http://www.wi-fi.org/file/wigig-and-the-future-of-seamless-connectivity-2013>.

^{10/} See *id.* at 8; NPRM ¶ 58. See also Wi-Fi Alliance, *Discover Wi-Fi, WiGig CERTIFIED*, <http://www.wi-fi.org/discover-wi-fi/wigig-certified> (last visited Dec. 23, 2015).

^{11/} Lindsey Kratochwill and Matt Safford, *WiGig: The Fastest Wireless*, *POPULAR SCIENCE* (2014), <http://bestofwhatsnew.popsoci.com/wigig>.

^{12/} NPRM ¶¶ 22, 310.

^{13/} See IEEE 802.11 TGay Use Cases (IEEE 802.11-2015/0625r3), at 7-12 (Sept. 2015), *available at* <https://mentor.ieee.org/802.11/dcn/15/11-15-0625-03-00ay-ieee-802-11-tgay-usage-scenarios.pptx>.

57-64 GHz band, with a few exceptions to promote innovation. It is pleased to have the opportunity to submit the following comments.

II. THE COMMISSION SHOULD DESIGNATE THE 64-71 GHZ BAND FOR UNLICENSED OPERATIONS

Wi-Fi Alliance agrees with the Commission that authorizing operations under the Part 15 rules is preferable to licensing in the band.^{14/} The Commission correctly notes that “authorizing Part 15 operations in the 64-71 GHz band will allow this band to be used in conjunction with the existing 57-64 GHz band to double the spectrum available for the next generation of unlicensed wireless broadband technologies.”^{15/} Further, as the Commission states, oxygen attenuation is less severe in the 64-71 GHz band than in the 57-64 GHz band,^{16/} so permitting unlicensed operations in the 64-71 GHz band would open up the door for new end-user applications operating over longer distances.^{17/} Extending Part 15 operations to the 64-71 GHz band would therefore greatly enhance the capacity of next-generation WiGig technologies.

As the Commission notes, the 65-71 GHz band is also authorized for use by Inter-Satellite service (“ISS”) use. However, Wi-Fi Alliance agrees with the Commission that mobile operations in the band can be introduced without causing interference to existing operations.^{18/} The Commission observes that, “[b]ecause of the high atmospheric absorption in this frequency range, it is highly unlikely that signals at the power levels contemplated would be able to reach satellites

^{14/} NPRM ¶ 58.

^{15/} *Id.* In 2013, the Commission decided to permit Part 15 operations in the 57-64 GHz band in order to “help the Commission fulfill its objectives to bring broadband access to every American by providing additional competition in the broadband market, lowering costs for small business owners accessing broadband services, and supporting the development of 4th generation (4G) and other wireless services in densely populated areas.” *Id.* ¶ 54. *See also Revision of Part 15 of the Commission’s Rules Regarding Operation in the 57-64 GHz Band*, Report and Order, 28 FCC Rcd. 12517, ¶ 1 (2013). As demand for unlicensed capacity continues to increase, permitting unlicensed use of the adjacent 64-71 GHz band is a logical extension of the Commission’s earlier action.

^{16/} NPRM ¶ 310.

^{17/} *See supra* text accompanying note 13.

^{18/} *See* NOI Comments at 4-6.

using ISS links.”^{19/} Ofcom’s recent study of aggregate 2.4 GHz Wi-Fi emissions from the ground detected by aircraft further demonstrates how mobile operations in the 65-71 GHz band are unlikely to cause interference to satellites.^{20/} Ofcom’s study concluded that, in a “worst case scenario for Wi-Fi emissions,” the measured emissions were lower than expected (*i.e.*, “towards the more optimistic values predicted by the . . . model and some 20 dB lower than those predicted by the most pessimistic case”).^{21/} At much higher frequencies with even less signal propagation, aggregate emissions from 65-71 GHz band mobile operations are even less likely to be significant to inter-satellite communications.

III. THE COMMISSION SHOULD GENERALLY APPLY PART 15 TECHNICAL REQUIREMENTS FOR THE 57-64 GHZ BAND TO THE 64-71 GHZ BAND

The Commission seeks comment on whether to apply the Section 15.255 technical requirements, now applicable to the 57-64 GHz band, to the 64-71 GHz band.^{22/} Wi-Fi Alliance agrees with the Commission that “the existing technical rules in the 57-64 GHz band can successfully apply to the proposed 64-71 GHz adjacent band, with certain minor adjustments.”^{23/} Ensuring the uniformity of technical rules for unlicensed devices operating across the 57-71 GHz band benefits both manufacturers and consumers through the creation of economies of scope and scale. Manufacturers would be able to design and market devices operable across the whole band, potentially driving down costs — to the ultimate benefit of consumers — for devices throughout the band.

^{19/} NPRM ¶ 59.

^{20/} See Ofcom, *SE24 Meeting M86 – WI52: 2.4 GHz Wi-Fi Airborne Measurements*, at 1 (Feb. 12, 2015), available at [http://www.cept.org/Documents/se-24/28001/SE24\(15\)166R0_WI52_Ofcom_24_GHz-Airborne_Meas_ove-r_London](http://www.cept.org/Documents/se-24/28001/SE24(15)166R0_WI52_Ofcom_24_GHz-Airborne_Meas_ove-r_London).

^{21/} See *id.*

^{22/} NPRM ¶ 303.

^{23/} *Id.*

For these reasons, Wi-Fi Alliance supports generally extending to the 64-71 GHz band the Section 15.255 technical rules. However, the Commission should revisit the continued application of three of the current rules to the existing 57-64 GHz band *and* evaluate whether those changes should be extended to the 64-71 GHz band as well. *First*, the Commission should consider lifting the current prohibition on the use of unlicensed devices in the 57-64 GHz band on aircraft and not extend that prohibition to the 64-71 GHz band. *Second*, while the Commission should retain and extend to the 64-71 GHz band the existing Section 15.255(b)(1)(ii) power limits for outdoor, high-gain antennas, it should increase the Section 15.255(b)(1)(i) power limits for indoor and outdoor lower-power transmitters by 10 dB. *Finally*, as the Commission proposes, it should no longer require the publicly-accessible coordination channel at 57.00-57.05 GHz.

A. Transmissions in the 57-71 GHz Band on Aircraft Should Be Permitted.

As the Commission explains, Section 15.255(a)(1) prohibits operations in the 57-64 GHz band on board aircraft.^{24/} Nevertheless, it observes that there is ongoing collaboration investigating the compatibility of new chipsets intended for use in future WiGig products on board aircraft, and seeks comment on whether transmissions in the 57-71 GHz band should be permitted in that setting.^{25/} The Commission also asks whether it is possible to limit unlicensed device operation on aircraft to a portion of the 57-64 GHz band to minimize the potential impact to radio astronomy observations.^{26/}

Wi-Fi Alliance agrees that the Commission should consider permitting transmissions in the 57-71 GHz band on aircraft. The current restriction on use of devices using the 57-64 GHz band

^{24/} *Id.* ¶ 304; 47 C.F.R. § 15.255(a)(1).

^{25/} NPRM ¶¶ 304-306.

^{26/} *See id.* ¶ 306.

should be lifted. Similarly, the Commission should impose no restriction on the use of devices in the 64-71 GHz band on aircraft.

B. The Power Limits for Outdoor Devices Using High Gain Antennas Should Be Extended to the 64-71 GHz Band, and the Remaining Power Limits Should Be Increased by 10 dB For the Entire 57-71 GHz Band.

The Commission's rules specify two types of emission limits for the 57-64 GHz band — permitting lower emission levels for any application indoors or outdoors, as well as higher emission levels for outdoor transmitters with high-gain antennas.^{27/} In proposing to extend the same requirements to the 64-71 GHz band, the Commission asserts that applying the same two types of emission limits to the 64-71 GHz band would benefit both low-power networking communication links and high-power, high-antenna-gain fixed point-to-point backhaul links.^{28/}

Wi-Fi Alliance agrees that the Commission should provide two types of emission limits for the entire 57-71 GHz band. The current emission limits in Section 15.255(b)(1)(ii) for transmitters using outdoor, high-gain antennas remain appropriate and should be retained for the 57-64 GHz band and extended to the 64-71 GHz band. However, the Commission should increase average and peak EIRP limits for indoor and outdoor lower-power applications (*i.e.*, those not using high-power, outdoor antennas) by 10 dB. In other words, Wi-Fi Alliance proposes that the Commission amend Section 15.255(b)(1)(i) to impose an average EIRP limit of 50 dBm and peak EIRP limit of 53 dBm. These higher EIRP limits would support devices with more antenna array elements and power amplifiers — promoting a greater diversity of applications, including those requiring multiple-room coverage indoors.

^{27/} See *id.* ¶¶ 308-309; 47 C.F.R. § 15.255(b)(1)(i)-(ii).

^{28/} See NPRM ¶ 310.

C. The Publicly-Accessible Coordination Channel at 57.00-57.05 GHz Should Be Removed.

The Commission proposes removing the Section 15.255(d) requirement setting aside a publicly-accessible coordination channel at 57.00-57.05 GHz, in which only spurious emissions and emissions related to coordination techniques between non-interoperable transmitters are permitted. Wi-Fi Alliance agrees. As the Commission notes, there has been no report submitted to the FCC related to specific experimental research with respect to 57.00-57.05 GHz, and “co-existence between 60 GHz devices is better resolved by voluntary standards than by a coordination requirement in the rules.”^{29/} Further, removing the requirement would help simplify the technical rules and would provide a useful additional 50 megahertz for data transmission.

IV. THE COMMISSION SHOULD PERMIT PART 15 OPERATIONS IN THE 71-76 GHz, 81-86 GHz, AND 92-95 GHz BANDS

The Commission seeks comment on whether to allow unlicensed Part 15 operations in the 71-76 GHz and 81-86 GHz bands and whether to permit outdoor unlicensed operations in the 92-95 GHz band.^{30/} Wi-Fi Alliance continues to encourage the Commission to permit additional unlicensed mobile and fixed operations in those bands, under Part 15 rules. These bands are especially useful for wireless backhaul and other new applications requiring wide bandwidth, and are essential to the growth of mobile broadband. As Wi-Fi Alliance noted in its comments on the NOI, an IEEE 802 task group is studying technologies that would target the use of 100 gigabit-per-second wireless communications for a variety of applications (*e.g.*, server-to-server communications in data centers, wireless backhaul and fronthaul, etc.) in the 60 GHz to 300 GHz

^{29/} *Id.* ¶ 312.

^{30/} *See id.* ¶¶ 81-91.

frequency range.^{31/} To continue stimulating innovation in unlicensed devices, the Commission should maximize the available spectrum for such uses and open up the 71-76 GHz, 81-86 GHz, and 92-95 GHz bands to both indoor and outdoor unlicensed uses.

V. CONCLUSION

Wi-Fi Alliance commends the Commission’s proposal to provide spectrum complementary to the 57-64 GHz band for innovative unlicensed uses. As the Commission itself notes, permitting Part 15 operations in the 64-71 GHz band would “double the spectrum available for the next generation of unlicensed wireless broadband technologies”^{32/} and hasten the development of low-latency, ultra-high-speed wireless connectivity.

Respectfully submitted,



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^{31/} See NOI Comments at 8-9, *citing* IEEE 802.15 Documents, https://mentor.ieee.org/802.15/documents?is_group=003d (last visited Dec. 21, 2015) (providing the full record of work of the IEEE 15.3d Task Group).

^{32/} NPRM ¶ 58.