

**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
)	
Amendment of the Commission’s Rules Regarding the 37.0-38.6 GHz and 38.6-40.0 GHz Bands)	ET Docket No. 95-183 (Terminated)
)	
Implementation of Section 309(j) of the Communications Act – Competitive Bidding, 37.0-38.6 GHz and 38.6-40.0 GHz Bands)	PP Docket No. 93-253 (Terminated)
)	
Petition for Rulemaking of the Fixed Wireless Communications Coalition to Create Service Rules for the 42-435 GHz Band)	RM-11664
)	

COMMENTS OF WI-FI ALLIANCE

Wi-Fi Alliance submits these comments in response to the Notice of Inquiry (“NOI”) issued by the Commission examining the potential for mobile radio services in the bands above 24 GHz.^{1/} Wi-Fi Alliance and its members are encouraged by the NOI and see great potential for the expanded use of unlicensed spectrum in the bands above 24 GHz. In particular, Wi-Fi Alliance encourages the Commission to extend the existing Part 15 rules to operations in the 64-71 GHz band and to add authorization for Part 15 devices to operate in the 70, 80, and 90 GHz bands and in the bands above 95 GHz where consistent with international allocations.

^{1/} 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 Rcd. 13020 (2014) (“NOI”); see also *Wireless Telecommunications Bureau and Office of Engineering and Technology Extend Period to File Comments and Reply Comments in Response to Notice of Inquiry on Use of Spectrum Bands Above 24 GHz for Mobile Radio Services*, Public Notice, DA 14-1703, GN Docket No. 14-177 (rel. Nov. 25, 2014) (extending filing deadlines).

I. INTRODUCTION

Wi-Fi Alliance is a global, non-profit industry association of approximately 600 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. In 2013, the Wireless Gigabit (“WiGig”) Alliance, which developed and promoted WiGig communications technologies, united with Wi-Fi Alliance, thereby consolidating WiGig technology and certification development in Wi-Fi Alliance.^{2/} In this proceeding, the Commission is exploring the development of rules to accommodate a wide variety of mobile services in the millimeter wave bands.^{3/} As the Commission explained, the coalescence of technologies, both licensed and unlicensed, in the bands above 24 GHz could lead to the emergence of a more capable generation of wireless mobile services.^{4/} Unlicensed devices using Wi-Fi and WiGig technologies in particular have already supported innovative, practical, and widely deployed technical solutions that have served as an important complement to wireless technologies, enabling the growth of mobile and fixed wireless connectivity for industry, government, academic, and public applications.^{5/} Some of the applications currently supported

^{2/} See *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>.

^{3/} See NOI ¶ 15.

^{4/} See *id.* ¶ 13.

^{5/} See Wi-Fi Alliance, *Discover Wi-Fi, WiGig CERTIFIED™*, <http://www.wi-fi.org/discover-wi-fi/wigig-certified> (last visited Dec. 29, 2014) (“WiGig White Paper”). While Wi-Fi and WiGig both refer

by Wi-Fi and WiGig include mobile wireless access, fixed wireless connectivity, and wireless backhaul applications. Looking forward, the use of spectrum sharing and unlicensed operations will play an important role in the 5G architecture, particularly as technologies that support unlicensed devices continue to grow.^{6/}

Wi-Fi Alliance therefore encourages the FCC to consider authorizing mobile and fixed operations pursuant to its Part 15 rules when assessing the future use of the spectrum bands above 24 GHz. With 5G technologies on the horizon, higher frequencies will allow for antenna arrays that consist of a large number of transmitting elements of commercially-practical size that may lead to the proliferation of new, high-capacity technologies such as Massive Multiple-Input Multiple-Output (“MIMO”). Wi-Fi Alliance is particularly interested in the expansion of the current 57-64 GHz authorizations for mobile and fixed unlicensed operations pursuant to Part 15 to the 64-71 GHz band, which would create a 14-gigahertz wide spectrum band operating under a common set of rules. The Commission should also consider extending unlicensed operations to the frequencies above 71 GHz, which will foster innovation and support future applications for high data rate communications.

to devices that operate using the IEEE 802.11 family of standards, Wi-Fi uses the 802.11ac and earlier versions for applications in the bands below 5 GHz, while WiGig devices operate in the 60 GHz band using the 802.11ad specification. See WiGig White Paper at 2-4; *WiGig® Wins 2014 Popular Science Best of What’s New Award*, Wi-Fi Alliance (Nov. 18, 2014), <http://www.wi-fi.org/beacon/wi-fi-alliance/wigig-wins-2014-popular-science-best-of-what-s-new-award> (citing Lindsey Kratochwill and Matt Safford, *WiGig: The Fastest Wireless*, POPULAR SCIENCE (2014), <http://bestofwhatsnew.popsci.com/wigig>).

^{6/} See *Recommendations on 5G Requirements and Solutions*, 4G Americas, at 33 (Oct. 2014), http://www.4gamericas.org/documents/4G%20Americas%20Recommendations%20on%205G%20Requirements%20and%20Solutions_10%2014%202014-FINALx.pdf; see also NOI ¶ 12 (noting that Intel is exploring the development of, among other things, chipsets capable of supporting WiGig operations in the 60 GHz Band).

II. COMMENTS

A. Extension of Unlicensed Operations in the 60 GHz Bands

Among other things, the Commission seeks comment on whether to allow unlicensed operations in the 64-71 GHz band.^{7/} As the Commission notes, unlicensed operations are currently permitted under Part 15 in the 57-64 GHz band (the “60 GHz Band”).^{8/} In originally authorizing unlicensed operations in this band, the Commission determined that the propagation range – which is much more limited than that of radio signals at lower frequencies – made the 60 GHz Band particularly well suited for general unlicensed use.^{9/} Last year, the Commission modified Part 15 to extend the availability of systems to provide broadband service in the 60 GHz Band both indoors and outdoors.^{10/} However, the modification of rules did not extend beyond 57-64 GHz.^{11/}

Accordingly, Wi-Fi Alliance supports applying the Part 15 rules to operations in the entire 57-71 GHz band (the “Extended 60 GHz Band”), which would double the number of possible channels available to WiGig technologies in the U.S. These technologies, which are based on the IEEE 802.11ad specifications, offer low latency and security-protected connectivity

^{7/} See NOI ¶¶ 70-74, 100.

^{8/} See *id.* ¶ 71; see also 47 C.F.R. §§ 15.15, 15.255.

^{9/} See *Revision of Part 15 of the Commission’s Rules Regarding Operation in the 57-64 GHz Band*, Report and Order, 28 FCC Rcd. 12517, ¶ 2 (2013) (“60 GHz Order”); see also *Amendment of Parts 2, 15, and 97 of the Commission’s Rules to Permit Use of Radio Frequencies Above 40 GHz for New Radio Applications*, First Report and Order and Second Notice of Proposed Rulemaking, 11 FCC Rcd. 4481, ¶ 33 (1995).

^{10/} See 60 GHz Order ¶ 1; see also NOI ¶ 71. Specifically, the Commission amended its rules to (1) allow operation at higher power levels by unlicensed devices in the 60 GHz Band that use very high gain antennas and operate outdoors; (2) specify emission limits for all 60 GHz devices in terms of equivalent isotropically radiated power; (3) include certain specifications for compliance testing of 60 GHz devices operating at higher power with very high gain antennas; and (4) eliminate the requirement for certain 60 GHz devices to transmit identification information. See generally 60 GHz Order; see also NOI ¶ 71.

^{11/} See NOI ¶ 71.

between nearby devices and permit information transfer from device to device at up to seven gigabits per second.^{12/} Extending the band would enhance the capability of WiGig technologies to support denser deployments and multiple co-located user segments with increased data rate capacity.

Permitting unlicensed operations throughout the Extended 60 GHz Band could be accomplished without causing harmful interference to other operations in the band – including any inter-satellite service (“ISS”) operations that might eventually develop in the 65-71 GHz band segment.^{13/} Although the 65-71 GHz band segment is available for ISS, there are currently no ISS licenses in the band.^{14/} As demonstrated by years of successful operations in other frequency bands, unlicensed technologies like WiGig are capable of co-existing with other spectrum users while providing high data rate and near ubiquitous access. Indeed, as the Commission noted, “the most obvious candidate bands for Wi-Fi-type authorization would be in the 57-64 gigahertz band, where it already exists, and higher bands with similarly short transmission ranges.”^{15/} The Commission should therefore extend the 60 GHz Band to cover the full 57-71 GHz range under the same Part 15 rules that allow operation in the current 60 GHz Band, exploring as necessary any special rules or protocols that would be needed to implement this change. As required by the Commission’s rules, any such operations would be subject to not

^{12/} See Wi-Fi Alliance, *WiGig® and the Future of Seamless Connectivity* (Nov. 2013), <http://www.wi-fi.org/file/wigig-and-the-future-of-seamless-connectivity-2013>.

^{13/} See NOI ¶ 74.

^{14/} See *id.* ¶¶ 71, 73; *id.* n.116 (noting that four ISS licenses or authorizations in the 65-71 GHz band have been revoked, and 15 have been surrendered).

^{15/} *Id.* ¶ 100.

causing interference to, and accepting interference from, space radiocommunication services in the Extended 60 GHz Band.^{16/}

B. Extension of Unlicensed Operations to Frequencies Above 71 GHz

The Commission seeks comment on the advisability of allowing unlicensed Part 15 operations in the 70 and 80 GHz band segments.^{17/} In 2003, the Commission explored whether to permit unlicensed operations in the 71-76 GHz (“70 GHz”), 81-86 GHz (“80 GHz”), and 92-95 GHz (“90 GHz”) bands and determined that there was considerable interest in using the 90 GHz Band for Part 15 devices.^{18/} Among other things, commenters noted that unlicensed devices are ideal for a wide range of applications and can successfully coexist with other applications in the same spectrum.^{19/} The Commission therefore determined to permit Part 15 devices to operate in the 90 GHz Band for indoor use.^{20/}

However, due to concerns regarding the impact of unlicensed operations in the 70 GHz and 80 GHz bands, and because of the FCC’s determination that the 70 GHz and 80 GHz bands were more likely to be used for fixed services than the 90 GHz Band, the Commission decided not to permit the use of the 70 GHz and 80 GHz bands for unlicensed devices.^{21/} Accordingly, the Commission’s rules currently permit non-federal entities to obtain non-exclusive, nationwide

^{16/} See *id.* ¶ 73 (citing 47 C.F.R. § 2.106, n.5.553).

^{17/} See NOI ¶¶ 75-82.

^{18/} See *Allocations and Service Rules for the 71-76 GHz, 81-86 GHz and 92-95 GHz Bands; Loea Communications Corporation Petition for Rulemaking*, Report and Order, 18 FCC Rcd. 23318, ¶ 40 (2003) (“70-80-90 GHz Order”).

^{19/} See *id.* ¶ 40 (citing Comments of the Fixed Wireless Communications Coalition, WT Docket No. 02-146, RM-10288, at 7 (filed Dec. 18, 2002)); see also Comments of Wi-Fi Alliance, WT Docket No. 02-146, RM-10288 (filed Dec. 18, 2002).

^{20/} See *70-80-90 GHz Order* ¶ 40.

^{21/} See *id.* ¶ 41.

licenses in these bands. Those licensees must protect federal fixed satellite service (“FSS”) operations and coordinate proposed links with certain astronomy observatories.^{22/}

Additionally, the 71-74 GHz band segment contains co-primary allocations for federal and non-federal fixed, FSS, mobile, and Mobile Satellite Service (“MSS”) operations, while the 74-76 GHz band segment has co-primary allocations for federal and non-federal fixed, FSS, mobile, and Space Research Service operations.^{23/} The 80 GHz Band includes co-primary federal and non-federal allocations for fixed, FSS, mobile, and radio astronomy operations, with the 81-84 GHz segment also including MSS operations.^{24/} Despite not allocating unlicensed operations in the 70 and 80 GHz bands, however, the Commission “reserve[d] discretion to revisit this decision as the services in these bands mature and new technology is developed regarding sharing.”^{25/} Now is the time to revisit that decision.

Wi-Fi Alliance supports reexamination of the 70 GHz and 80 GHz bands for unlicensed operations and encourages the Commission to permit mobile and fixed operations pursuant to its Part 15 rules to frequencies in those bands. Advances in wireless technology will support effective spectrum utilization for a wide variety of commercial applications. Importantly, unlicensed applications in these bands could co-exist with existing federal and non-federal operations.^{26/} As discussed above, the very nature of unlicensed operations is their ability to operate in an open, shared spectrum ecosystem. Accordingly, they can and do share a variety of frequency bands with other authorized users, both licensed and unlicensed. As the Commission

^{22/} See NOI ¶¶ 78-79.

^{23/} See *id.* ¶ 80; 47 C.F.R. § 2.106. The 74-76 GHz band segment also includes non-federal allocations for broadcasting and Broadcasting Satellite Service operations. See *id.*

^{24/} See NOI ¶ 80; 47 C.F.R. § 2.106.

^{25/} 70-80-90 GHz Order ¶ 41.

^{26/} See NOI ¶ 81.

suggests, such sharing could be achieved, for instance, through an automated coordination and registration system.^{27/} The Commission has already proposed to use a real-time spectrum database management system in the 3.5 GHz band^{28/} and the 600 MHz band,^{29/} which is similar to that used to manage Television White Spaces devices.^{30/} A comparable scheme could be adapted to advanced services in higher frequency bands where there are licensed services operating at higher power.

More broadly, the Commission asks for feedback on any other bands above 24 GHz that are not included in the NOI that may be appropriate for advanced mobile services.^{31/} Currently, there is work underway by an IEEE 802 task group to study the development of technologies that would target the use of 100 gigabit-per-second wireless communications for a variety of applications in the 60 GHz to 300 GHz frequency range.^{32/} This body of work is focused on creating wireless point-to-point applications such as server-to-server communications in data

^{27/} See *id.* ¶¶ 81, 97-99.

^{28/} See *Amendment of the Commission's Rules with Regard to Commercial Operations in the 3550-3650 MHz Band*, Further Notice of Proposed Rulemaking, 29 FCC Rcd. 4273 (2014) (proposing rules for shared tiers of service to be managed by a dynamic Spectrum Access System); see also NOI ¶ 98.

^{29/} See *Amendment of Part 15 of the Commission's Rules for Unlicensed Operations in the Television Bands, Repurposed 600 MHz Band, 600 MHz Guard Bands and Duplex Gap, and Channel 37, and Amendment of Part 74 of the Commission's Rules for Low Power Auxiliary Stations in the Repurposed 600 MHz Band and 600 MHz Duplex Gap; Expanding the Economic and Innovation Opportunities of Spectrum Through Incentive Auctions*, Notice of Proposed Rulemaking, 29 FCC Rcd. 12248 (2014) (proposing rules to expand the location and frequency information in the white spaces databases so they can be used to identify available frequencies for white spaces devices (including wireless microphones) in the repurposed 600 MHz band, guard bands, and Channel 37); see also NOI ¶ 98.

^{30/} See *Unlicensed Operation in the TV Broadcast Bands; Additional Spectrum for Unlicensed Devices Below 900 MHz and in the 3 GHz Band*, Second Memorandum Opinion and Order, 25 FCC Rcd. 18661 (2010) (adopting rules to make unused spectrum in the TV bands available for unlicensed broadband wireless devices using geo-location technology and a database to identify unused channels); see also NOI ¶ 98.

^{31/} See NOI ¶ 50.

^{32/} See IEEE 802.15 Documents, https://mentor.ieee.org/802.15/documents?is_group=003d (last visited Dec. 26, 2014) (providing the full record of work of the IEEE 15.3d Task Group).

centers; wireless backhaul and fronthaul; chip-to-chip communications for multi-chip modules; and closed proximity point-to-point applications (*e.g.*, kiosk downloading and file exchange). Each of these applications requires support for data rates above 100 gigabits per second, which in turn means there is a need for more wireless bandwidth to support the higher data rates. Above 95 GHz, there is little spectrum with FCC service rules.^{33/} The Commission should therefore create Part 15 service rules for bands above 95 GHz that would spark innovation and technological developments.

^{33/} *See generally* 47 C.F.R. § 2.106.

III. CONCLUSION

Unlicensed technologies have a proven track record of co-existence with, and minimizing interference to, other spectrum users, while providing high data rate capabilities and near ubiquitous access. In exploring the reallocation of spectrum above 24 GHz, the Commission should therefore encourage the expansion of unlicensed operations in additional spectrum bands, including extending the existing Part 15 rules to the 64-71 GHz band and adopting Part 15 rules for unlicensed operations in the 70 and 80 GHz bands and the bands above 95 GHz. By doing so, the Commission can help foster development of innovative technologies and creative technical solutions to complement and facilitate the provision of mobile wireless services.

Respectfully submitted,



WI-FI ALLIANCE

Edgar Figueroa
President and CEO

WI-FI ALLIANCE
10900-B Stonelake Blvd.
Suite 126
Austin, TX 78759
(512) 498-9434
efigueroa@wi-fi.org

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