

**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

REPLY COMMENTS OF WI-FI ALLIANCE

Wi-Fi Alliance®^{1/} submits these reply comments in response to comments of other parties in the above-referenced proceedings in which the Commission proposes additional rules

^{1/} Wi-Fi®, the Wi-Fi logo, the Wi-Fi CERTIFIED logo, Wi-Fi Protected Access® (WPA), WiGig®, the Wi-Fi ZONE logo, the Wi-Fi Protected Setup logo, Wi-Fi Direct®, Wi-Fi Alliance®, WMM®, and Miracast® are registered trademarks of Wi-Fi Alliance. Wi-Fi CERTIFIED™, Wi-Fi Protected Setup™, Wi-Fi Multimedia™, WPA2™, Wi-Fi CERTIFIED Passpoint™, Passpoint™, Wi-Fi CERTIFIED Miracast™, Wi-Fi ZONE™, WiGig CERTIFIED™, Wi-Fi Aware™, Wi-Fi HaLow™, the Wi-Fi Alliance logo and the WiGig CERTIFIED logo are trademarks of Wi-Fi Alliance.

for millimeter wave spectrum already designated for terrestrial mobile use and seeks comments on other upper band spectrum that can be allocated for those operations.^{2/} The record supports Wi-Fi Alliance’s requests that the Commission ensure that there is sufficient unlicensed spectrum in the millimeter wave bands; that unlicensed spectrum be used on a device-centric basis where possible, rather than through a third-party database; and that the Commission implement Wi-Fi Alliance’s two-step proposal for use of WiGig devices aboard aircraft.

I. INTRODUCTION

Wi-Fi Alliance’s initial comments in response to the *FNPRM*^{3/} urged the Commission to designate sufficient spectrum for unlicensed use between 24 GHz and 57 GHz and above 95 GHz; continue its current approach to authorizing use of the 70/80 GHz bands; designate the entire lower 37 GHz band for unlicensed use; and authorize unlicensed operations in the 57-71 GHz band onboard aircraft. In these reply comments, Wi-Fi Alliance, *first*, reiterates the importance of unlicensed spectrum, which is critical to the wireless ecosystem and helps drive the U.S. economy.^{4/} *Second*, Wi-Fi Alliance notes that others agree that access to unlicensed spectrum in the millimeter wave bands should not routinely be encumbered by burdensome third-party database mechanisms. *Finally*, Wi-Fi Alliance disagrees that the only way to protect Earth Exploration Satellite Services (“EESS”) and Radio Astronomy Service (“RAS”) operations is to ban operations in the 57-71 GHz band onboard aircraft.

^{2/} *Use of Spectrum Bands Above 24 GHz For Mobile Radio Services, et al.*, Report and Order and Further Notice of Proposed Rulemaking, 31 FCC Rcd. 8014 (2016) (hereinafter *Report and Order* or *FNPRM*, respectively).

^{3/} Comments of Wi-Fi Alliance, GN Docket No. 14-177, *et al.* (Sept. 30, 2016) (hereinafter *FNPRM* Comments of Wi-Fi Alliance”).

^{4/} *FNPRM* Comments of Wi-Fi Alliance at 3; Comments of Wi-Fi Alliance, GN Docket No. 14-177, *et al.* at 2-4 (filed Jan. 27, 2016) (hereinafter *NPRM* Comments of Wi-Fi Alliance); Reply Comments of Wi-Fi Alliance, GN Docket No. 14-177, *et al.* at 2 (Feb. 26, 2016) (hereinafter *NPRM* Reply Comments of Wi-Fi Alliance).

II. ADDITIONAL UNLICENSED SPECTRUM IS NEEDED TO SUPPORT THE NATION’S GROWING DEMAND FOR UNLICENSED SERVICES

Wi-Fi Alliance applauds the Commission’s allocation of the 14-gigahertz segment of contiguous spectrum in the 64-71 GHz band for unlicensed use, to encourage “the development of new and innovative unlicensed applications . . . through Wi-Fi and other unlicensed connections.”^{5/} Nevertheless, it is crucial that the Commission continue to increase unlicensed spectrum capacity. The proliferation of innovative wireless services that use unlicensed spectrum, including Wi-Fi, has continued to expand dramatically and the pace of growth is expected to accelerate. In the next three to four years, the average U.S. household will have thirteen different Wi-Fi-connected devices and Wi-Fi will account for nearly 64% of total Internet traffic.^{6/} Indeed, as NCTA explains, unlicensed operations will *only continue to grow* and will be an integral part of the 5G ecosystem.^{7/}

A few commenters disagree, suggesting that additional spectrum is not needed because the Commission already designated sufficient spectrum for unlicensed use in the *Report and Order*.^{8/} These commenters claim that the Commission should prioritize making licensed spectrum available in the bands between 24 GHz and 57 GHz.^{9/} These arguments – that the 14

^{5/} *Report and Order* ¶125.

^{6/} See Comments of NCTA – The Internet & Television Association, GN Docket No. 14-177, *et al.* at 4 (filed Sept. 30, 2016) (hereinafter NCTA Comments) (citing CISCO, *VNI Complete Forecast Highlights Tool*, North America, United States, Wired Wi-Fi and Mobile Growth (2016), http://www.cisco.com/c/m/en_us/solutions/service-provider/vni-forecast-highlights.html (select “United States” from the “North America” drop-down menu, select “2020 Forecast Highlights” and expand “Wired Wi-Fi and Mobile Growth”); IHS MARKIT, *Nine in 10 Global Broadband Households to Have Service Provider Wi-Fi by 2019, IHS Says* (June 5, 2015), <http://press.ihs.com/press-release/technology/nine-10-global-broadband-households-have-service-provider-wi-fi-2019-ihs-sa>).

^{7/} See NCTA Comments at 5.

^{8/} See *Report & Order* ¶¶4, 125.

^{9/} See Comments of AT&T, GN Docket No. 14-177, *et al.* at 11 (filed Sept. 30, 2016); Comments of the CCA, GN Docket No. 14-177, *et al.* at 8 (filed Sept. 30, 2016); Comments of Mobile Future, GN Docket No. 14-177, *et al.* at 6 (filed Sept. 30, 2016); Comments of 5G Americas, GN Docket No. 14-177,

gigahertz of spectrum already allocated should be the limit of unlicensed spectrum in the bands above 24 MHz – are wrong for at least three reasons.

First, and as Wi-Fi Alliance and others have demonstrated, it is unlicensed spectrum that is shouldering the load of carrying traffic to and from the Internet – the most significant area of wireless growth.^{10/} It is therefore appropriate that the Commission adequately support this growing need. *Second*, merely comparing the amount of spectrum designated for unlicensed and licensed use does not tell the whole story. Because of spectrum re-use and sharing techniques, unlicensed spectrum can often be used more intensely than licensed spectrum, supporting access from many more devices. Designating spectrum for unlicensed operations can therefore provide more capacity for more users. *Finally*, and as Wi-Fi Alliance pointed out earlier, there is a significant gap between the highest bands – at 5 GHz – currently used for unlicensed operations and the 57-71 GHz band made available in this proceeding for unlicensed devices. Just as licensed operators require access to different spectrum bands to meet different needs, so too will unlicensed technologies require access to spectrum with different propagation and other technical characteristics.^{11/}

CCA suggests that additional unlicensed spectrum is not necessary at this time because the unlicensed market is developing and that certain unlicensed devices (*e.g.*, WiGig devices

et al. at 2 (filed Sept. 30, 2016); Comments of CTIA, GN Docket No. 14-177, *et al.* at 10 (filed Sept. 30, 2016).

^{10/} *FNPRM* Comments of Wi-Fi Alliance at 5, n.11; NCTA Comments at 1 (explaining that “consumers continue to demand more throughput and the ability to connect a huge array of new devices to their networks. . . . Past data and industry forecasts show that much of this connectivity depends on Wi-Fi and other unlicensed services, and that this dependence will grow”).

^{11/} The Dynamic Spectrum Alliance (“DSA”) agrees. In urging the Commission to make additional unlicensed spectrum available, DSA notes that unlicensed spectrum is similar to licensed spectrum in that “there is a need for low-, mid-, and high-band unlicensed spectrum due to varying propagation characteristics of radio waves in different spectrum bands as well as the available channel sizes.” Comments of DSA, GN Docket No. 14-177, *et al.* at 2 (filed Sept. 30, 2016).

using the 57-64 GHz band) are just beginning to be introduced in the market.^{12/} CCA ignores, as noted above, the explosive growth of devices using unlicensed spectrum and the increasingly central role that unlicensed spectrum plays in the wireless ecosystem. While there may be limited use of the 57-64 GHz band today, the need for additional spectrum capacity for unlicensed devices will drive more intense use of the band. The use of all spectrum above 24 GHz for terrestrial operations – whether licensed or unlicensed – is limited today. The Commission’s action designating additional spectrum in the bands above 24 GHz for terrestrial operations will change that, for both licensed and unlicensed use. As Wi-Fi Alliance has noted, the use of spectrum for licensed and unlicensed use is complementary.^{13/} As a global leader in 5G development and deployment, the Commission cannot afford to wait to allocate additional spectrum for unlicensed use. It must designate that spectrum now to accommodate the 5G growth that will occur across the wireless industry.

III. DEVICE-BASED SPECTRUM MANAGEMENT IS THE BEST APPROACH TO PROMOTE EFFICIENT SPECTRUM USE

In allocating additional spectrum for unlicensed use, the Commission should not adopt un-tested sharing mechanisms that may unnecessarily complicate and/or frustrate spectrum access. An industry-developed device-based protocol, like that used by Wi-Fi, is the most efficient form of management of unlicensed spectrum. Several commenters generally agree that the Spectrum Access System (“SAS”) model is problematic.^{14/} For example, CTIA (who is

^{12/} Comments of the CCA, at 8.

^{13/} *FNPRM* Comments of Wi-Fi Alliance at 5.

^{14/} See, e.g., Comments of CTIA at 4; Comments of AT&T at 12; Comments of Mobile Future at 4; Comments of Fixed Wireless Communications Coalition, GN Docket No. 14-177, *et al.* at 7 (filed Sept. 30, 2016); Comments of Ericsson, GN Docket No. 14-177, *et al.* at 14 (filed Sept. 30, 2016) (“The SAS concept is new, unproven, and complex.”); Comments of the National Spectrum Management Association, GN Docket No. 14-177, *et al.* at 4 (filed Sept. 30, 2016); Comments of Collinear Networks, Inc., GN Docket No. 14-177, *et al.* at 8 (filed Sept. 30, 2016).

actively engaged in SAS experimentation in the 3.5 GHz band) states a SAS-type model in the millimeter wave bands will delay 5G deployment.^{15/} The Telecommunications Industry Association is concerned with use of a SAS in the millimeter wave bands “*particularly when simpler frequency coordination mechanisms would suffice.*”^{16/} Intel Corporation explains that SAS is unnecessary, particularly in the lower segment of the 37 GHz band, designated for unlicensed operations, which lacks complications and special considerations that might require a complex coordination mechanism.^{17/}

It is unclear how – or even if – SAS will work in any of the millimeter wave bands.^{18/} Discussing SAS in the proposed 47 GHz band, the Fixed Wireless Communications Coalition illustrates the need for a better understanding of SAS by expressing that “[u]ntil SAS technology has shown itself capable of managing many thousands of mobiles simultaneously and prioritizing their access to spectrum at a high level of reliability, we think it unwise to adopt rules on the premise that a still-nascent technology will emerge as expected.”^{19/} CTIA explains that “it would defy logic to extend the SAS model to the millimeter wave bands before it has been successfully deployed in any frequency band.”^{20/}

A few commenters differ.^{21/} Federated Wireless claims that SAS represents a proven technology and urges the Commission to embrace SAS as a comprehensive approach to better

^{15/} Comments of CTIA at 23.

^{16/} Comments of the Telecommunications Industry Association, GN Docket No. 14-177, *et al.* (filed Sept. 30, 2016) (emphasis added).

^{17/} Comments of Intel Corporation, GN Docket No. 14-177, *et al.* at 4 (filed Sept. 30, 2016).

^{18/} *See* Comments of CCA at 5.

^{19/} Comments of Fixed Wireless Communications Coalition at 7.

^{20/} Comments of CTIA at 23-24.

^{21/} *See, e.g.*, Comments of Federated Wireless, Inc., GN Docket No. 14-177, *et al.* at 7 (filed Sept. 30, 2016); Comments of Google Inc. and Google Fiber Inc., GN Docket No. 14-177, *et al.* at 8 (filed Sept. 30,

spectrum management.^{22/} Federated Wireless bases this claim on the Commission’s ongoing work with the Department of Defense and National Telecommunications and Information Administration to permit SAS technology in the Citizens Broadband Radio Service (“CBRS”).^{23/} Federated Wireless mischaracterizes the state of SAS in the CBRS. It ignores that: (1) the agencies’ work is *ongoing*; (2) final approval of SAS administrators remains pending; and (3) SAS technology has not been fully tested.

Wi-Fi Alliance acknowledges that there may be circumstances in which a device-based mechanism may not be appropriate – for example, where spectrum is shared between licensed and unlicensed users. Use of an SAS may be particularly appropriate if the alternative is lack of access to spectrum by unlicensed devices altogether. Wi-Fi Alliance supports a mechanism, including a SAS or a SAS-like model, on a case-by-case basis, in complex spectrum management scenarios where device-based contention techniques may be challenging. Nonetheless, SAS and other third party access models need further testing before they are implemented in the millimeter wave bands.

IV. THE COMMISSION SHOULD AUTHORIZE UNLICENSED OPERATIONS IN THE 57-71 GHZ BAND ON BOARD AIRCRAFT

Wi-Fi Alliance reiterates that the Commission should authorize unlicensed use of the entire 57-71 GHz band onboard aircraft. Many commenters support such unlicensed use.^{24/} For example, the Fixed Wireless Communications Coalition supports unlicensed operations at 57-71

2016); Comments of Open Technology Institute at New America and Public Knowledge, GN Docket No. 14-177, *et al* at 11-13 (filed Sept. 30, 2016).

^{22/} Comments of Federated Wireless at 2-3.

^{23/} *Id.* at 3.

^{24/} *See, e.g.*, Comments of the Boeing Company, GN Docket No. 14-177, *et al* at 54 (filed Sept. 30, 2016); Comments of Fixed Wireless Communications Coalition at 3; Comments of DSA at 8 (supporting the proposal to extend unlicensed operations up to 72.5 GHz).

GHz onboard aircraft while avoiding the first WiGig channel to ensure that EESS operations are protected.^{25/} The Boeing Company explains that the Commission should continue its consideration of unlicensed spectrum use on aircraft in the 57-71 GHz band.^{26/}

The National Academy of Sciences' Committee on Radio Frequencies ("CORF") suggests that the prohibition on unlicensed use should remain, pending technical analyses and sharing studies regarding the impact of 60 GHz unlicensed aeronautical operations on EESS and RAS.^{27/} CORF also urges the Commission to prohibit wireless avionics intra-communication operations.^{28/} CORF, however, has not provided any information that demonstrates the flaws in Wi-Fi Alliance's two-step approach to introduce unlicensed service on a limited basis.^{29/} Commission adoption of this approach will accomplish the dual goals of promoting 60 GHz devices, including on board aircraft, and protecting incumbent operations on an interim basis while further analysis, if necessary, of the potential impact on incumbent services is conducted.

V. CONCLUSION

Wi-Fi Alliance commends the Commission's actions to date in this proceeding. As it proceeds to designate additional spectrum for mobile terrestrial operations in the bands above 24 GHz, the Commission should designate sufficient spectrum for unlicensed use below 57 GHz in order to accommodate the rapidly developing need for unlicensed capacity. Access to unlicensed

^{25/} Comments of Fixed Wireless Communications Coalition at 3.

^{26/} Comments of the Boeing Company at 54.

^{27/} Comments of the National Academy of Sciences' Committee on Radio Frequencies, GN Docket No. 14-177, *et al* at 12-14 (filed Sept. 30, 2016).

^{28/} *Id.*

^{29/} As detailed in Wi-Fi Alliance's *FNPRM* comments that approach would consist of the following: *first*, the Commission should remove the prohibition on unlicensed operations on WiGig Channels 2-3 aboard aircraft, which will alleviate harmful interference concerns to EES and RAS operations; and *second*, the Commission and stakeholders should continue to conduct studies pertaining to the use of WiGig Channels 1,4,5, and 6. *FNPRM* Comments of Wi-Fi Alliance at 9-10.

spectrum in the millimeter wave bands should not be unnecessarily encumbered by overly complex third party database mechanisms where device-centric models will suffice. Finally, Wi-Fi Alliance has presented a path to using WiGig spectrum aboard aircraft while, if necessary, this issue receives further study.

RESPECTFULLY SUBMITTED,

A handwritten signature in black ink, appearing to read 'Edgar Figueroa', with a long horizontal flourish extending to the right.

Edgar Figueroa
President and CEO

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

October 31, 2016