

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

In the Matter of	)	
	)	
Amendment of Part 15 of the Commission’s Rules	)	ET Docket No. 14-165
for Unlicensed Operations in the Television Bands,	)	
Repurposed 600 MHz Band, 600 MHz Guard	)	RM-11840
Bands and Duplex Gap, and Channel 37	)	
	)	

**COMMENTS OF WI-FI ALLIANCE**

Wi-Fi Alliance<sup>1/</sup> submits these comments in response to the Petition for Rulemaking submitted by Microsoft Corporation (“Microsoft”)<sup>2/</sup> that asks the Commission to change its rules governing white space devices in order to foster the further deployment of those devices.

According to Microsoft, doing so will improve broadband access in rural areas and allow for narrowband operations such as those used in the Internet of Things (“IoT”).<sup>3/</sup> Wi-Fi Alliance agrees that the Commission should issue a Notice of Proposed Rulemaking seeking comment on

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<sup>2/</sup> *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*, Petition for Rulemaking, ET Docket No. 14-165, RM-11840 (May 3, 2019) (“*Petition*”); *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*, Public Notice, RM-11840 (rel. May 9, 2019).

<sup>3/</sup> *Petition* at 1.

the changes proposed by Microsoft and other potential modification to the rules governing white space devices.

## I. INTRODUCTION AND SUMMARY

Wi-Fi Alliance is a global, non-profit industry association of over 800 leading companies from dozens of countries devoted to connecting everyone and everything everywhere. 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. Certified, interoperable Wi-Fi systems are critical to the Nation's wireless ecosystem, key components of the country's economic growth and catalysts for technological innovation. White space devices have the potential to maximize efficient spectrum use, power developing IoT applications, and close the digital divide, making them an important unlicensed communications tool. Wi-Fi Alliance therefore supports Microsoft's work on this important technology and its request that the Commission reevaluate a number of the rules governing white space devices.

It has been five years since the Commission last fully evaluated its rules governing white space devices, when it made necessary changes based on the anticipated 600 MHz broadcast incentive auction and repacking of the TV band.<sup>4/</sup> Since then, much has changed in the white space device landscape, which justifies the Commission reviewing its rules. *First*, it is now generally accepted that the geo-location and database approach is successful in protecting

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<sup>4/</sup> *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 et al.*, Notice of Proposed Rulemaking, 29 FCC Rcd 12248 (2014). A Report and Order and Order on Reconsideration, which addressed several pending Petitions for Reconsideration from the Order, was adopted in earlier this year. *Amendment of Part 15 of the Commission's Rules for Unlicensed White Space Devices*, Report and Order and Order on Reconsideration, ET Docket Nos. 16-56, 14-165, FCC 19-24 (Mar. 20, 2019). Petitions for Reconsideration related to operations on Channel 37 (which impacted the usage of 40 mW personal or portable white space devices) and alternatives for the database to address short-notice reservations for Electronic News Gathering microphones were not considered.

incumbent operations from receiving harmful interference.<sup>5/</sup> *Second*, the application and potential value of narrowband white space devices for IoT have been demonstrated through experimental licenses.<sup>6/</sup> And *finally*, it is more urgent than ever that the Commission use all available tools to close the digital divide.<sup>7/</sup> Wi-Fi Alliance therefore urges the Commission to issue an NPRM incorporating Microsoft’s proposals.

## **II. IMPROVEMENTS TO THE RULES WILL PROVIDE ADDITIONAL TOOLS TO BRING BROADBAND CONNECTIVITY TO UNSERVED AREAS**

Microsoft requests that the Commission allow fixed white space devices using spectrum no closer than the second-adjacent channel to TV broadcast stations and in less congested areas to operate at a higher radiated power limit.<sup>8/</sup> The minimum separation distance between these higher-power fixed white space devices and nearby TV broadcast stations would increase proportionately based on the methodology currently in the Commission’s rules.<sup>9/</sup> The Commission should propose to change the rules as Microsoft suggests. Even after the proposed rule changes, white spaces databases will continue to ensure that incumbent operations remain

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<sup>5/</sup> See, e.g., Letter of Stacey G. Black, AVP Federal Regulatory – Spectrum, AT&T Services *et al.* to Marlene H. Dortch, Secretary, FCC, ET Docket No. 18-295 (Apr. 22, 2019) (detailing the support of 6 GHz incumbents and frequency coordinator Comsearch for the use of geolocation databases for 6 GHz automatic frequency coordination); National Telecommunications and Information Administration, *Spectrum Sharing Model Gaining Ground*, News Release (May 1, 2019) (detailing NTIA’s work on the 3.5 GHz band spectrum access system, which is built on geolocation databases).

<sup>6/</sup> *Petition* at 15; see, e.g., *Application of Microsoft Corporation*, ELS File No. 0049-EX-CM-2018, Call Sign WJ2XCD (filed Mar. 7, 2018).

<sup>7/</sup> See, e.g., *Remarks of FCC Chairman Ajit Pai at the Farm Foundation/U.S. Department of Agriculture Summit*, Apr. 18, 2018 (“On my first day as FCC Chairman in January 2017, I said that my number one priority was closing the digital divide and bringing the benefits of the Internet age to all Americans”).

<sup>8/</sup> *Petition* at 4-5.

<sup>9/</sup> *Id.*

protected from harmful interference, and there is no reason to suspect that new interference issues will arise from this proposal.

Microsoft also proposes that the Commission allow fixed white space devices to operate at heights above average terrain (“HAATs”) of up to 500 meters in less congested areas.<sup>10/</sup> Like its proposal to increase radiated power levels, Microsoft recommends increasing proportionately, based on the current methodology, the minimum separation distance between the fixed white space devices operating at HAATs above 500 meters in less congested areas and nearby broadcast stations.<sup>11/</sup> Microsoft’s proposal will allow white space networks to reach rural areas where the only available structure for the white space device’s base station may be a natural feature such as a ridge, or which, for some other reason, require or justify a higher installation. The white spaces database will continue to ensure that incumbent operations will be protected from harmful interference, as it currently does.

Finally, Microsoft proposes that the Commission allow fixed white space devices to operate in a first adjacent channel at power levels greater than 40 mW in less congested areas.<sup>12/</sup> Under the current rules, a block of three vacant channels is required for a fixed white space device to operate on a single channel at the maximum power level of 4 W.<sup>13/</sup> Microsoft explains this proposed change by noting that allowing fixed white space devices to operate on the first adjacent channel in less congested areas will increase the number of channels available for white space device operations.<sup>14/</sup> Despite the smaller number of broadcast stations in less congested

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<sup>10/</sup> *Petition* at 11-15.

<sup>11/</sup> *Id.* at 11-13.

<sup>12/</sup> *Id.* at 3, 9.

<sup>13/</sup> 47 C.F.R. § 15.709(b)(1).

<sup>14/</sup> *Petition* at 8-9.

areas, their channel assignments may unnecessarily limit the availability of spectrum for white space device operations, based on second-adjacent protection requirements. Demonstrations of fixed white space device operations on a first adjacent channel to a broadcaster at power levels approaching the Commission's EIRP limit without causing harmful interference have already been conducted outside the United States, in Africa,<sup>15/</sup> for both analog and digital TV broadcasts. At a minimum, the Commission should take a fresh look at the issue and seek comment on this proposed change.

While Microsoft did not ask the Commission to seek comment on new methodologies for interference calculation, Wi-Fi Alliance believes this topic should be considered in the context of proposed higher power white space device operations on the first adjacent channel. Since the Commission last fully evaluated its white space devices rules in 2014, there have been significant advances in cloud computing. White space databases are cloud based. Concerns about the computational intensity required for multiple white space devices using a circa 2014-2015 terrain-based model can be easily addressed in 2019. The Commission should seek comment on the use of terrain-based models to calculate minimum white space device separation distances, and whether this will allow greater use of the white spaces while continuing to fully protect incumbents. The use of those models may be able to identify areas within the protected contour on the first adjacent channel that could be used for white space device operations, for example, at higher power in less congested areas.

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<sup>15/</sup> M.T. MASONTA, L.M. KOLA, A.A. LYSKO, L. PIETERSE & M. VELEMPINI, NETWORK PERFORMANCE ANALYSIS OF THE LIMPOPO TV WHITE SPACE (TVWS) TRIAL NETWORK 2 (IEEE Africon 2015) <https://ieeexplore.ieee.org/document/7331923>.

### **III. THE COMMISSION SHOULD EXTEND THE RULES TO PERMIT GEO-FENCED OPERATION OF FIXED WHITE SPACE DEVICES ON MOBILE PLATFORMS**

As technology evolves, mobile and transportable access points will constitute important use-cases in the Wi-Fi ecosystem, addressing the growing demand for mobile connectivity. Current rules allow for personal/portable white space devices to operate within a geo-fenced area.<sup>16/</sup> Microsoft proposes that the Commission also allow fixed white space devices to operate within a geo-fenced area registered in – and validated by – the white spaces databases.<sup>17/</sup> Fixed white space devices operating within this geo-fence would be allowed to operate on moveable platforms, and the geolocation coordinates would be checked every minute; when the fixed white space device’s geo-coordinates come within 1.6 km of the geo-fence boundary – roughly the distance a vehicle moving at 60 mph travels in a minute – the white space device would cease operation.<sup>18/</sup> Wi-Fi Alliance agrees that this approach would further the Commission’s goal of fostering innovation in the white spaces while also protecting incumbent operations. This issue is similar to the Commission’s consideration of mobile and transportable operations in the 6 GHz proceeding, which Wi-Fi Alliance also supports, and potential interference concerns have been extensively analyzed in the context of that proceeding.<sup>19/</sup>

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<sup>16/</sup> 47 C.F.R. § 15.711(d)(5).

<sup>17/</sup> *Petition* at 22-26.

<sup>18/</sup> *Id.* at n.41.

<sup>19/</sup> *See Comments of Wi-Fi Alliance*, ET Docket No. 18-295 at 34-35 (Feb. 15, 2019) (“*WFA 6 GHz Comments*”).

#### IV. THE COMMISSION SHOULD ESTABLISH RULES FOR NARROW CHANNEL WHITE SPACE DEVICE OPERATION OPTIMIZED FOR THE INTERNET OF THINGS

As Wi-Fi Alliance has explained, the need for unlicensed spectrum capacity continues to grow, and different use cases will require spectrum in different bands.<sup>20/</sup> It has noted that “it is likely that Internet of Things applications will be well-suited for lower bands, like current TV band spectrum.”<sup>21/</sup> The challenge, however, is that white space device rules were developed with *broadband* operations in mind, not the *narrowband* operations which characterize most IoT deployments. For example, as Microsoft points out, for a fixed white space device operating at 1 W conducted power, the power spectral density (“PSD”) limit is 12.6 dBm in any 100 kilohertz segment.<sup>22/</sup> But, a white space device limited to 12.6 dBm in power could not operate in a 100 kilohertz channel within the 6 megahertz channel: it would have to be spread out across 6 megahertz, with no more than -4.8 dBm in any 100 kilohertz segment. As IoT operating bandwidth tends to be a few hundred kilohertz and below,<sup>23/</sup> under the current rules, the conducted power would not be sufficient to take advantage of the greater range in the VHF and UHF spectrum bands.

Wi-Fi Alliance agrees with Microsoft that the Commission should define what constitutes a narrowband white space device and permit those operations under its rules. However, rather than proposing the rules Microsoft has suggested, the Commission should seek comment on an

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<sup>20/</sup> *Id.* at 2-9.

<sup>21/</sup> *See Comments of Wi-Fi Alliance*, ET Docket No. 16-56 at 3 (May 6, 2016).

<sup>22/</sup> *Petition* at 16.

<sup>23/</sup> *See* Kais Mekki, Eddy Bajic, Frederic Chaxel & Fernand Meyer, *A Comparative Study of LPWAN Technologies for IoT Deployment*, 5 ICT Express 1 (Mar. 2019) <https://www.sciencedirect.com/science/article/pii/S2405959517302953?via%3Dihub> (comparing different IoT standards and noting the benefits of narrowband and ultra-narrowband for IoT).

appropriate upper channel size limit for a narrowband white space device in order to minimize the risk of interference, both with narrowband and broadband operations. A contention-based mechanism such as listen-before-talk or a schedule-based mechanism can be implemented to prevent simultaneous narrowband transmissions at a location.

Wi-Fi Alliance supports the proposal that the Commission establish a power spectral density (“PSD”) limit for narrowband white space devices. Microsoft suggests that the conducted power limit per 100 kilohertz in a narrowband device be the same as the PSD limit in any 100 kilohertz segment for a 1 W conducted power device operating within a 6 megahertz channel: 12.6 dBm.<sup>24/</sup> This is a reasonable approach, but Wi-Fi Alliance asks the Commission to consider scaling the conducted power limit per 100 kilohertz in narrowband devices to the upper channel size limit in narrowband white space devices. For example, the conducted power limit in a 200 kilohertz narrowband channel would be 15.6 dBm.

Microsoft also proposes a duty cycle based on its experimental IoT deployments in agriculture.<sup>25/</sup> Rather than proposing the suggested rules, Wi-Fi Alliance asks the Commission to seek comment on other IoT applications that could conceivably utilize the VHF and UHF bands, and their corresponding duty cycles, without adverse effects on these and other operations in the band. Capping the total airtime consumption to only 10 seconds per hour, as Microsoft has proposed,<sup>26/</sup> may limit the potential range of applications.

Finally, Wi-Fi Alliance supports Microsoft’s proposal for ensuring that the maximum conducted power for *all* IoT devices operating in a 6 megahertz channel at any one time be no

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<sup>24/</sup> *Petition* at 18.

<sup>25/</sup> *Id.* at 15.

<sup>26/</sup> *Id.* at 19.



greater than the maximum conducted power of a broadband white space device operating in a 6 megahertz channel.<sup>27/</sup> This should be sufficient to protect licensed operations from harmful interference.

## V. CONCLUSION

It is timely for the Commission to consider changes to its white space device rules that will better enable this technology to support IoT and close the digital divide. Wi-Fi Alliance supports the Petition. In issuing an NPRM, the Commission should also seek comment on the additional issues raised here by Wi-Fi Alliance.

Respectfully submitted,

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<sup>27/</sup> *Id.* at 19-20.

**CERTIFICATE OF SERVICE**

I, Jonathan Markman, hereby certify that on June 10, 2019, copies of the foregoing

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