

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

In the Matter of	)	
	)	
Unlicensed Use of the 6 GHz Band	)	ET Docket No. 18-295
	)	
Expanding Flexible Use in Mid-Band Spectrum Between 3.7 and 24 GHz	)	GN Docket No. 17-183
	)	

To: The Commission

**COMMENTS OF CAMBIUM NETWORKS, LTD.**

Cambium Networks, Ltd. (“Cambium”), pursuant to Section 1.415(a) of the rules of the Federal Communications Commission (“FCC”), submits these Comments in response to the Notice of Proposed Rulemaking (“NPRM”) in the above-referenced proceedings.<sup>1</sup> Cambium supports new opportunities to make unlicensed use in the 5.925-7.125 GHz band for new technology and services, particularly to promote broadband connectivity and to help alleviate spectrum congestion in other bands that are authorized for unlicensed use. We provide these comments regarding certain technical aspects of the NPRM and to urge the Commission to adopt higher-power device limits, with appropriate protections for incumbent uses, to further facilitate broadband deployments nationwide, with particular emphasis on rural areas that are costly to serve with broadband.

---

<sup>1</sup> *Unlicensed Use of the 6 GHz Band; Expanding Flexible Use in Mid-Band Spectrum Between 3.7 and 24 GHz*, Notice of Proposed Rulemaking, ET Docket No. 18-295, GN Docket No. 17-183 (released Oct. 24, 2018)(“NPRM”). Federal Register publication of the NPRM occurred on December 17, 2018. 83 Fed. Reg. 64506 (Dec. 17, 2018).

## **Background**

Cambium builds Wi-Fi and fixed wireless broadband point-to-point and point-to-multipoint solutions. Our products and services support communications networks deployed by service providers, enterprises, governmental and military agencies, oil, gas and utility companies, Internet service providers and public safety first responders. Cambium supports a variety of broadband deployments using several spectrum bands, and we build devices for use in license-exempt spectrum bands to support cost-effective broadband connectivity for point-to-point and point-to-multipoint installations.

## **Discussion**

The Commission proposes to make the 5.925-6.425 GHz and 6.525-6.875 GHz bands (designated as the U-NII-5 and U-NII-7 bands, respectively) available for unlicensed operations “consistent with the existing rules for unlicensed device operations in the nearby U-NII-1 and U-NII-3 bands...”<sup>2</sup> Cambium supports the NPRM’s request for public comment on proposals and use cases for these bands, as well as the Commission’s recognition of the potential for promoting broadband services using the unlicensed model that has proven so successful in the U-NII-1 and U-NII-3 bands. We agree with WISPA that making available additional spectrum for unlicensed use is an important objective, and Cambium also supports proposals to facilitate lower-power indoor operations in the 6 GHz band.<sup>3</sup> We also support the proposed implementation of a centralized Automated Frequency Coordination (“AFC”) for managing interference. However, we urge the Commission to authorize certain higher-power operations to help optimize use of the band to meet Federal objectives to spur new and better broadband deployments nationwide.

---

<sup>2</sup> NPRM at para. 25.

<sup>3</sup> Comments of the Wireless Internet Service Providers Association ET Docket No. 18-295, GN Docket No. 17-183 (Feb. 15, 2019). Cambium supports the Comments of WISPA with respect to the NPRM.

***I. Higher-Power Client Devices Should be Authorized in the U-NII-5 and U-NII-7 bands.***

In the NPRM, the Commission proposes power levels similar to those in existing U-NII bands.<sup>4</sup> In Cambium's view, the FCC's technical standards should include an option for higher-power fixed client devices, thereby advancing the public interest in new and improved broadband deployments. More specifically, the FCC proposes maximum EIRP power spectral density limits for client devices such that the "maximum conducted output power is 63 milliwatts and maximum power spectral density is 5 dBm in any 1 megahertz band. If a transmitting antenna with directional gain greater than 6 dBi is used, the maximum power and power spectral density shall be reduced by the amount in dBi that the directional gain is greater than 6 dBi."<sup>5</sup> This 63 mW (18 dBm) limit, even with the 6dBi adjustment for antenna gain for a maximum EIRP limit of 24 dBm, is much lower than the power limit for standard-power access points, which is 1 watt, or 30 dBm. The Commission seeks comment on whether higher-power operations could be permitted under certain conditions. In Cambium's view, the FCC should adopt the option to allow deployment of higher-power fixed client devices that properly register with the AFC system and provide all configuration and location parameters. Fixed clients typically have directional antennas with much narrower beams than the access point, thereby generating less interference. The AFC system would calculate any possible interference to be generated by this fixed client device and would provide a list of frequencies for permissible operations for that device. Because the device would have access to the AFC system only through the access point in a centralized model, the device should be allowed to transmit on the channel being used so that the AFC may access all parameters needed to evaluate channel availability, but devices would not be allowed

---

<sup>4</sup> NPRM at para. 25.

<sup>5</sup> *Id.* at para. 78.

to transmit user traffic until authorized by the AFC.

Under these conditions, FCC rules should authorize client devices at the same power limits as the access points. The proposed power limit effectively predetermines the types of services that could be offered in the bands by unduly restricting the availability of efficient point-to-multipoint and point-to-point deployment options. The FCC states “that the standard-power access points that are most likely to be deployed in the U-NII-5 and U-NII-7 bands will be used to provide wide area coverage and will use omnidirectional or wide-beamwidth antennas (such as 60 or 120 degrees) rather than the highly directional antennas employed by fixed microwave services.”<sup>6</sup> This need not be the case in these bands.

- *Point-to-multipoint networks* rely on devices that use directional antennas to limit harmful interference, but the links themselves also must be balanced. If directional antennas for the client devices are at the same EIRP limit, there is no increase in interference intensity to other base stations nearby because the access point already radiates at that EIRP, and the client devices are pointing at the access point. Furthermore, Wireless Internet Service Provider, or WISP, operations, unlike mobile operations, require balanced links because upstream throughputs are only slightly lower than downstream throughputs.
- *Point-to-point networks*, as the Commission has stated, would be impractical under the proposed rules because of the relatively low permitted EIRP levels.<sup>7</sup> Again, if the Commission adopts Cambium’s proposed higher power limit, point-to-point operation would not only be practical, it would be beneficial. Adoption of Cambium’s proposal would enable a deployment option that could facilitate a line-of-sight distance of tens of miles at 36 dBm operations, and harmful interference would be mitigated by the combination of corresponding narrow beamwidths and mandatory registration of each device with the AFC system and operations.

For these reasons, Cambium urges the FCC to establish power limits for client devices that are the same as those for their access points to facilitate fixed point-to-point and point-to-multipoint operations that build on the success of such operations in other bands. Separately, Cambium agrees with WISPA that the use of such higher-power client devices should not be limited to rural

---

<sup>6</sup> *Id.* at para. 65.

<sup>7</sup> *Id.* at n. 133.

and underserved areas given the need for higher-power operations in certain congested areas. For Cambium and its customers, the availability of an option for higher device power would bring many benefits to enabling more cost-effective and spectrally efficient broadband deployments, particularly in rural areas.

***II. The FCC Should Adopt a Centralized Automated Frequency Coordination Model for Determining Operating Frequencies in the U-NII-5 and U-NII-7 Bands.***

The Commission seeks comment on its proposal to determine permissible operating frequencies for U-NII-5 and U-NII-7 devices by requiring that standard-power access points “obtain a list of permissible frequencies from an AFC system prior to transmitting or a list of prohibited frequencies in which it cannot transmit.”<sup>8</sup> As suggested above, Cambium agrees that the service rules for the U-NII-5 and U-NII-7 bands should, in general, be harmonized with the existing rules for the 5 GHz, with higher power limits in specific cases and with the addition of AFC to protect licensed operations. Further, the Commission invites on whether the AFC system, which is described as a “simple database,” should be a centralized model with data stored centrally or in the cloud, or whether the system should be decentralized with the standard-power access point storing a local database. In Cambium’s view, the centralized model offers important advantages. It is straightforward to implement and promotes efficiencies in harmonizing access to permissible operating frequencies. Rather than relying on many individual standard-power access points to maintain and update a local database, a centralized location can easily be updated any time a new devices is to be included in the protected services list, or if a device is no longer using resources. For this reason, Cambium supports use of the centralized approach for the proposed AFC system.

---

<sup>8</sup> *Id.*

The FCC asks whether the AFC system “should determine frequency availability using the maximum permissible power for a standard-power access unit, or should it determine frequency availability at power levels less than the maximum, and calculate a list of available frequencies and the maximum power on each one?”<sup>9</sup> Cambium urges the Commission that spectrum availability is at a premium with many installations. Many access points are adding features to support wider and wider channel bandwidths, and often operators require access to multiple channels to cover a region without causing self-interference. In Cambium’s view, a channel should not be considered unavailable in cases of marginal interference to incumbent devices where such interference can be remedied by reducing the access point’s EIRP.

The NPRM seeks comment on whether the FCC should limit the maximum installation height of outdoor standard-power access points, and if so, whether that limit should be 30 meters above ground level based on FCC estimates of “typical” installation heights.<sup>10</sup> We believe that the protection zones should be calculated based on actual installation heights, as provided by the professional installer, rather than on estimated heights, which may be underinclusive and thereby preclude potentially beneficial installations that could be operated without causing harmful interference. This approach would promote more intensive and efficient spectrum use on a site-by-site basis by permitting installation above 30 meters in cases where no impermissible interference is created to protected zones. Such installations would reduce potential congestion for installations at lower heights and thus reducing the likelihood of interference, thereby allowing for more intensive spectrum use at a single location. Accordingly, Cambium urges the FCC not to create an artificial height limit for outdoor standard-power access points.

---

<sup>9</sup> *Id.* at para. 26.

<sup>10</sup> *Id.* at para. 51.

With respect to the question of whether device registration in the AFC database is needed,<sup>11</sup> Cambium supports device registration via the centralized database model through transmission of location data to AFC systems, but Cambium urges the FCC to clarify certain aspects of the device registration process. A database that lists and protects extraneous non-operating devices would burden the system unnecessarily and would reduce spectral efficiency by shielding from the AFC spectrum that in fact should be deemed available. Accordingly, if the device registration process is dynamic and occurs when the device is powered up, the FCC should adopt a process to account for scenarios when devices are powered off are out of service or are not available in the network.

The FCC asks whether the Universal Licensing System does not currently collect additional technical data that is needed to facilitate automatic coordination.<sup>12</sup> Cambium notes that certain technical parameters in addition to geographic coordinates and antenna height allow more a more accurate calculation of the device's potential for interference. These parameters include antenna azimuth, antenna beamwidth, front-to-back ratio and antenna/device downtilt. Use of such parameters can help optimize network performance while balancing the need to mitigate the potential for harmful interference to neighboring devices. Alternatively, if these parameters are not provided to ULS, Cambium recommends that AFC system calculations be based on conservative default values.

### ***III. The FCC Should Not Mandate the Use of Integrated Antennas***

The FCC asks whether it should require that antennas be integrated with devices operating in these bands. Cambium urges the Commission not to adopt this requirement. Connectorized

---

<sup>11</sup> *Id.* at paras 27-28.

<sup>12</sup> *Id.* at para. 50.

units would allow installers to have greater flexibility to select an antenna that is appropriate for specific deployments. Under this approach, the professional installer would enter the information of the antenna gain into the unit so that the transmit power is properly calculated to meet the EIRP limits. Because of wide variation in the types of deployments in the field, installers should retain some flexibility to use antennas that are most appropriate for the installation rather than be limited to a “one size fits all” approach

### **Conclusion**

Cambium applauds the Commission for inviting public inquiry on these matters and for recognizing the vital importance of unlicensed spectrum in the broadband ecosystem. Cambium concurs in the need for more spectrum for unlicensed use in the 6 GHz band and in the potential utility of AFC for managing spectral interference and for protecting incumbent uses in the band. That said, higher power limits for outdoor use and the authorization of higher-power client devices, subject to appropriate operating conditions and managed via AFC, are necessary for these bands to more fully advance the Commission’s objectives and the public interest. For these reasons, Cambium encourages the FCC to adopt the proposals set forth herein.

Respectfully submitted,

/s/  
Scott Imhoff  
Vice President of Product Management  
CAMBIUM NETWORKS, LTD.  
3800 Golf Road Suite 360  
Rolling Meadows, IL 60008

February 15, 2019