

**Before the
Federal Communications Commission
Washington, D.C. 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) Discontinuing 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 VUBIQ NETWORKS, INC.

Vubiq Networks, Inc. (“Vubiq”) hereby provides comments in the above-captioned proceeding¹ in support of the Commission’s goal of expanding unlicensed use of frequencies

¹ Use of Spectrum Bands Above 24 GHz for Mobile Radio Services, Notice of Proposed Rulemaking, GN Docket No. 14-177 et al. (rel. Oct. 23, 2015) (“NPMR”).

above 24 GHz. It will be vitally important that unlicensed broadband providers gain access to mmWave spectrum, and the Commission's proposals in this proceeding will satisfy this need.

BACKGROUND

Vubiq, located in Irvine, CA, manufactures 60 GHz millimeter wave point-to-point wireless link products that are designed to transport Ethernet traffic at gigabit and higher speeds. Vubiq holds eleven patents for various millimeter wave applications, from components to system level technologies. Vubiq's technology uses proprietary modulation techniques and up to 2 GHz wide channels to support wideband communications. It's Chief Technology Officer, Mike Pettus, was a member of the Commission's Millimeter Wave Communications Working Group, which nearly twenty years ago proposed the basis for the current Section 15.255 rules.

Vubiq's products are used by segments of the wireless broadband market that require high-speed connections: Wireless Internet Service Providers ("WISPs"); fiber network operators; enterprise users and business campuses; and carriers. Providing a high-speed solution to these users will increase competition in the provision of broadband – both WISPs and fiber network operators (often CLECs) compete directly with carriers to provide high bandwidth internet connections, for example.

The benefits of wireless broadband technology include avoiding the costs and complexity of other types of deployment, such as that trenching and permitting that is required to provide fiber or cable access. Having a high speed wireless alternative for the last mile of fiber connectivity is a big competitive advantage. For businesses that operate on extended campuses, wireless broadband allows easy and quick expansion as the business grows and new buildings are brought into use with high speed LAN/WAN connectivity. In comparison, with the traditional carrier approach antiquated T1 or T3 service would be offered, which is a low-

performance solution² and also very costly, as it requires trenching to run new fiber run between buildings. In many situations this simply is not possible. With the ability to install a millimeter wave link in less than a single day, wireless gigabit data connectivity is a more effective solution.

In the future, major carrier network buildout, whether 4G/LTE or 5G, will include smaller cell base stations, or small cells, at locations like street lights, traffic signals and buildings. These base stations will require even higher speed connectivity from what exists today, and with little or no fiber connectivity from these types of locations, the solution is wireless backhaul. Thus, while the Commission's focus in this proceeding primarily has been on providing spectrum for mobile (5G) operations, opening additional mmWave spectrum for unlicensed technologies is equally important.

DISCUSSION

Vubiq is strongly in favor of the Commission's proposal to allocate 64-71 GHz for unlicensed use.³ Unlicensed bands historically have served as test beds for innovative technologies, with much benefit to the economy. An additional 7 GHz of spectrum, creating a single 14 GHz mmWave unlicensed band, will meet the growing demand for wireless broadband services, at faster speeds than ever before. And with equipment already available, unlicensed users are poised to quickly deploy and make use of this new allocation.

A. The 64-71 GHz Band is Ideal for Long Range Transmissions.

The Commission asks whether there are technical considerations in the 57-64 GHz band that are applicable to unlicensed use of the 64-71 GHz band, recognizing that unlicensed use may need to protect future allocated services.⁴

² T1 is 1.5 Mbps and T3 45 Mbps.

³ NPRM at ¶ 58.

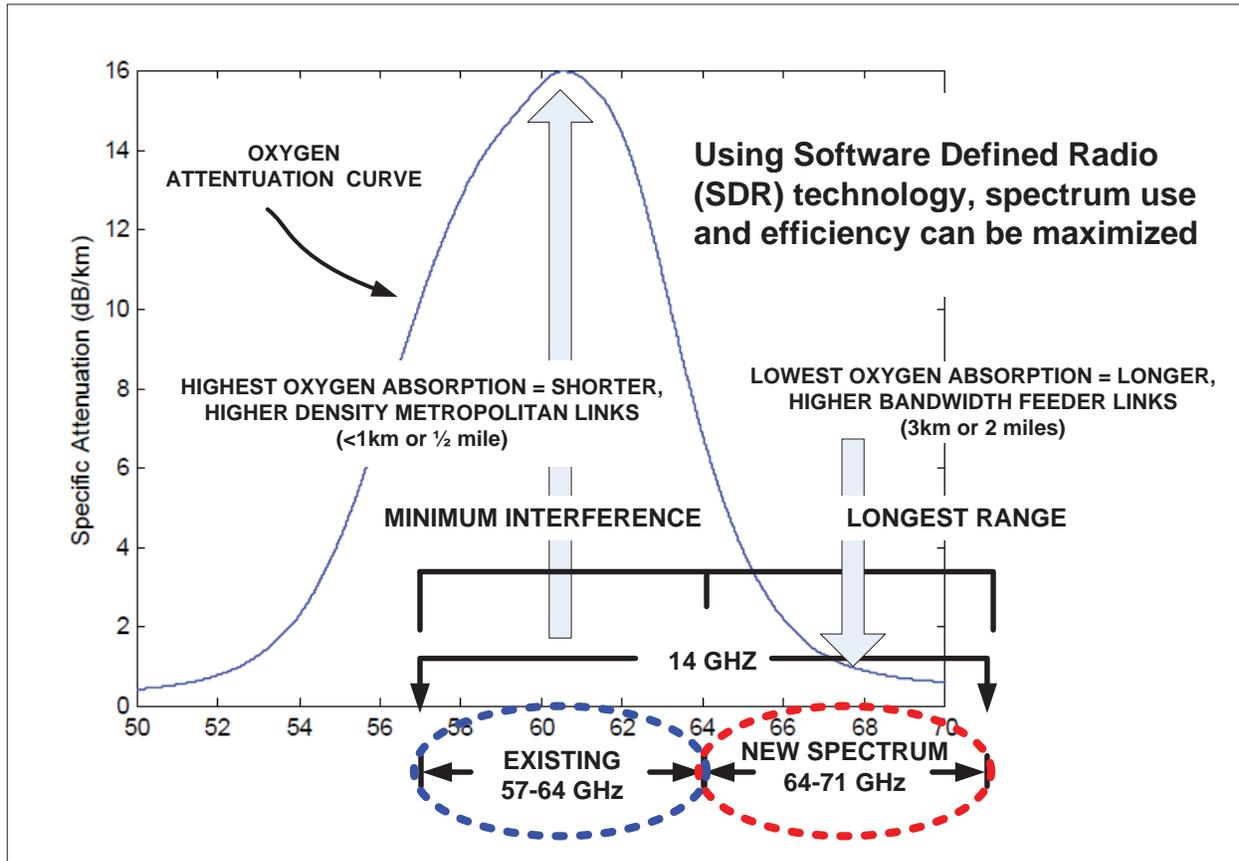
⁴ NPRM at ¶ 59.

60 GHz, also known as “V-band,” allows for short range communications due to the effects of oxygen attenuation. 60 GHz thus is ideal for high speed communications links in downtown metropolitan areas due to the huge frequency re-use capability. Natural oxygen attenuation centered at 60 GHz provides the frequency re-use that supports very high density networks in the metropolitan applications. The adjacent “E-band” (71-76 and 81-86 GHz) also allows for wideband communications, but at longer ranges because there is very low oxygen absorption at these frequencies. But the E-band is operated as a licensed service, with specific limitations on minimum antenna size (gain) required as part of the regulatory framework.⁵ Although the licensing process is fairly straightforward for the E-band, the licensing requirement along with constraints on antenna size inhibit rapid and flexible deployment of high speed wireless links. For this reason, an additional unlicensed allocation in a portion of the V-band where there is very low oxygen absorption, with no regulatory constraints in terms of licensed station locations and antenna size limitations, makes for the most flexible deployment.

Vubiq agrees with the Commission’s tentative conclusion that equipment used in 64-71 GHz would be able to operate at longer range and higher throughput than equipment used in 57-64 GHz because the 64-71 GHz frequency range is not attenuated by the oxygen phenomenon. Depending on technical design, links can be deployed for either short, high-density applications or longer, low density applications with a single programmable product, as the chart below

⁵ See 47 C.F.R. §§ 101.1501-101.1527.

illustrates:



Having an unprecedented 14 GHz of unlicensed millimeter wave spectrum allocation would enable point-to-point link design capable of data rates up to 50 Gbps.

B. Proposed Technical Rules for 64-71 GHz.

The Commission proposes specific technical rules for 64-71 GHz,⁶ and asks what additional technical and operating characteristics and interference mitigation techniques should be considered in assessing sharing of the band by unlicensed users.⁷ Vubiq supports applying the existing Section 15.255 rules to the 64-71 GHz band, with the modification suggested in the NPRM (*i.e.* elimination of the coordination channel). In particular, the proposal to apply the two

⁶ NPRM at ¶¶ 300-315.

⁷ NPRM at ¶ 59.

types of emission limits in Section 15.255(b)(1) to the proposed 64-71 GHz band will be quite beneficial for obtaining high-speed data throughputs.

1. Sharing Analysis and Modeling

The Commission seeks comment on spectrum sharing analyses and models, and technical information on operating characteristics to better understand propagation and sharing in the mmWave bands.⁸

Vubiq generally agree that there must be a common method for modeling millimeter wave propagation. This is especially true for 5G applications. For the point-to-point fixed application, the beam patterns are typically very narrow and controlled. Vubiq does not foresee any issues with sharing or interference unless there are other co-located links specifically within the 60 GHz band. This kind of potential interference has traditionally been worked out through cooperation with the users and technical solutions such as re-locating, polarization diversity, and frequency diversity have provided the best means to sharing spectrum.

The system technical characteristics for Vubiq's application of a 60 GHz outdoor fixed point to point system are:

1. Maximum peak transmitter power for use in the 60 GHz band: +16 dBm.
2. Maximum average transmitter power, including modulation back-off: +10 dBm.
3. Minimum antenna gain: 38 dBi. In all cases the peak power and antenna gain will meet the current FCC rules as specified in Section 15.255 for outdoor, point-to-point fixed applications.
4. Maximum antenna half-power beamwidth: 1.8 degrees.
5. Typical polarization: Vertical. For installations where two co-located links are installed customers may choose to use both vertical and horizontal polarization.
6. Minimum receiver noise figure: 6 dB.
7. Transmission and reception are simultaneous using frequency division duplexing (FDD).
8. Proposed bandwidth: 50 MHz to 2 GHz using programmable modulation techniques from non-coherent OOK up through 1024 QAM.
9. Symbol Rates: 25 Mbaud to 1500 Mbaud.

⁸ NPRM at ¶¶ 316-317.

10. Typical Use Cases: Point-to-point 60 GHz full duplex link with gigabit and higher bandwidth Ethernet transport for the following market segments: Mobile backhaul, fiber extension, enterprise/campus connectivity, and WISPs.

2. Equipment Authorization

The Commission seeks comment on measurement techniques and RF exposure compliance.⁹ Vubiq's devices involve single-beam, professionally installed point-to-point links; conducted measurements from a single antenna port are straightforward. The Commission should ensure that the rules adopted for 64-71 GHz allow for measurement for single beam systems, not just for systems containing antenna arrays. Current FCC guidelines are sufficient for single beam systems. In terms of measurement bandwidth, the measurement bandwidth for frequencies above 1 GHz (1 MHz) is most appropriate; a wider bandwidth would allow too much thermal noise into the measurement, distorting the results.

In terms of RF exposure, because Vubiq's devices are professionally installed point-to-point links with single antennas, the current standards used for MPE can apply.

CONCLUSION

For the forgoing reasons, Vubiq enthusiastically supports the Commission's proposed rules to open the 64-71 GHz band to unlicensed use.

Respectfully submitted,
/s/

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⁹ NPRM at ¶¶ 318-324.