**Before the**
**FEDERAL COMMUNICATIONS COMMISSION**
**Washington, D.C. 20554**

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| In the Matter of | ) | |
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| 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 |
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**REPLY COMMENTS OF CHARTER COMMUNICATIONS, INC.**

Charter Communications, Inc. ("Charter") files these reply comments in response to the Federal Communications Commission's ("Commission's") Notice of Proposed Rulemaking ("NPRM"), seeking comment on proposed unlicensed use in portions of the 5.925-7.125 GHz ("6 GHz") band.[1] Charter strongly supports the Commission's efforts to permit unlicensed use in the 6 GHz band, and urges the Commission to allow unlicensed operations throughout the entire band.

Unlicensed spectrum is a critical component of the wireless ecosystem. Not only has it unleashed technological advancements, such as Wi-Fi, but it also has facilitated billions of dollars of economic growth and investment in the United States.[2] As Charter explained in its comments, millions of American businesses and consumers rely on Wi-Fi every day to

[1] *See In re Unlicensed Use of the 6 GHz Band*, Notice of Proposed Rulemaking, 33 FCC Rcd 10,496 (2018).

[2] *See* Comments of Charter Communications, Inc. at 1, ET Docket No. 18-295 (Feb. 15, 2019) ("Charter Comments"); Comments of Wi-Fi Alliance at 5, ET Docket No. 18-295 (Feb. 15, 2019) ("Wi-Fi Alliance Comments") ("A recently produced analysis of the economic value of Wi-Fi concluded that the annual Wi-Fi contribution to the U.S. economy is almost $500 billion today, and will nearly double by 2023.").

communicate, connect, and create.[3] And as the Wi-Fi Alliance emphasized, "Wi-Fi is the primary on-ramp to the Internet[,]. . . with hotspots on planes, trains, and in cars, as well as in coffee shops, restaurants, and hotels."[4] Wi-Fi also is crucial to the development of the Internet of Things ("IoT") as it "provides ways for devices to connect to one another, such as for virtual reality, file transfer, and local video streaming"[5] at lower costs.[6] Cisco "projects that worldwide machine-to-machine connections, the traffic at the core of the Internet of Things, will more than double between 2017 to 2022, growing from 6.1 billion connections to 14.6 billion."[7] Almost half of these connections will be connected home applications, such as home security and home automation, many of which "will communicate via Wi-Fi."[8]

As a leading connectivity provider in the country, Charter especially appreciates the expansive use of Wi-Fi today. Charter's advanced Wi-Fi network currently supports approximately 250 million wireless devices. And Charter continues to enhance its network capabilities to ensure its subscribers have access to the latest wireless technologies and increased speeds. Charter recently introduced the latest Wi-Fi technology—802.11ax or "Wi-Fi 6"[9]—and

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[3] *See* Charter Comments at 1; *see also* Comments of NCTA—The Internet & Television Association at 2, ET Docket No. 18-295 (Feb. 15, 2019) ("Wi-Fi is the primary technology through which American consumers and businesses access the Internet.").

[4] Wi-Fi Alliance Comments at 2.

[5] *See id.* at 5.

[6] Comments of Public Interest Organizations at 7, ET Docket No. 18-295 (Feb. 15, 2019) ("Unlicensed spectrum also provides the primary source of connectivity for machine-to-machine data transfer and emerging industrial IoT networks—including for energy and environmental monitoring and controls, mobile healthcare monitoring, industrial automation, intelligent transportation networks, smart meter reading, control systems for agricultural technology, vehicle tolling, inventory tracking, and traffic lights. All of these are among the use cases experiencing dramatic growth with declining costs to consumers thanks to open, unmediated connectivity using unlicensed bands.").

[7] Comments of Cisco Systems, Inc. at 8, ET Docket No. 18-295 (Feb. 15, 2019).

[8] *Id.*

[9] *See* Charter Comments at 2.

already is looking ahead by preparing for the forthcoming "Wi-Fi 7," which may start to be available as early as two to three years from now. Wi-Fi 7 will enable 320 megahertz channels, requiring even greater amounts of unlicensed bandwidth. There is no other spectrum on the horizon other than the 6 GHz band that would support such wide channels.

These technologies offer unprecedented benefits, such as improved speeds, expanded coverage, and increased capacity.[10] Moreover, as several commenters note, it is estimated that "Wi-Fi 6 global annual chipset shipments will exceed 1 billion by 2022, driven by numerous factors, including growth in Wi-Fi-enabled devices, increased per-user traffic demand, greater number of users[,] . . . increased cellular offloading, and higher-density Wi-Fi deployments."[11] The Wi-Fi Alliance further explains that "[t]he next generation of Wi-Fi – Wi-Fi 6 – is designed to deliver greater capacity, faster speeds, and lower latency to support forthcoming connectivity needs such as 5G applications."[12] To that end, Charter submits that Wi-Fi 6, and the impending Wi-Fi 7, will play an integral role in enabling the United States to lead 5G deployments worldwide. Not only will consumers experience applications equivalent to 5G in the home and office, where they primarily rely on Wi-Fi, but the accompanying explosion of wireless traffic will also require additional Wi-Fi capacity to support offloading and ensure consumers see the full benefits of 5G, provided there is enough unlicensed spectrum to prevent a bottleneck.[13]

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[10] *See id.*

[11] Comments of Apple Inc. et al. at 11, ET Docket No. 18-295 (Feb. 15, 2019) ("Apple et al. Comments").

[12] Wi-Fi Alliance Comments at 40.

[13] *See, e.g.*, Comments of the Computing Technology Industry Association (CompTIA) at 2, ET Docket No. 18-295 (Feb. 15, 2019) ("Allowing unlicensed devices to operate in the 6 GHz band is crucial to the future of next generation wireless service in America. . . . The Commission must capitalize on this unique opportunity to make more than 1 GHz of spectrum available for unlicensed use in a single proceeding. Opening up the 6 GHz band is, quite simply, a key component in winning the global race to 5G.").

Global leadership in 5G therefore not only requires additional licensed spectrum: it is critical that the Commission also make available hundreds of megahertz of additional unlicensed spectrum, including in the 6 GHz band. Such efforts will help satisfy the growing demand for Wi-Fi, and allow the United States to remain competitive with other countries.[14] As it stands, the United States will soon exhaust its unlicensed spectrum resources.[15] And "[b]ased on projected growth in demand for Wi-Fi, [in the next few years], up to 1500 megahertz of additional mid-band spectrum may be needed to sustain the Wi-Fi ecosystem."[16] Allowing unlicensed use throughout the 6 GHz band will ensure that Charter and others are able to deploy Wi-Fi 6 in a manner that maximizes the full benefit of this advanced wireless technology.

Several commenters in fact indicate that "[m]aking the 6 GHz band available for unlicensed use will . . . allow Wi-Fi 6 to reach its full potential"[17] as cutting-edge Wi-Fi technologies like this require greater amounts of spectrum before they can be fully delivered to American consumers. In fact, the 6 GHz band will be entirely used by Wi-Fi 6 and future technologies, rather than the older unlicensed technologies, which will ensure clean and highly efficient spectral use. And it is important to make this large amount of unlicensed spectrum available soon because Wi-Fi 6 is expected to be available as early as 2020, or 2021 at the latest.

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[14] *See* Apple et al. Comments at 10 ("Unlike many other technological sectors, the unlicensed-technology industry—including chipmakers, device manufacturers, and integrators—is centered in the United States, increasing the nation's global economic competitiveness. Supporting Wi-Fi directly supports U.S. technological leadership.").

[15] *See* Charter Comments at 2; Comments of Broadcom at 1, ET Docket No. 18-295 (Feb. 15, 2019) ("Broadcom Comments") ("Demand for unlicensed services, especially Wi-Fi, continues to grow, and the existing unlicensed spectrum in the 2.4 GHz and 5 GHz bands has become congested.").

[16] Wi-Fi Alliance Comments at 6.

[17] Apple et al. Comments at 10.

For these reasons, Charter disagrees with Ericsson's proposal to repurpose a portion of the 6 GHz band for flexible use licensed service. The Commission's adoption of Ericsson's proposal to permit licensed use in the 6.425-7.125 GHz band[18] would result in the wholesale *repurposing* of the identified portion of the band, thereby leaving incumbents to be displaced and relocated. In addition, it would significantly limit the amount of spectrum potentially available to unlicensed users in the 6 GHz band; under Ericsson's proposal, four of the seven 160 megahertz channels in the 6 GHz band would be designated for licensed use.[19] Such an approach would hinder the ability of providers like Charter to offer Gigabit Wi-Fi speeds using Wi-Fi 6 and other advanced Wi-Fi technologies, and deprive consumers from utilizing high-bandwidth, high-speed services and applications, including augmented and virtual reality, at

[18] *See* Comments of Ericsson at 13, 16-17, ET Docket No. 18-295 (Feb. 15, 2019) ("[R]epurposing the 6.525-7.125 GHz band for flexible use licensed service would address the licensed spectrum gap in the mid-band and substantially advance the U.S. effort to lead on 5G." "The 6.425-6.525 GHz band presents a unique challenge but also an opportunity for the Commission as it deliberates how to allocate spectrum in the 6 GHz band. . . . Ericsson proposes that this 100 megahertz of spectrum be used on an indoor-only, licensed basis."); *see also* Comments of CTIA at 9-10, ET Docket No. 18-295 (Feb. 15, 2019) ("The Commission should promptly issue a further notice of proposed rulemaking to consider licensing the upper portion of the 6 GHz band for exclusive use, flexible rights services. With this new notice, the Commission can fully explore licensed use cases for the upper 6 GHz band and ensure that it allocates new uses in the band in the most optimal way to meet consumer demands."); Comments of Verizon at 14, ET Docket No. 18-295 (Feb. 15, 2019) ("While Verizon is committed to maximizing the opportunity in the 3.7-4.2 GHz band, it has called for making available hundreds of megahertz of mid-band spectrum to advance U.S. interests in 5G. . . .This must include freeing up additional mid-band spectrum for licensed mobile use.").

[19] Charter previously has explained that if the Commission permits indoor, low power devices to operate in the 5.925-6.425 GHz ("U-NII-5") and 6.525-6.875 GHz ("U-NII-7") bands that would permit these devices to operate across seven contiguous 160 megahertz channels. *See* Charter Comments at 3-4; *see also* Broadcom Comments at 2 ("The Commission has already proposed to allow low-power indoor operations in U-NII-6 (6.425–6.525 GHz) and U-NII-8 (6.875–7.125 GHz). For the same reasons that the FCC correctly determined that low-power indoor devices will not cause harmful interference to incumbents in these bands, these devices can also share the U-NII-5 (5.925-6.425 GHz) and U-NII-7 (6.875–7.125 GHz) bands. Modifying the proposal in this way is of central importance to making the entire 6 GHz band a success because it increases the number of 160-megahertz channels for low-power indoor operations from one to seven.").

lower costs.[20] Permitting unlicensed use in the 6 GHz band, however, will not require any displacement of incumbents or the need to clear the band. Opening the 6 GHz band to unlicensed users will simply expand shared usage of limited spectrum with no impact on existing users.

Similarly, the Commission should reject Qualcomm's proposal to adopt rules to promote synchronized operations in the U-NII-7 band.[21] While Qualcomm claims this proposal is technology-neutral, it is not. Qualcomm's proposal would favor synchronized operations over asynchronized operations in this band. By requiring synchronized mode of operation, any technologies that currently do not employ synchronization would either be prohibited from or be provided second class treatment when operating in this band. For example, there are several types of IoT systems which only transmit small data sporadically and with no fixed transmission duration, and therefore have no need for a synchronized mode of operation. Such technologies, which are often deployed in industrial settings, would be excluded from using this band. Charter believes that when providing rules of engagement in any unlicensed spectrum, not only is it important to create technology-neutral rules, but also foster rules allowing fair and equal priority for channel access and channel use irrespective of a particular mode of operation (*e.g.*, asynchronous vs. synchronous). The latter is particularly important for cases where one technology or mode of operation may overshadow another technology or mode of operation. As such, Charter believes the Commission should continue to adhere to its usual practice of crafting technology neutral rules for flexible spectrum usage that avoid creating any dependencies between the spectrum in question and any particular technology or operating mode.

[20] *See* Charter Comments at 3-4.

[21] *See* Comments of Qualcomm Inc. at 18-23, ET Docket No. 18-295 (Feb. 15, 2019).

## CONCLUSION

For the foregoing reasons, the Commission should move expeditiously to open up the entire 6 GHz band for unlicensed use and adopt technical parameters for the band that are technologically neutral. These approaches not only will allow the 6 GHz band to be put to its highest and best use, but also will maximize investment in this spectrum. Moreover, adoption of these policies will ensure that the United States remains a world leader in deploying advanced wireless technologies by enabling the future of Wi-Fi through the deployment of Wi-Fi 6 and the forthcoming Wi-Fi 7.

Respectfully submitted,

*/s/ Howard J. Symons*


Howard J. Symons
Johanna R. Thomas
Bernadette M. Walli
JENNER & BLOCK LLP
1099 New York Avenue, NW
Suite 900
Washington, DC 20001
(202) 639-6000

*Counsel for Charter Communications, Inc.*

Elizabeth Andrion
*Senior Vice President, Regulatory Affairs*
Colleen King
*Vice President, Regulatory Affairs*
CHARTER COMMUNICATIONS, INC.
601 Massachusetts Avenue, NW
Suite 400W
Washington, DC, 20001
(202) 621-1900


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