

**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

COMMENTS OF FACEBOOK, INC.

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I. Introduction and Summary

Facebook’s mission is to give people the power to share and make the world more open and connected. More than three years ago, Facebook launched Internet.org to address the broader issue that today, nearly four billion people—60% of the people on the planet—are still not connected to the Internet. And because the rate of Internet penetration growth has slowed from 14% in 2010 to under 7% in 2015, Facebook also launched its own Connectivity Lab to develop new technologies that specifically focus on connecting the unconnected. Connecting these people—most of whom live in the developing world—is a complicated effort that requires not just bringing network infrastructure to more people, but also requires addressing the regulatory environment, access technology standards, and other issues that affect the awareness, availability, and affordability of internet access.¹

Spectrum policy is a key part of the regulatory environment that affects both the affordability and availability of the internet. Improving connectivity in the United States and around the world means pursuing spectrum policy that maximizes the utilization of this limited resource and promotes the expansion of both the capacity and coverage of wireless networks. As an innovator in spectrum management, the Commission is in a unique position to adopt spectrum policies that achieve these objectives in the United States, while also setting an example for the rest of the world.

As the Commission moves forward with its Further Notice of Proposed Rulemaking in its *Spectrum Frontiers* proceeding,² the Commission can maximize the utilization of spectrum and expand the capacity and coverage of networks by doing the following. *First*, the Commission

¹ Internet.org by Facebook, State of Connectivity 2015 – A Report on Global Internet Access at 6-8 (Feb. 22, 2016).

² *Use of Spectrum Bands above 24 GHz, et al.*, Report and Order and Further Notice of Proposed Rulemaking, 31 FCC Rcd 8014 (2016) (“*Spectrum Frontiers* FNPRM”).

should make available additional spectrum bands under flexible use policies to ensure that an abundant supply of quality spectrum remains available for a variety of users and platforms, including spectrum above 95 GHz. And *second*, the Commission should encourage spectrum sharing in more bands, including in the 37 GHz band, and through broader use-or-share performance requirements in the millimeter wave bands. Such sharing systems can maximize the use of spectrum, ensure that licensed spectrum does not lie fallow, and provide unlicensed access to spectrum for new and innovative uses.

II. The Commission Should Make Available Additional Spectrum Bands Under Flexible Use Policies that Promote Use by a Variety of Platforms.

Facebook fully supports the Commission's efforts to make additional millimeter wave spectrum available for fixed or mobile use,³ and the Commission's efforts to identify and allocate spectrum above 95 GHz.⁴ Making an abundance of spectrum available for flexible use, at a range of frequencies, will reduce barriers to entry and increase innovation and competition, which will ultimately boost connectivity in the United States and around the world.

Connecting the unserved and underserved in the United States and around the world will require a wide variety of technical solutions. For example, in dense, urban areas, wireless terrestrial systems can efficiently serve end users and support backhaul links. In less dense areas, where broadband infrastructure must be deployed over large areas, using high altitude solar-powered unmanned aircraft to provide backhaul-type links to terrestrial aggregation points may be part of the optimal solution. And, in remote, sparsely populated areas, where there are significant gaps in infrastructure and the economic barriers of installing that infrastructure are

³ *Id.* at 8144, ¶ 369.

⁴ *Id.* at 8169, ¶¶ 442-45.

considerably higher, satellite services may provide the most efficient way to connect. So while it will take a mix of technical solutions to connect the world's unserved and underserved areas, each of these solutions will require access to spectrum—the lifeblood of wireless networks.

Therefore, to maximize connectivity, spectrum policy should maximize use across a variety of platforms—including mobile. Mobile connectivity is a key onramp to the internet both in the U.S. and abroad. Global mobile data traffic is projected to increase tenfold by 2019.⁵ The Commission's proposals to add mobile allocations to millimeter wave bands make sense. At the same time, Facebook agrees with the Commission's assessment that “much is unknown about all future uses of the [millimeter wave] bands.”⁶ And as the record in this proceeding has shown, “there are wide variety of services, including fixed, mobile, and satellite, for which these bands could be used.”⁷

For these reasons, Facebook fully supports the Commission's proposal to authorize flexible use licenses that would permit fixed and mobile services in a range of bands identified by the International Telecommunication Union for IMT-2020, specifically: 24.25-24.45 GHz and 24.75-25.5 GHz, 31.8 GHz-33.4 GHz, 42-42.5 GHz, 47.2 GHz-50.2 GHz, and 50.4 GHz-52.6 GHz.⁸ Facebook believes that the Commission's flexible approach can accommodate the coexistence of new mobile allocations with existing fixed allocations in these bands, as well as others that have been identified by the ITU for further study. Coexistence between services will

⁵ Cisco Visual Networking Index: Global Mobile Data Traffic Forecast Update 2014-2019 White Paper, *available at* http://www.cisco.com/c/en/us/solutions/collateral/service-provider/visual-networking-index-vni/white_paper_c11-520862.html.

⁶ *Use of Spectrum Bands Above 24 GHz for Mobile Radio Services*, Notice of Proposed Rulemaking, 30 FCC Rcd. 11878 at 11888, ¶ 23 (2015) (“*Spectrum Frontiers NPRM*”).

⁷ *Spectrum Frontiers FNPRM* at 8145, ¶ 372.

⁸ *Id.* ¶ 373.

help enable a variety of technologies to more fully use the spectrum—be they mobile, fixed terrestrial, satellite, or new technologies such as the high altitude platform stations (HAPS) that Facebook is currently developing.⁹ Specifically, Facebook is currently in the process of testing potential flight operations and studying spectrum bands that were identified for HAPS in World Radiocommunication Conferences (WRC) from 1997-2012 or agreed upon for study for HAPS at WRC-15. The fixed service bands previously identified for HAPS are the 6440-6520 MHz, 6560-6640 MHz, 27.9-28.2 GHz, 31.0-31.3 GHz, 47.2-47.5 GHz and 47.9-48.2 GHz bands; the bands identified for study at WRC-15 are the 21.4-22 GHz, 24.25-27.5 GHz, and 38-39.5 GHz bands.¹⁰ Despite the overlap between these bands and the bands that the Commission is proposing to allocate for mobile use, Facebook believes that the Commission’s flexible approach will accommodate both uses. The Commission should adopt rules that are flexible enough to ensure future technologies can share in the shared spectrum regime that the Commission is moving towards for the spectrum frontiers.¹¹

In addition, Facebook supports the Commission’s efforts to identify and allocate spectrum above 95 GHz for commercial use.¹² Presently, despite existing allocations, the Commission’s radio service rules end at 95 GHz. The only commercial authorizations available

⁹ See Casey Newton, Facebook Takes Flight, The Verge, <http://www.theverge.com/a/mark-zuckerberg-future-of-facebook/aquila-drone-internet>.

¹⁰ World Radiocommunication Conference, Final Acts WRC-15, Resolution 160, at 261-63 (2015).

¹¹ For instance, the proposed antenna height limits for UMFUS licenses, *see Spectrum Frontiers FNPRM* ¶ 506, should not be automatically imposed on future HAPS licensees as a means for disqualifying HAPS use in certain bands. The Commission should be flexible as new uses and services emerge.

¹² *Spectrum Frontiers FNPRM* at 8169, ¶¶ 442-45.

are through Part 5 experimental licenses. This inhibits market entry for innovative technology and applications above 95 GHz. And it inhibits innovators from acquiring funding to move technology from academic ideas to real-world solutions. For example, the academic community is starting to explore systems above 95 GHz to meet the ever-increasing demand for data while maintaining or decreasing direct current power consumption.¹³ By identifying spectrum bands and proceeding to create service rules for such bands, the Commission can open the doors to real innovation, just as it did with the 60 GHz band years ago.

III. The Commission Should Maximize Spectral Efficiency and Utilization Through the Use of Sharing Technologies and Meaningful Buildout Requirements.

To date, the Commission has led the world in cutting-edge spectrum management tools and the use of sharing technologies by allowing spectrum sharing in currently, or temporarily, unused frequencies on a non-interfering basis in TV White Spaces and in the 3.5 GHz band. In this proceeding, the Commission should continue to make additional spectrum bands available to unlicensed users through sharing technologies. Such technologies have the potential to maximize spectrum use across a variety of users. The use of sharing technologies could also help to balance the needs of mobile network operators seeking to invest in wide-area network infrastructure as well as the needs of other platforms, all while keeping these bands open to the innovation that is yet to come. Moreover, as the Commission has noted, millimeter wave bands can facilitate extensive frequency reuse in the same geographic area,¹⁴ making these bands particularly suited to sharing technologies. Sharing technologies could also increase access to

¹³ See, e.g., M.J.W. Rodwell, 50 - 500 GHz Wireless: Transistors, ICs, and System Design, Microwave Conference (GeMIC) 2014 (Mar. 24, 2014) *available at* <http://ieeexplore.ieee.org/document/6775196/>.

¹⁴ *Spectrum Frontiers NPRM* at 11941 ¶ 215.

unlicensed spectrum, which further drives innovation and investment that can supplement and support mobile networks and expand broadband access at low cost. And sharing technologies could be used to ensure that licensed spectrum does not lie fallow. Around the world, licensed spectrum resources are often significantly underutilized in lower population density areas. Yet this spectrum remains unavailable to others due to delayed buildout and weak license buildout requirements. If unused spectrum were instead open for unlicensed access through sharing technologies, this would no longer be a concern.

Therefore, Facebook supports the Commission's proposal to use sharing technologies to facilitate co-equal sharing in the lower segment of 37 GHz band (37- 37.6 GHz) between Federal and non-Federal fixed and mobile users.¹⁵ Facebook supports the use of effective sharing technologies that would coordinate among tiers of users in the 37 GHz band.¹⁶ Facebook also supports the Commission's proposal to bring shared access into the upper segment of the 37 GHz band (37.6-38.6 GHz) through a use-it-or-share-it performance requirement.¹⁷ Such a requirement should take effect after 5 years or even sooner to maximize access to unused spectrum.

Additionally, Facebook urges the Commission to adopt meaningful and enforceable buildout requirements for all of the millimeter wave spectrum bands to ensure that licensed spectrum is not underutilized. Facebook believes that one solution would be to adopt a use-or-share requirement more broadly, rather than just the 37 GHz band, that would require licensees

¹⁵ *Spectrum Frontiers FNPRM* at 8171 ¶ 450.

¹⁶ *Id.*

¹⁷ *Id.* at 8173-74 ¶¶ 460-64.

to share any unused spectrum after five years or even sooner.¹⁸ A number of different mechanisms have been shown to effectively facilitate sharing, including sharing technologies. A use-or-share requirement would serve not only to ensure that the spectrum is fully utilized, but it could serve to motivate licensees to build out more quickly.

IV. Conclusion

Facebook believes that improving connectivity in the United States and around the world means pursuing spectrum policy that maximizes the utilization of this limited resource and promotes the expansion of both the capacity and coverage of wireless networks. As an innovator in spectrum management, the Commission is in a unique position to adopt spectrum policies that achieve these objectives in the United States, while also setting an example for the rest of the world. As the Commission moves ahead with its *Spectrum Frontiers* proceeding, it should do the following. *First*, the Commission should make available additional spectrum bands under flexible use policies to ensure that an abundant supply of quality spectrum remains available for a variety of users and platforms, including spectrum above 95 GHz. And *second*, the Commission should encourage spectrum sharing in more bands, including in the 37 GHz band, and through broader use-or-share performance requirements in the millimeter wave bands. By doing so, the Commission's policies will better maximize the use of spectrum, ensure that licensed spectrum does not lie fallow, and provide unlicensed access to spectrum for new and innovative uses.

¹⁸ *Id.* at 8176 ¶ 474.

Respectfully submitted by:

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