

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

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In the Matter of)	
)	
Spectrum Horizons)	ET Docket No. 18-21
)	
Battelle Memorial Institute Petition for)	RM-11713
Rulemaking to Adopt Fixed Service Rules in the)	(Terminated)
102-109.5 GHz Band)	
)	
Request for Waiver of ZenFi Networks, Inc. and)	WT Docket No. 15-245
Geneva Communications LLC)	(Terminated)
)	
James Edwin Whedbee Petition for Rulemaking)	RM-11795
To Allow Unlicensed Operation in the 95-1,000)	
GHz Band)	
_____)	

COMMENTS OF APPLE INC.

May 2, 2018

INTRODUCTION

Apple Inc. (“Apple”) applauds the Commission’s forward-looking exploration of how the agency can promote innovation and investment in the 95 GHz-3,000 GHz range, through the Notice of Proposed Rulemaking (“NPRM”) in the above-referenced proceeding. Apple recommends that the Commission approach this proceeding with the goal of encouraging a range of innovative business and engineering approaches that market forces determine best utilize these frequencies, and work to avoid restrictive regulations, band plans, or predictions about future uses of the bands that could dictate outcomes and limit innovation.

Fortunately, the NPRM generally advances these goals. However, a subset of its proposals could impose rules that hamstring market-based innovation. Specifically, the proposed band structure intersperses relatively narrow unlicensed bands with substantially more licensed spectrum, thereby capping the width of unlicensed bands and substantially limiting unlicensed engineering opportunities. Indeed, the FCC’s proposal could unintentionally preclude or significantly undermine promising technologies that are being coordinated internationally in spectrum allocation proceedings. To achieve its stated goal to facilitate innovation by conservatively allocating this spectrum, the Commission should therefore either support the innovative companies working to develop future wireless technologies by allowing for substantially wider unlicensed bands, or pursue other strategies to preserve regulatory flexibility in recognition of the difficulty of making predictions about the future path of technology.

DISCUSSION

The Commission recognizes that the spectrum identified in this NPRM is “a largely blank slate upon which bold new technologies can be written” and proposes a “multi-platform

approach” to foster the development of new technologies.¹ Understanding the difficulty of predicting future spectrum uses,² it wisely attempts to implement the light-touch regulatory approach that it has lauded in other contexts.³ In particular, the Commission notes that its proposed band structure was designed to achieve “balance between the specificity needed to encourage further investment and the generality required for spectrum bands whose potential use is largely undefined.”⁴ It seeks comment on both the particular uses interested parties foresee and whether sufficient knowledge exists about those technologies to efficiently and appropriately allocate these bands.⁵ Wisely, the Commission states that a primary goal of this proposal is to “leave room to enable future . . . access opportunities and technologies.”⁶

Apple supports the Commission’s vision for the bands above 95 GHz and appreciates its continued efforts to move away from prescriptive spectrum regulations. The Commission should consider, however, the likelihood that the proposed allocation structure will have precisely the

¹ *Spectrum Horizons et al.*, Notice of Proposed Rulemaking and Order, FCC 18-17, ET Docket No. 18-21, RM-11713, WT Docket No. 15-145, RM-11795, ¶¶ 26–27 (rel. Feb. 28, 2018) (“NPRM”).

² *Id.* ¶ 27.

³ *See, e.g., Expanding Flexible Use in Mid-Band Spectrum Between 3.7 and 24 GHz*, Notice of Inquiry, 32 FCC Rcd. 6373 (2017); Remarks of Ajit Pai, Chairman, Federal Communications Commission, at the Mobile World Congress at 2-3 (Feb. 28, 2017) (“[W]e embraced a flexible use policy for wireless spectrum. Instead of mandating that a specific type of wireless technology be used in a particular spectrum band, the government left that choice to the private sector, which is better able to calibrate use to meet consumer demand.”), https://apps.fcc.gov/edocs_public/attachmatch/DOC-343646A1.pdf.

⁴ NPRM ¶ 27.

⁵ *Id.*

⁶ *Id.* ¶ 2.

effect it hoped to avoid: precluding some technologies and services, including some that are already being considered in international proceedings.

I. The Commission’s Proposals May Preclude Planned “Horizons” Technologies.

International coordination is already underway for the use and development of unlicensed technologies that may be incompatible with the band structure that the Commission has proposed. For example, ETSI and the Electronic Communications Committee of the European Conference of Post and Telecommunications Administrations are advancing new short-range radiodetermination applications that would operate between 120 GHz and 260 GHz and would require bandwidths of 20 gigahertz or more to function optimally.⁷ Existing forms of this technology are central to various industries, including environmental protection, human safety, and manufacturing.⁸ Providing room to develop these technologies at higher frequencies with larger bandwidths has the potential to significantly improve the fidelity of these technologies, supporting applications that are infeasible today. Likewise, the ITU has begun to study the use of spectrum between 275 GHz and 450 GHz for high-speed, short range communications technologies, which would similarly depend on sufficient spectrum for very wide bandwidth operations.⁹

Therefore, while it is true that this spectrum is a largely “blank slate” today, there are already concrete examples of likely uses for these bands which should be considered in the Commission’s decision making. The Commission, in keeping with its light-touch regulatory

⁷ See, e.g., ETSI, Technical Report 103 498, at Introduction & § 7.1.1.2.

⁸ *Id.* § 5.1.

⁹ ITU-R Working Party 1A, Proposed Revision to Working Document Towards a Preliminary Draft New Report ITU-R sm.[275-450ghz_sharing] (adopted Nov. 2017).

philosophy, should avoid restrictive rules that would preclude the technologies that have begun to emerge and instead use these examples to inform its expectations about unknown future uses. Prematurely restricting operations above 95 GHz—by, for example, creating only a few narrow unlicensed bands—without reliable information about the technical characteristics of future systems may also threaten future U.S. competitiveness in emerging wireless technologies. Historically, the U.S. has been a leader in wireless innovation due, in part, to its willingness to open new spectrum.¹⁰ Premature or overly restrictive spectrum regulation, however, results in inefficiencies, opportunity costs, and that “familiar scenario” of managing or relocating incumbents when the optimal use for allocated spectrum changes over time.¹¹ The U.S. risks being stuck with, or racing to undo, improvident and overly restrictive regulatory decisions while the rest of the world forges ahead with new technologies.

II. The Commission Should Establish a More Balanced Spectrum Policy That Supports Both Licensed and Unlicensed Innovation.

Apple strongly supports FCC action to identify more licensed and unlicensed spectrum. Our customers depend on both every day, but a band plan that elevates one over the other would undermine the consumer experience and U.S. competitiveness. As the Commission has repeatedly recognized, both in this proceeding¹² and in others,¹³ unlicensed spectrum is a

¹⁰ *See, e.g.*, NPRM, Statement of Commissioner Brendan Carr; *see also id.*, Statement of Chairman Ajit Pai (noting that continued U.S. leadership entails making additional spectrum commercially available).

¹¹ *See, e.g., id.*, Statement of Commissioner Michael O’Rielly; *see also id.*, Statement of Commissioner Jessica Rosenworcel (expressing fear of “balkaniz[ing] spectrum” and encouraging comments on reorganizing the proposed bands).

¹² *See id.* ¶¶ 6, 26.

¹³ *E.g., Use of Spectrum Bands Above 24 GHz For Mobile Radio Services*, Second Report and Order, Second Further Notice of Proposed Rulemaking, Order on Reconsideration, and

significant driver of the innovation that animates the market and spurs U.S. leadership; it facilitates the most aggressive innovation by the largest number of parties. But the proposed allocation structure includes only a handful of unlicensed bands.¹⁴

By proposing that only a small fraction of the spectrum it allocates should be available for unlicensed use, the Commission reduces the band's potential to support new innovation and growth. It also undermines the balance between specificity and generality that the Commission seeks as a means to avoid the costs and inefficiencies of misallocating spectrum. We therefore recommend that the Commission increase the fraction of the spectrum that it opens to unlicensed spectrum. It need not achieve parity between licensed and unlicensed bands, but the current approach far too heavily preferences licensed technologies.

In part, the Commission could address the need for a higher proportion of unlicensed spectrum by permitting unlicensed technologies to share these bands with licensed services. In addition to allowing for greater innovation, this would dramatically improve the efficiency of spectrum use. The Commission has already proposed innovative sharing opportunities between

Memorandum Opinion and Order, 32 FCC Rcd. 10,988, 11,065 ¶ 232 (2017) (“Unlicensed spectrum provides the low barriers to entry that can encourage innovative business models, while not undermining the substantial investments of which more established operators are capable.”); *Revision of Part 15 of the Commission’s Rules to Permit Unlicensed National Information Infrastructure (U-NII) Devices in the 5 GHz Band*, Notice of Proposed Rulemaking, 28 FCC Rcd. 1769, 1793 ¶ 75 (2013) (“The additional spectrum also would expand opportunities for innovative spectrum access models by creating new avenues for opportunistic and unlicensed use of spectrum and increasing research into new spectrum technologies.”).

¹⁴ See NPRM ¶¶ 53, 55; see also *id.* ¶ 57 (seeking comment on additional bands, including 116-122 GHz).

Fixed Service, Fixed Satellite Service, and unlicensed services in its Mid-Band Spectrum NOI¹⁵ and such sharing mechanisms should be explored and implemented at the outset in the bands above 95 GHz. The Commission itself notes that “bands above 95 GHz generally can accommodate spectrum sharing without requiring complex sharing arrangement.”¹⁶ Additionally, permitting sharing from the beginning of the allocation would allow both licensed and unlicensed network designers to engineer their systems in a manner that accounts for sharing and more effectively limits harmful interference. We recommend that the Commission therefore establish a comprehensive, flexible sharing plan and reduce the need for a future reexamination of spectrum efficiency, as has occurred consistently in other bands in recent years.

III. The Commission Should Adopt a Band Structure that Is Compatible with a Wider Range of Uses, and Sufficiently Flexible to Respond to Future Technological Developments.

In addition, to the need for a greater proportion of unlicensed spectrum, we recommend that the Commission establish larger unlicensed bandwidths. The proposed unlicensed bands range from 1 gigahertz to 7.2 gigahertz wide. These bandwidths are too narrow to enable optimal use of the technologies identified above, and are likely to substantially limit the utility of the band for a larger range of still undefined technologies that will seek access to these bands in the future. Further, the unlicensed bands are intermixed with licensed bands throughout the 95-275 GHz range,¹⁷ thereby limiting the additional bandwidth that could be added through future

¹⁵ *Expanding Flexible Use in Mid-Band Spectrum Between 3.7 and 24 GHz*, Notice of Inquiry, 32 FCC Rcd. 6,373, 6,381-87 ¶¶ 24-43 (2017).

¹⁶ See NPRM ¶¶ 24.

¹⁷ Compare NPRM ¶¶ 53, 55, 57, with *id.* ¶¶ 28, 39.

allocations, and making aggregation far more difficult. To address this issue, we recommend that the Commission create wider contiguous unlicensed bands than suggested in the NPRM.

Another option would be for the Commission to adopt a more gradual approach that recognizes the difficulty in predicting future technologies. It could establish licensed and unlicensed designations in a more discrete subset of frequencies to provide certainty in these bands, while reserving judgment on licensed and unlicensed designations in a larger percentage of the spectrum between 95 GHz and 275 GHz. This approach would address the need to identify some bands for more focused development by licensed standards groups, but would not lock in hard-to-make FCC technology predictions for such a large portion of the Spectrum Horizons, thereby better achieving the balance the Commission seeks.

As part of this approach, Apple supports the Commission's proposal for experimental licensing in the bands above 95 GHz and believes that adopting this flexible model will help to spur innovation in the band. As the band is still largely greenfield, this is a rare opportunity to allow for freedom of exploration that does not exist in other bands and advantage should be taken.

IV. CONCLUSION

Apple supports the Commission's efforts to open a large amount of underexplored spectrum in a way that promotes innovation and leaves room for future uses. Especially on unknown horizons such as these, the Commission is right to trust in emergent market forces over rules based on government predictions about the future of technology. But even high-level allocation decisions can undermine this goal. The small amount of spectrum proposed for unlicensed use, the narrowness of those bands, and their distribution between licensed bands will combine to disadvantage unlicensed technologies and impede further innovation. As Chairman

Pai recently remarked, “instead of having regulators decide which frequencies are useful, we should put spectrum out there as a testbed and leave it to the innovators to figure out how to use it.”¹⁸ In moving forward with this NPRM, the Commission should seek ways to adjust its proposal to better support the innovators who will make these bands successful.

Respectfully submitted,

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May 2, 2018

¹⁸ Remarks of FCC Chairman Ajit Pai at Carnegie Mellon University’s Software Engineering Institute: Bringing the Benefits of the Digital Age to All Americans at 7 (Mar. 15, 2017), https://apps.fcc.gov/edocs_public/attachmatch/DOC-343903A1.pdf.