

**Before the
NATIONAL TELECOMMUNICATIONS INFORMATION ADMINISTRATION
Washington, D.C. 20554**

Developing a Sustainable Spectrum Strategy
for America's Future

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COMMENTS OF APPLE INC.

Maria Kirby
Senior Policy Counsel

Mark Neumann
*Senior Manager
Regulatory Engineering*

Brandy Sykes
*ITU Policy and Spectrum Lead
Regulatory Engineering*

APPLE INC.
801 Pennsylvania Ave NW
Suite 915
Washington DC 20004

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INTRODUCTION

Apple Inc. (Apple) appreciates the opportunity to submit this filing in response to the National Telecommunications and Information Administration's (NTIA) Request for Comments regarding the development of a National Spectrum Strategy.¹ The United States has led the world with forward-looking spectrum policies for decades. A hallmark of these policies has been flexibility. Rather than rigidly requiring spectrum users to adopt specific technologies, standards, or business plans, U.S. policies have given innovators the freedom to discover and implement new advances. As a result, our country has led the world in the development of wireless technologies.

As NTIA designs the National Spectrum Strategy, Apple recommends that it continue to champion the commitment to flexibility and focus on innovation that has served the U.S. so well. Apple recommends that the strategy include three core goals: (1) to encourage a range of innovative business and engineering approaches so market forces can determine the best use of each frequency band, (2) to avoid restrictive regulations or government predictions about future uses of the bands that could dictate outcomes and limit innovation, and (3) to continually bring new bands into use while working to achieve greater efficiency and intensity of use of existing government, commercial, and shared bands.

Apple also recommends that the strategy include commitments to two specific ways to advance these goals: (1) pursuit of a balanced spectrum policy that brings more licensed and unlicensed spectrum into use to serve consumers, and (2) support for band plans and technical

¹ *Developing a Sustainable Spectrum Strategy for America's Future*, Notice and Request for Comments, 83 Fed. Reg. 65,640 (Dec. 21, 2018) (Request for Comments or Request).

rules in current and future spectrum proceedings that encourage investment and innovation rather than requiring particular channelization approaches and/or channel bandwidths geared to any one standard, or otherwise favoring a subset of today’s technologies over innovations to come.

I. The National Spectrum Strategy should adopt a balanced spectrum policy that brings more licensed and unlicensed spectrum into use to benefit consumers

Apple strongly supports the Presidential Memorandum’s commitment to a “balanced” spectrum policy.² The strategy should implement this requirement by committing to identify a balance of licensed and unlicensed spectrum to support wireless innovation. Our customers depend on both licensed and unlicensed spectrum bands every day, and the wireless industry will need access to more of both types of spectrum resource to meet consumer demand for wireless services. A National Spectrum Strategy that elevates one over the other would therefore undermine the consumer experience and U.S. competitiveness.

As Assistant Secretary David Redl has explained, “we must use this finite resource effectively, so we can fully support our 21st century wireless needs. We need to plan for the future—so there will be enough spectrum for 5G, unlicensed, and the next generation of satellite systems that hold so much potential.”³ Similarly, the Federal Communication Commission

² *Developing a Sustainable Spectrum Strategy for America’s Future*, Memorandum for the Heads of Executive Departments and Agencies, 83 Fed. Reg. 54, 513 (Oct. 30, 2018) (Presidential Memorandum).

³ David J. Redl, Assistant Secretary for Communications and Information, National Telecommunications and Information Administration NTIA Spectrum Policy Symposium Remarks (June 12, 2018).

(Commission) has repeatedly recognized,⁴ unlicensed spectrum is a 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. Moreover, a balance of licensed and unlicensed spectrum is the best way to support U.S. economic growth. Recent studies confirm that unlicensed technologies generate enormous economic value. For example, analysis by Dr. Raul Katz, Director of Business Strategy Research at the Institute for Tele-Information at Columbia University, shows that unlicensed spectrum accounted for over \$525 billion in value added to the U.S. economy in 2017.⁵ Dr. Katz’s analysis also concludes that the value of unlicensed spectrum will continue to grow, reaching more than \$834 billion by 2020—provided that sufficient unlicensed spectrum resources are available to support this expected growth.⁶

⁴ *Use of Spectrum Bands Above 24 GHz for Mobile Radio Services*, Notice of Proposed Rulemaking, 30 FCC Rcd. 11,878, 11,882, 11,890 ¶¶ 6, 26 (2015) (Spectrum Horizons NPRM); *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 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.”).

⁵ Raul Katz, Telecom Advisory Services LLC, *A 2017 Assessment of the Current & Future Economic Value of Unlicensed Spectrum in the United States* (Apr. 2018), available at <http://glenechogroup.isebox.net/wififorward/economic-value-of-unlicensed-spectrum-to-reach-more-than-834-billion-by-2020>.

⁶ *See id.* at 4, 76 (“If future assignment of unlicensed spectrum is not fulfilled, it is plausible to consider that economic value creation would be at risk.”).

Finally, while the National Spectrum Strategy need not advocate for parity between licensed and unlicensed bands, in the past the U.S. has too heavily preferred the identification of licensed bands over unlicensed bands. This is especially true when accounting for the leading role unlicensed technologies play in internet access for Americans—far more data travels over unlicensed bands than over any other frequency range. The country has an opportunity to correct this imbalance, however, with important ongoing proceedings concerning unlicensed technologies in mid-band spectrum and above 95 GHz. We encourage NTIA to consider each how these proceedings could contribute to achieving an overall approach that is closer to the balance that the Presidential Memorandum requires.

II. The National Spectrum Strategy should support band plans and technical rules that encourage investment and innovation rather than favoring any one technology or standard

In addition to the need for a balanced spectrum approach that brings more licensed and unlicensed spectrum to innovators, the country needs the technical rules that govern frequency bands to support innovation rather than serving as a barrier to entry. The National Spectrum Strategy should therefore include a commitment to support technical rules in new and ongoing proceedings—such as band plans, channelization systems, and power and gain limits—that impose as few limitations on innovation as possible. And the strategy should find that the government should avoid mandating the use of any one technology or standard or limiting access to any commercial band for only government-selected purposes or particular industries. Such industrial policy undermines innovation, reduces the value of spectrum, and is likely to include mistaken assumptions about the evolution of technology.

For example, Apple recommends that the strategy favor larger unlicensed bandwidths whenever possible, including in the pending Spectrum Horizons bands ranging from 95 GHz to 275 GHz, where NTIA will coordinate with the FCC because of the presence of government spectrum users. Proposed unlicensed bandwidths of between 1 gigahertz to 7.2 gigahertz wide are too narrow to enable optimal use of these frequencies by emerging technologies 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 proposed unlicensed bands are intermixed with licensed bands throughout the 95-275 GHz range,⁷ thereby limiting the additional bandwidth that could be added through future allocations and making aggregation far more difficult. To address this issue in the Spectrum Horizons frequencies, and as a more general proposition as NTIA considers new unlicensed bands, Apple recommends that the National Spectrum Strategy recognize the value of wider contiguous unlicensed bands to support technological evolution.

For similar reasons, Apple suggests that the National Spectrum Strategy support the adoption of flexible technical rules in commercial bands whenever possible. Prescriptive technical rules, for example those that mandate, or that lock in the details of interference-reduction mechanisms, are necessarily based on assumptions built on today's technologies. This approach handcuffs future advances. Instead, the National Spectrum Strategy should support a more flexible, less prescriptive approach of rules that establish required outcomes and then allow individual companies the flexibility to design the best technical way to achieve those outcomes.

⁷ Compare Spectrum Horizons NPRM ¶¶ 53, 55, 57, with *id.* ¶¶ 28, 39.

Finally, the FCC has proposed innovative sharing opportunities between Fixed Service, Fixed Satellite Service, and unlicensed services in its *Unlicensed Use of the 6 GHz Band* NPRM.⁸ The National Spectrum Strategy should continue to expand on such sharing mechanisms. Establishing effective sharing mechanisms has become critical as we pursue more efficient use of spectrum. Therefore, instituting a comprehensive, flexible sharing plan should be a key part of National Spectrum Strategy.

III. Conclusion

Apple shares NTIA's goals of increasing spectrum access, promoting efficient and effective spectrum use, and supporting innovation. The National Spectrum Strategy will advance these goals if it establishes a balanced approach that seeks to make new licensed and unlicensed spectrum available for commercial use, creates larger unlicensed spectrum blocks to allow emerging technical advances, and governs these new bands through flexible, non-prescriptive technical rules.

⁸ *Unlicensed Use of the 6 GHz Band, et al.*, Notice of Proposed Rulemaking, FCC 18-147 (rel. Oct. 24, 2018)

Respectfully submitted,

/s Maria Kirby

Maria Kirby
Senior Policy Counsel

Mark Neumann
Senior Manager
Regulatory Engineering

Brandy Jo Sykes
ITU Policy and Spectrum Lead
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