

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

In the Matter of)	
)	
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
)	

To: The Commission

REPLY COMMENTS OF AT&T SERVICES, INC.

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AT&T Services, Inc., on behalf of the subsidiaries and affiliates of AT&T Inc. (collectively, “AT&T”), hereby submits the following reply comments in response to the Federal Communications Commission’s (“Commission” or “FCC”) Notice of Proposed Rulemaking (“NPRM”) in the above-captioned proceedings seeking input on permitting certain unlicensed uses in the 5.925-7.125 GHz (“6 GHz”) band.¹ The Commission faces ever-increasing demand for additional spectrum for wireless broadband,² and AT&T lauds the Commission for its leadership on making more spectrum available for both licensed and unlicensed use.³ Of particular relevance here, those spectrum allocation efforts have provided unlicensed users

¹ *Unlicensed Use of the 6 GHz Band; Expanding Flexible Use in Mid-Band Spectrum Between 3.7 and 24 GHz*, Notice of Proposed Rulemaking, FCC 18-147, ET Docket No. 18-295, GN Docket No. 17-183 (Oct. 24, 2018) (“NPRM”); available at: <https://docs.fcc.gov/public/attachments/FCC-18-147A1.pdf> (last visited Mar. 18, 2019).

² See, e.g., NPRM, ¶4.

³ See, e.g., *Expanding Flexible Use of the 3.7 to 4.2 GHz Band*, Order and Notice of Proposed Rulemaking, 33 FCC Rcd 6915 (2018); *Use of Spectrum Bands Above 24 GHz for Mobile Radio Services*, Third Report and Order, Memorandum Opinion and Order, and Third Further Notice of Proposed Rulemaking, 33 FCC Rcd 5576 (2018); *Spectrum Horizons*, 33 FCC Rcd 2438 (2018); *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 (2013).

access to substantial spectrum resources outside of the 6 GHz band. Notwithstanding such substantial access to unlicensed spectrum (including low-, mid-, and high-band spectrum for unlicensed use) Radio Local Area Network (“RLAN”) advocates have pressed for broad access to the 6 GHz band, even though the record demonstrates that this NPRM, as drafted, does not define adequate protections for the critical services of incumbent licensed users. The alternative proposal from CTIA and Ericsson has far greater potential for success because it at least seeks to ensure continuity of service for microwave incumbents; however, even that proposal will require substantial additional technical analysis and continued stakeholder dialogue. Regardless of how the Commission chooses to proceed, AT&T urges the Commission to continue to seek input in order to ensure that incumbent, licensed operations receive comprehensive protections from harmful interference in the 6 GHz band.

I. SUMMARY

In 2017, the Commission released a Notice of Inquiry and began to consider whether spectrum between 7 and 24 GHz could be made available for wireless broadband services, including holding out the potential for unlicensed use in the 6 GHz band.⁴ The FCC’s subsequent NPRM in this proceeding sought comment on a proposal to permit standard-power access point (“AP”) devices under an automated frequency coordination system (“AFC”) and indoor, low-power AP devices to engage in unlicensed use of the 5.925-7.125 GHz band, alongside incumbent licensed operations. Now, however, RLAN Advocates, relying on a 2018 RKF study they funded (“RKF Study”),⁵ argue that the FCC should create four classes of

⁴ *Expanding Flexible Use in Mid-Band Spectrum Between 3.7 and 24 GHz*, Notice of Inquiry, 32 FCC Rcd 6373 (2017) (“NOI”).

⁵ RKF Engineering Services, *Frequency Sharing for Radio Local Area Networks in the 6 GHz Band 24-26 at 53-54* (Jan. 2018) (“RKF Study”), attached to Letter from Paul Margie, Counsel,

unlicensed use: UNII-5 (5.925-6.425 GHz); UNII-6 (6.425-6.525 GHz); UNII-7 (6.525-6.875 GHz); and UNII-8 (6.875-7.125 GHz).⁶ Under their proposal, both Low-Power Indoor (“LPI”) devices would be permitted to operate across the entire 6 GHz band without AFC,⁷ and 14 dBm indoor and outdoor operations in UNII-5, UNII-7 and the bottom 100 MHz of UNII-8 would be permitted without AFC.⁸ CTIA and Ericsson, meanwhile, have recommended that the FCC pursue unlicensed use in the lower 6 GHz (500 MHz) under an AFC regime, auction and license upper 6 GHz (700 MHz), and explore permitting non-Federal use of 7 GHz (7.125-8.5 GHz) (“CTIA/Ericsson Proposal”).⁹

While AT&T is not inalterably opposed to accommodating unlicensed use in the 6 GHz band, the introduction of RLAN devices must respect the rights of, and recognize the critical needs served by, existing primary users of the band. Yet, instead of building upon the NPRM proposals and incorporating enhancements to address the legitimate concerns of incumbent users, RLAN Advocates continue to rely on a single flawed technical study,¹⁰ adopt the premise that

Apple Inc., Broadcom Corporation, Facebook, Inc., Hewlett Packard Enterprise, and Microsoft Corporation to Marlene H. Dortch, Secretary, FCC (filed Jan. 26, 2018). The RKF Study was funded by Broadcom, Cisco, Facebook, Google, Hewlett Packard Enterprise, Intel, MediaTek, Microsoft, and Qualcomm.

⁶ Comments of RLAN Group, ET Docket No. 18-295, GN Docket No. 17-183 at 2-3 (filed Feb. 15, 2019) (“RLAN Advocates Comments”).

⁷ *Id.* at 3-4, 16-35.

⁸ *Id.* at 4, 16-17, 35-39.

⁹ Comments of Ericsson, ET Docket No. 18-295, GN Docket No. 17-183 at 3 (filed Feb. 19, 2019).

¹⁰ RKF Study at 53-54. For more detailed discussion criticizing the RKF Study or questioning its underlying assumptions, *see, e.g.*, Comments of Intelsat License LLC and SES Americom, Inc., ET Docket No. 18-295, GN Docket No. 17-183 at 7, 10 (filed Feb. 15, 2019); Comments of Decawave, ET Docket No. 18-295, GN Docket No. 17-183 at 5-6, 10-12, and 14 (filed Feb. 15,

some harmful interference to incumbent users is acceptable, and attempt to extricate themselves from even minimal regulations designed to protect Fixed Service (“FS”) users. FS use of the 6 GHz band is critically important—those links serve Public Safety, Critical Infrastructure, Utility, and vital communications needs in the United States.¹¹ The Commission simply cannot risk impairing those needs based only on vague assertions from the unlicensed industry and a wholly untested coordination database.

As discussed below, AT&T believes that some AFC mechanism probably could be developed that would both permit RLAN deployment and protect existing primary FS users. As the record shows, however, there are some significant issues that require resolution with respect to how the AFC would operate. Although the FS community has articulated the problems they perceive—and some potential regulatory requirements to resolve them—the RLAN Advocates

2019); Comments of National Association of Broadcasters, ET Docket No. 18-295, GN Docket No. 17-183 at 5-8 (filed Feb. 15, 2019); Comments of Society of Broadcast Engineers, Inc., ET Docket No. 18-295, GN Docket No. 17-183 at 6 (filed Feb. 15, 2019); Letter from Patrick McFadden, Associate General Counsel, National Association of Broadcasters, to Marlene H. Dortch, Secretary, Federal Communications Commission, ET Docket No. 18-295 (filed Oct 10, 2018); and Letter from Cheng-yi Liu and Mitchell Lazarus, Counsel, Fixed Wireless Communications Coalition to Marlene H. Dortch, Secretary, FCC, GN Docket No. 17-183 (filed Aug. 28, 2018).

¹¹ *See, e.g.*, Comments of Los Angeles County, California; the City and County of Denver, Colorado; the City of Kansas City, Missouri; Ozaukee County, Wisconsin; and the Government Wireless Technology & Communications Association, GN Docket No. 17-813 at 4 (filed Oct. 2, 2017); *see* Comments of National Public Safety Telecommunications Council, GN Docket No. 17-813 at 6-7 (filed Sept. 11, 2017); Comments of Association of Public Safety Communications Officials International, GN Docket No. 17-813 at 3 (filed Oct. 2, 2017); Reply Comments of Association of American Railroads, GN Docket No. 17-813 at 3 (filed Nov. 15, 2017); Comments of the Utilities Technology Council and Edison Electric Institute, GN Docket No. 17-813 at 6-12 (filed Oct. 3, 2017). Comments of Lower Colorado River Authority, GN Docket No. 17-813 at 4 (filed Oct. 2, 2017); Comments of Tucson Electric Power Company, GN Docket No. 17-813 at 4 (filed Oct. 2, 2017); and Comments of Southern Company Services, Inc., GN Docket No. 17-813 at 4-7 (filed Oct. 3, 2017).

have argued such solutions would be costly, difficult, or somehow delay their inchoate schedule for launching products. AT&T is open to alternative solutions, but it strongly believes that the problems identified with the AFC must somehow be solved. If the RLAN Advocates do not like the rules proposed by primary users, they should offer their own regulatory proposals instead of arguing that RLANs can be trusted without any regulatory guardrails and citing solely to a much-criticized study. Among other things, AT&T believes the RLAN industry must solve the problem of how interfering RLAN devices can be controlled after widespread consumer deployment and how instances of interference can be resolved by the AFC without forcing incumbents to engage in a time-consuming and costly triangulation of intermittent mobile users.¹²

On balance, AT&T believes the CTIA/Ericsson Proposal is a better-formed solution for responsibly introducing unlicensed use into the 6 GHz band. Even there, where the proposal envisions implementation of an AFC, relocation of FS users, and a funding mechanism to achieve a rough *status quo ante*, additional diligence is needed—more transparency and technical analysis of how FS would be accommodated in the 7 GHz band—as well as outreach to National Telecommunications and Information Administration (“NTIA”) and other stakeholders to ensure shared federal/non-federal use could be implemented.

¹² See Comments of Duke Energy, GN Docket No. 17-183 at 3-4 (filed Oct. 2, 2017) (“Duke Energy Comments”) (“Resolution of interference problems ... involves searching for unwanted frequencies with antennas and spectrum analyzer equipment. This is repeated in multiple locations, using triangulation or other logical geographic methods, in an effort to locate the source of the unwanted signals. ... This process can take days or weeks. When the source is finally identified, then efforts to resolve the problem can begin. Cost to the licensee can easily be in the tens of thousands of dollars to identify and resolve a single instance of interference.”).

II. INTRODUCTION OF UNLICENSED USE INTO THE 6 GHz BAND WOULD REQUIRE A CAREFUL AND THOUGHTFUL BALANCING OF PUBLIC INTEREST GOALS.

As Chairman Pai remarked at the White House’s 5G Summit last year, “U.S. leadership in 5G technology is a national imperative for economic growth and competitiveness.”¹³ Indeed, this Commission has pursued a bold, comprehensive agenda to Facilitate America’s Superiority in 5G Technology (“5G FAST Plan”).¹⁴ The FCC’s 5G FAST Plan incorporates “[f]orward-thinking spectrum policy, modern infrastructure policy, and market-based network regulation form the heart of [its] strategy for realizing the promise of the 5G future.”¹⁵ Despite the Plan’s stated focus on spectrum, “[I]ittle if any mid-band spectrum is expected to be available from 7 to 24 GHz [for licensed use supporting 5G], at least in the foreseeable future.”¹⁶ On that basis alone, the CTIA/Ericsson Proposal warrants consideration, as it would, if demonstrated to be feasible, provide crucial support for 5G needs of licensed and unlicensed industries.

¹³ Remarks of Ajit Pai, Chairman, FCC, at White House 5G Summit, Washington, DC (Sep. 28, 2018), *available at*: <https://docs.fcc.gov/public/attachments/DOC-354323A1.pdf> (last visited Mar. 18, 2019); Presidential Memorandum on Developing a Sustainable Spectrum Strategy for America’s Future, Section 1 (Oct. 25, 2018) (“[I]t is imperative that America be first in fifth-generation (5G) wireless technologies”); *available at*: <https://www.whitehouse.gov/presidential-actions/presidentialmemorandum-developing-sustainable-spectrum-strategy-americas-future> (last visited Mar. 18, 2019).

¹⁴ FCC, “The FCC’s 5G FAST Plan”; *available at*: <https://www.fcc.gov/5G> (last visited Mar. 18, 2019).

¹⁵ *Id.*; *see also* Ajit Pai, “Keeping Up A Fast Pace On Spectrum,” FCC Blog (Oct. 1, 2018); *available at*: <https://www.fcc.gov/news-events/blog/2018/10/01/keeping-fast-pace-spectrum> (last visited Mar. 18, 2019).

¹⁶ Comments of Ericsson, ET Docket No. 18-295, GN Docket No. 17-183 at 3 (filed Feb. 15, 2019) (“Ericsson Comments”).

Beyond that, however, and as this Commission is aware, 6 GHz microwave bands are essential components of telecommunications networks—wireless networks in particular—and reliance on these bands will only continue to increase with the introduction of 5G and continued network densification.¹⁷ Introducing RLAN use into the 6 GHz band, therefore, should consider both its impact on the balance of unlicensed and licensed spectrum, as well as its potential to attack the connective tissue of existing licensed networks and any future 5G networks. That result could undermine the benefits of 5G for the public and risk U.S. leadership in this vital area. If this Commission considers 5G to be an “economic imperative,” it needs to ensure that RLAN Advocates’ proposals do not undermine what stakeholders can hope to achieve in the 6 GHz band with 5G.

A. The 6 GHz FS Band Is a Vital, Unique, and Fragile Resource.

The 6 GHz band supports a lengthy list of essential telecommunications, public safety, infrastructure, and utility operations, and the FirstNet network will rely on 6 GHz facilities to meet the reliability requirements of public safety users. As the NPRM observes, fixed service in the 6 GHz band is used for:

highly reliable point-to-point microwave links that support a variety of critical services such as public safety (including backhaul for police and fire vehicle dispatch), coordination of railroad train movements, control of natural gas and oil pipelines, management of electric grids, long-distance telephone service, and backhaul for commercial wireless providers such as traffic between commercial wireless base stations and wireline networks.¹⁸

¹⁷ Comments of CenturyLink, GN Docket No. 17-183 at 2-3 (filed Oct. 3, 2017); *see* Letter from Jared M. Carlson, Vice President, Government Affairs and Public Policy, Ericsson, to Marlene H. Dortch, Secretary, Federal Communications Commission, GN Docket No. 17-183, at 1-2 (Oct. 15, 2018).

¹⁸ *See* NPRM, ¶9 (internal citations omitted).

The record overflows with contributions from stakeholders in public safety, utilities and other critical services, and wireless backhaul providers.¹⁹ The unique advantages of 6 GHz for these essential services are certainly worth reiterating here:

- 6 GHz microwave links can span long distances of 10 to 50 kilometers—on average 30 kilometers—and traverse areas where deploying intermediate hops or fiber optic transmission would be too costly or too impracticable, such as mountain tops.
- 6 GHz is a rapidly deployable option for circuits where fiber optic transmission is not available.²⁰
- 6 GHz microwave is not susceptible, like fiber, to cable cuts or “backhoe fade,” which makes it a uniquely important asset for critical communications on a standalone basis or as a backup to fiber. Many of these links backhaul traffic from cell sites and therefore are integral to the proper functioning of the Nation’s 9-1-1 system.
- 6 GHz systems are also typically among the fastest systems to be brought back on-line during any post-disaster restoration effort, as well as providing temporary rapid service delivery to such areas.²¹

Although 6 GHz spectrum confers a number of unique benefits, 6 GHz systems are also uniquely vulnerable:

- The boresight of antennas used in point-to-point microwave paths is typically very large and can cover hundreds of square miles; indeed, when coordinating microwave links in the 6 GHz band, interference potential is assessed at distances up to 125 miles in all directions and 250 miles in the main beam. Any mobile operation within this capacious reception area will be received by the microwave system, causing

¹⁹ *NOI*, 32 FCC Rcd at 6381-82, ¶¶25, 6384-85, ¶¶32-35; Comments of Utilities Technology Council, ET Docket No. 18-295, GN Docket No. 17-183 at i (filed Feb. 19, 2019).

²⁰ Comments of AT&T, ET Docket No. 18-295, GN Docket No. 17-183 at 14 (filed Oct. 2, 2017) (“AT&T Comments”).

²¹ *See, e.g.*, Reply Comments of State of West Virginia Department of Military Affairs and Homeland Security, GN Docket No. 17-813 at 1 (filed Nov. 7, 2017).

interference.²² Given that the magnitude of the risk of RF interference is high, such services will inevitably become less reliable.

- Moreover, even very weak signals can create interference. Because interference caused by a mobile device is indistinguishable from atmospheric or environmental fade, this will reduce the effectiveness of the link's engineered fade depth.²³
- Essential services, including mobile device data backhaul and other electric, oil, and gas applications that depend on 6 GHz microwave systems are engineered for necessarily high levels of reliability, *i.e.*, 99.9999% or no longer than 30 seconds of downtime per year.²⁴ Moreover, resynchronizing a fixed service receiver, even after a brief interference event, may require 15 minutes or more, so a brief outage on an FS link may have much greater consequences as failures cascade into other networked facilities.²⁵
- FS microwave operations are unable to monitor links for interference, as a general matter. Even if any interference were to be detected, there would be no way to locate, identify, or resolve the interfering device.²⁶

²² Reply Comments of AT&T, GN Docket No. 17-183 at 17 (filed Nov. 15, 2019) (“AT&T Reply”); *see also* Coordination Contours For Terrestrial Microwave Systems, National Spectrum Managers Association, Recommendation WG 3.90.026 (Apr. 1992), *available at*: <http://nsma.org/wpcontent/uploads/2016/05/WG3.90.026.pdf> (last visited Mar. 18, 2019).

²³ AT&T Comments at 16. Contrary to claims from the Wi-Fi Alliance, there is no such thing as “excess fade margin”; the fade margin is a parameter explicitly engineered into the design of microwave systems to accommodate atmospheric and other propagation changes that affect the reliability of a path. *See* Comments of Fixed Wireless Communications Coalition, ET Docket No. 18-295, GN Docket 17-183 at 11, 15-18 (filed Feb. 15, 2019); *see also* Comments of National Public Safety Telecommunications Council, ET Docket No. 18-295, GN Docket 17-183 at 8-9 (filed Feb. 15, 2019); Comments of Southern Company Services, ET Docket No. 18-295, GN Docket 17-183 at 11, 15-16 (filed Feb. 15, 2019); Comments of National Spectrum Management Association, ET Docket No. 18-295, GN Docket 17-183 at 24 (filed Feb. 15, 2019); Comments of Critical Infrastructure Coalition, ET Docket No. 18-295, GN Docket 17-183 at 8 (filed Feb. 15, 2019).

²⁴ Comments of National Spectrum Management Association, GN Docket No. 17-183 at 10 (filed Oct. 2, 2017) (“NSMA Comments”).

²⁵ Comments of APCO International, ET Docket No. 18-295, GN Docket No. 17-183 at 4 (filed Feb. 19, 2019) (“APCO International Comments”).

²⁶ *See* AT&T Reply at 18; NSMA Comments at 10-12.

- These limitations would be compounded by a large influx of unlicensed devices, particularly in light of the fact that much unlicensed activity is mobile and capricious.²⁷

In short, as AT&T noted in its initial comments, “[w]ith the prospect for harmful interference high and its sources untraceable . . . the outcome for incumbent licensed operations would be bleak.”²⁸

B. RLANs Already Have Access to Substantial Spectrum Resources, So The Commission Should Proceed Very Cautiously Before Introducing New Uses into the 6 GHz Band.

AT&T applauds the Commission’s substantial achievements in recently making spectrum available for both licensed and unlicensed uses. Over the past couple of years, the Commission has auctioned off billions of dollars of spectrum. At the same time, unlicensed use has proliferated in the 2.4 and 5.8 GHz bands, and it has begun to flourish in other bands as well.²⁹

The significant spectrum allocations for unlicensed devices include:³⁰

- 902-928 MHz
- 1920-1930 MHz (UPCS)
- 2.4 GHz (2400-2483.5 MHz) – Industrial, Scientific, and Medical band
- 3.55-3.7 GHz band – General Authorized Access (“GAA”) spectrum
- 5 GHz (5150-5350, 5470-5825 MHz)
- 60 GHz (57-71 GHz)

²⁷ APCO International Comments at 4-5.

²⁸ AT&T Comments at 15.

²⁹ See Comments of Wi-Fi Alliance, GN Docket No. 17--183 at 2-5 (filed Oct. 2, 2017); *Modification of Parts 2 and 15 of the Commission’s Rules for Unlicensed Devices and Equipment Approval*, Order and Second Memorandum Opinion and Order, 29 FCC Rcd 6366, 6370 ¶12 (2014).

³⁰ See NTIA, Draft “Unlicensed Spectrum Subcommittee Report” at 2 (Nov. 1, 2010), *available at*: https://www.ntia.doc.gov/files/ntia/meetings/csmac_unlicensed_subcommittee_report_draft_11072010.pdf.

In addition to these substantial resources, the FCC just voted an item providing additional unlicensed spectrum above 95 GHz.³¹

Despite the many opportunities that the Commission has made—and will make—available for unlicensed use, RLAN advocates continue to insist on more spectrum, proposing to disturb the long-settled expectations—and financial investments—of licensed incumbents. There is no crisis that requires shortcutting sound administrative and engineering practices, especially when the consequences of any misstep are so potentially catastrophic. AT&T is open to RLAN coexistence with its FS operations in the 6 GHz band, but only subject to stringent, baseline protections for FS incumbents. AT&T applauds cooperative efforts between the RLAN and incumbent licensee communities to work through a mutually acceptable sharing plan, but not putting vital systems at risk by skipping necessary diligence and jumping to wide-scale consumer deployment of devices exempt from any interference-prevention mechanisms based only on the flawed conclusions in the RKF Study.³² The 6 GHz band is too important, and the consequences of a misstep too dire, to permit this to happen.

³¹ FCC, “The FCC’s 5G FAST Plan”; available at: <https://www.fcc.gov/5G> (last visited Mar. 18, 2019); *FCC Proposes to Open Spectrum Horizons for New Services & Technologies*, Notice of Proposed Rulemaking, 33 FCC Rcd 2438 (2018); available at: https://docs.fcc.gov/public/attachments/FCC-18-17A1_Rcd.pdf (last visited Mar. 18, 2019).

³² RKF Study, *passim*; see also n. 10, *supra* (listing submissions in the record that challenge the methodology, assumptions, or conclusions of the RKF Study).

III. THE AUTOMATIC FREQUENCY COORDINATION SYSTEM MUST PROVIDE NEAR-PERFECT PROTECTION TO INCUMBENT FS SYSTEMS.

A. RLAN Advocates Must Submit Much More and Better Evidence That RLANs Can Coexist with FS in 6 GHz.

The shortcomings of the RKF Study were well documented by commenters to the Commission’s prior Notice of Inquiry.³³ The study, funded by RLAN Advocates, relies on a statistical modeling that randomly scatters RLAN with a distribution of locations and powers. Although this methodology purports to yield an average probability of RLAN interference, it fails to account properly for the fraction of RLANs in locations that provide much less attenuation or the fraction that have clear line-of-sight with FS receivers—by applying average attenuation, the study fails to address the many, many cases where attenuation not “average.” As a result, this statistical modeling does not fully represent the cases—with potentially devastating consequences—where non-average conditions result in actual interference to FS operations. For essential, incumbent operations, a numerical representation of the average types of cases is of little value: it is the exceptional cases that could result in enormous costs, major disruption, and incalculable tragedy. One RLAN device is sufficient to take down a vital FS link, and as APCO International observes: “[R]esynchronizing a fixed service receiver, even after a brief interference event, may require 15 minutes or more, unacceptably reducing the network availability time below that which public safety users require and have made substantial investments to achieve.”³⁴ In light of the flawed nature of the RKF Study, it is not surprising that incumbent operators are seeking more information about the effects of RLAN co-existence with

³³ *See id.*

³⁴ APCO International Comments at 7.

their long-standing operations. AT&T, therefore, demands more comprehensive analyses in the record before it can fully endorse any integration proposal.

As previously noted, AT&T is cautiously receptive to sharing in the 6 GHz band; however, the AFC system must flawlessly prevent—not simply reduce the risk of—interference to incumbent users. The importance of licensed operations in the 6 GHz band necessitates highly-stringent requirements, supported by trustworthy data, that not only protect the interests and financial investments of incumbent licensees, but also the members of the American public who benefit from licensees’ essential services. The Commission should therefore require that certain baseline—but flexible—requirements to be met before such sharing can occur. First, as AT&T emphasized in its previous comments, the FCC must ensure that unlicensed entrants bear the costs of integrating unlicensed use into the 6 GHz band—including the costs to both operate any AFC system and mitigate any interference events.³⁵ Second, incumbents should not be burdened with chasing interference. As discussed, FS receivers do not generally have any monitoring capability beyond error rate, nor do they have the ability to triangulate and isolate individual interfering RLAN devices, so the RLAN Advocates must find a mechanism to rapidly and decisively resolve “trouble tickets.”

B. Any Acceptable AFC System Must Include Certain Key Features and Undoubtedly Meet Certain Vital Requirements To Ensure the Protection of Primary, Incumbent Users.

As AT&T has argued, any interference prevention measures, including the AFC system, must function nearly flawlessly. The FS community, as the record amply documents, cannot afford instances of interference. Thus, the AFC must be fully vetted, tested, and evaluated by

³⁵ AT&T Comments at 5; *see also* Comments of CTIA, ET Docket No. 18-295, GN Docket No. 17-183 at 17 (filed Feb. 19, 2019) (“CTIA Comments”); Comments of Southern Company Service, Inc., ET Docket No. 18-295, GN Docket No. 17-183 at 19-20 (filed Feb. 19, 2019).

both the Commission and multi-stakeholder coalitions in real-world scenarios. That said, AT&T is mainly concerned with the efficacy of the results, not the mechanism to achieve the results. Thus, if the RLAN Advocates believe the obvious solution is too costly or too unwieldy to implement, they should offer alternatives that provide regulatory guardrails and achieve the same effect. Regardless, the result must be near perfect protection for primary licensees.

First, as a starting point, the RLAN Advocates must provide a scheme to ensure that consumer devices can be individually and collectively controlled post-deployment, whether indoor, outdoor, low-power, standard power, or any combination thereof. In AT&T's view, this compels the conclusion that all such devices—without exception—should be required to coordinate through, or be under the control of an AP that coordinates through,³⁶ the AFC system in order to transmit in the 6 GHz band.³⁷ This basic point was echoed by many stakeholders that opposed the Commission's proposal to allow indoor low-power access point operations in the U-NII-5 and U-NII-7 bands without the need for authorization from AFC.³⁸ Instead of addressing the fundamental concern, RLAN Advocates' have instead proposed to exempt all low-power indoor APs and very low power APs from AFC requirements.³⁹

³⁶ Client devices tied to an AP can be coordinated through an AP, as long as the AP coordination factors in the worst case scenarios for operation by client devices (distance, number, duty cycle, power, *etc.*). Note that tethered/networked APs should either be coordinated separately or the worst case scenario should consider the greater client distances that could be reached by networked APs. *See* CTIA Comments at 19.

³⁷ *See also* Comments of Comsearch, ET Docket No. 18-295, GN Docket No. 17-183 at 8 (filed Feb. 15, 2019) (“Comsearch Comments”) (“Comsearch strongly disagrees and urges the Commission to require all unlicensed devices operating in the U-NII-5 and U-NII-7 sub bands to use AFC.”).

³⁸ *See* NPRM, ¶73.

³⁹ RLAN Advocates Comments at 2-3.

While the RLAN Advocates seem eager to bypass AFC development, which would allow them to flood the market with such non-AFC system compliant devices in the near term,⁴⁰ these devices, once unleashed, will forever become part of the radio landscape. In AT&T's view, unless the entire RLAN ecosystem is managed by one or more AFC systems, there is no practical way to "to put the genie back in the bottle" and recall a non-AFC complaint device that causes harmful interference.

Second, the RLAN community must propose a reliable, fast, and accurate process for resolving interference events involving 6 GHz unlicensed devices. In AT&T's view, this compels a requirement that RLANs register some digital ID and transaction data with the AFC, and that APs transmit some digital ID. AT&T recognizes that, for years, RLAN Advocates have argued against digital IDs for RLANs and device registration requirements, but they have provided no mechanism in *lieu* of those requirements to address interference if it occurs. Given the lack of identities and control over unlicensed operations, licensed operators have little cost-effective recourse against interference. Indeed, as AT&T noted previously, "the process of resolving just one instance of interference can take weeks of searching for unwanted frequencies with antennas and spectrum analyzers in an effort to triangulate the offending device, racking up costs easily in excess of tens of thousands of dollars."⁴¹ The burden to ensure seamless integration into the 6 GHz band should rightly be upon the new entrant, and imposing this financial penalty upon incumbent service providers would be unacceptable. As a result, AT&T does not see any way that interference could be mitigated in the absence of some auditable records held by the AFC system that include traceable device IDs and frequency/time assignment

⁴⁰ *Id.* at 3.

⁴¹ AT&T Comments at 15, *citing* Duke Energy Comments at 8.

data. Moreover, a requirement to transmit device IDs to trace devices in the real world could be greatly beneficial. In sum, the RLAN Advocates must develop a fast, reliable, and auditable system for addressing interference.

Third, the AFC systems must be subject to requirements that ensure they function properly and have the appropriate controls. In AT&T's view, this means that the AFC operators should also be FCC tested and certified. The Office of Engineering and Technology should develop a detailed AFC security, reliability, testing, and controlled AFC testbed process in collaboration with multi-stakeholder group.

While AT&T does not believe it is necessary for the Commission to prescribe the number of, interoperability between, and data sharing requirements applicable to AFC systems, the Commission should ensure that AFC system frequency assignment is not a function that can be spoofed and that the AFC mechanisms within RLAN devices cannot be tampered with to bypass AFC control. While more rigorous security requirements requiring encryption may be overly proscriptive at this time, the Commission should consider the potential for devices to be hacked or altered after being fielded and address mechanisms to prevent those devices from operating.⁴²

Fourth, AT&T remains concerned with the potential for devices to continue to operate on "auto-pilot" or by default even though the interference environment has changed. In AT&T's view, this compels the conclusion that RLAN devices must adhere to stringent regulations for re-validating their use of frequencies. AT&T, for example, agrees with Comsearch and APCO International that all devices should re-validate frequency use with the AFC system every 24

⁴² See nn. 48-51, *infra*, and accompanying text.

hours, at a minimum.⁴³ Also, in the event that a device is moved any significant distance, it should be required to re-validate its frequency use with the AFC system.⁴⁴ The AFC system should also have the affirmative ability to issue cease-and-desist orders to APs, in the event that a given device is creating harmful interference.⁴⁵

Finally, because of the crucial importance of device location to accuracy and validity of coordination, AFC systems should only coordinate fixed APs at this time, and RLAN Advocates must address location accuracy in an enforceable and auditable manner. Specifically with respect to the former issue, AFC systems should not provide frequency assignments to any RLAN devices that are in motion. Certainly, the question of mobile or drone operation may be revisited in the future if AFC systems can build an operating history that demonstrates FS links are being protected. However, addressing such questions now would be premature at this time—mobile and aeronautical operation adds additional complexity to the AFC system in order to deal with corner cases that may or may not have commercial applicability. Moreover, the potential for interference from devices that intentionally move is considerably greater than it is for fixed devices.

With respect to location determinations, RLAN Advocates must develop, vet, and test effective mechanisms to ensure that AP locations are accurate and reliable. As AT&T argued in

⁴³ See Comsearch Comments at Attach. A, Tbl. 3; APCO International Comments at 7 (“APs should detect when they have been moved and verify frequency availability prior to transmitting—reverification should occur every 24 hours in any event.”).

⁴⁴ Comsearch Comments at Attach. A, Tbl. 3.

⁴⁵ See Comments of Verizon, ET Docket No. 18-295, GN Docket No. 17-183 at 4-5 (filed Feb. 15, 2019) (“The Commission should require the use of an AFC system that uses positive control to manage operations between new unlicensed devices and existing incumbent uses.”); CTIA Comments at 19.

its initial comments, unfixed, unlicensed devices pose a significant—but often untraceable—threat to licensed operations. This is only exacerbated by the “itinerant and fluctuating nature of most unlicensed activity”: an unlicensed device causing harmful interference “might never be located, since it would likely be in motion or transmitting only intermittently and, therefore, even if detected, may have moved or turned off prior to being located.”⁴⁶ One solution—roundly rejected by the RLAN Advocates as unduly onerous⁴⁷—is a requirement that unlicensed devices be professionally installed. To support their position that such installation should be optional, the RLAN Advocates point to their flawed RKF study and make blithe, untenable assumptions that consumers will only make safe, prescribed uses of their devices. That conclusion provides no firm basis upon which to unleash an unregulated ecosystem of unfixed consumer devices that may meander into the boresights of licensed users’ antennas. Because RLAN Advocates refuse to require professional installation of their devices, the RLAN industry must demonstrate and detail a proven, effective mechanism to ensure that devices are operated in accordance with regulatory parameters (*e.g.*, indoor) and accurately provide locations to coordinate for identification and mitigation purposes. Certainly, the statistical improbability of a device being operated in an unexpected manner is plainly inadequate consolation to a licensed user whose operations have been detrimentally impacted by potentially infrequent, but inevitable consumer misuse of an unlicensed device.

Indeed, as commenters have observed, this has occurred—notwithstanding the protections of a database-driven real time coordination systems. In 2009, the FAA discovered

⁴⁶ AT&T Comments at 15.

⁴⁷ RLAN Advocates Comments at 30-33.

that modified autonomous U-NII devices were creating harmful interference to its Terminal Doppler Weather Radar (“TDWR”) systems.⁴⁸ Although U-NII devices operating in the 5.6-5.65 GHz portion of the U-NII-2C band were required to incorporate an interference mitigation technique (called Dynamic Frequency Selection or “DFS”), many equipment manufacturers and third parties had modified the devices to enable operation in frequency bands for which the devices had not been certified or they had modified the devices without properly implementing the required scanning protocols.⁴⁹ The FCC required manufacturers to secure all U-NII devices against unlawful modifications in 2014,⁵⁰ but, to date, the Enforcement Bureau continues to bring actions against companies operating devices that cause interference to TDWR systems.⁵¹

The TDWR interference events are not isolated, and the Commission should be wary of attempts to overpromise on the efficacy of AFC systems. As commenters have pointed out, there

⁴⁸ See John E. Carroll *et al.*, NTIA Technical Report TR-11-473, “Case Study: Investigation of Interference into 5 GHz Weather Radars from Unlicensed National Information Infrastructure Devices, Part 1” (Nov. 2010); *available at*: <https://www.its.bldrdoc.gov/publications/2548.aspx> (last visited Mar. 18, 2019); John E. Carroll *et al.*, NTIA Technical Report TR-11-479, “Case Study: Investigation of Interference into 5 GHz Weather Radars from Unlicensed National Information Infrastructure Devices, Part 2” (July 2011); *available at*: <https://www.its.bldrdoc.gov/publications/2554.aspx> (last visited Mar. 18, 2019); John E. Carroll *et al.*, NTIA Technical Report TR-12-486, “Case Study: Investigation of Interference into 5 GHz Weather Radars from Unlicensed National Information Infrastructure Devices, Part 3” (June 2012); *available at*: <https://www.its.bldrdoc.gov/publications/2677.aspx> (last visited Mar. 18, 2019).

⁴⁹ See 47 C.F.R. § 15.407(h)(2); *Unlicensed National Information Infrastructure (U-NII) Devices in the 5 GHz Band*, Notice of Proposed Rulemaking, 28 FCC Rcd 1769, 1772 ¶9 (2013).

⁵⁰ See *Revision of Part 15 of the Commission’s Rules to Permit Unlicensed National Information Infrastructure (U-NII) Devices in the 5 GHz Band*, First Report and Order, 29 FCC Rcd 4127, 4130-31 ¶¶11-12 (2014).

⁵¹ See FCC, Enforcement Bureau, “U-NII and TDWR Interference Enforcement”; *available at*: <https://www.fcc.gov/general/u-nii-and-tdwr-interferenceenforcement> (last visited Mar. 18, 2019).

is a long history of database-driven real time coordination systems being unable to address incidences of real world interference.⁵² For example, the Commission permitted unlicensed radio transmitters to operate in the unused spectrum between television stations (“TV white spaces”) pursuant to a regime involving a dynamic database that identified vacant TV channels at specific locations and equipping white space devices with geo-location capabilities.⁵³ However, the database proved to be rife with design flaws, including, “inaccurate location information, false or questionable names by installers, fake serial numbers, and falsified or missing contact information.”⁵⁴ As Verizon concluded: “[W]hite space database administrators have corrected or deleted obviously false information, [but] the nature of the database itself remains more of a standalone registration process that is unable to prevent harmful interference.”⁵⁵ Accordingly, creating a robust, comprehensive database that is auditable and complete may be the only way to ensure that incumbent licensees are protected against interference—but, even properly implemented, this not be a complete solution.

C. AT&T Is Cautiously Optimistic That a Functional AFC System Could Eventually Evolve To Permit RLAN Operation at Higher Power.

Parties have suggested that so long as RLAN devices are AFC system controlled, there is no need to mandate maximum power levels. They allege that if real-time coordination is being employed, there is, in theory, no harm to permitting higher-power operation that is determined to

⁵² Verizon Comments at 4-7.

⁵³ *See Unlicensed Operation in the TV Broadcast Bands*, Second Memorandum and Order, 25 FCC Rcd 18661 (2010); *see* Verizon Comments at 9.

⁵⁴ Verizon Comments at 9.

⁵⁵ *Id.*

be non-interfering.⁵⁶ Regardless of whether this reasoning has merit, AT&T is concerned about combining the still untested AFC system with higher power operation, and whether the use of higher power by some unlicensed systems might have a preclusive effect on the ability of other unlicensed devices to gain access to the spectrum. If the AFC system concept is proven out in field trials and rigorous testing, AT&T would have a higher degree of confidence that the proposed system would continue to protect FS incumbents under high power conditions. As a result, AT&T suggests that consideration of higher power operation should be deferred temporarily until further testing of the basic AFC system functions has concluded and been proven to be successful under real world operating conditions.

IV. THE CTIA/ERICSSON PROPOSAL SHOULD BE CAREFULLY AND CAUTIOUSLY CONSIDERED.

As discussed above, CTIA and Ericsson have formulated a potentially appealing compromise to integrate unlicensed users into the 6 GHz band. Specifically, they propose that the Commission should:⁵⁷

- (1) Pursue unlicensed [and licensed] opportunities in the 5.925-6.425 GHz [lower 6 GHz band] with an emphasis on rules that render the band neutral to choice of technology;
- (2) Explore the introduction of new licensed opportunities in the 6.425-7.125 GHz bands [via an auction];
- (3) Ensure that incumbent operations are protected from harmful interference or accommodated; and
- (4) [Consider] whether to transition [6 GHz band incumbents to] the [erstwhile exclusively federal] 7.125-8.5 GHz band” and make it a shared band.

⁵⁶ See, e.g., Verizon Comments at 10; CTIA Comments at 20.

⁵⁷ Ericsson Comments at 3.

If implemented as envisioned, this proposal would provide a needed balance of licensed and unlicensed spectrum, protect incumbent users, and incorporate a funding mechanism to relocate users that cannot be protected.⁵⁸ While AT&T supports these goals, it believes further technical analysis, transparent Federal input, and continued stakeholder dialogue is essential to refine this proposal if it moves forward.

In particular, because very little information is available to commercial operators regarding Federal use of the 7 GHz band, AT&T is unable to determine whether its 6 GHz FS systems could be relocated to 7 GHz and co-exist with preexisting federal use as a practical and technical matter. Crucial variables include whether there are areas of the country where FS systems could not be accommodated, whether there are power or bandwidth restrictions that would be applied to 7 GHz operations, and whether additional hops might be necessitated by the higher band 7 GHz environment, such as if the density of existing federal links necessitated a detour from a current link route. Furthermore, it would also be critical to establish the terms by which future FS uses would be permitted and accommodated into the band—if commercial 6 GHz systems were to be relocated to 7 GHz, it would be crucial that sharing between licensed and Federal users would be effectuated on a co-equal basis, whereby Federal users would be unable to preempt relocated 6 GHz use and force FS systems to cease operation.

At its core, however, the CTIA/Ericsson Proposal has potential merit. If achievable, it balances licensed and unlicensed interests more appropriately, protects incumbent uses, and includes a funding mechanism to ensure that existing FS systems do not incur financial penalties in the process of creating a commercialization opportunity for an unrelated industry.

⁵⁸ *Redevelopment of Spectrum to Encourage Innovation in the Use of New Telecommunications Technologies*, First Report and Order and Third Notice of Proposed Rulemaking, 7 FCC Rcd 6886 (1992) (subsequent history omitted).

V. CONCLUSION

AT&T lauds this Commission’s commitment to making increased spectrum available for licensed and unlicensed use to support a 5G future. However, the 6 GHz band is too integral to vital operations—and too vulnerable to interference—for the Commission to proceed hastily towards permitting unlicensed use. An AFC system, with appropriate protections above and beyond what are proposed in the NPRM, could address many of incumbent licensees’ concerns regarding harmful interference. However, the Commission should solicit input from other federal agencies and stakeholders with regards to the potentially attractive solution from CTIA and Ericsson.

Respectfully submitted,

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