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 Operation 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, 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 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

REPLY COMMENTS OF CTIA

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I. INTRODUCTION AND SUMMARY.

CTIA hereby files these reply comments in response to the Commission's *Further Notice of Proposed Rulemaking* ("*FNPRM*") seeking comment on proposed rules that would authorize

mobile operations in additional spectrum bands above 24 GHz.[1] The record in this proceeding has demonstrated that spectrum above 24 GHz will play an essential role in enabling 5G wireless services. Initial comments show widespread agreement with CTIA's vision for the regulatory framework for these spectrum bands—consistent with the extremely successful methodology used by the Commission for commercial mobile services. The Commission should apply a regulatory approach consistent with that adopted in the *Order* for the additional spectrum bands above 24 GHz to enable the wireless industry to have a harmonized technical and licensing structure for all 5G services.

In particular, the Commission should:

- **Enable efficient deployment of 5G across the millimeter wave bands.** For the 24 GHz, 29 GHz, 31 GHz, 32 GHz, 40-42 GHz, 42 GHz, 47 GHz, and 50 GHz spectrum bands, the Commission should apply the same Part 30 licensing and technical rules as were recently adopted for the 28 GHz and 37.6-40 GHz bands. The remaining Local Multipoint Distribution Service ("LMDS") spectrum in the 29 GHz and 31 GHz bands also should be made available for mobile services. Applying the same licensing and technical rules for all millimeter wave spectrum will provide economies of scale and scope and allow for the efficient and expeditious deployment of 5G services to U.S. consumers.

- **Avoid rules that would undermine investment.** The Commission should reject proposals that would undermine the certainty needed by licensees to speed the deployment of millimeter wave spectrum. Spectrum sharing in the bands will not require the use of the experimental Spectrum Access System ("SAS"), and it will not be necessary or effective to mandate "use it or share it" requirements on exclusive-use, licensed spectrum.

- **Foster a spectrum environment to support terrestrial mobile deployment.** The focus of Commission efforts should remain on providing more spectrum for terrestrial mobile services and not on speculative satellite systems. With Fixed-Satellite Service ("FSS") entities having access to more than *five times* the millimeter wave spectrum that terrestrial mobile providers have nationwide (22 GHz for FSS versus 3.85 GHz for terrestrial mobile), the FCC should continue to

[1] *Use of Spectrum Bands Above 24 GHz for Mobile Radio Services*, Report and Order and Further Notice of Proposed Rulemaking, 31 FCC Rcd 8014 (2016) ("*Order & FNPRM*").

prioritize additional, cleared spectrum for mobile broadband services. Changes to power limits and relaxations on the use of the millimeter wave bands for satellite services as requested by satellite entities would negatively impact the performance of terrestrial services. Adjacent band satellite services can and will be protected by terrestrial wireless providers as necessary and the Commission should allow affected stakeholders to work collaboratively to develop protection criteria.

- **Create a more equitable balance by making the additional bands available on a licensed, exclusive-use basis.** Requests made by unlicensed proponents for additional spectrum bands, including the 37-37.6 GHz and 70/80 GHz bands, should be denied. The Commission has already provided more than *four times* the amount of spectrum for unlicensed devices than it has for licensed services in the millimeter wave bands. The emphasis for the current phase of this proceeding should be on allocating new bands for licensed services.

By adopting these recommendations, the Commission will continue to help ensure a robust 5G ecosystem will develop and cement the United States' place as the unquestioned leader in mobile technologies and services.

II. THE COMMISSION SHOULD EXTEND THE REGULATORY APPROACH ADOPTED IN THE *ORDER* TO THE PROPOSED MILLIMETER WAVE BANDS.

The Commission has embarked upon a trailblazing path to identify and allocate spectrum above 24 GHz for next-generation 5G services. These efforts are critical to enabling the United States to remain the unquestioned leader in the development and deployment of innovative mobile broadband services. The hallmark of the U.S. regulatory approach has been to allow the wireless industry to dictate the technical and operational characteristics of wireless spectrum usage, with minimal technical regulations to alleviate any interference between uses. This framework has led to North American users consuming more data traffic per subscriber per month than any other geographic area in the world.[2] By 2020, there will be a six-to-seven-fold

[2] Comments of CTIA, WT Docket No. 16-137, at 14 (filed May 31, 2016).

increase in data usage by the average subscriber in North America.[3] Indeed, it is estimated that mobile data traffic will grow twice as fast as fixed IP traffic from 2015 to 2020.[4]

In adopting the *Order*, the Commission acknowledged the role its flexible, exclusive-use licensing model had in "facilitating access to spectrum, maximizing flexibility, and encouraging wireless innovation."[5] To promote the deployment of the spectrum above 24 GHz, the Commission established a coherent framework for the 27.5-28.35 GHz ("28 GHz") and 37.6-40 GHz ("37 GHz") bands that built on the highly successful model used for other commercial wireless spectrum bands.[6] The Commission should extend this flexible-use methodology to additional spectrum bands: 24.25-24.45 GHz and 24.75-25.25 GHz ("24 GHz"), 29.1-29.25 GHz ("29 GHz"), 31-31.3 GHz ("31 GHz"), 31.8-33.4 GHz ("32 GHz"), 40-42 GHz, 42-42.5 GHz ("42 GHz"), 47.2-50.2 GHz ("47 GHz"), and 50.4-52.6 GHz ("50 GHz"). CTIA believes that this approach will provide certainty and assurances to the wireless industry that will encourage investment and deployment in the spectrum above 24 GHz for the new 5G ecosystem.

A. Mobile Use Above 24 GHz Should Be Governed By The Flexible Part 30 Rules.

In permitting use of the 28 GHz and 37 GHz bands for mobile services, the Commission adopted a new service, the Upper Microwave Flexible Use Service ("UMFUS"), under a new Part 30 of its rules.[7] Part 30 provides a unified set of rules governing the various types of

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[3] *Id.*

[4] Cisco, Visual Networking Index Mobile Forecast, http://www.cisco.com/assets/sol/sp/vni/forecast_highlights_mobile/index.html#~Country.

[5] *Order & FNPRM* ¶ 3.

[6] *Id.* ¶ 2.

[7] *Order & FNPRM* ¶ 161.

UMFUS operations that may be offered and provides clarity on the service and technical rules associated with mobile services.[8] Further, Part 30's licensed, flexible-use approach replicates the extremely successful methodology employed by the Commission for other commercial wireless services. CTIA applauds their adoption and use for the 28 GHz and 37 GHz bands.

Commenters in the proceeding agree that extending the use of Part 30 to the 24 GHz, 32 GHz, 40-42 GHz, 42 GHz, 47 GHz, and 50 GHz bands will allow for the certainty and flexibility needed to invest and deploy novel 5G services in the millimeter wave bands. For instance, Verizon notes that the Commission should open up the 24 GHz, 32 GHz, and 42 GHz bands to mobile use under traditional licensing models known to promote investment and innovation.[9] Samsung likewise argues for the additional millimeter wave bands to be licensed under rules consistent with those adopted for the 28 GHz, 37 GHz, and 39 GHz bands because a consistent licensing approach will enable and foster the robust deployment of 5G services.[10] T-Mobile provides further support for the application of Part 30 of the Commission's rules to the additional bands, stating that this approach would generally allow for consistency throughout the millimeter wave spectrum.[11] Moreover, as Huawei states, bringing the millimeter wave bands identified in the *FNPRM* within the scope of the new Part 30 rules would accommodate the needs and likely

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[8] *Id.*

[9] Comments of Verizon, GN Docket No. 14-177, IB Docket No. 15-256, RM-11664, WT Docket No. 10-112, IB Docket No. 97-95, at 3 (filed Sept. 30, 2016) ("Verizon *FNPRM* Comments").

[10] Comments of Samsung Electronics America, Inc. and Samsung Research America, GN Docket No. 14-177, IB Docket No. 15-256, RM-11664, WT Docket No. 10-112, IB Docket No. 97-95, at 5-6 (filed Sept. 30, 2016) ("Samsung *FNPRM* Comments").

[11] Comments of T-Mobile USA, Inc., GN Docket No. 14-177, IB Docket No. 15-256, RM-11664, WT Docket No. 10-112, IB Docket No. 97-95, at 7 (filed Sept. 30, 2016) ("T-Mobile *FNPRM* Comments").

future growth of wireless users, as well as the introduction of new services by providers, given the flexibility afforded under those provisions.[12]

CTIA strongly supports this effort. As the record makes clear, extension of this regulatory framework will allow for the development and investment necessary for the successful deployment of the new 5G ecosystem. Although the millimeter wave bands already hold great promise for supporting 5G systems, significant research and development must still be done before the spectrum can be put to mobile use. As a result, providing a stable and predictable regulatory environment is critical to allowing such development and investment to continue to occur.

B. The Commission Should Include All LMDS Spectrum Under Part 30 Rules.

The LMDS is licensed in three distinct spectrum bands: 28 GHz, 29 GHz, and 31 GHz.[13] Of these three bands, Part 30 mobile use was only permitted in the 28 GHz band; the Commission did not seek comment on extending mobile rights to the remaining two LMDS spectrum bands.[14] Commenters in the record, however, suggest that the 29 GHz and 31 GHz LMDS bands would be strong candidates for flexible-use licensing as well.[15]

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[12] Comments of Huawei Technologies, Inc. (USA) and Huawei Technologies Co., Ltd., GN Docket No. 14-177, IB Docket No. 15-256, RM-11664, WT Docket No. 10-112, IB Docket No. 97-95, at 6-7 (filed Sept. 30, 2016) ("Huawei *FNPRM* Comments").

[13] *See* 47 C.F.R. §101.1005.

[14] *Order & FNPRM* ¶ 6.

[15] Comments of Nextlink Wireless, LLC, GN Docket No. 14-177, IB Docket No. 15-256, RM-11664, WT Docket No. 10-112, IB Docket No. 97-95, at 3 (filed Sept. 30, 2016) ("Nextlink *FNPRM* Comments"); Comments of Straight Path Communications Inc., GN Docket No. 14-177, IB Docket No. 15-256, RM-11664, WT Docket No. 10-112, IB Docket No. 97-95 (filed Sept. 30, 2016), at 3 ("Straight Path *FNPRM* Comments"); Verizon *FNPRM* Comments at 4.

CTIA agrees with commenters who suggest that the remaining LMDS spectrum bands should be added to the Part 30 rules to allow mobile services. These two spectrum bands are generally lower frequency than many of the other bands proposed for Part 30 uses and will therefore propagate better than higher millimeter wave frequencies.[16] According to Ericsson, the entire LMDS band (from 27.5 to 31.3 GHz) can likely be handled by an integrated radio, meaning that device manufacturers can build equipment capable of using the entire LMDS band at marginal additional costs.[17] Moreover, absent Commission action to allow for mobile use of all LMDS spectrum, the remaining spectrum could be stranded once incumbent licensees replace their existing operations with the new 5G operations under Part 30.[18] The goal of the *FNPRM* is to "ensure that additional spectrum is available to allow the next generation of wireless technologies to flourish in the mmW bands,"[19] and CTIA believes that applying the flexible Part 30 rules to all of the LMDS spectrum bands would be entirely consistent with that objective.

C. Part 30 Licensees Should Have Flexible Performance Requirements.

CTIA noted in its comments that performance requirements should be crafted to reflect the evolving nature of 5G services and technologies so that licensees would retain the flexibility needed to deploy innovative systems.[20] The record overwhelmingly supports this approach. As Qualcomm correctly points out, the unique characteristics of millimeter wave band deployments

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[16] Nextlink *FNPRM* Comments at 4.

[17] Comments of Ericsson Inc., GN Docket No. 14-177, RM-11664, at 37 (filed Jan. 15, 2015).

[18] Verizon *FNPRM* Comments at 5.

[19] *Order & FNPRM* ¶ 369.

[20] Comments of CTIA, GN Docket No. 14-177, IB Docket No. 15-256, RM-11664, WT Docket No. 10-112, IB Docket No. 97-95, at 16 (filed Sept. 30, 2016).

necessitate new thinking with regard to performance requirements.[21] Ericsson agrees that the Commission should be cautious about imposing requirements that may discourage 5G deployment, namely overly prescriptive performance and deployment metrics.[22] Straight Path, while advocating for the adoption of clear performance metrics, also emphasizes the importance of flexible performance metrics.[23] Other commenters express similar desires for flexible performance requirements and concerns about the premature application of overly-specific, heavy-handed performance mandates that would inhibit experimentation and innovation in the millimeter wave bands.[24]

The Commission, based on the consistent and nearly unanimous record, should establish

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[21] Comments of Qualcomm Incorporated, GN Docket No. 14-177, IB Docket No. 15-256, RM-11664, WT Docket No. 10-112, IB Docket No. 97-95, at 13 (filed Sept. 30, 2016) ("Qualcomm *FNPRM* Comments") ("Performance metrics for the millimeter wave bands must be as flexible as the underlying service rules to account for the broad range of 5G services, usage models, and applications. Some deployments may comprise large numbers of devices densely packed into small areas, while others may offer service using a relatively small number of high-capacity devices deployed over a large area. Accordingly, the FCC should evaluate performance showings on a case-by-case basis at this early stage to afford licensees the necessary flexibility to develop and deploy innovative new services and demonstrate novel service showings.").

[22] Comments of Ericsson, GN Docket No. 14-177, IB Docket No. 15-256, RM-11664, WT Docket No. 10-112, IB Docket No. 97-95, at 18 (filed Sept. 30, 2016) ("Ericsson *FNPRM* Comments) ("Given that the development of spectrum above 24 GHz for flexible uses is at a nascent stage and the Internet of Things is yet it in its early stages of evolution, the Commission should take a cautious approach to regulation and retain flexibility.").

[23] Straight Path *FNPRM* Comments at 11 ("[T]he use cases for 5G have not been, and may not be, fully developed for years. Therefore, even if the Commission offers a safe harbor for combined services, it must retain the flexibility for licensees to be able to demonstrate that the service they provide is 'substantial' even if it does not meet the safe harbor guidelines. While safe harbor standards will be beneficial for licensees, they should not unnecessarily constrain licensees' development of innovative services based on a concern that the provision of those services will limit the opportunity for license renewal.").

[24] Nextlink *FNPRM* Comments at 18-20; T-Mobile *FNPRM* Comments at 26; Verizon *FNPRM* Comments at 8.

a flexible, case-by-case approach for performance requirements in the spectrum bands above 24 GHz. Flexible performance requirements will provide the necessary certainty for investment while not penalizing licensees for exploring new or novel network configurations or deployments.

D. All Part 30 Licensees Should Be Granted Ten-Year Licenses With Renewal Expectancies.

The record affirms that the Commission should provide a ten-year license term, with renewal expectancies, for licenses in the 24 GHz, 29 GHz, 31 GHz, 32 GHz, 40-42 GHz, 42 GHz, 47 GHz, and 50 GHz bands. CTIA agrees with commenters that a ten-year license term will give licensees the certainty needed to invest and innovate in these new mobile bands and would be consistent with the license terms afforded to other similarly situated mobile services.[25] CTIA therefore urges the Commission to adopt a ten-year term with a renewal expectancy for all Part 30 licensees.

E. A Consistent Technical Framework Should Be Applied To Part 30 Services.

The record is clear that the technical framework for the new 24 GHz, 29 GHz, 31 GHz, 32 GHz, 40-42 GHz, 42 GHz, 47 GHz, and 50 GHz bands should be consistent with the requirements promulgated for the 28 GHz and 37.6-40 GHz bands. Specifically, commenters argue that the base, mobile, and transportable power limits should be the same as those adopted for the 28/37 GHz bands—*i.e.*, 75 dBm/100 MHz EIRP for base stations; 43 dBm EIRP maximum mobile power limit; and 55 dBm EIRP maximum power for transportable stations.[26]

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[25] Comments of AT&T, GN Docket No. 14-177, IB Docket No. 15-256, RM-11664, WT Docket No. 10-112, IB Docket No. 97-95, at 13 (filed Sept. 30, 2016) ("AT&T *FNPRM* Comments") 13; Qualcomm *FNPRM* Comments at ii.

[26] Samsung *FNPRM* Comments at 6; Huawei *FNPRM* Comments at 16.

Further, out-of-band emissions limits should be -13 dBm/MHz for base/mobile/transportable stations, as is true for the 28/37 GHz bands.[27] Finally, commenters assert that licensed spectrum blocks should generally be a minimum of 200 megahertz, where the spectrum band is suitably large to accommodate such a block size.[28]

CTIA supports this approach. A consistent licensing and technical framework for all spectrum bands above 24 GHz will enable wireless providers and vendors to develop and deploy equipment and services at scale. It also will result in a broader ecosystem, more rapid roll-out of new services, and enhanced competition among suppliers to the U.S. and global markets. As Ericsson articulates, "globally harmonized spectrum remains integral to the continued growth of the mobile industry and should be the touchstone for selecting spectrum for IMT-2020."[29]

III. THE COMMISSION SHOULD DECLINE PROPOSALS THAT WOULD INHIBIT THE DEPLOYMENT OF MILLIMETER WAVE SPECTRUM FOR TERRESTRIAL MOBILE SERVICES.

While CTIA supports many of the fundamental proposals and suggestions made by the Commission and commenters, some commenters offer proposals that, if adopted, could irreparably harm the viability of spectrum use above 24 GHz. As the record demonstrates, the Commission should reject overly prescriptive regulations that could choke off experimentation, innovation, and investment.[30]

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[27] *Id*.

[28] Samsung *FNPRM* Comments at 5; Ericsson *FNPRM* Comments at 17; Huawei *FNPRM* Comments at 8; Comments of Nokia, GN Docket No. 14-177, IB Docket No. 15-256, RM-11664, WT Docket No. 10-112, IB Docket No. 97-95, at 7 (filed Sept. 30, 2016) ("Nokia *FNPRM* Comments").

[29] Ericsson *FNPRM* Comments at 4.

[30] *Id*. at 18.

A. A Spectrum Access System Should Not Be Utilized For The 37-37.6 GHz Band.

Use of the still experimental SAS technology to manage sharing in the 37-37.6 GHz band risks harming the timely deployment of this spectrum for 5G and may be fundamentally impractical in application. As the Commission is aware, CTIA continues to support the development and integration of a SAS in the 3.5 GHz band. However, as Ericsson notes, utilization of a SAS framework was developed to accommodate multiple tiers of unequal sharing parties with differing protection requirements.[31] The sharing environment in the 37-37.6 GHz band, on the other hand, is very different because it involves simple co-equal sharing by co-primary users in a single tier, making the SAS mechanism unnecessary.[32] Further, as Nokia points out, application of a SAS in the millimeter wave bands could prove to be ineffective or inefficient.[33] Nokia presents extensive modeling and measurements into the record that provide one example of an alternative, more apt approach that could be considered for sharing in the millimeter wave bands.[34] CTIA recommends that the FCC decline to adopt a SAS for the 37-37.6 GHz band and instead initiate technical discussions among federal and non-federal stakeholders to help establish use cases that can be used to model sharing scenarios and requirements.[35]

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[31] *Id*. at 16.

[32] *Id*.

[33] Nokia *FNPRM* Comments at 12.

[34] *Id*. at Appendix 1.

[35] T-Mobile *FNPRM* Comments at 21.

B. Proposals For "Use It Or Share It" Requirements Would Inhibit 5G Deployment and Harm Investment and Innovation.

Adoption of proposals by unlicensed and satellite proponents[36] for "use it or share it" requirements would inhibit 5G deployment and harm investment and innovation. The record demonstrates the significant drawbacks to undermining licensee rights to their spectrum in this manner.

For instance, T-Mobile cautions against permitted shared access of the unused portions of the millimeter wave bands on a "use it or share it" basis (37.6-38.6 GHz), which T-Mobile explains would introduce uncertainty and undermine the band for commercial operations.[37] AT&T notes that "[o]pportunistic sharing, in fact, has not been successfully deployed on any large scale basis and prior attempts to develop opportunistic sharing have failed."[38] Straight Path similarly opposes proposals to adopt "use it or share it" rules in the millimeter wave bands as they would be unnecessary, impractical, and overly burdensome.[39] And Intel argues that developing the regulatory "use it or share it" framework would cause delays and place

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[36] Comments of Facebook, Inc., GN Docket No. 14-177, IB Docket No. 15-256, RM-11664, WT Docket No. 10-112, IB Docket No. 97-95, at 7 (filed Sept. 30, 2016); Comments of Open Technology Institute at New America and Public Knowledge, GN Docket No. 14-177, IB Docket No. 15-256, RM-11664, WT Docket No. 10-112, IB Docket No. 97-95, at 16-18 (filed Sept. 30, 2016).

[37] T-Mobile *FNPRM* Comments at 24-25 ("It is questionable as to whether licensees will actually be able to displace sharers when they wish to use spectrum that they acquired at action. Moreover, requiring licensees to provide information about system operations, which is a necessary prerequisite to sharing, is contrary to the nature of geographic area licensing and may impede licensees' ability to dynamically reconfigure their networks. Adopting a use-it-or-share-it approach would therefore hamstring licensees, create greater uncertainty, and harm the Commission's efforts to maximize spectrum efficiency.").

[38] AT&T *FNPRM* Comments at 12.

[39] Straight Path *FNPRM* Comments at 7-10.

operational burdens on licensees, which would put at risk the roll-out of next-generation services and, as a result, the U.S.'s international 5G leadership.[40]

The record fails to demonstrate that mandating "use it or share it" requirements will lead to successful spectrum sharing. Instead, mobile providers will not have certainty that their use of the spectrum will be protected, thereby calling into question the willingness of terrestrial licensees to make significant capital outlays to purchase and deploy spectrum where their full license rights could be impeded. As CTIA noted in its initial comments, the Commission should instead promote efficient spectrum use through the use of the flexible, exclusive-use licensing methodology that has successfully allowed the U.S. to be the worldwide leader in the deployment of commercial mobile networks.

C. The Commission Should Not Impair The 37.5-40 GHz Band For Terrestrial Use.

There is no logical reason for the Commission to permit modifications to existing satellite service limitations. In particular, satellite proponents have not persuasively shown that increases in the power flux density ("PFD") or removal of the prohibition on satellite end-user equipment in the 37.5-40 GHz band would have no adverse effect on terrestrial wireless operations.

First, recent real-world measurements show a potential for harmful interference from satellite operations to terrestrial mobile services. Nokia has conducted measurements demonstrating that, in the 28 GHz band: (1) measured levels were typically 20-30 dB higher than the limits established for the 28 GHz band by the Commission to protect terrestrial operations; (2) the PFD levels measured in the vertical plane were typically 1-2 dB higher than

[40] Comments of Intel Corporation, GN Docket No. 14-177, IB Docket No. 15-256, RM-11664, WT Docket No. 10-112, IB Docket No. 97-95, at 18-19 (filed Sept. 30, 2016).

the horizontal; (3) the measured levels to the sides and rear of sites were higher than expected; (4) there was no roll-off as a function of the azimuth angle as SIA argued there would be; and (5) there were equal levels of PFD at all angles—about a 10 dB reduction as compared to the 0 degree measurement.[41] These findings show that satellite transmissions' emission levels are higher and impact a greater angular area as compared to the adopted PFD limits of -77.6 dBm/m2/MHz, thereby revealing a strong potential for interference to terrestrial broadband services.

Although Boeing provides a technical analysis purporting to demonstrate that terrestrial operations would be fully protected if the PFD limit were increased,[42] this analysis contains a number of flawed assumptions that, if corrected, would indicate that terrestrial wireless operations would be impinged upon by such a change. Nokia's real-world measurements demonstrate that the assumptions made by Boeing when establishing its modeling of the interference environment for the 37.5-40 GHz band will likely require measurements rather than simply modeling before they can be relied upon by the Commission.

Moreover, as T-Mobile notes in its comments, the isolation expected by Boeing in its analysis for mobile base stations from satellite downlink transmissions requires that base stations not point at elevation angles above the horizon.[43] However, base station antennas may actually steer to higher elevation angles when dealing with difficult propagation environments.[44] Boeing

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[41] Nokia *FNPRM* Comments at 17-19.

[42] *See e.g.*, *Ex Parte* Presentation of The Boeing Company, GN Docket No. 14-177, IB Docket No. 15-256, RM-11664, WT Docket No. 10-112, IB Docket No. 97-95 (filed July 7, 2016).

[43] T-Mobile *FNPRM* Comments at 29.

[44] *Id*.

also assumes that all terrestrial base stations would have some shielding from high powered satellite earth stations, another assumption that may not be accurate.[45] Until the satellite proponents provide sufficient evidence that mobile services would be protected from interference, the Commission should not increase the PFD limit in the 37.5-40 GHz band.

Second, the record demonstrates that the Commission should maintain the prohibition on satellite end-user equipment in the 37.5-40 GHz band. While FSS entities assert that such equipment would only exist on a secondary, non-interference basis, the wireless industry is concerned that such deployment of satellite receivers would lead to broader coverage by satellite beams—and unpredictable interference to 5G base stations and mobile receivers.[46] Moreover, permitting satellite user terminals would unduly burden terrestrial users either by imposing restrictions on operations or by subjecting terrestrial operators to onerous requirements to identify sites serving mobiles.[47] The satellite proponents have thus not met their burden of showing that permitting satellite end-user equipment in the 37.5-40 GHz band would not adversely affect terrestrial wireless operations in the band. The Commission should therefore reject this proposal.

D. Passive Satellite Service Systems Can Be Fully Protected By Terrestrial Mobile Providers.

For several of the spectrum bands above 24 GHz under consideration for mobile services, there are passive satellite services in adjacent bands that will require interference protection. For example, the 31.3-31.8 GHz band directly adjacent to the 32 GHz band under consideration is

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[45] *Id*.

[46] *Id*. at 30.

[47] Ericsson *FNPRM* Comments at 20.

allocated for Earth Exploration Satellite Service ("EESS") (passive), radio astronomy ("RAS"), and Space Research (passive).[48] Additionally, RAS must be protected in the 42.5-43.5 GHz band that is adjacent to the 42 GHz band under consideration for mobile services[49] and also in the 48.94-49.04 GHz band that is co-channel with the 47 GHz band.[50] Similarly, the 50.2-50.4 GHz and 52.6-54.25 GHz bands have primary allocations for the EESS (passive) and Space Research (passive) that are adjacent to the proposed 50 GHz band.[51]

CTIA agrees with commenters that these passive services can be protected through exclusion zones,[52] interference coordination,[53] and aggregate emissions limitations.[54] Rather than rejecting use of the 32 GHz, 42 GHz, 47 GHz, and 50 GHz bands for terrestrial mobile use, the Commission should allow mobile operations in these bands and establish necessary protections, if any, for passive services that future UMFUS licensees can meet to initiate operations. Additionally, given the nascence of 5G standards efforts, the Commission should encourage collaborative discussions among all affected stakeholders to determine the appropriate protection criteria for the passive services.[55]

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[48] *Order & FNPRM* ¶ 394.

[49] *Id*. ¶ 400.

[50] *Id*. ¶ 408.

[51] *See* 47 C.F.R. §2.106.

[52] T-Mobile *FNPRM* Comments at 12-13.

[53] *Id*. at 16.

[54] *Id*. at 19.

[55] *Id*. at 16.

E. The Commission Should Focus on Licensed Spectrum In Order to Create a More Equitable Balance in the Millimeter Wave Bands.

CTIA urges the Commission to focus on creating licensed spectrum opportunities with the *FNPRM* bands, which will create a more equitable balance between licensed and unlicensed millimeter wave spectrum overall. Some commenters argue that the 37-37.6 GHz band should be made available for unlicensed devices (presumably instead of exclusive use licenses),[56] while other commenters seek to dedicate the 71-76 GHz ("70 GHz") and 81-86 GHz ("80 GHz") bands for unlicensed devices.[57] CTIA opposes these suggestions, as they would exacerbate the disparity between licensed and unlicensed spectrum in the millimeter wave bands. The Commission already has identified 14 gigahertz of contiguous spectrum for unlicensed uses in this proceeding.[58] In contrast, licensed providers thus far have been limited to just 3.25 gigahertz of spectrum above 24 GHz—meaning that unlicensed devices have access to more than *four times* the spectrum that licensed providers can use.

Additionally, each of these bands will play critical roles in the development of the licensed 5G ecosystem. For example, the 37-37.6 GHz band would be a critical band for early and rapid deployment of licensed 5G services should the Commission adopt a reasonable licensing framework without an overly complicated sharing requirement. Indeed, numerous commenters have suggested alternative approaches for sharing of this band with the federal

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[56] Comments of Wi-Fi Alliance, GN Docket No. 14-177, IB Docket No. 15-256, RM-11664, WT Docket No. 10-112, IB Docket No. 97-95, at 9 (filed Sept. 30, 2016); Comments of Microsoft Corporation, GN Docket No. 14-177, IB Docket No. 15-256, RM-11664, WT Docket No. 10-112, IB Docket No. 97-95, at 16 (filed Sept. 30, 2016) ("Microsoft *FNPRM* Comments").

[57] Microsoft *FNPRM* Comments at 7-11.

[58] *See* 47 C.F.R. §15.255 (allowing unlicensed use for the entire 57-71 GHz band).

government that would enable seamless use for exclusive-use licensees.[59] Similarly, the 70 GHz and 80 GHz bands have provided extensive capabilities for wireless backhaul, and are forecast to comprise up to 20 percent of new backhaul deployments annually as soon as 2020.[60] With new small cell deployments associated with these high bands, wireless backhaul availability, reliability, and performance will be more critical to supplement fiber optic backhaul. It is important to utilize licensed spectrum to ensure carrier-grade performance, provide interference protection, and enable high quality next-generation services, many of which may require quality of service attributes. CTIA therefore urges the Commission to decline suggestions for additional unlicensed spectrum bands above 24 GHz.

IV. CONCLUSION.

CTIA is encouraged by the proposals made by the Commission seeking to further expand and enhance its 5G vision. CTIA enthusiastically supports the identification and allocation of additional exclusive-use, licensed spectrum bands designed to meet the ever-increasing demands of U.S. consumers for mobile broadband services. CTIA asks that the Commission expeditiously adopt flexible licensing and technical rules for the 24 GHz, 29 GHz, 31 GHz, 32 GHz, 40-42 GHz, 42 GHz, 47 GHz, and 50 GHz bands, consistent with the regulatory framework promulgated for the 28 GHz and 37.6-40 GHz bands. The Commission should reject unnecessary sharing regimes and should focus on dedicating additional spectrum for licensed use. Developing a stable and flexible rule structure to govern the entirety of the millimeter wave

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[59] *See e.g.*, Ericsson *FNPRM* Comments at 16-17; T-Mobile *FNPRM* Comments at 21-23; Nokia *FNPRM* Comments at 10-14.

[60] Ericsson *FNPRM* Comments at 14.

bands will help to continue the innovation and investment necessary to maintain U.S. mobile wireless leadership.

Respectfully submitted,

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