Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, DC 20554

In the Matter of	)	
	)	
Amendment of the Commission's Rules	)	GN Docket No. 12-354
With Regard to Commercial Operations	)	
In the 3550-3650 MHz Band	)	

REPLY COMMENTS OF BLiNQ NETWORKS, INC.

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REPLY COMMENTS OF BLiNQ NETWORKS, INC.

I. INTRODUCTION AND SUMMARY.

BLiNQ Networks Inc. ("BLiNQ")[1] submits these reply comments in response to the Commission's April 23, 2014 *Further Notice of Proposed Rulemaking* on proposed rules for a new Citizens Broadband Radio Service in the 3550-3650 MHz Band (the "3.5 GHz Band").[2]

In response to the *Further Notice of Proposed Rulemaking* (*"FNPRM"*), most commenters recognize the need to increase maximum effective isotropic radiated power ("EIRP") limits in the band.[3] As these commenters explain, the current limits are too low, and higher

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[1] Headquartered in Plano, Texas, BLiNQ is a pioneer of Backhaul Self-Organizing Network ("B-SON") technologies that change the way mobile operators deliver mobile broadband services in urban areas. BLiNQ has developed an innovative small cell backhaul solution that allows mobile operators to deploy small cells exactly where they are needed to eliminate over-capacity hotspots while significantly reducing the time and expense associated with traditional backhaul. In particular, BLiNQ offers a point-to-multipoint backhaul product that operates in non-line-of-sight ("NLOS") conditions to provide high capacity backhaul links for small cells.

[2] *Amendment of the Commission's Rules with Regard to Commercial Operations in the 3550-3650 MHz Band*, Further Notice of Proposed Rulemaking, 29 FCC Rcd 4273 (2014) ("*3.5 GHz FNPRM*").

[3] *See* Comments of BLiNQ Networks, Inc., GN Docket No. 12-354 at 10 (July 14, 2014); Comments of Google, Inc., Docket No. 12-354 at 25 (July 14, 2014); Comments of Motorola Solutions, Inc., GN Docket No. 12-354 at 5 (July 14, 2014); Comments of Multi-Path Networks, GN Docket No. 12-354 at 1 (April 28, 2014); Comments of Nokia Solutions and Networks US, GN Docket No. 12-354 at 19-20 (July 14, 2014); Comments of T-Mobile USA, Inc., GN Docket No 12-354 at 12 (July 14, 2014); Comments of Verizon, GN Docket No. 12-354 at 8 (July 14,

limits will enable a wider range of deployment and use cases in the band, including small cells, backhaul for small cells, and point-to-multipoint systems.

BLiNQ has proposed 3.5 GHz rules that adjust power limits incrementally depending on the horizontal beamwidth of the operations, rather than whether the service is identified nominally as "point-to-point."[4] By focusing on what actually increases the risk of interference – namely, beamwidth and EIRP – rather than whether the proposed system happens to fall into one of two loosely-defined use cases, the Commission can reduce the threat of interference while encouraging innovative system architectures and promoting more efficient use of the available frequencies.[5]

While commenters properly call for higher power limits in the 3.5 GHz Band, successful development of the 3.5 GHz Band will depend on (i) providing sufficient interference protection to incumbents, and (ii) permitting ample opportunity for other General Authorized Access (GAA) users in the band by not creating more interference than necessary to provide service. BLiNQ's proposed solution balances these priorities by allowing for higher power levels where the use of narrower beamwidths reduces the risk of interference, and requiring lower power levels where the use of wider beamwidths increases the risk of interference.[6]

2014); Comments of Ericsson, GN Docket No. 12-354 at 10 (July 14, 2014); Comments of Pierre de Vries, GN Docket No. 12-354 at 24 (July 14, 2014); Comments of Qualcomm, GN Docket No. 12-354 at 13 (July 14, 2014).

[4] Comments of BLiNQ at 2, 10. BLiNQ recommends intermediate power limits of 50 dBm EIRP for horizontal beamwidths of fifteen degrees or less, 46 dBm for horizontal beamwidths of twenty-five degrees or less, 43 dBm for horizontal beamwidths of thirty-five degrees or less, and 40 dBm for horizontal beamwidths of ninety degrees or less to enable a range of innovative use cases in the band.

[5] Comments of BLiNQ at 8.

[6] BLiNQ's proposed power limits would limit the aggregate amount of interference, even without considering the role of clutter (i.e., the role of buildings and other structures in attenuating radio signals). Because some, if not many, of the 3.5 GHz Band transmitters will be deployed in the clutter, concerns about potential interference will be even further reduced.

Allowing increased EIRP when horizontal beamwidths are narrower is but one way the Commission can promote innovative, somewhat-higher-powered use cases in the band without increasing the risk of harmful interference. In the 2.4 GHz and 60 GHz Bands, for example, the Commission authorized a range of higher EIRP limits based on variations in antenna gain.[7] Because beamwidth generally becomes narrower as antenna gain increases, higher-gain antennas increase EIRP without appreciably increasing the potential for harmful interference. As an alternative to allowing higher EIRP limits according to narrower beamwidths, therefore, the Commission could build on its precedent from the 2.4 GHz and 60 GHz Bands and permit a range of higher EIRP levels in the 3.5 GHz Band based on the antenna gain deployed. Whether the Commission relies on variations in beamwidth or variations in antenna gain, allowing for higher power in situations where the risk of harmful interference is not appreciably greater would stimulate investment, accelerate deployment, and promote more innovative use of the 3.5 GHz Band.

Additionally, many commenters oppose incorporating the 3.65 GHz Band into the proposed 3.5 GHz Band framework because it would disrupt incumbents in the band and could impede the proposed development of services, including point-to-multipoint backhaul operations. The proposed rules contain inadequate protections for the substantial investment existing operators have expended in the 3.65 GHz Band. Ultimately, the comments illustrate extensive support for increased power limits to enable a range of uses in the 3.5 GHz Band and for the Commission to proceed carefully by considering power limits before incorporating the 3.65 GHz Band under the proposed rules.

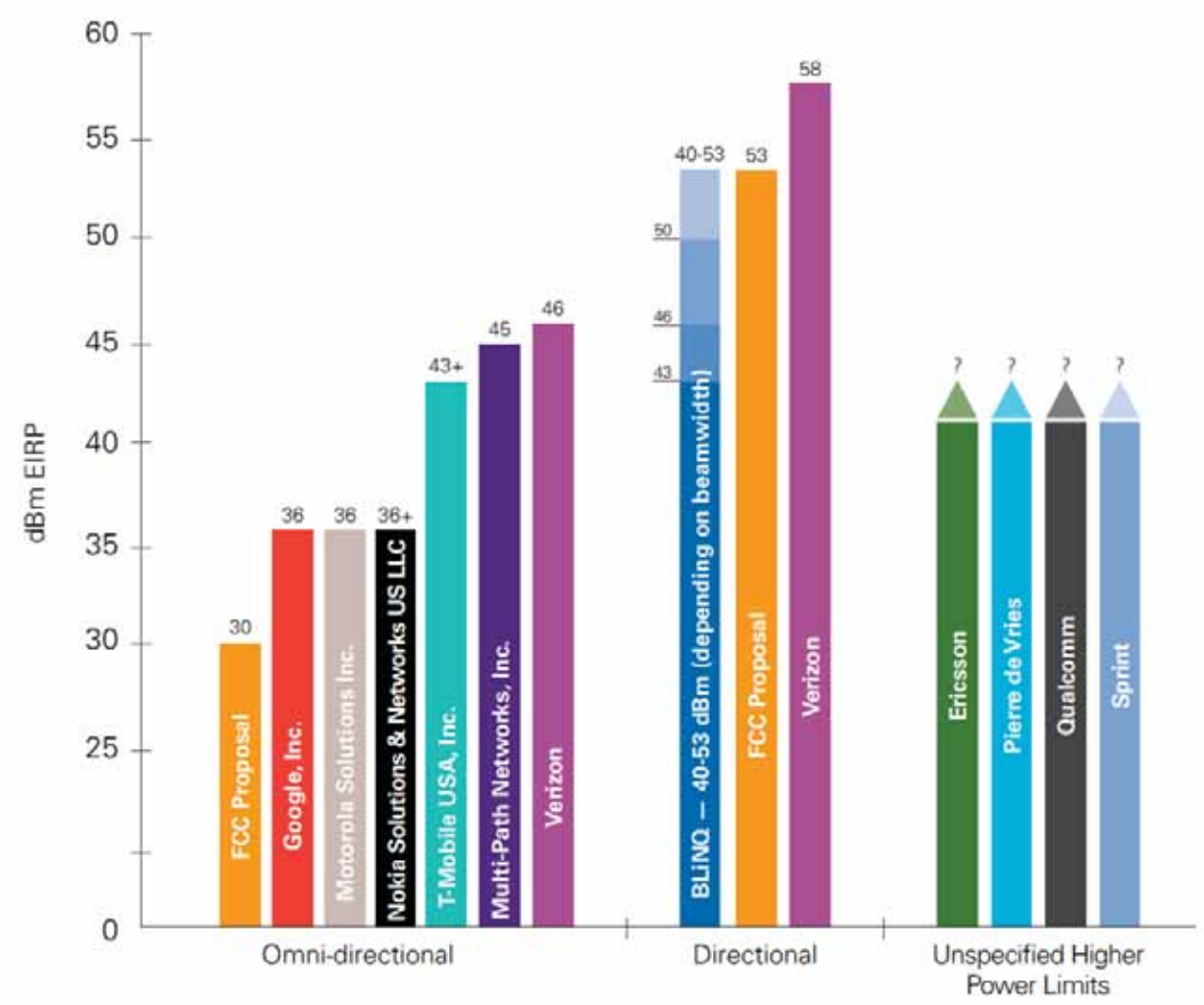
[7] *See* 47 C.F.R. §§ 15.255(b)(1)(ii); 15.247(c)(2).

II. COMMENTERS AGREE THAT INCREASED POWER LIMITS WILL ENABLE A WIDER RANGE OF INNOVATIVE USE CASES FOR THE BAND, INCLUDING POINT-TO-MULTIPOINT BACKHAUL.

By increasing maximum EIRP limits in the band, particularly for narrow beamwidth Citizens Broadband Radio Service Devices ("CBSDs") in non-rural areas, the Commission can enable more innovative uses. Many commenters, in addition to BLiNQ, propose increases to the maximum EIRP limits. The precise values range from 36 dBm to 53 dBm, and several commenters simply indicate support for higher power limits generally:

[Remainder of Page Intentionally Left Blank]

Support for Increased Power Limits in Non-Rural Areas[8]



[8] *See* Appendix 1: Table of Support for Increased Power Limits in Non-Rural Areas; *see also 3.5 GHz FNPRM* ¶¶ 74-75; Comments of Google at 25; Comments of Motorola Solutions at 5; Comments of Nokia Solutions and Networks US at 19-20; Comments of T-Mobile USA, Inc. at 12; Comments of Multi-Path Networks at 1; Comments of Verizon at 8; Comments of BLiNQ Networks, Inc. at 10; Comments of Ericsson at 10; Comments of Pierre de Vries at 24; Comments of Qualcomm at 13 (advocating for higher power levels inland, away from the coast); Comments of Sprint Corp., GN Docket No. 12-354 at 5, n.14 (July 14, 2014) (supporting higher power levels, noting that the currently proposed power levels would prevent a range of uses, but expressing concern about the expansion of exclusion zones).

This widespread support for higher power limits illustrates that the Commission can promote innovative and intensive use by increasing the power limits in the band.

A. The Currently Proposed EIRP Power Limits Are Too Restrictive, and Higher Power Limits Will Enable a Wide Range of Use Cases in the 3.5 GHz Band.

Several commenters, including T-Mobile and Verizon, explain that the currently proposed limits would only accommodate a narrow range of uses in the 3.5 GHz Band. According to T-Mobile, the Commission's current proposal only accommodates one type of use: low-powered General Authorized Access ("GAA")-type devices. As T-Mobile explains, higher power limits would accommodate a wider range of innovative use cases in the band, including non-line-of-sight ("NLOS") small cells and backhaul operations.[9] Similarly, Verizon explains that the Commission's currently proposed EIRP limit of 30 dBm only supports the use case of indoor picocells. Outdoor uses would require higher power limits.[10]

Likewise, Ericsson, Google, Motorola, and Nokia explain that increasing the proposed power limits will enable more types of services and more intensive use of the 3.5 GHz Band. Ericsson urges the Commission to increase power limits to support more use cases, including small cells, backhaul, and, where appropriate, macrocells, noting that the current proposed power limits are too low for this range of uses.[11] Google explains that the Commission should increase the proposed power limit of 30 dBm EIRP because it is one-quarter of the 36 dBm EIRP maximum transmit power permitted by the Commission for many existing WiFi operations in the 2.4 GHz and 5.8 GHz Bands.[12] Google notes that the success of the new 3.5 GHz Band model will depend on operators' ability to deploy usable networks, and future applications not foreseen

[9] Comments of T-Mobile at 12.
[10] Comments of Verizon at 8.
[11] Comments of Ericsson at 10.
[12] Comments of Google at 25.

today may benefit from the availability of higher transmit power.[13] Similarly, Motorola Solutions supports increasing the power limit to 36 dBm EIRP to be more consistent with unlicensed device power levels and to allow for better in-building penetration.[14] Nokia also recommends increasing the power limit to 36 dBm EIRP to be consistent with the 2.4 GHz Band and 5 GHz Band power levels.[15]

To enable a wider range of uses while addressing any interference concerns, the Commission can allow increased power limits for narrow-beamwidth operations, which have a substantially reduced risk of interference relative to wider-beamwidth operations, which pose the greatest interference concerns.[16] Verizon, for example, recognizes that narrower beamwidth operations create less interference. Verizon explains that "the allowable antenna gain values need to be increased to allow greater directivity and possible sectorization," and it recommends a power limit of 46 dBm for omnidirectional uses and a higher power limit of 58 dBm EIRP for directional coverage.[17] While BLiNQ's point-to-multipoint systems can operate at somewhat lower power levels than those Verizon proposes, Verizon properly identifies narrower-beamwidth applications for higher power limits because they create less interference than wider-beamwidth applications. By authorizing higher power limits based on horizontal antenna beamwidth, the Commission can promote innovative uses while adequately addressing interference concerns.

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[13] *Id.*
[14] Comments of Motorola Solutions at 5.
[15] Comments of Nokia at 19-20.
[16] *See* Comments of BLiNQ at 10.
[17] Comments of Verizon at 2, 8.

B. Restrictive Power Limits for PALs Are Unnecessary Because PAL Licensees Are Otherwise Responsible for Protecting Neighboring Operations.

As T-Mobile and Verizon explain, restrictive power limits for Priority Access License ("PAL") licensees are unnecessary because PAL licensees must not interfere with geographically neighboring operations (i.e., operations outside of PAL license areas). In addition, PAL licensees must otherwise comply with out-of-band emissions ("OOBE") limits.[18] In other words, even if PAL licensees are authorized to operate at higher power limits, PAL licensees will not interfere with other operations because they must operate within their geographic license areas and remain subject to OOBE limits. As Verizon puts it, while there might be some justification for attempting "to 'pack' together larger numbers" of GAA users because higher power limits may crowd out other useful GAA operations, there is no similar necessity with respect to PAL licensees because each individual operator can choose how to deploy within its license area.[19] Moreover, according to T-Mobile, PAL systems can be more easily identified and controlled than GAA systems because PAL systems are under the control of a single network operator in a given geographic area, as opposed to GAA systems, which may be operated by general consumers.[20] Thus, because PAL licensees are responsible for protecting neighboring operations from interference, there is little reason to adopt a restrictive power limit for these licensees.

C. The Spectrum Access System ("SAS") Could Enable CBSDs to Operate at Higher Power Levels While Limiting Interference Concerns.

The SAS could use a number of dynamic methods to enable CBSDs to operate at higher power levels while protecting incumbent users and reducing interference in the 3.5 GHz Band. For example, as Shared Spectrum recognizes, the rules could allow the SAS to use sensing to

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[18] *See* Comments of T-Mobile at 12; Comments of Verizon at 7-8.
[19] Comments of Verizon at 7-8.
[20] Comments of T-Mobile at 12.

enable higher-power operations.[21] Alcatel-Lucent similarly explains that the SAS should have discretion to permit CBSDs to operate at higher power levels based on the location of the CBSD and knowledge of incumbents in the region.[22] Likewise, Pierre de Vries suggests that the framework could specify the maximum resulting signal strength at a protected receiver and let an SAS calculate the allowed transmit power.[23] Or, as Qualcomm explains, the SAS could allow higher power levels for cellular deployments further inland, away from the coast.[24] As these commenters agree, the Commission can employ the SAS to allow higher power limits based on the context of a particular deployment. While commenters may have different views about the proper context on which to base power adjustments, commenters agree that the Commission should rely on context-sensitive power limits to encourage more innovative and more intensive use of the 3.5 GHz Band.

III. IN THE ALTERNATIVE TO ALLOWING HIGHER EIRPS BASED ON NARROWER HORIZONTAL ANTENNA BEAMWIDTHS, THE COMMISSION COULD AUTHORIZE HIGHER EIRPS FOR HIGHER GAIN ANTENNAS, AS IT HAS AT 60 GHZ AND 2.4 GHZ.

The Commission has previously allowed operators to decide the best model for deployment by adopting a range of power limits, rather than just one or two pre-determined limits. In both the 60 GHz and 2.4 GHz bands, the Commission adopted a sliding scale of power limits based on the gain of the antenna, authorizing a greater EIRP to the extent the gain of the antenna is greater.[25] At 60 GHz, for example, the Commission has adopted an average EIRP limit of 82 dBm, reducing the average EIRP limit 2 dB for every dB that the antenna gain is

[21] Comments of Shared Spectrum Company, GN Docket No. 12-354 at 3 (July 11, 2014).
[22] Comments of Alcatel-Lucent, GN Docket No. 12-354 at 12 (July 14, 2014).
[23] Comments of Pierre de Vries at 24.
[24] Comments of Qualcomm at 13.
[25] *See* 47 C.F.R. §§ 15.247(c)(2).

below 51 dBi.[26] Similarly, at 2.4 GHz, the Commission requires that the conducted output be reduced by 1 dB for each 3 dB that the directional gain of the antenna or antenna array exceeds 6 dBi.[27]

In adopting these EIRP limits, the Commission explained that higher gain antennas have narrower beamwidths and thus create less interference. As the Commission described in adopting the 60 GHz EIRP limits, "[a]s the antenna gain increases, the beamwidth of the antenna becomes narrower, making it less likely that these devices will cause interference to nearby receivers."[28] Similarly, in originally adopting EIRP limits at 2.4 GHz that vary based on gain, the Commission explained that this framework would "maintain an 'equivalent' area of

[26] *See Revision of Part 15 of the Commission's Rules Regarding Operation in the 57-64 GHz Band*, Report and Order, 28 FCC Rcd 12517 ¶ 24 (2013) ("*60 GHz Report and Order*"); 47 C.F.R. § 15.255(b)(1)(ii).

[27] *See* 47 C.F.R. § 15.247(c)(2)(ii). Put another way, the Commission adopted the following power limits:

60 GHz Power Limits		
Gain (dBi)	**Tx Power (dBm)**	**EIRP (dBm)**
51	31	82
50	30	80
49	29	78
48	28	76
47	27	74
46	26	72
45	25	70

2.4 GHz Power Limits		
Gain (dBi)	**Tx Power (dBm)**	**EIRP (dBm)**
24	24	48
21	25	46
18	26	44
15	27	42
12	28	40
9	29	38
6	30	36

Note that the 2.4 GHz power limits assumes that the system employs qualifying channel-hopping technology to be eligible for the higher 1 Watt (30 dBm) power limits. *See id.* §§ 15.247(b); 15.255.

[28] *60 GHz Report and Order* ¶ 26.

interference, i.e., the geographic area over which interference could result with a directional antenna as compared to the area obtained with an omnidirectional antenna."[29]

In expanding its higher power limits based on gain at 2.4 GHz from point-to-point systems to point-to-multipoint sectorized and phased array antenna systems, the Commission explained that "[t]hese 'smart antennas' focus their radio transmissions according to the geographic locations of their users."[30] These "advanced antenna technologies provide for increased spectrum efficiency because they allow for greater re-use of the same radio frequencies."[31] By extending the framework allowing for higher EIRP limits based on higher antenna gains to point-to-multipoint systems, the Commission allowed more than just omnidirectional or point-to-point antennas to be used and enabled these advanced antenna technologies in the band.[32]

Working from the Commission's proposed limits of 30 dBm conducted power plus 23 dBi gain for point-to-point applications down to 24 dBm conducted power plus 6 dBi gain for omnidirectional applications, the Commission could adopt the following limits:

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[29] *Amendment of Parts 2 and 15 of the Commission's Rules Regarding Spread Spectrum Transmitters*, Report and Order, 12 FCC Rcd 7488 ¶ 16 (1997) ("*2.4 GHz Point-to-Point Report and Order*"). Based on concerns that a manufacturer would create a high-gain antenna with a beamwidth that nonetheless remained relatively wide in the horizontal or vertical plane (i.e., creating gain by limiting beamwidth in only one plane), the Commission specifically considered limiting ratio between horizontal and vertical beamwidths to a factor of two. *Id.* ¶ 18. However, the Commission ultimately determined that this ratio was unnecessary because most antennas already met this requirement and it could prevent applications that require a different antenna design. *Id.*

[30] *Modification of Parts 2 and 15 of the Commission's Rules for Unlicensed Devices and Equipment Approval*, Report and Order, 19 FCC Rcd 13539 ¶ 2 (2004)

[31] *Id.* ¶ 6.

[32] *See id.*

Alternative Maximum EIRP Proposal: Adjusting EIRP Based on Antenna Gain

Gain (dBi)	Tx Power (dB)	EIRP (dB)
23	30	53
20	29	49
17	28	45
14	27	41
11	26	37
8	25	33
6	24	30

Whether the Commission relies on variations in beamwidth or variations in antenna gain, allowing for higher power in situations where the risk of harmful interference is not appreciably greater would stimulate investment, accelerate deployment, and promote more innovative use of the 3.5 GHz Band.

IV. COMMENTERS RECOGNIZE THAT IF POWER LIMITS ARE NOT INCREASED, THE INCLUSION OF THE 3.65 GHz BAND WOULD THREATEN EXISTING INVESTMENT AND INHIBIT USE OF THE 3.65 GHz BAND.

Adopting 3.5 GHz rules that do not take into account the root causes of harmful interference will sharply constrain innovation and investment in the 3.5 GHz Band. Moreover, extending excessively stringent, overly prescriptive 3.5 GHz rules to already-operational services in the 3.65 GHz Band would work a severe hardship on those businesses and entrepreneurs that have invested considerable resources in the 3.65 GHz Band relying on the current rules.

Several commenters express concern with extending the originally-proposed 3.5 GHz rules to the 3.65 GHz Band because existing 3.65 GHz systems are authorized to operate at power levels of 40 dBm EIRP per ten-megahertz block.[33] AT&T explains that the currently proposed power limits for the 3.5 GHz Band would jeopardize the feasibility of current point-to-multipoint and backhaul operations in the 3.65 GHz Band if those rules were applied to the

[33] *See* 47 C.F.R. § 90.1321(a). Under these rules, the maximum EIRP for a 10 MHz channel is 10 Watts, which is equivalent to 40 dBm.

3.65 GHz Band.[34] Sprint explains that it has worked with vendors to test and develop equipment that would operate under the existing Part 90 Subpart Z rules, including equipment related to small cells and non-line-of-sight backhaul; Sprint adds that extending restrictive power limits would harm this investment and its planned operations.[35] Similarly, Cohere Technologies, a startup specializing in modulation technology, explains that it would have to significantly adjust its current design parameters to accommodate a lower EIRP limit, which would create minimum link budgets for operators and directly harm backhaul applications.[36] Cloud Alliance urges the Commission not to include the 3.65 GHz Band unless it can increase power levels to enable continued wireless internet service provider operations in the band.[37] Furthermore, other commenters, including utility providers and organizations invested in the development of a Smart Grid network,[38] as well as technology and wireless service providers,[39] also express concern about how the proposed limitations on service would not adequately accommodate legacy systems.[40]

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[34] Comments of AT&T, GN Docket No. 12-354 at 44 (July 14, 2014).
[35] Comments of Sprint Corp. at 3.
[36] Comments of Cohere Technologies, GN Docket No. 12-354 at 3-4 (July 14, 2014).
[37] Comments of Cloud Alliance, GN Docket No. 12-354 at 2 (July 14, 2014).
[38] *See e.g.*, Comments of Ameren Services Co., GN Docket No. 12-354 at 2 (July 11, 2014); Comments of Exelon Corp., Docket No. 12-354 at 6 (July 14, 2014); Comments of Oncor Electric, GN Docket No. 12-354 at 4 (July 14, 2014); Comments of the Utilities Telecom Council, GN Docket No. 12-354 at 13 (July 14, 2014); and Comments of the Wimax Forum, GN Docket No. 12-354 at 1 (July 11, 2014).
[39] *See e.g.*, Comments of AT&T at 38; Comments of Airspan, GN Docket No. 12-354 at 1 (July 14, 2014); Comments of Siemens Industry, GN Docket No. 12-354 at 1-2 (July 14, 2014); Comments of Sprint Corp. at 3-4; and Comments of Telrad Networks, Docket No. 12-354 at 1 (July 14, 2014).
[40] Note that interference to satellite operations is a largely tangential issue to continued operations at the current power levels in the 3.65 GHz Band. Concerns regarding interference to C-Band (3700 MHz – 4200 MHz) earth stations relate to out-of-band emissions rather than EIRP power limits. *See, e.g., 3.5 GHz FNPRM* ¶¶ 152-61. Similarly, the Commission has proposed that existing grandfathered Fixed Satellite Service ("FSS") stations in the 3.65 GHz Band be entitled to the same protections as FSS stations in the 3.5 GHz Band. *See* proposed 47 C.F.R. §§

Taken together, these comments suggest three important conclusions. First, the originally proposed 3.5 GHz Band power limits are inflexible and incompatible with evolving system architectures. Second, the extension of excessively stringent 3.5 GHz rules to the 3.65 GHz Band would thwart the legitimate, investment-backed expectations of existing 3.65 GHz operators. And third, all stakeholders would benefit from gaining experience with how the 3.5 GHz rules apply and operate before the Commission extends the new rules to additional frequency bands.

Adopting more context-sensitive power levels for the 3.5 GHz Band promises to create substantial new opportunities for investment, economic growth, and broadband deployment. By comparison, prematurely expanding the proposed 3.5 GHz rules – especially in the stringent, proscriptive form proposed in the original *Notice* – would disserve the public interest in expanding broadband deployment using the 3.5 GHz and the 3.65 GHz spectrum.

V. CONCLUSION.

To encourage a wider, more innovative range of uses for the 3.5 GHz Band, the Commission should increase power limits while protecting incumbent users against harmful interference and promoting intensive use of the band. By incorporating limits based on horizontal antenna beamwidth[41] or, in the alternative, based on higher gain antennas,[42] the Commission can address interference concerns and still permit a more efficient and much more diverse range of uses in the band. Additionally, the Commission can prevent threatening the

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96.17, 96.20. Additionally, the Commission has explained that certain non-federal radiolocation operations in the band, which are secondary under the Table of Allocations, should remain secondary to the 3.5 GHz Band framework. *See 3.5 GHz FNPRM* ¶ 149.

[41] Comments of BLiNQ at 16. Intermediate power limits of 50 dBm EIRP for horizontal beamwidths of fifteen degrees or less, 46 dBm for horizontal beamwidths of twenty-five degrees or less, 43 dBm for horizontal beamwidths of thirty-five degrees or less, and 40 dBm for horizontal beamwidths of ninety degrees or less will promote innovation in the band.

[42] *See, e.g.*, 47 C.F.R. §§ 15.255(b)(1)(ii); 15.247(c)(2).

existing operations and associated investment in the 3.65 GHz Band by carefully considering whether to incorporate that spectrum into the proposed framework and, at a minimum, ensuring that those devices will be authorized to operate at current power limits of 40 dBm EIRP per ten-megahertz block if the band were to be incorporated into the overall 3.5 GHz Band regulatory model.

Respectfully submitted,

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[43] Special thanks to Joely Denkinger of the University of Colorado Law School for her help in preparing these comments.

Appendix 1: Table of Support for Increased Power Limits in Non-Rural Areas

Party	Proposed Power Limits for CBSDs in Non-Rural Areas
FCC Proposal	• **30 dBm EIRP (24 dBm transmit + 6dBi gain).** • **53 dBm EIRP (30 dBm transmit + 23 dBi gain) for fixed point-to-point systems.**[44]
BLiNQ Networks	• **40-53 dBm EIRP (depending on beamwidth).**[45]
Google, Inc.	• **36 dBm EIRP.**[46]
Motorola Solutions, Inc.	• **36 dBm EIRP.**[47]
Multi-Path Networks, Inc.	• **45 dBm EIRP.**[48]
Nokia Solutions and Networks US LLC	• **At least 36 dBm EIRP.**[49]
T- Mobile USA, Inc.	• **At least 37 dBm transmit power (43+ dBm EIRP).**[50]
Verizon	• **46 dBm EIRP for omnidirectional uses** • **58 dBm for directional coverage.**[51]
Ericsson	• **Higher power levels.**[52]
Pierre de Vries	• **Higher power levels.**[53]
Qualcomm	• **Increase power levels inland (inland U.S., away from coast).**[54]
Sprint	• **Higher power levels.**[55]

[44] *See 3.5 GHz FNPRM* ¶¶ 74-75.
[45] *See* Comments of BLiNQ Networks, Inc. at 10.
[46] Comments of Google at 25.
[47] Comments of Motorola Solutions at 5.
[48] Comments of Multi-Path Networks at 1.
[49] Comments of Nokia Solutions and Networks US at 19-20.
[50] Comments of T-Mobile USA, Inc. at 12.
[51] Comments of Verizon at 8.
[52] Comments of Ericsson at 10.
[53] Comments of Pierre de Vries at 24.
[54] Comments of Qualcomm at 13.
[55] Comments of Sprint Corp., Docket No. 12-354 at 5, n. 14 (July 14, 2014). Sprint supports higher power levels, noting that the currently proposed power levels would prevent a range of uses, but is concerned about the expansion of exclusion zones.