

**Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, DC 20554**

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

REPLY COMMENTS OF T-MOBILE USA, INC.

T-Mobile USA, Inc. (“T-Mobile”) submits these reply comments in response to the comments of other parties in the above-referenced proceeding,^{1/} which proposes to create a new Citizens Broadband Service in the 3550-3650 MHz band (“3.5 GHz Band”). The comments show that the 3.5 GHz band can be an important tool for carriers to meet small cell needs and that the alternative two-tiered Licensed Shared Access (“LSA”) approach is a more effective means by which the band can be shared with incumbent users. The use of small cells can also reduce the size of exclusion zones.

I. INTRODUCTION AND BACKGROUND

In its comments, T-Mobile noted that carriers have small cell and backhaul needs that can be accommodated in the 3.5 GHz Band and that all small cell use need not occur on an unlicensed basis.^{2/} While T-Mobile and other carriers use unlicensed spectrum today for offloading, it does not follow that unlicensed spectrum is always the most efficient way to increase capacity through small cell use. In addition to increasing capacity through small cell use, T-Mobile pointed out that the 3.5 GHz Band can also be used to meet the expanding need

^{1/} See *Amendment of the Commission’s Rules with Regard to Commercial Operations in the 3550-3650 MHz Band*, Notice of Proposed Rulemaking, 12 FCC Rcd 15594 (2012) (“NPRM”); *Amendment of the Commission’s Rules with Regard to Commercial Operations in the 3550-3650 Band*, Order, GN Docket No. 12-354, DA 13-298 (rel. Feb. 28, 2013) (extending the reply comment deadline to April 5, 2013).

^{2/} See Comments of T-Mobile USA, Inc., GN Docket No. 12-354 (filed Feb. 20, 2013) (“T-Mobile Comments”).

for backhaul capacity.^{3/} T-Mobile rejected as overly complex the Commission’s proposal to permit access to the 3.5 GHz Band using a three-tiered “access by rule” scheme.^{4/} Accordingly, T-Mobile recommended that the Commission make some of the 3.5 GHz Band available for licensed operations, noting that a licensed approach would better protect incumbent users, simplify sharing, facilitate greater spectrum use, align with the FCC’s spectrum auction obligations, and accommodate a wider variety of technologies.^{5/}

While some commenting parties continue to urge the Commission to proceed with the untested and theoretical approach envisioned by its principal proposal, others – including those actually engaged in the development of technology and equipment – propose a simplified two-tiered method by which the spectrum can be more fully used. The LSA architecture would be consistent with spectrum management techniques undertaken elsewhere and would better ensure a predictable quality of service for 3.5 GHz Band users. Accordingly, T-Mobile is pleased to have the opportunity to submit these reply comments to support the Commission’s dedication of a portion of the 3.5 GHz Band using the LSA methodology.

II. REPLY COMMENTS

A. 3.5 GHz Band Spectrum Can be Used on a Licensed Basis to Build Out HetNets

Other commenters agree with T-Mobile that some of the 3.5 GHz Band spectrum should be designated for licensed use.^{6/} The Telecommunications Industry Association (“TIA”) observed that “exclusive licensed spectrum models offer a superior user experience based on

^{3/} See *id.* at 4-5.

^{4/} See *id.* at 5-8.

^{5/} See *id.* at 8-10.

^{6/} See, e.g., Comments of the Telecommunications Industry Association, GN Docket No. 12-354, at 5-7 (filed Feb. 20, 2013) (“TIA Comments”); Comments of Nokia Siemens Network US LLC, GN Docket No. 12-354, at 12-19 (filed Feb. 20, 2013) (“NSN Comments”); Comments of Ericsson, GN Docket No. 12-354, at 5-7 (filed Feb. 20, 2013) (“Ericsson Comments”).

predictable service quality, compared to the proposed license-by-rule approach.”^{7/} TIA further notes, as did T-Mobile, that the Commission’s assumption that carriers would not use the 3.5 GHz Band if licensed on an exclusive basis is inaccurate.^{8/}

As many commenters pointed out, if available to commercial providers, the 3.5 GHz Band can be used as a component of mobile broadband providers’ heterogeneous access networks (“Het Nets”).^{9/} As CTIA-The Wireless Association® (“CTIA”) explained, “[H]etNets deploy a mix of technologies, frequencies and cell sizes to optimally respond to customer demand – including small cells that supply capacity in high traffic areas.”^{10/} 4G Americas commented that HetNets “will be instrumental in meeting the coverage and capacity needs of increasingly data-centric networks of the future in a cost and operationally efficient fashion.”^{11/}

B. The Commission Should Adopt a Two-Tier Licensing Approach

T-Mobile agrees with the many commenters who urge the Commission to continue to focus on making clear, exclusive, spectrum available for commercial operations. As CTIA stated, “the Federal government should continue to pursue clearing of additional spectrum for mobile broadband as its preferred approach for bands below 3 GHz.”^{12/} Even if commercial

^{7/} TIA Comments at 5; *see also* NSN Comments at 12 (“The commercial mobile market has blossomed under a framework of access to exclusively licensed spectrum. This paradigm is driving the deployment of robust 4G broadband networks across the country.”).

^{8/} *See* TIA Comments at 4 (“Those comments were interpreted out of context and were directed toward specific NTIA analysis results which included mobility, as well as large exclusion zones covering major population centers.”).

^{9/} *See, e.g.*, Comments of Alcatel-Lucent, GN Docket No. 12-354, at 6 (filed Feb. 20, 2013) (“Alcatel-Lucent Comments”) (“Service providers in the Americas are rolling out heterogeneous networks (‘HetNets’) where outdoor small cells (‘micro’ and ‘metro’ cells) and indoor small cells (‘femto’ and ‘pico’ cells) are embedded in the coverage area of macrocells.”); Comments of CTIA-The Wireless Association®, GN Docket No. 12-354, at 5 (filed Feb. 20, 2013) (“CTIA Comments”).

^{10/} CTIA Comments at 5.

^{11/} Comments of 4G Americas, GN Docket No. 12-354, at 2 (filed Feb. 20, 2013). The Comments of 4G Americas include an October 2012 white paper which presents a comprehensive explanation of HetNets and how they will be a critical component of commercial networks. *See also* Comments of PCIA – The Wireless Infrastructure Association and The DAS Forum, A Membership Section of PCIA, GN Docket No. 12-354, at 3 (filed Feb. 20, 2013) (“PCIA Comments”); TIA Comments at 3.

providers have licensed access to the 3.5 GHz Band, it will be on a shared basis with incumbent users. However, shared use of spectrum is no substitute for cleared spectrum available to carriers on a geographically and temporally unlimited basis. As the Consumer Electronics Association stated: “[t]he Commission should not in any way substitute dynamic spectrum access in this band – no matter how promising in theory – for concrete actions that clear and reallocate desirable federal spectrum for exclusive commercial use This approach has brought spectrum into the marketplace and billions of dollars into the U.S. Treasury. The Commission should not diverge from this path or delay its ongoing efforts to examine, clear and reallocate other bands.”^{13/}

While T-Mobile agrees that the Commission and NTIA should continue the productive work in which they have been engaged to identify and make available additional exclusive spectrum for commercial operations, the 3.5 GHz Band presents a valuable opportunity to share with incumbent users. However, the sharing approach that the Commission proposes is unnecessarily complex. Other commenters agree. For instance, the Competitive Carriers Association refers to the FCC’s proposed three-tiered shared access model as “overly-complex.”^{14/} CTIA similarly observes that the Commission’s proposal is “problematic for a number of reasons.”^{15/}

^{12/} CTIA Comments at 9.

^{13/} Comments of the Consumers Electronics Association, GN Docket No. 12-354, at 10-11 (filed Feb. 20, 2013) (“CEA Comments”); *see also* Comments of AT&T, GN Docket No. 12-354, at 1 (filed Feb. 20, 2013) (“AT&T Comments”) (asserting that “the Commission should continue to concentrate its efforts on clearing and auctioning exclusive-use spectrum for mobile broadband applications”); CTIA Comments at 2 (“The sharing scenarios investigated here are not a substitute for cleared spectrum for mobile broadband.”); Comments of Qualcomm Incorporated, GN Docket No. 12-354, at ii (filed Feb. 20, 2013) (“Qualcomm Comments”) (“There is no question that our first choice for additional spectrum for mobile broadband remains fully cleared spectrum.”).

^{14/} *See* Comments of the Competitive Carriers Association, GN Docket No. 12-354, at 3 (filed Feb. 20, 2013).

^{15/} CTIA Comments at 13.

In addition to being too complex, the Commission’s plan does not provide priority (*i.e.*, more than general, opportunistic) access to commercial systems. Some commenters urge the Commission to add commercial providers to the entities that would enjoy priority access.^{16/} However, merely adding commercial carriers to the list of users in a three-tier architecture that may compete for access to 3.5 GHz Band spectrum is not optimal. Instead, the Commission should use a two-tiered approach under which a single licensee would have access to the licensed spectrum when the incumbent operator is not using it.

This LSA approach is endorsed by, among others, Qualcomm Incorporated (“Qualcomm”), Nokia Siemens Network US LLC (“NSN”) and Ericsson, which are leading providers of technology and equipment to the wireless communications industry today.^{17/} As NSN explains:

ASA spectrum rights are granted to ASA licensees subject to the terms defined by the relevant authority (government, regulatory) and to the existing usage of incumbent users. ASA licensees use the spectrum on a shared and non-interference basis with the incumbents. Sharing under the ASA framework is binary by nature, as it permits spectrum use by either the incumbent or ASA licensee. The ASA licensee enjoys exclusive spectrum rights of use where and when the spectrum is not used by the incumbent. When the incumbent needs the spectrum back, the ASA licensee will need to evacuate the spectrum and likely will shift to other spectrum A key feature of ASA is that it allows offering a predictable quality of service for all spectrum users when each has exclusive access to that spectrum at a given location and at a given time.^{18/}

^{16/} See, e.g., PCIA Comments at 5 (arguing that “[c]ommercial wireless service providers and other operators should have access to the Priority Access tier”); Comments of Cambium Networks, GN Docket No. 12-354, at 2 (filed Feb. 20, 2013) (proposing that “the second tier consist of commercial broadband service providers”); Comments of the Information Technology Industry Council, GN Docket No. 12-354, at 3 (filed Feb. 20, 2013) (noting that the Priority Access tier need not be limited to “mission critical” uses and that “[c]ommercial users have a similar need for . . . this tier”); Comments of Mobile Future, GN Docket No. 12-354, at 7 (filed Feb. 20, 2013) (“[C]ommercial service providers must be permitted to secure licenses to provide services in specified locations to offload traffic on a non-interfering basis to users in the Incumbent Access tier.”).

^{17/} NSN and Qualcomm refer to the LSA architecture as Authorized Shared Access (“ASA”) and citations to their comments contain that term.

^{18/} NSN Comments at 17.

Qualcomm points out two of the important benefits of using the LSA architecture over the Commission's three-tier approach. First, this approach is already being developed by the European Telecommunications Standards Institute and has been endorsed by 27 European Union member companies.^{19/} In Europe, LSA is being standardized to enable mobile broadband in the 2.3-2.4 GHz band.^{20/} The Commission should take advantage of the significant work that has already been performed elsewhere in order to promote more effective use of the 3.5 GHz Band in the United States.

Second, the LSA paradigm offers benefits to potential and current users of the 3.5 GHz Band over the three-tier approach that the Commission proposes. As T-Mobile pointed out, the uncertainty of being able to access spectrum in the three-tier architecture that the Commission proposes will dissuade carriers from using the spectrum, ultimately preventing the development of a robust equipment market.^{21/} As Qualcomm noted, “[i]n contrast to sharing in an unlicensed regulatory framework where multiple uncoordinated users are permitted access [to] the same frequency band at the same location and at the same time, licensed ASA technology enables a licensed network operator to tightly manage access to the ASA spectrum . . . in order to provide all users with a reliable quality of service”^{22/}

As T-Mobile also noted, general access to the 3.5 GHz Band is not the best way to ensure that incumbent operations are protected.^{23/} LSA provides a better method to prevent harmful interference to existing users. As Qualcomm observed: “ASA, along with licensed operations,

^{19/} Qualcomm Comments at 11.

^{20/} *See id.*; *see also* NSN Comments at 16; Ericsson Comments at 10 (noting, like Qualcomm, that a key report on LSA implementation is due to be released for comment in June 2013 and adopted in November 2013).

^{21/} *See* T-Mobile Comments at 7.

^{22/} Qualcomm Comments at 14.

^{23/} *See* T-Mobile Comments at 8.

provides the command and control structure necessary to utilize and vacate spectrum as needed by government incumbent users; no ‘rogue’ devices can operate in such a framework As a result, ASA can fully protect incumbents, and if there are problems with interference caused by sharing, the ASA licensee is readily identifiable Finally, the information that federal incumbent users will be providing in order to enable sharing with mobile broadband use is sensitive information . . . so it is particularly important that such information be kept secure The ASA regulatory framework . . . is particularly well-suited for these purposes.”^{24/}

C. The 3.5 GHz Band Should be Optimized for TDD Operations

T-Mobile noted that there are already two 3rd Generation Partnership Project (“3GPP”) time division duplex (“TDD”) band classes covering the 3.5 GHz Band, making the band useful for Long Term Evolution (“LTE”) technology.^{25/} Other commenters note the existence of the 3GPP band classes and urge the Commission to optimize the 3.5 GHz Band for TDD use. NSN observes that “TDD mode efficiently uses the spectrum by inherently allowing configurable asymmetry The TDD option would also allow expansion of the band downwards from 3550 MHz and upwards from 3650 MHz in the event additional spectrum is made available while still being covered by 3GPP Bands 42 and 43. [A Frequency Division Duplex (‘FDD’)] band would not allow as smooth expansion.”^{26/} NSN further recommends against mixing TDD and FDD operations in the same band. Alcatel-Lucent also proposes designating the band for TDD use, based on the duplex gap that would be required to support FDD operations.^{27/}

^{24/} Qualcomm Comments at 14-15.

^{25/} See T-Mobile Comments at 9-10.

^{26/} NSN Comments at 10.

^{27/} See Alcatel-Lucent Comments at 12; see also Qualcomm Comments at 16. Qualcomm also points out that “In contrast to a FDD plan, a TDD plan will better support continued full duplex communications if a small cell is required to move to an open channel in order to avoid receiving interference from (or causing interference to) incumbent government users.” Qualcomm Comments at 16. Even though, unlike T-Mobile, it endorses the Commission’s plan for the 3.5 GHz band, Google also

D. A Minimum 10 MHz Block Size is Required

Commenters take different positions on the size of the spectrum block to which 3.5 GHz Band users should have access. Ericsson, for example, urges the Commission “to adopt rules that support large, contiguous channel allocations in multiples of 5 MHz” because Band 42 and 43 channel bandwidths are denoted in multiples of 5 megahertz and such allocations will ensure that LTE technology can make the most use of this band.^{28/} Google recommends channels of at least 20 megahertz because such channels “offer higher statistical multiplexing efficiency, as devices are able to complete bursty transmissions in a shorter duration of time.”^{29/} NSN advocates segmenting the 3.5 GHz Band into two blocks of 50 megahertz each that would be covered by the existing TDD Band 42 and Band 43, harmonizing it with the rest of the world.^{30/}

T-Mobile proposes that the Commission permit the use of the 3.5 GHz Band in blocks of not less than 10 megahertz. Ten megahertz blocks of unpaired spectrum using TDD technology would allow approximately the same performance as 5 megahertz paired blocks used for FDD operations. Ten megahertz blocks would also be consistent with the 3GPP Band 42 and 43 channelization scheme. While Google proposes the use of 20 megahertz blocks, there may not be sufficient spectrum to allow multiple entities to become licensed for 20 megahertz, particularly if some of the 3.5 GHz Band is made available for unlicensed operations. The same is true of 50 megahertz blocks. Licensing the spectrum in 10 megahertz blocks will strike the

anticipates that the band will be used for TDD operations. *See* Comments of Google Inc., GN Docket No. 12-354, at 8 (filed Feb. 20, 2013) (“Google Comments”).

^{28/} Ericsson Comments at 14.

^{29/} Google Comments at 8 (adding that “20 MHz TDD channels coupled with a lack of static partitioning between secondary exclusive and GAA users will ensure a robust mobile broadband experience”).

^{30/} *See* NSN Comments at 8.

appropriate balance between permitting multiple entities access to licensed 3.5 GHz Band spectrum and ensuring that the blocks are large enough to support customer traffic.

E. Small Cell Technology May Reduce the Size of Exclusion Zones

The *NPRM* notes that incumbent use of the 3.5 GHz Band may result in “exclusion zones” within which non-government users would be prohibited from operating.^{31/} According to the *NPRM*, NTIA estimated that the exclusion zones would cover approximately 60 percent of the United States population.^{32/} However, use of the small cell technology that the *NPRM* envisions may result in reduced exclusion zones. As AT&T points out, the “Fast Track Report calculated exclusion zones based on the assumption that the shared spectrum would be used for high-power, high site WiMAX base stations. The Notice, however, proposes a very different service: low-power small cell operations.”^{33/} NSN similarly agrees that “the much lower transmit power typically used in small cells as compared to macro cells will greatly help mitigate interference from the broadband systems into the incumbent systems.”^{34/} Commenters widely agree that NTIA’s recommended exclusion zones are unnecessarily conservative if small cell technology is used.^{35/}

^{31/} See *NPRM* ¶¶ 6-8, 66-68.

^{32/} See *id.* ¶ 6.

^{33/} AT&T Comments at 12 (internal citations omitted).

^{34/} NSN Comments at 22; see also Comments of InterDigital, Inc., GN Docket No. 12-354, at 8 (filed Feb. 20, 2013) (determining that “the 150 km exclusion zone around the FSS earth station seems much too large to be used in this context, especially when this exclusion zone is based on sharing studies that used high power WiMAX devices”); Comments of the National Cable & Telecommunications Association, GN Docket No. 12-354, at 9 (filed Feb. 20, 2013) (noting that the *NPRM* “suggests that the exclusion zones in the Fast Track report may be overstated because they were based on an assessment of commercial deployment of WiMAX equipment in the band”).

^{35/} See, e.g., Qualcomm Comments at 2 (“[I]f lower-power small cell technology are used in the exclusion zones proposed by NTIA, the exclusion zones can be reduced substantially from the sizes originally recommended by NTIA.”); CEA Comments at 8 (“[T]he Commission should evaluate NTIA’s proposed exclusion zones, and narrow those exclusion zones to reflect the proposed use of small cell technology in the band”); Comments of Motorola Solutions, Inc., GN Docket No. 12-354, at 7 (filed Feb.

Accordingly, the FCC should re-evaluate the type of exclusion zones that are necessary. T-Mobile notes that Qualcomm re-calculated the exclusion zones based on NTIA's model but used operating parameters appropriate for small cells. It found that the exclusion zones can be reduced to less than 10 miles in the case it studied, much less than the exclusion zones contemplated by NTIA.^{36/} While T-Mobile has not independently validated Qualcomm's results, they demonstrate that the FCC should not rely on NTIA's initial analysis to determine the size of exclusion zones. The FCC should further evaluate this issue to determine their appropriate size.

III. CONCLUSION

The record in this proceeding supports making the 3.5 GHz Band available for licensed commercial operations. To accommodate incumbent users, parties also agree that the FCC's proposed three-tier mechanism is unnecessarily complex and should be replaced with the two-tiered LSA model. T-Mobile supports that approach and further proposes that the 3.5 GHz Band be optimized for TDD operations, that the spectrum be made available in blocks of not less than 10 megahertz, and that the Commission re-evaluate the size of exclusion zones.

Respectfully submitted,

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20, 2013) (“[T]he originally proposed exclusion zones for the 3.5 GHz band should be relaxed, due to the lower power transmitters and lower deployment densities than were originally studied.”).

^{36/} See Qualcomm Comments at 17, Appendix.