

**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-
3650 MHz Band

GN Docket No. 12-354

COMMENTS OF QUALCOMM INCORPORATED

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SUMMARY

As the record in this proceeding plainly demonstrates, Qualcomm and its wireless industry partners have done an extensive amount of research, development, testing, and refinement for the deployment of small cells in the 3.5 GHz band on a nationwide basis in the most effective and timely manner. This extensive technical work should enable the FCC and all stakeholders to move forward in this proceeding. Previously, Qualcomm explained that a two tier spectrum access framework, called Authorized Shared Access (“ASA”), can be used to support the deployment of small cells to meet consumers’ data demands by opening access to this presently under-utilized band where and when U.S. government incumbent users are not operating. Qualcomm originally proposed this technical-regulatory framework to the FCC more than three years ago, and along with our industry partners, which include European operators, vendors, and even regulators, we have worked to standardize this same two tier framework in ETSI and are deploying it in the EU in the 2.3 GHz band.

Unfortunately, the Commission’s *FNPRM* would delay small cell deployment in the 3.5 GHz band because it proposes to implement a complex and untested technical-regulatory framework that uses three tiers across the entire band and, to boot, the FCC continues to propose for the priority licensed tier ultra-small geographic areas with ultra-short licenses. The Commission would have priority licensed users dynamically share spectrum on an interference-free basis with incumbent federal radar systems and permit general authorized access users to access the spectrum when incumbent federal users and priority licensed users are not operating. This three tier framework, which has not been implemented anywhere in the world, introduces unnecessary complexity and certainly will delay deployment in the band when compared to the two tier solution that has been fully developed, successfully tested, and standardized, and is being deployed in other countries.

The FCC proposes to implement several novel and untested spectrum licensing concepts

quality of service and full mobility may not be necessary and where there is wider bandwidth to support greater capacity and higher data rates such as in the 5 GHz band with 20 to 160 MHz-wide channels and in the 60 GHz band with 2 GHz-wide channels. There also are bands like the 3.5 GHz band, which is underutilized by current incumbent users but not yet made available for mobile broadband. The 3.5 GHz band is used by incumbent federal users only in certain areas of the country and not all the time, so where and when they are not using the band it can be integrated into carrier networks to support full mobility and provide a reliable quality of service. And, by using a simpler two tier spectrum access framework, such as ASA, and relying on an existing cellular technology such as LTE, the 3.5 GHz band can be put to use quickly to help expand mobile network capacity for American consumers.

The *FNPRM* inexplicably proposes to adopt the large exclusion zones to protect incumbent naval radar systems that were in the NTIA Fast Track Report and cover 60% of the U.S. population. The 3.5 GHz band would not be viable with these zones, as the FCC itself recognized in its *December 2012 NPRM*. Fortunately, these exclusion zones were based upon NTIA's belief that the spectrum would be used for a macro-cellular network, but the analysis changes dramatically when small cells are considered.

Our Comments on the *December 2012 NPRM* contained an extensive technical analysis showing that if the 3.5 GHz band is used for LTE small cells operating at lower power levels on a licensed and tightly-managed basis via a two tier framework, interference to radars can be avoided and the required exclusion zones can be drastically reduced from hundreds of kilometers inland to 10 to 20 kilometers inland. While allowing the 3.5 GHz band to be shared by small cells will shrink the exclusion zones substantially and help ease the spectrum crunch, there will be times and locations when the small cells will not be able to use the spectrum because the

government incumbents will be using the spectrum. At those times and locations, the small cells will move to another portion of the 3.5 GHz band, or to another band, using the same multi-band support and frequency agility that today's small cells and mobile devices already utilize.

The FCC can quickly open access to the 3.5 GHz band in the U.S. by taking advantage of the substantial amount of work that has been carried out in Europe to standardize ASA (which ETSI refers to as LSA). This two tier framework provides several major advantages that should be particularly attractive to incumbent federal defense users. It supports a secure interface between federal users and priority licensees and can protect sensitive information, such as when and where naval radars are operating. Implementation of this framework also is completely transparent to the mobile device and does not require any changes to the device or the underlying cellular technology. From the perspective of the user device, operating on 3.5 GHz under this framework is no different from operating on any other cellular band. Once a small cell is cleared for communications by the federal user, operation occurs within the small cell service area, just as it would within a macro-cell, and enables the spectrum to be used for carrier aggregation or supplemental downlink and provide the best possible user experience. In deciding how to best move forward with small cells in the 3.5 GHz band, the FCC should take advantage the extensive work that the wireless industry has done on this two tier framework.

In conclusion, a great deal of work has been done to develop, analyze, and field test small cell technology and develop, test, and standardize a two tier spectrum access framework that will work well in this band. We recommend that the FCC implement a two tier framework in this band and then permit third tier general authorized users when it is shown that they can operate without causing interference to the higher tier incumbent and priority licensees. Qualcomm is very excited about enabling use of the 3.5 GHz band as soon as possible.

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COMMENTS OF QUALCOMM INCORPORATED

QUALCOMM Incorporated (“Qualcomm”) hereby comments on the FCC’s *Further Notice of Proposed Rulemaking* that proposes to implement a number of novel spectrum management concepts in the 3.5 GHz band that the Commission has never before implemented.¹ While Qualcomm has done extensive work on spectrum sharing with incumbent federal users and on small cell technology and remains optimistic about the possibility of timely deploying these technologies in the 3.5 GHz band, Qualcomm is concerned that the Commission is hoping to enable the nationwide rollout of small cells in this band by carrying out multiple simultaneous experiments that include band-wide adoption of a completely novel and untested three-tier technical-regulatory spectrum access framework, limited term licenses with no right of renewal, and census-tract area licenses that could result in more than one million separate licenses to be administered in this band alone. Qualcomm strongly recommends that the FCC rely on a standardized two-tier spectrum sharing framework and implement tried and true spectrum management tools that have worked well in countless other bands to put the 3.5 GHz band to use

¹ See Amendment of the Commission’s Rules with Regard to Commercial Operations in the 3550-3650 MHz Band, GN Docket No. 12-354, *Further Notice of Proposed Rulemaking*, FCC 14-49 (Apr. 23, 2014) (“*FNPRM*”).

for consumers in a timely manner, as described herein. It is critically important that this band be made available as soon as possible to address consumers' insatiable appetite for robust mobile broadband connectivity. Experimentation is important, but Qualcomm believes that this band should be made available using spectrum management tools and licensing means that are known to work well.

INTRODUCTION

Qualcomm is very excited by the possibility of deploying small cells in the 3.5 GHz band because we believe that small cell technology will play an essential role in meeting the mobile broadband demands of users well into the future. Mobile broadband data usage has been doubling annually over the past several years, and if this trend continues for the next ten years, the level of usage in a decade will be more than 1000 times today's level.² In light of this extraordinary growth trend, Qualcomm has set a corporate goal to meet what we call the "1000x Challenge" — to support this growth by expanding the wireless capacity of today's mobile broadband networks by 1000 times. We believe that 3.5 GHz small cells need to play a key role in supporting this growth in devices, applications, services, and data usage, and have proposed means that can put the band to such use in the most efficient and timely manner.

Qualcomm and its wireless partners have shown that the use of a two-tier spectrum access framework, known as Authorized Shared Access or ASA, should be used in the 3.5 GHz band because it is the quickest way to open this underutilized band for mobile broadband use given that the underlying technical work is complete. Operation within the ASA framework does not require any changes to the device or the underlying cellular technology. The small cell base station, like a macro cell base station, simply tells the user device when and where it is able

² See *FNPRM* at ¶ 1.

to operate, and ASA tells the small cell base station when and where it is clear to operate in the 3550 to 3650 MHz band.

The FCC can take advantage of the extensive standardization work on this two tier framework that has been completed in Europe for the 2.3 GHz band. Indeed, since the time we first proposed the ASA framework to the FCC more than three years ago,³ Qualcomm and its industry partners have been hard at work standardizing and implementing ASA in ETSI, and that process is nearly complete.⁴

Qualcomm is concerned that the *FNPRM* proposes to implement a novel, complex, and untested three-tier technical-regulatory framework across the entire 3.5 GHz band and proposes several novel spectrum licensing concepts, such as limited term licenses with no right of renewal and the auction of license rights at the highly granular census tract level. While Qualcomm commends the FCC for considering “outside the box” licensing concepts, we advise the agency against implementing these new concepts in this band for it will delay and could even preclude the necessary capital investment to deploy small cells in the band, which is badly needed to meet users’ exponentially increasing data demands.

We believe that 3.5 GHz spectrum rights should be awarded by geographic area licenses that run for 10 year terms with a renewal expectation (similar to licenses awarded today via auction), or allocated using a licensed-by-rule framework, or perhaps both, each in discrete portions of the 3.5 GHz band. Licensees should be permitted to disaggregate or partition the

³ See Comments of Qualcomm, Inc., at i, 2-3 & 5-10 in ET Docket No. 10-237, *Promoting More Efficient Use of Spectrum Through Dynamic Spectrum Use Technologies* (Feb. 28, 2011); Comments of Qualcomm, Inc., at i & 4-9, in ET Docket No. 10-123, *Spectrum Task Force Request For Information On Frequency Bands Identified By NTIA As Potential Broadband Spectrum* (Apr. 22, 2011). See also Comments of Qualcomm, Inc., at 5-6, in ET Docket No. 10-236, *Promoting Expanded Opportunities for Radio Experimentation and Market Trials under Part 5 of the Commission’s Rules and Streamlining Other Related Rules* (Mar. 10, 2011).

⁴ See Qualcomm Comments (Feb. 20, 2013) at 11-13; Reply Comments (Apr. 5, 2013) at 5-7.

spectrum, which accomplishes the same purposes that the FCC wants to accomplish via the one year term and the small geographic licensing units, but allows the marketplace to work freely. These tried and true licensing means, with which the Commission has had much success, would allow the mode of licensing to be network operator-driven, consumer-driven, or some combination of the two.

DISCUSSION

I. The 3.5 GHz Band Must Be Made Available For Small Cell Use As Soon As Possible

As Qualcomm and its wireless industry partners have explained throughout this proceeding, and as the FCC, NTIA and Congress all recognize, the wireless industry and the federal government need to continue working together to completely clear additional spectrum for mobile broadband use and to investigate and capitalize on sharing opportunities for mobile broadband in spectrum bands like the 3.5 GHz band, which cannot be completely cleared of incumbent federal users in a reasonable time frame. The reason for doing so is clear: We are in the early stages of a mobile broadband revolution and unleashing additional mobile spectrum is essential to supporting America's exponentially increasing mobile data demands.

A. Deployment In The 3.5 GHz Band Will Be Hampered If All Of The FCC's Novel Spectrum Access Proposals Are Implemented At The Starting Gate

It is critically important that the Commission make the 3.5 GHz band available for mobile broadband use as soon as possible, and Qualcomm has provided the FCC with detailed technical information on how to make that a reality. The Commission, however, is proposing rules to govern access to the 3.5 GHz band that Qualcomm fears will delay the mobile industry's ability to put the band to use. Specifically, in the *FNPRM*, the FCC proposes to simultaneously implement at least four novel and untested spectrum management concepts: (1) Dynamically

and among two tiers of commercial users, each with distinct spectrum access rights;

(2) Implementation of licensed small cells on a nationwide basis; (3) Licenses with one-year terms that may be extended for no more than five years total, with no right of renewal;

(4) License areas at the U.S. census-tract level, which would result in approximately 74,000 licenses for each specific swath of spectrum, and more than 1 million total licenses for this band along if the entire 3550 to 3700 MHz band is licensed in 10 MHz blocks.

Implementing just one of these novel concepts in a new spectrum band would introduce challenges to deployment, but if the FCC follows implements all four concepts in the 3.5 GHz band at the starting gate, it will certainly delay deployment by introducing a number of new and currently unsolved complexities, including: (a) the need to manage access to the same swath of spectrum by priority users where and when incumbents are not operating and by general authorized access users when both priority users and incumbents are not operating; (b) the need to keep the information on when and where federal incumbent users are operating completely secure; (c) the need to manage a dynamic interference environment among three discrete tiers of licensees each with different interference rights, which greatly complicates interference remediation efforts when interference does occur; (d) the use of limited-term licenses with no right of renewal that cover such small geographic areas that will be administratively burdensome and undermine investment in the band; and (e) with census-tract sized licenses, the need to continuously manage interference among multiple adjacent priority and general access licensees in close proximity given that multiple disparate and unaffiliated licensees within a several city block radius may hold rights to the same swath of spectrum. Additional challenges are likely to be encountered as these known concerns are examined and addressed, which will further delay much-needed deployment in this important band.

B. Qualcomm And Others In The Wireless Industry Have Shown How The Band Can Be Most Effectively And Quickly Put To Use For Mobile Broadband

Qualcomm and its industry partners have proposed means of simplifying the FCC's proposals to ensure that the band can be timely put to effective use, as explained below. The FCC should implement two tiers in the band initially and only introduce the third general authorized access tier after it is shown that such operations will not interfere with priority and incumbent users. To encourage investment in this shared band, the FCC should use traditional licensing means, such as 10 year license terms with a right of renewal, and larger geographic area licenses, such as those used in other licensed mobile bands. To the extent the Commission wants to conduct an experiment in the 3.5 GHz band using the four untested spectrum management concepts listed in Section I.A above, it should do so in a limited portion of the band, not the entire 100 to 150 MHz swath of spectrum. Implementing all of these novel concepts in the entire band, as the *FNPRM* proposes to do, will delay deployment in the band and put at risk the ultimate goal of using the band to support mobile broadband connectivity.

Qualcomm and its industry partners have proposed using a two tier framework, which is being deployed in Europe, to enable the operation of mobile broadband small cells when and where the incumbent naval radar systems are not operating. In this way, the band can be integrated into networks to support mobile operations and provide a reliable quality of service when the band is available. Qualcomm has demonstrated how this two tier framework, called Authorized Shared Access ("ASA"), would allow small cells to efficiently share the 3.5 GHz band with the incumbents and greatly enhance and expand mobile broadband network capacity.⁵

⁵ See Qualcomm Comments at 15-19.

1. The Original NTIA Exclusion Zones Can Be And Must Be Substantially Reduced To A Few Tens Of Kilometers Inland By Deploying Small Cells

Reducing the NTIA Fast Track Report exclusion zones, which cover 60% of the U.S. population, is critically important to the success of the 3.5 GHz band because the band is not commercially viable if the spectrum is not available in regions of the country where such a large portion of the U.S. population lives. The FCC must not implement regulations that adopt the exclusion zones in the NTIA Fast Track Report, as the *FNPRM* proposes to do,⁶ because it will cripple the usefulness and value of the band to support mobile broadband.

Qualcomm closely reviewed the technical basis for the exclusion zones in the NTIA Fast Track Report and presented in its opening comments⁷ on the *December 2012 NPRM* unchallenged technical analyses showing that the exclusion zones can be reduced by an order of magnitude by deploying small cells that operate with much lower transmit power than the typical cellular macrocells that NTIA had assumed in the Fast Track Report. The analyses considered the impact of ground-based, airborne, and shipborne radar systems on small cell deployments in the coastal area of San Diego and showed that the exclusion zone can be less than 10 miles inland for the case of a small cell attempting to co-exist with radar systems. Qualcomm also has conducted laboratory testing with NTIA to determine the impact of radar system interference on LTE performance. While NTIA is preparing a detailed technical report containing those findings, Qualcomm expects that the report will show that LTE is very robust to radar interference even when LTE is experiencing particularly extreme signal-to-noise ratio conditions.

⁶ See *FNPRM*, App. A – Proposed Rule Section 96.15 – Protection of Federal Incumbents; see also *id.* at ¶ 5.

⁷ See, e.g., Qualcomm February 20, 2013 Comments & Appendix.

Permitting the 3.5 GHz band to be shared by small cells will shrink the exclusion zones substantially, yet there will be times and locations when the small cells are not able to use the spectrum because the government incumbents are operating there. At those times and locations, mobile broadband operations can move to another portion of the 3.5 GHz band, which will be 100 to 150 MHz wide, or to another band, using the same multi-band support and frequency agility that is integral to today's macro cellular, heterogeneous networks. Small cells thus can greatly expand mobile broadband network capacity and bring some relief to the mobile broadband data capacity crunch.

2. The FCC Should Implement A Two Tier Licensing Framework Because It Can Be Deployed Quickly And Effectively, And Support A Guaranteed QoS

The FCC's proposal to implement a three tier spectrum access framework across the entire 3.5 GHz band is worrisome because it introduces a whole host of concerns discussed above and would delay the deployment of small cells in the band. To the extent the FCC wants to experiment in this band using three tiers of spectrum access, it should do so in a limited portion of the band and extend it throughout the band only after it is shown that the general authorized access users can reliably "avoid causing harmful interference to Priority Access Licensees and Incumbent Users" which will require substantial development, testing and refinement. A two tier spectrum framework such as ASA can be deployed much more quickly and reliably.

A Two Tier Framework Can Support Federal Incumbent Users' Needs. As Qualcomm and others have explained, the ASA two tier framework allows commercial licensees to operate within the interstices of the frequency band where and when government users are not using it, and to quickly vacate the spectrum so incumbents can operate on a completely interference-free basis. In this way, ASA can support coast-to-coast mobile broadband operations via small cells

operating on a licensed basis where spectrum is available. As was explained in comments filed last year, “carriers can make even greater use of spectrum for broadband capacity if that spectrum is made available to them on an exclusive basis through licensing [because it] provides significantly greater certainty, allowing more complete integration into carrier networks using LTE technology for both wide-area cells and small cells.”⁸

The ASA two tier structure can support a secure interface between federal users and priority license holders and thus is perfectly suited to protect sensitive information, such as when and where naval radars are operating (or not operating). Moreover, implementation of two tiers under this framework is completely transparent to the end user device. From the perspective of the user’s device, operating on 3.5 GHz is just like operating on any other licensed band and does not require any changes to the device or the underlying cellular technology. A multi-band device that supports 3.5 GHz operations would be controlled by a small cell base station that, like a macro cell base station, tells the device when and where it can operate.⁹

This two tier framework also can allow the spectrum to be used with clear and full accountability at all times for the federal incumbents. Only network OAMs will communicate with the SAS, and vice versa. And, at any given time, at any given location, and at any given portion of the band, if an ASA rights holder is using the spectrum, they will be fully accountable for operating in compliance with the permissible parameters.

⁸ Comments of T-Mobile USA, Inc. (Feb. 20, 2013) at 4. *See also* Comments of Nokia Siemens Networks US LLC (Feb. 20, 2013) at 19-20.

⁹ The priority license holder’s Operations, Administration, and Maintenance (“OAM”) network system would connect to the Spectrum Access System (“SAS”) to determine the interference limits within which operations can occur within a particular channel at a given time and location. The 3.5 GHz band SAS need only know the aggregate receive power level that U.S. government incumbents can tolerate at a given location, time, and frequency — and thus does not need to know exactly where and when federal users are operating. Once a small cell is cleared for communications by the priority licensee’s OAM, operation occurs within the small cell service area within the acceptable power levels, much like it would within a macro-cell.

Virtually All Of The Technical Work To Enable A Two Tier Framework At 3.5 GHz Is Done. As noted above, ETSI is implementing in Europe the ASA two tiered framework, where it is referred to as LSA for Licensed Shared Access. Since Qualcomm filed its comments and reply comments on the *NPRM* and subsequent Public Notices in this docket in 2013 and earlier this year, significant progress has been made in the European Union (“EU”) on ASA/LSA. The FCC should leverage this work.

The two tier regulatory framework is endorsed by the 28 Regulators of EU Member States. In November 2013, the Radio Spectrum Policy Group released its favorable Opinion on LSA.¹⁰ The two tier framework is now defined by CEPT in its approved and published ECC Report 205, which includes implementation guidelines.¹¹ Furthermore, recently approved CEPT ECC Decision (14)02 harmonizes technical and regulatory conditions for mobile use of the 2.3 GHz band and also provides administrations with guidelines for implementing the two tier framework in this band.¹² At the same time, ETSI is working to standardize the ASA/LSA two tiered framework in the 2.3 GHz band; it has approved and published a System Reference Document¹³ defining the criteria and operational features for two tiers and is now working on the

¹⁰ See European Commission, Radio Spectrum Policy Group, “RSPG Opinion on Licensed Shared Access,” RSPG13-538 (Nov. 12, 2013) *available at* https://circabc.europa.eu/sd/d/3958ecef-c25e-4e4f-8e3b-469d1db6bc07/RSPG13-538_RSPG-Opinion-on-LSA%20.pdf.

¹¹ See ECC Report 205 - Licensed Shared Access (LSA) (approved Feb. 2014) *available at* <http://www.erodocdb.dk/Docs/doc98/official/pdf/ECCREP205.PDF>

¹² See ECC Decision (14)02 - Harmonised technical and regulatory conditions for the use of the band 2300-2400 MHz for Mobile/Fixed Communications Networks (MFCN) (approved June 27, 2014) *available at* <http://www.erodocdb.dk/Docs/doc98/official/pdf/ECCDEC1402.PDF>.

¹³ ETSI Technical Report, ETSI TR 103 113 V1.1.1 (2013-07) “Electromagnetic Compatibility and Radio Spectrum matters (ERM); System Reference Document (SRDoc); Mobile broadband services in the 2 300 MHz – 2 400 MHz frequency band under Licensed Shared Access regime” *available at* http://www.etsi.org/deliver/etsi_tr/103100_103199/103113/01.01.01_60/tr_103113v010101p.pdf.

system requirements for operation of Mobile Broadband Systems in the 2.3GHz band under LSA and approval is expected very soon. The two tier framework also was demonstrated with partners at Mobile World Congress 2014 and live trials are underway.

As Qualcomm and others have explained, the FCC should leverage this extensive work because it will help speed deployment of small cell technology in the 3.5 GHz band in the U.S.

3. The Commission Should Rely On Conventional Licensing Mechanisms Until It Proves In Multi-Tiered Dynamic Spectrum Sharing Mechanisms

The *FNPRM* proposes some novel spectrum licensing concepts for the 3.5 GHz band, including one-year spectrum licenses that can be combined for no more than five years with no right of renewal and the auction of license rights at the census tract level.¹⁴ While Qualcomm supports exploration of innovative means of managing spectrum access and licensing spectrum rights such as these, there are at least four reasons why the Commission should not implement these concepts in the 3.5 GHz band.

First, the wireless industry desperately needs more mobile broadband spectrum, and Qualcomm is concerned that testing new licensing concepts, such as those identified above, will delay deployment of small cells in this band. *Second*, Qualcomm also is concerned that these new licensing approaches will cast a cloud of uncertainty over this important new band and deter continued investment. *Third*, the management of spectrum use rights in 74,000 census tracts each with a one-year license term (even if aggregated into a five year terms) would be administratively burdensome for the licensees and could invite rent-seeking spectrum speculators with limited interest in putting the band to use.¹⁵ *Fourth*, the FCC is already engaged in a novel use of the 3.5 GHz band, that is, dynamic spectrum sharing between mobile users and incumbent

¹⁴ See *FNPRM* at ¶¶ 44-52.

¹⁵ Indeed, the *FNPRM* does not propose a build-out requirement and thus would further encourage this troublesome behavior.

naval radar operations, and adding on top of that a brand new, untested licensing scheme for the mobile licensee(s) heightens the other concerns noted above. To the extent the FCC decides to experiment with novel spectrum licensing concepts, it should do so in another band that is not already complicated by the dynamic spectrum sharing environment that will be present at 3.5 GHz.

The FCC should stick with well-established and proven licensing models in the 3.5 GHz band because mobile broadband operators desperately need to incorporate this spectrum into their networks to continuing meeting consumers' exponentially increasing data demands. Accordingly, Qualcomm believes that 3.5 GHz spectrum rights should be allocated by using the more typical larger geographic areas and 10 year license terms with an expectation of renewal, much like licenses awarded today via auction, or in a manner such as the licensed-by-rule framework, or both, each in discrete portions of the bands.¹⁶ In this way, the spectrum may be used for carrier aggregation or supplemental downlink to provide the best possible user experience.

Moreover, with regard to geographic area licensing, the Commission could auction channels in areas across the U.S. as it does with traditional mobile licenses, and allow the auction winners to deploy small cells using ASA within the exclusion zones and perhaps deploy higher-powered macro-cells in inland areas outside the exclusion zones originally identified by NTIA.

4. The 3.5 GHz Band Should Be Allocated In 10 or 20 MHz Blocks And Small Cells Near The Coasts Should Be Allowed To Operate With 30 dBm EIRP

Qualcomm supports the FCC's proposed technical requirements for operations in the 3.5 GHz band with minor modifications. For example, Qualcomm supports licensing the

¹⁶ See *FNPRM* at ¶¶ 45-46.

3.5 GHz mobile broadband spectrum in 10 MHz or 20 MHz unpaired blocks,¹⁷ so that these blocks may be used for Time Division Duplex (“TDD”) or Supplemental Downlink (“SDL”) operations.

3.5 GHz mobile broadband small cells should be allowed to operate with a maximum transmit power of 30 dBm EIRP for cellular-like deployments in both rural and non-rural areas near the coast lines, which is important to protect incumbent federal radar systems.¹⁸ Allowing 47 dBm EIRP in rural locations near the coast lines could cause interference to incumbent systems and should not be allowed.¹⁹ Qualcomm supports the FCC allowing the band to be used at higher-power levels for cellular deployments further inland, farther away from the coast.²⁰

In addition, Qualcomm recommends that the FCC should use a traditional licensing model with static frequency assignments for priority users at the initial stages of implementation because dynamically assigned spectrum allocations adds complexity to an already highly complex interference environment.²¹

C. The FCC Should Verify That Its Novel Three Tier Framework Works Via Testing In Another Band Before Extending It To The Entire 3.5 GHz Band

Qualcomm believes that it is important to study novel spectrum access concepts and novel spectrum management tools because it may lead to more efficient use of the limited spectrum resource. In the *3.5 GHz FNRPM*, however, the FCC is proposing to implement too

¹⁷ See *FNPRM* at ¶ 47 (proposing 10 MHz channels only).

¹⁸ See *id.* at ¶ 74.

¹⁹ See *id.*

²⁰ Qualcomm also supports the proposed out of band emissions limit of -13 dBm/MHz, see *FNPRM* at ¶ 81, so long as the FCC also allows a relaxation that it has applied in other cases, *i.e.*, the use of a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter in the 1 MHz bands immediately outside and adjacent to the relevant frequency block.

²¹ See *id.* at ¶¶ 32-34.

many unproven and untested concepts that will certainly delay deployment of small cells in this band. Access to this band is needed as soon as possible in order to address the mobile broadband data demands.

Verizon recently reported that it is working with Qualcomm and Ericsson to conduct field trials that configure the 3.5 GHz band spectrum as LTE supplemental downlink with its existing wireless network and that later this month Verizon will be testing the ASA two tier framework along with these same companies to demonstrate how the two-tiered spectrum sharing approach can protect government operations from harmful interference.²² As AT&T has explained, integration of a “licensed spectrum band such as 3.5 GHz could offer an ... even better user experience than Wi-Fi as small cells would be connected directly to a mobile operator’s macro network.”²³ AT&T cautions, however, that the FCC’s proposed three-tier approach, in contrast to implementing two tiers, “has a high level of deployment risk – especially if attempted all at once [and] could have disastrous consequences and could actually set progress back.”²⁴

The Commission should ensure that the three tier framework proposed in the *FNPRM* works as designed before it is implemented in the entirety of the 3.5 GHz band. Given that the third tier general authorized access licensees may not cause any interference to the two higher level tiers, namely the federal incumbents and the priority access licensees, allowing such

²² See Verizon Policy Blog by Patrick Welsh, Director - Federal Government Affairs, “Spectrum Sharing in the 3.5 GHz Band” (July 11, 2014) available at <http://publicpolicy.verizon.com/blog/entry/spectrum-sharing-in-the-3.5-ghz-band>

²³ AT&T Public Policy Blog by Stacey Black, Assistant Vice President of Federal Regulatory, “Spectrum Sharing: Let’s Walk Before Running” (May 22, 2014) available at <http://www.attpublicpolicy.com/fcc/spectrum-sharing-lets-walk-before-running/>.

²⁴ *Id.* (“[T]he 3.5 GHz proceeding holds promise as a basis for future applications such as small cells. It would be a shame for it to be delayed or worse, unrealized as a result of a rushed and potentially troubled deployment, especially when alternative proposals to reduce risk and increase certainty readily exist. Spectrum sharing can work, but a “walk before you run” approach is warranted and appropriate.”).

operations inside the 3.5 GHz band — after they are shown to work as designed in all environments — will not delay implementation of priority access licensees via the two tier ASA framework. Requiring that all three tiers operate throughout the entire band at the starting gate, as the *FNPRM* proposes, will certainly delay priority licensed access to the band and impact the usefulness of the band for meeting the exponentially increasing mobile broadband spectrum needs.

CONCLUSION