

**Federal Communications Commission
Washington, D.C. 20554**

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

COMMENTS OF MICROSOFT CORPORATION

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Summary

Microsoft Corp. (Microsoft) applauds the Commission's continued efforts to open up the 3.5 GHz band to wireless broadband. This proceeding could help the Commission achieve its goal of making the most productive and efficient use of this valuable and underutilized spectrum. The final order that the Commission adopts here could set the framework for connectivity in other bands domestically and offer a framework for spectrum sharing globally. Critically, if past is prologue, spectrum policies adopted in this proceeding that promote efficiency and strike the right balance between competition, investment, and innovation will deliver the greatest benefits to consumers. Accordingly, the rules in this proceeding should ensure opportunistic access to shared spectrum nationwide. Microsoft urges the Commission to ensure that its final rules reflect the following key principles:

- **Promoting Opportunistic Access:** The Commission should encourage opportunistic connectivity in the 3.5 GHz band. Just as creation of unlicensed access and emergence of a Wi-Fi device ecosystem helped revolutionize connectivity in the past decade, new regulatory models and new forms of dynamic spectrum access technologies have similar potential. For this reason, the Commission should set aside the greater of 50 MHz or 50 percent of non-incumbent spectrum in each census tract across the extended 3.5 GHz band for opportunistic, General Authorized Access (GAA) connectivity.
- **Nationwide Footprint for Opportunistic Access:** Companies are eager to develop new technologies that connect consumers to the Internet over the 3.5 GHz band. But before committing substantial time and money, they need assurance that the technology will be available to consumers nationwide. Accordingly, the Commission should minimize the size of exclusion zones that will keep more than 60 percent of the U.S. population from obtaining access to this band.
- **Flexibility:** Over-regulation inhibits nascent technologies. The Commission should adopt a light touch to licensing GAA services that provide companies with sufficient flexibility to develop technology that makes the best use of the 3.5 GHz band.
- **Public Confidence in Spectrum Sharing:** A coordinated and well-managed Spectrum Access System (SAS) is key to successful operation of the 3.5 GHz band. Microsoft encourages the Commission to require a process to resolve disputes when two or more SAS Administrators are involved, take further steps to prevent potential discrimination by

SAS Administrators, and facilitate industry discussions for enabling different GAA technologies to coexist.

CONTENTS

I.	THE COMMISSION’S RULES SHOULD RESERVE SUFFICIENT SPECTRUM FOR GAA IN EVERY CENSUS TRACT	3
II.	A NATIONAL FOOTPRINT IS NECESSARY FOR A COMMERCIALY VIABLE GAA ECOSYSTEM TO DEVELOP	6
A.	<u>The NTIA Exclusion Zones are Based on an Outdated Report</u>	6
B.	<u>The Commission Should Expand the Nationwide Footprint through Dynamic Sharing and Inclusion of the 3650-3700 MHz Band</u>	9
III.	THE COMMISSION SHOULD STRUCTURE THE NEW PART 96 REQUIREMENTS TO IMPOSE ONLY THOSE REGULATIONS NECESSARY TO PROTECT INCUMBENTS FROM HARMFUL INTERFERENCE	10
IV.	A WELL-MANAGED SAS IS CRITICAL TO THE SUCCESS OF THE 3.5 GHZ BAND	12

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Microsoft Corp. (Microsoft) appreciates the Commission’s diligence in developing regulations that make the most productive use of the 3.5 GHz band.¹ Through the sharing of spectrum, this underutilized band has tremendous potential to enable the deployment of innovative services and devices based on broadband small-cell technologies that meet the burgeoning consumer demand for wireless connectivity.

Microsoft shares the vision of the President’s Committee of Advisors on Science and Technology (PCAST) that the “norm for spectrum use should be sharing, not exclusivity.”² We support the Commission’s framework of three tiers of access -- Incumbents, Priority Access (PA), and General Authorized Access (GAA) -- managed by a dynamic Spectrum Access System (SAS). We note that the revised framework proposes open eligibility for PA use rather than the Commission’s original vision for the tier.³ In addition to changing the likely mix of PA

¹ Amendment of the Commission’s Rules with Regard to Commercial Operations in the 3550-3650 MHz Band, Docket No. 12-354, Further Notice of Proposed Rulemaking (April 23, 2014) (FNPRM).

² President’s Council of Advisors on Science and Technology, Report to the President, Realizing the Full Potential of Government-Held Spectrum to Spur Economic Growth, July 2012 (PCAST Report) at vi.

³ Amendment of the Commission’s Rules with Regard to Commercial Operations in the 3550-3650 MHz Band, Docket No. 12-354, Further Notice of Proposed Rulemaking (Dec. 12, 2012)

(continued...)

licensees (PALs) and how the PA tier will evolve, it also impacts GAA spectrum use – which is our principal interest.

A thriving GAA ecosystem -- which includes device makers, chip makers, component suppliers, and carriers -- requires a critical mass of GAA spectrum available in every census tract nationwide. Exclusion zones that prevent nearly 60 percent of the U.S. population from using the spectrum band may present an insurmountable hurdle to commercialization. Microsoft recognizes and appreciates that the Commission continues to work with NTIA and other federal agencies to rationalize the extent of the federal exclusion zones required in light of the predominant “small cell” use cases. Success in this endeavor is vital to creating a robust GAA ecosystem.

A well-managed SAS is critical to the successful operation of the 3.5 GHz Band. In particular, the Commission should require mechanisms to automatically resolve disputes that may arise among competing SAS Administrators. Similarly, there needs to be a concerted effort to ensure these devices can coexist in the band because it is likely that GAA devices may employ different standards. At minimum, the Commission should convene the various industry groups to develop industry coordination agreements and protocols. As a backstop, though, the Commission should clarify that it is willing to issue such rules, if necessary.

Microsoft has urged the Commission to allow GAA base stations and end user devices to be unlicensed under Part 2 and Part 15 of the Commission's rules. Because the

(continued...)

(NPRM) at ¶9 (“[A] portion of the 3.5 GHz Band designated for small cell use by certain, quality-of-service dependent users at specific targeted locations which limits these licenses to critical access facilities.”).

FNPRM indicates that the Commission will license GAA under new Rule 96, we urge the Commission to make its Part 96 rules user-friendly and accessible as an unlicensed regulatory regime. Such an approach would allow end-user devices to operate without registration, limit the amount of information the SASs collect, minimize the time SASs maintain information, and minimize the regulatory burden on individuals and non-priority access organizations that want to operate fixed and portable base stations (Consumer Band Radio Service Devices).

I. THE COMMISSION’S RULES SHOULD RESERVE SUFFICIENT SPECTRUM FOR GAA IN EVERY CENSUS TRACT

Sufficient bandwidth is necessary for private sector investment in deploying GAA devices in the 3.5 GHz band. For this reason, assuming the spectrum band is expanded and extends from 3550 to 3700 MHz, the Commission should set aside the greater of 50 MHz or 50 percent of non-incumbent spectrum within each census tract for GAA use.

Microsoft understands the desire to devote part of the band to licensed carriers in a Priority Access (PA) tier, but this should not come at the expense of GAA users. Of particular concern is the FNPRM’s proposal to allow Contained Access Users (CAU) to operate on up to 20 MHz of the GAA portion of the 3.5 GHz band. In the December 2012 NPRM, the Commission envisioned the PA tier as including “hospitals, utilities, state and local governments, and/or other users with a distinct need for reliable, prioritized access to broadband spectrum at specific localized facilities.”⁴

Under the proposed rules in the FNPRM, there would be open eligibility for PA users, and these critical access users could instead use up to 20 MHz on the GAA tier in each

⁴ NPRM at ¶ 9.

census tract. Microsoft is concerned that the FNPRM has effectively created a fourth tier of access for the critical users who were initially contemplated to occupy the PA tier. This change necessarily would shrink the available spectrum and make it difficult to operate GAA devices in census tracts within densely populated areas where part of the band is off limits due to incumbents.

In addition, the FNPRM's proposal on eligibility for this spectrum use is vague, creating the potential for a large number of users to claim reserved spectrum on the GAA tier. Specifically, the FNPRM's definition of a Contained Access User -- a "[q]ualified government and non-government entities entitled to protection with Contained Access Facilities in furtherance of a mission that supports the public interest"⁵ -- does include entities that the Commission earlier had suggested would be PA users, but it also goes considerably beyond that since there is no definition of the term "qualified" and one's interpretation of "the public interest" can be limitless. It also leaves out any reference to "quality-of-service dependent users," which is one of the arguments why an entity should be "entitled to protection."

Likewise, the FNPRM's definition of Contained Access Facilities (CAF) is "[a]n indoor or otherwise physically contained location used by Contained Access Users for the express purpose of performing core mission operations."⁶ This definition also lacks precision and clear limits. For example, if a hospital or state and local government office consists of a campus of adjacent or nearby buildings, would the entire campus be considered a single contained unit, including the outdoor space in between buildings? Without clarity on this point,

⁵ FNPRM at p.65.

⁶ *Id.*

the Capitol Hill complex in Washington, DC could be interpreted to include the entirety of [30] square blocks in the middle of a large city.

The Commission also should require a prospective CAU to demonstrate the need for a higher quality-of-service to justify exclusive use of frequencies within its facility. Successful applicants should be afforded such protection, but as such their reservation should come out of the PA pool of spectrum. Applicants that cannot show such a need are welcome to operate a CBSD as a GAA under the rules covering all GAAs.

Finally, adopting a “use it or share it” approach would help to ensure that sufficient spectrum is available for GAA devices. Microsoft supports proposed rule §96.13(c) and believes it should be extended a step further to make the most efficient use of spectrum. PA licensees may choose to not put their spectrum to use immediately or throughout the entire census tract in which they are authorized to operate. GAA CBSDs and end-user devices should be allowed to access unused PA channels within an entire census tract, or portions thereof, for opportunistic use. The SAS determines the available frequencies at a given geographic location and assigns them to CBSDs.⁷ The SAS can take unused PA channels at a given geographic location within the census tract and make it available to be added into the spectrum pool for GAA use. The GAA CBSD loses access to the channel when there is a PA CBSD requesting a channel assignment from the SAS for immediate use. With a dynamic SAS, the entire process should happen as close to real time as possible.

⁷ *Id.* at ¶ 95.

II. A NATIONAL FOOTPRINT IS NECESSARY FOR A COMMERCIALY VIABLE GAA ECOSYSTEM TO DEVELOP

As Microsoft has noted in an earlier filing:

Opportunistic communications such as the Citizens Broadband Service will only flourish in the 3.5 GHz band if the Commission dedicates sufficient spectrum to GAA. Manufacturers and service providers are prepared to meet the demand for dynamic technology and deploy products and services for the 3.5 GHz band.⁸

Microsoft considers a national footprint with the smallest possible exclusion zones as essential for convincing the private sector to make the significant investments necessary to develop and manufacture devices capable of leveraging 3.5 GHz GAA spectrum.

A. The NTIA Exclusion Zones are Based on an Outdated Report

The Commission proposes adoption of the Exclusion Zones set forth in the National Telecommunications and Information Administration's (NTIA) Fast Track Report for federal incumbent users.⁹ According to the 2010 report:

The 3500-3650 MHz band is used by Department of Defense radar systems with installations on land, on ships and on aircraft. In general, the predominant use in the band by mobile radars is on ships and aircraft. Most of the aircraft and fixed, land-based systems are operated at military training areas and test ranges, recognizing that tactical necessities ultimately determine operational requirements. Functions performed by these systems include search for near-surface and high altitude airborne objects, sea surveillance, tracking of airborne objects, air traffic control, formation flight, and multi-purpose test range instrumentation.¹⁰

⁸ Comments of Microsoft, GN Docket No. 12-254 (Dec. 5, 2013).

⁹ NTIA, An Assessment of the Near-Term Viability of Accommodating Wireless Broadband Systems in the 1675-1710 MHz, 1755-1780 MHz, 3500-3650 MHz, 4200-4220 MHz, and 4380-4400 MHz Bands (Oct. 2010) ("Fast Track Report") at 2-2.

¹⁰ *Id.* at p. vi.

Similarly, the Commission notes that the “[e]xclusion Zones were a condition for the Executive Branch agreeing to provide access to this spectrum for non-federal use.”¹¹

Microsoft recognizes the need to protect federal incumbents and existing primary Fixed Satellite Service (FSS) earth stations operating in the 3.5 GHz band from harmful interference. The Fast Track Report’s exclusion zones would prevent the deployment of 3.5 GHz services to more than 60 percent of the population of the United States, primarily in heavily populated coastal states. Additionally, exclusion zones to protect FSS earth stations licensed to operate in the 3600-3650 MHz band and commercial satellite services licensed to operate in the 3550-3650 MHz bands until the end of the equipment’s useful lifetime will further limit the availability of spectrum in the band for PA and GAA use.¹²

The proposed exclusion zones would discourage many technology companies from manufacturing 3.5 GHz components, chipsets, and devices, and deploying services leveraging GAA and PA spectrum. Developing such new connectivity is expensive. Companies must be assured that their devices could work seamlessly across the entire country, not just in certain regions. Microsoft urges the Commission to continue discussions with the NTIA and other federal agencies to minimize the size of the exclusion zones in terms of geographic extent and frequency offsets to those that are shown to be necessary to protect incumbent users from interference.

In addition, the Commission should be aware that the information in the NTIA’s 2010 Fast Track Report is dated and therefore may be incomplete. Microsoft suggests the

¹¹ FNPRM at ¶ 140.

¹² *Id.* at ¶ 39.

Commission ask NTIA to update the information on federal exclusion zones based on government users that might not have been known to the agency or identified at the time of its 2010 Report, and make this information available to the public (for prospective SAS providers). For example, in the FNPRM, the FCC proposes creating new exclusion zones of a to-be-determined distance from federal facilities in St. Inigoes, MD; Pascagoula, MS, and Pensacola, FL.¹³ It would be helpful to know if other federal exclusion zones are under consideration. The Commission should make available information on the location and size of any new exclusion zones created by proposed changes in the priority or status of any type of satellite service operating on frequencies between 3550 and 3700 MHz.

In the report, NTIA concluded that both geographic separation (exclusion zones) and frequency offsets (40-50 MHz) are required to protect incumbent federal users from any new non-federal users of the 3.5 GHz band.¹⁴ As the Commission, NTIA, and many commenters have noted, NTIA's analysis assumed a 3.5 GHz high power, macro cell transmitter rather than a lower power, small cell transmitter.

Several commenters to the Commission's 2012 NPRM modeled the size of federal exclusion zones assuming a widespread deployment of small cells throughout the 3.5 GHz band.¹⁵ Based on our reading of these comments, the federal exclusion zones could be reduced significantly while still protecting the incumbents from harmful interference.

¹³ *Id.* at p. 81.

¹⁴ Fast Track Report at 4-39.

¹⁵ FNPRM at ¶ 5.

Moreover, when NTIA established the size of the exclusion zones, it did so in part to protect PA and GAA base stations and end user devices from the incumbents' broadcasts. But that approach is flawed: Federal exclusion zones should protect federal incumbent users from PA and GAA users, and not *vice versa*. GAA users are not protected under the rules and must accept interference from incumbents, PA, or other GAA users. Technology may have to be developed to protect GAA (and PA) CBSD and end user devices from the peak field strength¹⁶ emitted by federal incumbents operations, but that is an activity that the private sector will have every incentive to address.

B. The Commission Should Expand the Nationwide Footprint through Dynamic Sharing and Inclusion of the 3650-3700 MHz Band

In addition to using the steps above to look more critically at the NTIA data to ensure the smallest possible exclusion zones, the Commission can take additional steps to make more 3.5 GHz band spectrum available nationally for GAA. Specifically, the Commission should allow the possibility for GAA users to dynamically access spectrum within federal exclusion zones at locations, times, and frequencies when they are not in use by the incumbent. The GAA user assumes all risk of damage to the CBSD and/or end use devices from the incumbent's operations. In this way, additional opportunistic GAA spectrum could be put into use.

Moreover, expanding the size of the band would enable a larger national footprint. The Commission should incorporate the 3650 - 3700 MHz band under its proposed Part 96 rules for the 3550-3650 MHz spectrum band. Incorporating this band would allow more spectrum to

¹⁶ *Id.* at ¶ 143.

be available for GAA use nationwide. As GAA users would be permitted to operate on a range of frequencies in the band that has not been assigned to PA licensees (and not being used by incumbents), GAA CBSDs and end user devices will need to be able to operate on frequencies across the entire 150 MHz of the band.

III. THE COMMISSION SHOULD STRUCTURE THE NEW PART 96 REQUIREMENTS TO IMPOSE ONLY THOSE REGULATIONS NECESSARY TO PROTECT INCUMBENTS FROM HARMFUL INTERFERENCE

Microsoft has argued that GAA devices should be unlicensed under Part 2 and Part 15 of the Commission's rules. Microsoft still believes that this mechanism is the best tool the Commission has for facilitating the deployment of new technologies into the marketplace quickly because of the relatively low regulatory barriers to entry and because the technical rules governing Part 2 and Part 15 devices have proven effective in protecting incumbent users from interference. Microsoft would also like to see low power unlicensed devices not part of the Citizens Band Radio Service, such as for the Internet of Things, to be able to operate in the 3.5 GHz band with minimal requirements.

The FNPRM makes clear that the Commission intends to adopt a form of licensing by rule. The Commission has made efforts to assure unlicensed advocates that its license-by-rule approach for GAA has such a light regulatory touch that it is virtually tantamount to unlicensed access.

Keeping this in mind, Microsoft proposes the following parameters for a light touch approach regardless of which FCC rule part governs spectrum access:

- (1) There should be no SAS registration of end-user devices.

(2) There should be limits on the information the SAS collects and the time it maintains records for Citizens Band Radio Devices (CBSDs) and end-user devices.

(3) The regulatory burden on individuals and non-priority access organizations that want to operate fixed and portable GAA base stations (CBSDs) should be limited to those rules necessary to protect incumbents from harmful interference.

In addition, the Commission should modify the definition of a SAS and the obligations under which they operate to ensure that the SAS will not collect any information from end use devices. The FNPRM defines an SAS as a “system that maintains records of all authorized services and devices in the Citizens Broadband Radio Service frequency bands”¹⁷ and an End User Device as a “fixed, portable, or mobile device authorized and controlled by and authorized by a CBSD.”¹⁸ Taken together, one could conclude that an End User Device is an authorized device, and thus the SAS can maintain records for that End User Device. That is clearly not the intent of the Commission. The FNPRM states that CBSDs do “not include End User Devices”.¹⁹ To make the definition of SAS more consistent with this intent, the Commission should define SAS as a “system that maintains records of all authorized services and Citizens Broadband Radio Service Devices.”

To allay any public concerns that the SAS may use the collected information in a way that might compromise user privacy, the Commission also should adopt a rule requiring

¹⁷ *Id.* at p. 65.

¹⁸ *Id.*

¹⁹ *Id.*

SAS Administrators to disclose if it is using information transmitted by CBSDs and end user devices for any purpose other than operating the SAS. With multiple commercial SAS Administrators, PA licensees and GAA users will have a choice based on their preferences.

IV. A WELL-MANAGED SAS IS CRITICAL TO THE SUCCESS OF THE 3.5 GHZ BAND

Microsoft supports the Commission's proposal to require SASs to make their services available on a transparent and nondiscriminatory basis.²⁰ Microsoft strongly agrees with the Commission's proposal for multiple SAS Administrators.²¹ As the Commission has noted, having multiple Administrators provides consumers with much-needed choice in the marketplace.

Enabling multiple SAS Administrators, however, is only the first step toward preventing discrimination. Discriminatory behavior could occur when the SAS Administrator also controls one or more PALs in the same census tract as its customer. The Commission should explicitly and affirmatively state that a SAS Administrator cannot license (or lease) one or more PA channels either directly or through the secondary market. This structural independence requirement would eliminate the incentive for an SAS Administrator to provide preferential treatment for its PALs and is used by the Commission in other contexts.²²

Under the proposed rules, one of the responsibilities of the SAS Administrator is to establish and follow a process for registering and coordinating PA licensees and a process for

²⁰ *Id.* at Proposed Rule 96.48(j).

²¹ *Id.* at ¶ 91.

²² For instance, the Commission requires the administrators of local number portability to be impartial and neutral. *See* 47 C.F.R. § 52.11.

registering and coordinating GAA users.²³ To further protect consumers, the Commission should require a process to resolve disputes when two or more SAS Administrators are involved. Given the number of census tracts and channels nationwide, the process will have to be automated. But there does need to be some ability for a SAS Administrator to seek recourse with the Commission. The following are examples of some of the disputes that the Commission's dispute resolution process may eventually be asked to address:

- In some census tracts, all PA channels may be interchangeable, while in others, they may not be. One could imagine that, over time, SAS Administrators will develop and test analytics to determine the best channels in a given census tract for different use cases. If multiple SAS Administrators each seek to assign dynamically to its PA customers the same "best" channel(s) in a single census tract at the maximum permissible CBSD transmit power available, what happens? Would there need to be a financial settlement where the PAL that wants one or more specific channels through its SAS pays other PALs (through their respective SASs) to drop their claims? Should the rule be first come, first served?
- Under what circumstances may a SAS Administrator re-assign a PA channel from one licensee to another if each PAL was authorized by a different SAS? One can envision a SAS Administrator's automated computer program trying to give its customer the best channel(s) available. Should there be a "time to live" for each dynamic channel assignment?
- If two PA licensees, each registered by a different SAS, each have CBSDs that allegedly cause interference with one another within a census tract, which SAS ultimately determines which CBSD has to turn down its power if there is a disagreement of which licensee is at fault?

²³ FNPRM Proposed Rules §§ 96.48(d) and (e).

Because the FNPRM envisions a system with multiple SAS Administrators, Microsoft recommends the Commission retain ultimate enforcement authority. This reservation would prevent a single SAS Administrator from exerting too much control over the band.²⁴

Under the Commission's proposed rules, "[t]he SAS would ensure the Priority Access Licensees have access to allotted 10 megahertz channels and that GAA users are provided access to at least 50 percent of the band ... Individual GAA users would be assigned available bandwidth of a size and spectral location determined by the SAS (e.g. from 3550-3556 MHz or 3662-3673 MHz)."²⁵ Conceptually, this type of dynamic frequency assignment for GAA could make highly efficient use of the available spectrum. But there is much work that needs to be done with respect to standards development and other coexistence mechanisms to determine whether such an approach will be practical.

It is expected that some GAA CBSDs operating in the 3.5 GHz band will operate using a LTE standard, and other CBSDs will use a "Wi-Fi" standard. Under the FNPRM's proposed rules, SAS Administrators are responsible for establishing and following a process for registering and coordinating GAA users,²⁶ but they are not responsible for ensuring coexistence of GAA users operating on different technical standards.

Microsoft's preferred method for coexistence in the 3.5 GHz band is to require all GAA devices to employ some form of 'listen-before-talk'. We understand that there are some discussions to address the coexistence of 'Wi-Fi' and LTE-Unlicensed in the 5 GHz band.

²⁴ *Id.* at ¶ 162.

²⁵ *Id.* at ¶ 33.

²⁶ FNPRM Proposed Rule 96.48(e).

Assuming there is some agreed to mechanism, we would expect such an approach is directly applicable to the 3.5 GHz band. The Commission's role should be to facilitate industry discussions in an effort to reach consensus. The Commission also must make it clear that it will serve as the regulatory backstop, if necessary, if industry discussions get completely bogged down.

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Microsoft appreciates the opportunity to comment further on the Commission's diligent efforts to make the best use of the 3.5 GHz spectrum, and is eager to provide any additional information that might be useful as the Commission develops its final rules.

Microsoft urges the Commission to adopt final rules that allocate sufficient spectrum for GAA use across the entire nation, allowing industry to develop new technology to serve consumers over this valuable spectrum.

Respectfully submitted,

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