Before the
Federal Communications Commission
Washington, DC 20554

In the Matter of	)	
	)	
Expanding Flexible Use of the	)	GN Docket No. 18-122
3.7 to 4.2 GHz Band	)	

To: The Commission

COMMENTS OF THE BROADBAND ACCESS COALITION

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TABLE OF CONTENTS

SUMMARY ii

I. Introduction 1

II. Allowing Fixed P2MP Service in the 3.7 GHz Band will Accelerate the Availability of High-Throughput Broadband in Rural Areas 8

- **A. Rural Americans Continue to Lack Access to High-Throughput Fixed Broadband Service and Competitive Choice** 8
- **B. Mid-Band Spectrum is Affordable Infrastructure for Fixed Broadband Service** 11

III. The Commission Should Move Expeditiously To Increase the Intensity of Terrestrial Fixed Use of the 3.7 GHz Band 13

IV. Deployment of Fixed P2MP Broadband Service Will Not Affect FSS Use of the Band 14

- **A. P2MP Can Successfully Share the 3.7 GHz Band with FSS Operators** 15
- **B. The FCC Should Eliminate "Full-Band, Full-Arc" Interference Protection** 16

V. The Commission Should Make Available 300 Megahertz of Spectrum for Licensed Fixed P2MP Broadband Service 19

VI. Fixed P2MP Broadband Service Should be Licensed on a Co-Primary Basis in the Portion of the 3.7 GHz Band that is Not Reserved for Flexible Use 21

VII. Modernizing Part 101 Will Enable Rapid Deployment of Licensed P2MP Fixed Wireless Broadband Service 22

- **A. Authorization of Point-to-Multipoint FS in the 3.7 GHz Band** 22
- **B. Channel Plan** 23
- **C. Service Area and Power Limits** 24
- **D. Build-Out Requirements And Incremental Spectrum Licensing** 25
- **E. Frequency Coordination, Registration, And Licensing Requirements** 26
- **F. Frequency Agility Requirements** 29
- **G. Eliminate Utilization Requirement** 30
- **H. Professional Installation, Equipment Access and RF Exposure** 31
- **I. Automated Frequency Coordination** 31

VIII. Deployment of Fixed P2MP Broadband Service Will Not Affect Possible Future Clearing of the Band for Flexible Use 33

IX. Conclusion 35

SUMMARY

The digital divide is real, and it is persistent. To enable next-generation broadband service in rural America, we need not just subsidies, but spectrum, infrastructure, and competition policy working together to enable rural Americans to have the same access to digital opportunities as urban Americans. While the Commission has worked hard to ensure that infrastructure and subsidy policies align in order to cost-effectively support rural broadband, this proceeding offers the opportunity to ensure that sufficient spectrum is available for all rural Americans to enjoy more robust digital opportunities. This proceeding is about more than 5G, video distribution, or who gets what spectrum: it is about taking a balanced approach that accounts for the needs of rural Americans and creates opportunities for all Americans. And, it is why a broad and diverse coalition of rural providers, equipment manufacturers, technology companies, and consumer groups have come together to propose a balanced approach.

The Broadband Access Coalition ("Coalition") recognizes that winning the "race for 5G" is an important federal objective. However, critical as they are, mobile 5G networks will be just one component of the robust 5G ecosystem that is needed to connect every American home and business nationwide. Connecting the 24 million Americans that lack high-throughput broadband access in their homes is also a national priority – indeed, "closing the digital divide [is Chairman Pai's] top policy priority as FCC Chairman."[1] With 500 megahertz of 3.7 – 4.2 GHz ("3.7 GHz band") spectrum on the table and little more mid-band spectrum in the short-term pipeline, maintaining inefficient and antiquated "full-band, full-arc" protection for fixed satellite service

[1] Remarks of FCC Chairman Ajit Pai at the Fourth Meeting of the Federal Communications Commission's Broadband Deployment Advisory Committee, Jan. 23, 2018, at 1. *See also* Remarks of FCC Chairman Ajit Pai at the Farm Foundation/U.S. Department of Agriculture Summit, April 18, 2018, at 1 ("On my first day as FCC Chairman in January 2017, I said that my number one priority was closing the digital divide and bringing the benefits of the Internet age to all Americans.").

("FSS") would foreclose realization of the myriad consumer benefits of P2MP – a poor policy choice and a wasted opportunity.

In an effort to find a balanced approach, the Coalition has devised and supports a "win-win-win" solution that: (1) protects incumbent FSS operators from harmful interference, (2) clears 200 megahertz in the lower portion of the band for exclusive flexible use licensing, and (3) makes available, on a shared, frequency-coordinated basis with FSS, 300 megahertz of spectrum in the upper portion of the band for fixed P2MP broadband providers to deploy much-needed high-throughput broadband to unserved and underserved customers, particularly in rural areas.

Making available 300 megahertz in the 3.7 GHz band for licensed fixed wireless access will enable service providers to quickly, cost-effectively and intensively deploy gigabit or near-gigabit broadband service to rural Americans. By contrast, making available only 40 or 100 megahertz of spectrum for shared P2MP service will be wholly insufficient for vendors to invest in and develop equipment for the band and for operators to deploy broadband and other fixed wireless services in the band.

Importantly, intensive P2MP use can begin very soon after the new rules become effective. Development of equipment will benefit from equipment already being used in the adjacent 3650 - 3700 MHz band and soon to be widely deployed in the 3550 – 3700 MHz band. The existing Part 101 frequency coordination processes can easily incorporate the addition of P2MP at this time while a transition to more automated coordination procedures is implemented. That said, the Coalition sees no need for a coordination system as complex as the Spectrum Access System ("SAS") developed for the CBRS band, which was conceived to dynamically re-assign shared frequencies, to protect Federal shipborne and ground-based radar systems, and to accommodate two types of flexible use. Those dynamic spectrum management features are not applicable in the 3.7 GHz band. The SAS is far more complex than any automated system

required for P2MP operations in the 3.7 GHz band where there are no Federal incumbents and operators will be transmitting from fixed points to other fixed points, and operating on specific pre-coordinated licensed channels.

Since the coordination process will work equally well for any unused portion of the 3.7 GHz band, P2MP should also be authorized on an opportunistic basis in the lower 200 megahertz of the band. P2MP operators would be required to vacate the spectrum upon deployment of licensed flexible use services in the relevant geographic area.

Fixed P2MP service remains the most cost-effective way to bring broadband service to millions of Americans, primarily in rural areas. Fiber-based solutions cannot be built without substantial public subsidies in areas where population density on a per-road-mile basis is low. Capital costs to deploy fixed wireless systems are a fraction – about one-seventh the cost – of fiber and are still able to provide high-throughput broadband service. Fixed wireless solutions are also far more cost-effective per gigabyte for this purpose than mobile systems.

The Coalition has repeatedly demonstrated that fixed P2MP broadband service can successfully share the 3.7 GHz band with FSS operators. Unlike mobile terrestrial deployments, fixed wireless operators have the ability to coordinate use of spectrum on a localized basis and by sector, taking advantage of various methods, including antenna directionality and terrain shielding, to avoid interference to earth stations.

At present, the 3.7 GHz band is severely underutilized, primarily as a result of the antiquated "full-band, full-arc" licensing policy that requires protection for every satellite earth station across the entire 500 megahertz of the 3.7 GHz band and thereby restricts frequency coordination. In fact, a typical FSS earth station uses far less spectrum, as little as 23 megahertz, and does not communicate with the full panoply of orbital locations. As a result, the Coalition strongly supports the Commission's proposal to eliminate "full-band, full-arc" protection. The

Coalition also strongly supports the Commission's proposal to "develop a more complete record on existing FSS operations in [the 3.7 GHz] band [by requiring] earth station operators to file additional information on their existing facilities."[2] This information is absolutely critical to maximize sharing of the band by terrestrial users.

[2] *Expanding Flexible Use of the 3.7 to 4.2 GHz Band, Order and Notice of Proposed Rulemaking,* GN Docket No. 18-122, FCC 18-91 (rel. July 13, 2018) at ¶ 41.

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COMMENTS OF THE BROADBAND ACCESS COALITION

The Broadband Access Coalition ("Coalition") hereby submits its Comments in response to the above-captioned Notice of Proposed Rulemaking ("NPRM").[1]

I. Introduction

The digital divide is real, and it is persistent. To enable next-generation broadband service to rural Americans, we need not just subsidies, but spectrum, infrastructure, and competition policy working together to enable rural Americans to have the same access to digital opportunities as urban Americans. While the Commission has worked hard to ensure that infrastructure and subsidy policies align in order to cost-effectively support rural broadband, this proceeding offers the opportunity to ensure that sufficient spectrum is available for all rural Americans to enjoy more robust digital opportunities.

Making available 300 megahertz in the 3.7 – 4.2 GHz band ("3.7 GHz band" or "C-band") for fixed wireless access will enable service providers to quickly and cost-effectively deploy gigabit or near-gigabit broadband service in rural America. It will enable providers that have been diligently coordinating unlicensed spectrum to provide robust broadband to take their deployments and service to the next level: meeting the voracious consumer appetite for more and

[1] *Expanding Flexible Use of the 3.7 to 4.2 GHz Band, Order and Notice of Proposed Rulemaking,* GN Docket No. 18-122, FCC 18-91 (rel. July 13, 2018) ("NPRM" or "Order"). A list of the members of the Coalition is attached as Exhibit 1 hereto.

more bandwidth, enabling critical precision agriculture applications, widening the availability of high-speed telemedicine services, and ensuring that this generation of rural Americans have educational opportunities on par with their urban peers. And, it will enable more robust competition among fixed broadband providers. This proceeding is about more than 5G, video distribution, or who gets what spectrum: it is about taking a balanced approach that accounts for the needs of rural Americans and creates opportunities for all Americans. And, it is why a broad and diverse coalition of rural providers, equipment manufacturers, technology companies, and consumer groups have come together to propose a balanced approach.

Therefore, the Coalition applauds the Federal Communications Commission ("FCC" or "Commission") for recognizing the importance of providing high-speed broadband service to unserved and underserved rural areas, and the role that fixed point-to-multipoint ("P2MP") can play in providing such service.[2] Further, the Coalition commends the Commission for recognizing that the 3.7 GHz band, currently used primarily by Fixed-Satellite Service ("FSS") operators, can be shared with P2MP operators,[3] and that the public interest demands that the C-band spectrum be used more efficiently. In this regard, the Coalition appreciates the Commission's initiative in requiring FSS earth station operators seeking interference protection to register their receive-only earth stations with the Commission as a necessary precursor to using the frequency coordination process to maximize sharing among incumbent FSS users and future P2MP providers.[4]

[2] NPRM at ¶ 3 ("For example, fixed wireless services provide an additional opportunity to connect rural communities ….")

[3] *Id.* at ¶ 50 ("frequency coordination allows FSS and terrestrial fixed microwave to share the band on a co-primary basis, but coordination of mobile devices would be more complicated ….").

[4] Order at ¶¶ 18 – 22.

To find a balanced approach, the Coalition has devised and supports a "win-win-win" solution that: (1) protects incumbent FSS operators from harmful interference; (2) clears a portion of the band for exclusive flexible use licensing; and (3) enables fixed P2MP broadband providers to deploy badly needed high-throughput broadband to unserved and underserved customers, particularly in rural areas, initially using existing Part 101 frequency coordination rules.[5] The Coalition emphasizes that its proposals are consistent with other proposals to clear a portion of the 3.7 GHz band for flexible use licensing. Specifically, the Coalition supports segmenting the 500 megahertz of spectrum in the 3.7 GHz band as follows: (1) reserve and clear the lower 200 megahertz for flexible use licensing and a guard band; (2) maintain and, as necessary, re-pack FSS operations in the upper 300 megahertz; and (3) authorize P2MP to share the upper 300 megahertz with FSS on a frequency coordinated basis. The Coalition recognizes that certain "flexible use" services require "clean" spectrum because it is difficult for mobile services to share with FSS downlinks or fixed P2MP broadband. That is not the case for sharing between FSS and P2MP uses, both of which operate on a fixed-location basis.

Specifically, the Coalition strongly supports making 300 megahertz of spectrum available for licensed P2MP broadband wireless services in the upper portion of the 3.7 GHz band. By contrast, making only 40 or 100 megahertz of spectrum available for frequency coordinated licensing under Part 101 will discourage investment in the equipment and technology ecosystem and needlessly leave much of the band fallow in much of rural America. It is important to remember that in any given market, the presence of protected FSS facilities will further limit the amount of spectrum that P2MP licensees can coordinate in the upper portion of the band.

[5] In assessing the total economic benefit of the Coalition's proposal, the Commission must aggregate the combined benefits of exclusive "flexible use" spectrum, continued FSS operations, and P2MP broadband service to unserved and underserved areas. More specifically, the economic benefits with respect to the upper portion of the 3.7 GHz band are not only the addition of P2MP broadband services, but also the continued provision of FSS service.

The Coalition recognizes that winning the "race for 5G" is an important federal objective. However, critical as they are, mobile 5G networks will be just one component of the robust 5G ecosystem that is needed to serve every American home and business nationwide. Connecting the 24 million Americans that lack high-throughput broadband access in their homes is also a national priority – indeed, "closing the digital divide [is Chairman Pai's] top policy priority as FCC Chairman."[6] With 500 megahertz of 3.7 GHz spectrum on the table and little more mid-band spectrum in the short-term pipeline, preserving inefficient and antiquated "full-band, full-arc" protection would foreclose the myriad consumer benefits of P2MP – a poor policy choice and a wasted opportunity.

Importantly, P2MP services can be deployed rapidly and simply by slightly modifying existing Part 101 frequency coordination criteria and procedures to accommodate P2MP services. By contrast, clearing thousands of FSS receive-only facilities from a portion of the band will take years. During this time, and having the benefit of crucial technical details from incumbent FSS earth station operators, the Commission should enable commercial use of the upper 300 megahertz of the 3.7 GHz band for P2MP services. This authorization to coordinate into unused spectrum for P2MP should extend across the entire band, albeit on an opportunistic basis in the lower 200 megahertz of the 3.7 GHz band.

Finally, while P2MP operators can begin immediately to coordinate localized deployments with FSS incumbents under existing Part 101 rules, the Commission should also authorize a multi-stakeholder process to develop a more automated frequency coordination

[6] Remarks of FCC Chairman Ajit Pai at the Fourth Meeting of the Federal Communications Commission's Broadband Deployment Advisory Committee, Jan. 23, 2018, at 1. *See also* Remarks of FCC Chairman Ajit Pai at the Farm Foundation/U.S. Department of Agriculture Summit, April 18, 2018, at 1 ("On my first day as FCC Chairman in January 2017, I said that my number one priority was closing the digital divide and bringing the benefits of the Internet age to all Americans.").

system that can lower transaction costs, speed time to market, use spectrum more efficiently, and ensure that opportunistic users are denied permission if and when a licensee in the "cleared" portion of the band is ready to commence service in an area.

A. Petition For Rulemaking

On June 21, 2017, the Coalition filed a Petition for Rulemaking ("Petition") proposing to amend and modernize Parts 25 and 101 of the Commission's Rules to enable deployment of high-throughput, licensed P2MP fixed wireless broadband services in the 3.7 GHz band in a spectrally efficient manner, while protecting FSS and Fixed Service ("FS") incumbents from harmful interference through frequency coordination.[7] With a sufficient amount of spectrum and appropriate implementation of the Petition's proposals, these P2MP operations can facilitate the rapid deployment of much-needed gigabit and near-gigabit fixed broadband service to rural and other underserved areas.

The Petition proposed specific and concrete rule changes that would enable the immediate introduction of P2MP fixed wireless broadband service into the 3.7 GHz band without disrupting incumbent operations.[8] The Coalition is pleased that the Commission is proposing to adopt, or is seeking comment on, many of these proposals, and is requiring FSS operators that seek interference protection to register and update the IBFS database in order to obtain accurate inputs for a sharing regime.

The Petition emphasized that in less densely populated areas, fixed wireless technology is an efficient and cost-effective way for consumers to receive broadband services in their homes and at their businesses and community anchor institutions. In a growing number of rural areas,

[7] *See* Broadband Access Coalition, Petition for Rulemaking, filed June 21, 2017, RM-11791.

[8] *See id.* at 27 – 35.

fixed wireless technology is being combined with optical fiber to form cost-effective hybrid fiber-wireless networks.

The Coalition filed extensive comments and reply comments in response to the Commission's Notice of Inquiry regarding mid-band spectrum.[9] The Coalition also filed comments and reply comments in response to the Commission's Public Notice seeking comment on the feasibility of allowing commercial wireless services to share use of the 3.7 GHz band.[10] Since filing its Petition, the Coalition also has made numerous *ex parte* presentations with the Commission.

B. The Broadband Access Coalition

The Coalition is a diverse group of over 30 broadband service providers, technology companies, equipment vendors, trade associations, frequency coordinators, and non-profit organizations that support the development and deployment of licensed P2MP service in the 3.7 GHz band as a new means to enable affordable, high-throughput, last-mile broadband access in rural and other high-cost areas. Members of the Coalition include associations such as NTCA – The Rural Broadband Association, ITTA – The Voice of America's Broadband Providers, the Rural Wireless Association, and the Wireless Internet Service Providers Association ("WISPA"), companies such as Cincinnati Bell and Rise Broadband, and consumer groups such as the Consumer Federation of America, the Open Technology Institute at New America, and the Schools Health Libraries Broadband coalition. A complete list and brief description of each Coalition member is provided in Exhibit 1.

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[9] Notice of Inquiry, *Expanding Flexible Use in Mid-Band Spectrum between 3.7 and 24 GHz*, GN Docket No. 17-183, FCC 17-104 (rel. Aug. 3, 2017) ("Mid-Band NOI"). The Coalition filed its Comments on October 2, 2017 and its Reply Comments on November 15, 2017.

[10] Public Notice, *Expanding Flexible Use of the 3.7 – 4.2 GHz Band*, GN Docket No. 18-122, DA 18-446 (rel. May 1, 2018) ("3.7 GHz Band Public Notice"). The Coalition filed its Comments on May 31, 2018 and its Reply Comments on June 15, 2018.

In response to the Mid-Band NOI, a large number of commenters representing a wide range of interests voiced strong support either for the Coalition's specific proposals or for the general spectrum allocation approach advocated by the Coalition for the 3.7 GHz band. For example, major incumbent wireline carriers, including Frontier and Windstream, expressed specific support for moving forward with a rulemaking proceeding rooted in the Petition.[11]

C. The NPRM

In the NPRM, the Commission "seek[s] to identify potential opportunities for additional terrestrial use – particularly for wireless broadband services – of 500 megahertz of mid-band spectrum between 3.7 – 4.2 GHz."[12] In so doing, the Commission explains that it is "pursuing the joint goals of making spectrum available for new wireless uses while balancing desired speed to the market, efficiency of use, and effectively accommodating incumbent Fixed-Satellite Service (FSS) and Fixed Service (FS) operations in the band."[13] Consistent with the Coalition's Petition, the Commission "seek[s] comment on potential changes to the Commission's Rules to promote more efficient and intensive *fixed* use of the band on a shared basis starting in the top segment of the band and moving down."[14]

The Commission recognizes that "many communities still lack access to meaningful broadband connectivity."[15] Specifically, the Commission observes that "[m]ore intensive use of spectrum can allow wireless operators to fill gaps in the current broadband landscape. For

[11] *See generally*, Comments of Frontier Communications Corporation, Windstream Services, LLC, and Consolidated Communications, filed October 2, 2017 in response to the Mid-Band NOI.

[12] NPRM at ¶ 1.

[13] *Id.* at ¶ 2.

[14] *Id.* (emphasis added).

[15] *Id.* at ¶ 3.

example, fixed wireless services provide an additional opportunity to connect rural communities and to offer competitive wireless alternatives in urban areas."[16]

II. Allowing Fixed P2MP Service in the 3.7 GHz Band will Accelerate the Availability of High-Throughput Broadband in Rural Areas

A. Rural Americans Continue to Lack Access to High-Throughput Fixed Broadband Service and Competitive Choice

Recent Commission reports confirm the lack of fixed broadband availability and consumer choice in rural areas. According to the Commission's *2018 Broadband Progress Report*, as of December 2016, 16.1 percent of rural Americans lack access to fixed terrestrial broadband service at 10/1 Mbps, 30.7 percent lack access to fixed terrestrial broadband at 25/3 Mbps, and 36 percent lack access to fixed terrestrial broadband service at 50/5 Mbps.[17] Overall, more than 24 million Americans lack access to fixed terrestrial broadband at 25/3 Mbps.[18] Where broadband is available to rural Americans, competition is generally lacking – 48 percent have access to one provider, only 13 percent have access to more than one provider and 39 percent have access to none.[19] In addition to the urban-rural divide, there is also a broadband competition gap when it comes to high-speed broadband. Only 42 percent of developed census blocks in the U.S. have access to more than one provider offering fixed broadband speeds of at least 25/3 Mbps, and only 12 percent of developed census blocks in the U.S. have access to more than one provider offering fixed broadband speeds of at least 100 /10 Mbps.[20]

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[16] *Id.*

[17] *See 2018 Broadband Deployment Report*, FCC 18-10 (2018), at ¶ 57 (Table 4). *See also 2016 Broadband Progress Report*, 31 FCC Rcd 699, 738, n.261 (2016) (average land area of census tracts without 25/3 Mbps access is 84.8 square miles compared to 5.9 square miles for census tracts with access).

[18] *Id.* at ¶ 50.

[19] *See 2016 Broadband Progress Report* at ¶ 86 (Table 6).

[20] *See* "Internet Access Services: Status as of June 30, 2016," Industry Analysis and Technology Division, Wireline Competition Bureau (April 2017) ("*2017 Internet Access Report*"), at Fig. 4. Figure 4 shows that 58 percent of developed census blocks have access to one or fewer service providers offering

The Commission's *2016 Broadband Progress Report* also found a correlation between broadband access and household income, concluding that "[o]n average, the proportion of the population with access to each type of service [fixed terrestrial at 25/3 Mbps and mobile LTE] is highest in counties with the highest median household income, the highest population density, the lowest poverty rate, and the lowest rural population rate."[21] It is likely that consumers in rural areas will be less able to afford residential broadband service than their urban counterparts. According to the U.S. Department of Agriculture, 85.3 percent of persistent poverty counties – those that have consistently had high poverty rates over the last 30 years – are in non-metro areas.[22] As Chairman Pai has stated, "[i]n urban areas 98% of Americans have access to high-speed fixed service. In rural areas, it's only 72%. 93% of Americans earning more than $75,000 have home broadband service, compared to only 53% of those making less than $30,000."[23]

A recent Pew Research Center report observed that 24 percent of rural adults view access to high-speed Internet to be a major problem,[24] and "an additional 34% of rural residents see [access to high-speed internet] as a minor problem, meaning that roughly six-in-ten (58%) believe access to high speed internet is a problem in their area."[25] By contrast, 13 percent of

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broadband speeds of 25/3 Mbps and 88 percent of developed census blocks have access to one or fewer service providers offering broadband speeds of 100/10 Mbps. Further, Figure 4 *overstates* the level of competition because "a provider that reports offering service in a particular census block may not offer service, or service at that speed, to all locations in the census block." *Id*. at 6.

[21] *See 2018 Broadband Progress Report* at ¶ 62.

[22] The United States Department of Agriculture, Geography of Poverty, March 1, 2017, *available at* https://www.ers.usda.gov/topics/rural-economy-population/rural-poverty-well-being/geography-of-poverty/ (last visited July 15, 2017). *See also* "What Unites and Divides Urban, Suburban and Rural Communities," Pew Research Center (May 22, 2018) ("Pew Report"), at 89 (showing that about one-third of rural counties have concentrated poverty, *i.e.*, 20 percent or more residents are in poverty).

[23] Remarks of FCC Chairman Ajit Pai at "Broadband for All" Seminar, Stockholm, Sweden, June 26, 2017, at 1.

[24] *See* Pew Report at 45.

[25] Monica Anderson, "About a quarter of rural Americans say access to high-speed internet is a major problem," Pew Research Center, Sept. 10, 2018, *available at* http://www.pewresearch.org/fact-

Americans residing in urban areas and just nine percent of those residing in suburban areas view access to high-speed internet as a major problem.[26] Chairman Pai summed it up this way:

> If you live in rural America, you are much less likely to have high-speed Internet service than if you live in a city. If you live in a low-income neighborhood, you are less likely to have high-speed Internet access than if you live in a wealthier area. The digital divide in our country is real and persistent.[27]

Beyond the statistics and probabilities lie the real effects of a lack of fixed broadband access. An article from *The Post and Courier*, the Pulitzer Prize-winning daily newspaper in Charleston, South Carolina, reported that, in the six-county Low Country Promise Zone, "[t]wo in five residents can't buy broadband Internet because the infrastructure doesn't exist."[28] The article further states that leaving tens of thousands of people without broadband access "will have lasting effects that could leave the region behind. They see a problem with implications for their residents' health, education and economic opportunity. Their concerns echo through rural corners of the country from coast to coast."[29]

Education, the future of these communities, is also burdened by this high-speed broadband gap. According to the nonprofit EducationSuperHighway, 6.5 million students remain unconnected at school and 77 percent of those students live in rural areas.[30] The same study

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tank/2018/09/10/about-a-quarter-of-rural-americans-say-access-to-high-speed-internet-is-a-major-problem/ (last visited Oct. 19, 2018).

[26] *See* Pew Report at 45.

[27] Remarks of FCC Chairman Ajit Pai at the American Enterprise Institute, *The First 100 Days: Bringing the Benefits of the Digital Age to All Americans*, May 5, 2017, at 2.

[28] Thad Moore, *Half of South Carolina's rural 'Promise Zone' doesn't have Internet access. It has a plan to get it.*," THE POST AND COURIER, Dec. 2, 2017, *available at* https://www.postandcourier.com/business/half-of-south-carolina-s-rural-promise-zone-doesn-t/article_df05ac94-d624-11e7-b069-6fc7654c4377.html (last visited Dec. 4, 2017) ("Post and Courier Article").

[29] *Id.*

[30] EducationSuperHighway, "2017 State of the States" (2017), *available at* https://s3-us-west-1.amazonaws.com/esh-sots-pdfs/educationsuperhighway_2017_state_of_the_states.pdf .

found that schools from rural and small towns make up 3/4 of the schools without fiber.[31] Similarly, the Department of Education reported that 71 percent of students aged 5-to-17 years old in rural areas have fixed broadband, compared to 84 percent of students in the same age bracket in suburbs, and 74 percent of students in cities.[32]

It cannot be disputed that there is a persistent digital divide in this country, that rural Americans are on the wrong side of that divide, and that disconnection from the digital economy can have profound economic and social effects. According to a recent report, "[i]n rural markets, FWA [fixed wireless access] is rapidly becoming a more prevalent solution, since there's no magic bullet for lowering the cost to build out a fixed infrastructure."[33] Access to unused mid-band spectrum as infrastructure that enables the deployment of high-throughput and affordable fixed broadband service is an essential tool for bridging that gap.

B. Mid-Band Spectrum is Affordable Infrastructure for Fixed Broadband Service

In many areas of the U.S., consumers can obtain access to fixed broadband service only through a wireless internet service provider ("WISP"). A primary reason is that wired technologies such as fiber-to-the-home ("FTTH") and cable broadband cannot be cost-effectively deployed in areas with low population density.[34] In June 2017, the *Wall Street Journal* reported that "[r]ural America can't seem to afford broadband: Too few customers are spread over too great a distance. The gold standard is fiber-optic service, but rural internet providers say they

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[31] *Id.*

[32] "Student Access to Digital Learning Resources Outside of the Classroom," U.S. Department of Education (April 2018), Figure 11.1, page 65, *available at* https://nces.ed.gov/pubs2017/2017098.pdf.

[33] Mark Lowenstein, "*The Business Case for Fixed Wireless Access*," Sept. 2018, *available at* https://mwca2018.netcommwireless.com/ (last visited Oct. 19, 2018).

[34] *See, e.g.*, Hal Singer, *Assessing the Impact of Removing Regulatory Barriers on Next Generation Wireless and Wireline Broadband Infrastructure Investment* (June 2017), at 32 (estimating that, even if infrastructure barriers are removed, only 71 percent of the nation's premises will be economically viable for fiber).

can't invest in door-to-door connections with such a limited number of subscribers."[35] In the Low Country Promise Zone, local governments are mapping water tanks to enable fixed wireless broadband. As *The Post and Courier* states, "[f]rom the right vantage point, telecom companies could beam Internet service to homes miles away, rather than lay fiber. The idea is to take a page from satellite Internet, but with broadband beamed from water towers instead of space."[36]

Fixed P2MP service remains the most cost-effective way to bring broadband service to millions of Americans, primarily in rural areas. Fiber-based solutions cannot be built without substantial public subsidies in areas where population density is low. Capital costs to deploy fixed wireless systems are a fraction – about one-seventh the cost – of fiber and are still able to provide high-throughput broadband service.[37] They are also far more cost-effective per gigabyte for this purpose than mobile systems. This comes about primarily because of their longer range through use of highly-directional client antennas (as proposed by the Coalition) that have considerable gain compared to mobile client antennas, and are mounted at a higher location above ground, typically near rooftop height. This approach also makes efficient use of spectrum, as the directional client antennas can separate out signals from multiple base stations whose coverage may overlap on the same frequency.

Fixed P2MP systems also can bring service to unserved areas much more rapidly than fiber. No pole attachment processes or make-ready are required, nor does a path require the same environmental review. Construction is also far faster. An access point can be mounted on

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[35] Jennifer Levitz and Valerie Bauerlein, *Rural America is Stranded in the Dial-Up Age*, WALL ST. J., June 16, 2017, at A1. The article estimates that it costs $30,000 per mile to install optical fiber.

[36] Post and Courier Article. Many WISPs rely on vertical infrastructure such as water tanks and grain silos, in addition to traditional communications towers.

[37] *See* The Carmel Group, *Ready for Takeoff: Broadband Wireless Access Providers Prepare to Soar with Fixed Wireless*, (2017) ("Carmel Report"), at 12, Fig. 6.

an existing structure and placed into service almost immediately, in this case pending only frequency coordination.

The proposals in the Coalition's Petition, now largely articulated in the NPRM, offer a new and immediate opportunity for broadband providers, industrial IoT interests, utilities, and others to invest in network upgrades that can expand the availability and sustainability of affordable access to consumers in areas that are currently underserved.

III. The Commission Should Move Expeditiously To Increase the Intensity of Terrestrial Fixed Use of the 3.7 GHz Band

In light of the foregoing, the Coalition strongly supports the Commission's goal to make more efficient and intensive use of mid-band spectrum.[38] In the NPRM, the Commission seeks comment on making the spectrum available for "flexible use" and on adding "more intensive fixed use in the band by permitting point-to-multipoint service as a means to encourage efficient, cost-effective broadband deployment, particularly in rural areas."[39]

The Commission correctly recognizes that more intensive fixed use of the band will be far easier to accomplish than increased mobile use of the band. The Commission observes that "frequency coordination allows FSS and terrestrial fixed microwave to share the band on a co-primary basis, but coordination of mobile systems would be more complicated because [of] the movement of devices …."[40]

The 3.7 GHz band can be made available for fixed P2MP use easily and quickly. The band already is used for commercial purposes and does not need to be transferred from or shared with Federal government users. There are no ground-based or coastal Federal users to protect, and thus no need for sophisticated hierarchical sharing methods or exclusion zones to protect

[38] NPRM at ¶ 47.

[39] *Id.* at ¶ 49. The Coalition interprets "flexible" use to consist primarily of mobile and 5G use.

[40] *Id.*at ¶ 50.

sensitive military uses. The band is already allocated for FS and, therefore, no change to the Table of Allocations is necessary to include P2MP. Frequency coordination criteria and procedures, and the ULS and IBFS databases, are already in place.

Not only can the rules be amended in short order, but intensive P2MP use can begin very soon after the new rules become effective. Development of equipment will benefit from equipment already being used in the adjacent 3650 - 3700 MHz band and soon to be widely deployed in the 3550 – 3700 MHz band. As explained further below, the existing Part 101 frequency coordination processes can easily incorporate the addition of P2MP at this time while the transition to a more automated coordination procedure is developed.

IV. Deployment of Fixed P2MP Broadband Service Will Not Affect FSS Use of the Band

In its Petition and throughout this proceeding, the Coalition has repeatedly demonstrated the feasibility of P2MP fixed wireless broadband service sharing use of the 3.7 GHz band with incumbent FSS users and FS licensees pursuant to the well-established Part 101 coordination process.[41] More specifically, the Coalition,[42] together with Google,[43] presented an extensive technical analysis to Commission staff showing how P2MP fixed wireless broadband services can effectively and efficiently share use of the 3.7 GHz band with incumbent FSS users, particularly in large, rural parts of the country, on both a co-channel and non-co-channel basis.

[41] *See* Comments of the Broadband Access Coalition, filed Oct. 2, 2017, and Reply Comments of the Broadband Access Coalition, filed Nov. 15, 2017, in response to the Mid-Band NOI.

[42] *See* Broadband Access Coalition, Notice of Oral *Ex Parte* Presentation, GN Docket 17-183 and RM-11791 (March 29, 2018) ("Google/BAC Technical Presentation"). The technical analysis can be found at: https://ecfsapi.fcc.gov/file/10329174176162/Notice%20of%20Ex%20Parte%20Meetings%20-%20Broadband%20Access%20Coalition%20and%20Google%20LLC.pdf.

[43] Google is not a member of the Coalition.

A. P2MP Can Successfully Share the 3.7 GHz Band with FSS Operators

In Section VI below, the Coalition proposes specific changes to Part 101, including accelerated frequency coordination, to ensure that P2MP is not deployed unless and until frequency coordination with licensed or registered FSS incumbents is completed. Unlike mobile terrestrial deployments, fixed wireless operators have the ability to coordinate use of spectrum on a localized basis and by sector, taking advantage of various methods, including antenna directionality and terrain shielding, to avoid interference to earth stations.

P2MP operators can maximize unused spectral capacity based on geographic separation (co-channel) and frequency separation (non-co-channel). As Google stated in its Comments, "[w]ith actual knowledge of FSS frequency use, frequency separation could enable P2MP broadband connectivity to as many as 120 million Americans."[44] Frequency-coordinated P2MP providers can protect nearby earth stations by operating on C-band frequencies not being used at a given time and sufficiently separated from nearby earth stations (non-co-channel sharing).

In addition to sharing unused spectrum, fixed P2MP providers can also operate co-channel on a geography-coordinated basis outside of any protection zone required to protect C-band downlinks. As noted above, P2MP operators have the ability to coordinate the use of spectrum on a localized basis and by sector. Unlike a mobile deployment, which is inherently omnidirectional and moveable, a *fixed* P2MP deployment is geographically targeted and operates on a directional, sectorized basis, and thus can be coordinated to ensure geographic and directional isolation from earth stations.[45] The directional nature of *fixed* wireless P2MP also

[44] Comments of Google LLC in response to 3.7 GHz Band Public Notice, at 5, citing Google/BAC Technical Presentation.

[45] *Id.* at 5 - 6.

permits the coordination of sectors even where earth stations are in the area, but outside the beam of the base station and of the clients' return path.

In fact, the Coalition expects that in many geographic areas P2MP operators will be able to coordinate use of all, or nearly all, of the spectrum set aside for P2MP service. The Google/Coalition Technical Presentation analyzed the real-world FSS operation on the Monterey Peninsula illustrated this, by taking advantage of antenna directionality and other methods to avoid interference, even to nearby earth stations.[46] And, unlike nationwide mobile providers that desire a wide footprint of spectrum, P2MP deployments can occur on a localized basis, particularly in rural areas where clusters of homes and FSS operations are more dispersed.[47]

B. The FCC Should Eliminate "Full-Band, Full-Arc" Interference Protection

At present, the 3.7 GHz band is severely underutilized, primarily as a result of the antiquated "full-band, full-arc" licensing policy that requires protection for every satellite earth station across the entire 500 megahertz of the 3.7 GHz band and thereby severely constrains coordination of shared FS use. In order to construct a new terrestrial link, a Part 101 licensee must successfully complete a frequency coordination process ensuring that there will be no harmful interference to incumbent operations, namely FSS receive earth stations. Based on the inefficient legacy "full-band, full-arc" licensing regime, frequency coordinators must assume that *all* FSS earth stations are always using *all* 500 megahertz of spectrum in the band. In fact, a typical FSS earth station uses far less spectrum, as little as 23 megahertz.[48]

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[46] *See* Google/BAC Technical Presentation at slides 23 - 41.

[47] Intelsat/SES estimate that "65% of FSS receivers are located in urban/suburban locations." Joint Comments of Intelsat/SES/Intel in response to 3.7 GHz Band Public Notice, at 5.

[48] For example, a review of the IBFS database found approximately 975 C-band receive-only earth stations licensed to the Associated Press ("AP"). AP's web site indicates that it is using only 23 megahertz for each of these earth stations. *See* https://www.ap.org/discover/APTN.com-redirect---Coverage-Plan (last visited May 2, 2017).

The Coalition strongly supports the Commission's proposal to eliminate "full-band, full-arc" interference protection by specifying that:

> for purposes of interference protection, earth station operators will be entitled to protection *only* for those frequencies, azimuths, and elevation angles and other parameters reported as in regular use (*i.e.* at least daily) in response to future information collections ….[49]

The Coalition recommends that the Commission define "regular use" to mean that the earth station must *actually* use the frequencies for commercial or revenue-generating purposes at least daily. The Coalition is concerned that some earth station operators might be incented to skirt the rules by undertaking very brief testing on a daily basis across the entire 500 megahertz in order to prevent terrestrial operations from using any portion of the 3.7 GHz band in proximity to the earth station. This would defeat the purpose of the proceeding by reducing the intensity of use of the band.

The Coalition also strongly supports the Commission's proposal to "develop a more complete record on existing FSS operations in [the 3.7 GHz] band [by requiring] earth station operators to file additional information on their existing facilities."[50] This information is absolutely critical to set the stage for maximized sharing of the band by terrestrial users. In addition to the data points listed by the Commission, the Coalition recommends that operators not using an entire transponder be required to report the specific frequencies being used for that transponder. This will enable greater sharing of the band by terrestrial users.[51] It is essential that this FSS earth station data be collected on a nationwide basis so that terrestrial users can

[49] NPRM at ¶ 39 (emphasis added).

[50] *Id.* at ¶ 41.

[51] As noted previously, the approximately 975 earth stations registered by AP utilize only 23 megahertz on a single transponder, an operational fact that should be considered in frequency coordination calculations.

maximize sharing of the band on a nationwide basis.[52] Collecting information for an initial sample of areas would be wholly insufficient.[53]

It is also necessary for IBFS data to remain accurate and kept current. Frequency coordinators and prospective P2MP operators will require accurate data in order to assess the amount of spectrum and specific frequencies available in any given geographic area. For this reason, the Coalition supports a requirement that "any combination of frequency, azimuth, and elevation listed in the license of registration that is unused for more than, *e.g.* 180 days, should be deleted from the license or registration to minimize unnecessary constraints on successful frequency coordination of new operations."[54] Likewise, the Coalition supports a requirement that 3.7 GHz band FSS earth station licensees annually certify the continued accuracy of their IBFS data.[55] Moreover, the Commission should make it clear that the P2MP coordination process will fully protect FSS earth stations only to the extent that IBFS data is accurate and up-to-date. Without these safeguards, spectrally efficient sharing cannot be optimized.

Finally, the Coalition supports revising the Part 25 rules to permanently limit eligibility to file new earth stations by permitting incumbent earth station operators to modify earth stations at registered locations, but not to add new stations in new locations, and by prohibiting applications for new earth station registrations by non-incumbents.[56] The Coalition agrees with the Commission that "[l]imiting new earth stations in this manner would provide a stable spectral environment for more intensive terrestrial use."[57]

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[52] NPRM at ¶ 44.

[53] *Id*.

[54] *Id.* at ¶ 35.

[55] *Id.*at ¶ 36.

[56] *Id.* at ¶ 30.

[57] *Id.*

V. The Commission Should Make Available 300 Megahertz of Spectrum for Licensed Fixed P2MP Broadband Service

The Coalition strongly supports making 300 megahertz of spectrum available for licensed P2MP broadband wireless services.[58] By contrast, making available only 40 or 100 megahertz of spectrum will be wholly insufficient for vendors to invest in and develop equipment for the band and for operators to use the band for broadband and other fixed wireless services.[59] It is critical to remember that in any given market, operators may only be able to coordinate use of a portion of the spectrum set aside for P2MP fixed wireless service. The Coalition is mindful that clearing FSS operations from a portion of the lower band will require re-locating those FSS operations to the upper portion of the band – the portion of the band to be set aside for shared use by fixed P2MP services. Such re-location will reduce the amount spectrum available in certain geographic areas to prospective P2MP operators. But that is a far better option than having access to an insufficient amount of spectrum that will not spark investment and deployment in the equipment and operator ecosystem.

Licensed, shared P2MP broadband wireless services should be available throughout the entire portion of the 300 megahertz that will be shared with FSS, not some lesser subset of the upper portion of the segmented 3.7 GHz band. Limiting fixed P2MP use to just a portion of the upper 300 megahertz of the 3.7 GHz band would unnecessarily leave spectrum fallow that could just as easily be coordinated to enhance the capacity, expand the coverage, and lower the cost of broadband deployments in rural and other underserved areas. The coordination process is exactly the same in any portion of the band that remains allocated for FSS incumbents – and

[58] *See id.* at ¶ 119.

[59] *Id.*

therefore P2MP operators should be given the opportunity to serve their communities to the greatest extent possible without leaving fallow some arbitrary amount of spectrum.

As noted previously, the Coalition recognizes that winning the "race for 5G" is an important federal objective. However, that objective does not exist in a vacuum nor to the exclusion of other services that can be effectively accommodated through geographic sharing. Connecting the 24 million Americans that lack broadband access in their homes is also a national priority – indeed, "closing the digital divide [is Chairman Pai's] top policy priority as FCC Chairman."[60] With 500 megahertz of spectrum on the table and little more mid-band spectrum in the short-term pipeline, failing to maximize the myriad consumer benefits of P2MP would be a wasted opportunity.

Access to 300 megahertz of spectrum will enable a robust equipment market to flourish as manufacturers leverage existing 3550 - 3700 MHz technology (though without the need for a Spectrum Access System ("SAS") and sensing capabilities given the lack of military and shipborne incumbents). Under the Coalition's proposal, this will enable providers to coordinate and deploy initially on 40 megahertz of spectrum and ultimately up to 160 megahertz of spectrum, subject to "homesteading" spectrum aggregation rules intended to incentivize expeditious build-out and prohibit warehousing. With this amount of spectrum, providers could offer gigabit or near-gigabit speeds across wide areas of rural America. This is a true game-changer.

[60] Remarks of FCC Chairman Ajit Pai at the Fourth Meeting of the Federal Communications Commission's Broadband Deployment Advisory Committee, Jan. 23, 2018, at 1. *See also* Remarks of FCC Chairman Ajit Pai at the Farm Foundation/U.S. Department of Agriculture Summit, April 18, 2018, at 1 ("On my first day as FCC Chairman in January 2017, I said that my number one priority was closing the digital divide and bringing the benefits of the Internet age to all Americans.").

The economic impact would be huge. An analysis performed by economist William Lehr, relying on studies performed by others, concluded that "using fixed wireless instead of wired broadband to solve our rural broadband problem could save the U.S. economy upwards of $30 billion to $60 billion in investment."[61] According to a 2017 report prepared by The Carmel Group, fixed wireless broadband access can be deployed at one-seventh the capital expense of [fiber-to-the-home] and about one-fourth the capital expense of cable broadband.[62] Quoting a study prepared by consulting firm Wireless 20/20, RCRWireless reported that "fixed wireless could reduce capital expenditures by more than 50% for many low-density CAF II funded high-cost rural broadband deployments."[63] As Jeff Kohler, Chief Development Officer of Rise Broadband explained, "[t]he economics of the [fixed wireless broadband] business are very favorable. The reason is because it costs somewhere between a fifth to a tenth of the cost of building a traditional wireline network, be it cable or fiber."[64] With lower deployment costs and expeditious build-out, rural Americans can enjoy the economic, educational, and social benefits of broadband the same way that urban Americans do in far greater proportion.

VI. Fixed P2MP Broadband Service Should be Licensed on a Co-Primary Basis in the Portion of the 3.7 GHz Band that is Not Reserved for Flexible Use

For all of the reasons set forth above, fixed P2MP broadband service should be licensed on a co-primary basis with incumbent FSS earth stations in the portion of the 3.7 GHz band that

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[61] *See* William Lehr, *Analysis of Proposed Modifications to CBRS PAL Framework,* GN Docket No. 17-258 (filed Dec. 28, 2017) at 20-21.

[62] *See* Carmel Report at 12, Fig. 6.

[63] Berge Ayvazian, *Analyst Angle: 4G LTE leveraged for fixed wireless broadband in rural communities*, RCRWIRELESS, June 6, 2017, *available at* http://www.rcrwireless.com/20170606/analyst-angle/20170606wireless4g-lte-leveraged-for-fixed-wireless-broadband-in-rural-communities-tag10 (last visited June 27, 2017).

[64] *See* Mike Dano, *Top 10 ISPs to Watch: From C Spire to Redzone to Sonic*, FIERCE TELECOM, June 26, 2017, *available at* http://www.fiercetelecom.com/special-report/top-10-isps-to-watch-from-c-spire-to-redzone-to-sonic (last visited July 14, 2017).

is not cleared for flexible use. To be clear, fixed P2MP licensees would have to protect incumbent FSS earth stations from interference. This will be accomplished through the frequency coordination process described in greater detail below. Further, the Coalition recognizes that P2MP licensees will have to accommodate the re-packing of FSS operations into the portion of the 3.7 GHz band that is not set aside for flexible use.[65] All equipment certified for this service would be required to operate across the entire 3.7 GHz band, and be subject to frequency reassignment to accommodate re-packing of FSS earth stations from the lower 200 megahertz portion of the band.

VII. Modernizing Part 101 Will Enable Rapid Deployment of Licensed P2MP Fixed Wireless Broadband Service

In its Petition, the Coalition proposed to add a new Subpart K to Part 101 to prescribe rules governing the deployment of licensed P2MP fixed wireless broadband service. The proposed rules will continue to protect FSS incumbents from harmful interference. Set forth below is a detailed discussion of the rules recommended by the Coalition, in response to the Commission's proposals and requests for comment in the NPRM.

A. Authorization of Point-to-Multipoint FS in the 3.7 GHz Band

Part 101 currently sets forth rules for P2P, but not for P2MP. Because P2MP will be a licensed FS service that will co-exist with FSS and with grandfathered P2P services, it is appropriate to establish a new subpart within Part 101. As currently written, Section 101.101 authorizes the following operations in the 3.7 GHz band:

- Common Carrier Fixed Point-to-Point Microwave Service
- Local Television Transmission Service
- Private Operational Fixed Point-to-Point Microwave Service
- Fixed Satellite Service

[65] NPRM at ¶ 116.

Consistent with the Petition, the following service should be added to this list:

- Point-to-Multipoint Fixed Broadband Service

B. Channel Plan

The Coalition supports amending the existing channel plan to allow time division duplex ("TDD") on unpaired 20 megahertz channels. At present, Section 101.147(h) organizes the band as a series of twelve paired channels of 20 megahertz each, and one unpaired 20 megahertz channel.[66] The band plan assumes frequency division duplex ("FDD") operations. The existing channel plan is based on analog radios, and therefore, it is now obsolete. The industry has long-since moved to digital radios, and toward TDD operations for broadband networks, and the Coalition fully expects that licensed P2MP service providers will utilize TDD. The new rules in Subpart K should explicitly permit operation on unpaired 20 megahertz channels, enabling TDD operations.[67]

Many industry standards support 20 megahertz channels. For example, 20-megahertz channels are the standard channel size for the family of 802.11 devices. LTE also has a 20-megahertz maximum basic channel size, with carrier aggregation for wider bandwidths. The Coalition recommends explicitly allowing both contiguous and non-contiguous 20-megahertz channels to be aggregated up to a maximum of 160 megahertz of bandwidth for any licensee in a given area, subject to licensing and satisfaction of build-out obligations.

[66] 47 CFR § 101.147(h).

[67] The FCC asks commenters to address interference concerns between TDD and FDD. The Coalition submits that interference between TDD and FDD is highly unlikely because of the simple fact that modern radios designed for broadband links all operate using TDD. Nonetheless, the Coalition does not object to a requirement that proposed P2MP deployments utilizing TDD radios be required to protect grandfathered FDD radios operating fixed P2P links.

C. Service Area and Power Limits

The Coalition supports licensing on a geographic service area based on sectors and a maximum radius from the frequency coordinated access point.[68] The arc of the sector would be based on antenna beamwidth, as adjusted to conform to the arc that could be successfully coordinated. The Coalition proposes that the maximum arc of the sector should be 90 degrees. Frequency coordination should correspond to the specific pattern and orientation of the antenna proposed to be deployed.

The Coalition supports a maximum sector radius of 10 kilometers in more densely populated areas and up to 18 kilometers in rural areas for licensed P2MP service.[69] The Coalition recommends that the definition of "rural" be the same as the definition used for the E-Rate program, and that a link be designated as "rural" if either end is categorized as such.[70]

The Coalition supports a maximum EIRP of 50 dBm for licensed P2MP operations -- 0.03 percent of the maximum EIRP of 85 dBm permitted for P2P fixed links -- and a maximum conducted power of 1 Watt.[71] The power limits would apply both to access point and client devices. The power limits should not specify a minimum path length.[72]

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[68] The Coalition clarifies that it does not seek service areas based on a "circle designated by a specified radial distance from a center point." NRPM at ¶ 120. In its Petition, the Coalition proposed a "maximum sector radius." Petition at 30. That said, if a P2MP operator can coordinate operations for a 360 degree circle, using four or more independently-coordinated sector antennas, the operator should be licensed to operate in all directions from its access point.

[69] *See* NPRM at ¶ 120.

[70] *See id.* at ¶ 120. *See* Section 54.505(b)(3)(i) (located outside an urbanized area or urban cluster area with a population of 25,000 or more).

[71] *See* NPRM at ¶ 125.

[72] *See id.* Existing Sections 101.113 and 101.143(b) provide for P2P power limits that are a function of link length. The equation was designed many decades ago for long-haul P2P links. Under the existing rule, a 1 kilometer link is limited to 36 dBm – much lower than the power needed to provide robust high-throughput broadband service to a site-specific, frequency coordinated service area.

The Coalition supports application of the emission limits set forth in Section 101.111(a)(2)(ii). These limits currently apply to P2P operations above 15 GHz. However, these limits were written for digital radios and are based on 1 megahertz increments for measuring the emission limits. By contrast, the limits set forth in Section 101.111(a)(2)(iii) were designed for 4 kHz channelized analog radios, which are now antiquated.

D. Build-Out Requirements And Incremental Spectrum Licensing

In order to encourage careful spectrum planning and intensive use of the band, and to prevent spectrum warehousing that precludes use by others, the Coalition recommends that P2MP licensees be subject to several conditions.

First, the Coalition supports a build-out period of 12 months, a significant reduction from the 18-month build-out period applicable to Part 101 P2P licensees.[73] Second, once coordinated, an operator should not be permitted to reserve a channel for more than 30 days, during which time the P2MP applicant must either file an application with the Commission that is consistent with the frequency coordination, or lose any informal protection it may enjoy as a result of its coordination. This will deter "placeholder" channel reservations that tie up frequencies, a problem that exists for P2P under Part 101 today and could be exacerbated with P2MP given the more intensive use and larger geographic area involved.

Third, as a minimum build-out standard, P2MP licensees should be required to complete construction and commence service from at least one access point and at least five client radios within the licensed area within the 12-month period.[74] Failure to do so should result in automatic loss of protection for the frequency coordinated geographic service area. However, to ensure continued service to consumers, links already in service from that access point would

[73] *See id.* at ¶ 129.

[74] *See id.*

maintain their coordinated protection on an individual, path-by-path basis to protect customers served by those links.[75]

Finally, a P2MP licensee in the 3.7 GHz band initially should be limited to 40 megahertz of spectrum (*i.e.*, two 20-megahertz channels) in its site-specific, frequency coordinated service area until it certifies to the Commission that it has satisfied the build-out requirements. At that point, the licensee could seek coordination for additional 40-megahertz blocks of licensed spectrum, subject to prior frequency coordination notices filed by other parties, up to a maximum of 160 megahertz, in the licensed area. This rule will avoid contention, prevent spectrum warehousing, and promote competition in the fixed broadband market.

E. Frequency Coordination, Registration, And Licensing Requirements

The Coalition reiterates that the current Part 101 rules for FS frequency coordination, registration, and licensing will need to be modified, in some aspects, for P2MP service. The rules should codify an expedited coordination process (notification and response) with mandatory electronic notification and response.[76] An expedited coordination process will accelerate deployment while reducing the burden, and cost, of coordination. The expedited coordination process should begin 90 days after the new rules become effective.[77]

Ultimately, the expedited coordination process should be replaced by an automated process that incorporates real-time, real-world FSS protection developed by a multi-stakeholder group.[78] In the interim, the Commission should apply the technical standards for coordination set forth for CBRS in Section 96.17.[79] In all events, potential interference with FSS earth

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[75] *See id.*

[76] *See id.* at ¶ 123.

[77] *See id.*

[78] *See id.* at ¶ 124.

[79] *See id.* at ¶ 121.

stations will be analyzed to include all man-made obstructions (*e.g.*, buildings, walls, berms), as well as topographic obstructions (*e.g.*, mountains and hills). Frequency coordinators will develop an interference profile based upon the access point and a theoretical array of potential future client devices placed throughout the site-based, frequency coordinated service area.[80]

The Coalition proposes that applicants for licensed P2MP service be required to successfully complete frequency coordination for a self-selected access point or points at specified geographic locations, plus a specified maximum number of client devices that may be deployed within the site-based and frequency coordinated service area.[81] Because the coordination will consider all points within the sector to determine where client devices would be permissible, there should not be any separate coordination requirement, FCC application requirement, or regulatory fee for individual client devices within the coordinated area. If an operator seeks to deploy a client device outside its frequency coordinated geographic service area, it should be permitted to coordinate client devices on a path-by-path basis.

The applicant would specify the maximum EIRP for access point and client devices, along with the antenna characteristics.[82] However, unlike the specific requirements under existing Part 101.115, new Subpart K would allow the licensee freedom to choose from a range of antennas that meet the minimum performance requirements for access points and client devices. The licensee would be required to specify the following: gain; azimuth; polarization; height; azimuth and elevation half-power beamwidths; the center of the beam in heading (0 – 359 degrees); and tilt (*e.g.*, -10 degrees).[83] More detailed characteristics of an antenna model's

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[80] This interference profile, and the parameters taken into account in the interference analysis process, would also apply to site-specific client devices.

[81] *See* NPRM at ¶ 122.

[82] *See id*.

[83] *See id*.

radiation patterns would also be filed with the coordinators in order to calculate off-center radiation.

The Coalition sees no need for a coordination system as complex as the SAS developed for the CBRS band. The SAS was developed to dynamically re-assign shared frequencies, to protect Federal shipborne and ground-based radar systems, and to accommodate two types of flexible use. As a result, the SAS is far more complex than any automated system required for P2MP operations in the 3.7 GHz band where operators will be transmitting from fixed points to other fixed points, and operating on specific pre-coordinated licensed channels. While nothing as complicated as the SAS is required, the rapid development of an automated frequency coordination system for the 3.7 GHz band has the potential to speed coordination times, lower coordination costs, result in more efficient spectrum use, and reduce the burden on Commission staff. The Coalition recommends that the Commission delegate the development of a band-appropriate automated frequency coordination system to a representative group of industry stakeholders, much as the WinnForum has hosted the private sector process of developing the technical implementation for the CBRS band.

The Coalition agrees that technical data regarding P2MP operations should be submitted to ULS.[84] Upon successful completion of the coordination process, the ULS entry should reflect the geographic coordinates of the access point, the frequency range, power and antenna characteristics, the service area limits, the maximum number of future authorized client devices, and the maximum power and antenna characteristics of client devices. Only upon completion of coordination should an operator be permitted to apply for a Part 101 P2MP license.

[84] *See id*. at ¶ 132.

As noted above, service providers seeking to offer licensed P2MP systems must have the flexibility to install and operate client devices, without further coordination, in areas where the coordination process indicates that transmissions from the client device will not cause harmful interference to FSS earth stations. This process will eliminate the uncertainty, delay, and prohibitive cost of individually coordinating each client device.

F. Frequency Agility Requirements

The Coalition supports a requirement that all P2MP radios operating in the 3.7 GHz band -- both access points and client devices -- be frequency agile and thus capable of operating across the entire 3.7 GHz band and able to accommodate any 20-megahertz channel assignment(s). The Coalition also supports a requirement that licensed P2MP operators in the 3.7 GHz band relinquish, within 30 days of notice, any channel needed by an FSS operator due to re-packing necessary to clear the flexible use portion of the lower 3.7 GHz band if that channel can no longer be frequency coordinated for P2MP use. If the channel can be coordinated for a more limited geographic area or at a reduced power level, the licensed P2MP operator must limit its operations accordingly. In all events, the P2MP operator may seek to coordinate use of a different channel. Further, the Coalition proposes that FSS operators be required only to notify a single database (*e.g.*, ULS, an authorized frequency coordination entity, or the automated database), which would then notify all 3.7 GHz band P2MP operators.

These requirements will ensure maximum flexibility for licensed P2MP operations to co-exist with incumbent FSS and grandfathered FS licensees and with each other. A future automated database will expedite coordination and reduce the time needed to re-coordinate channels when necessary. Consequently, the Coalition supports a requirement that access points be software upgradeable to communicate with a future automated database over the public internet, with client devices capable of following instructions from the associated access point to

change channels, power and/or bandwidth as necessary.[85] By definition, all access points will be connected to the Internet, so notifications and software upgrades will be easy to implement.

The Coalition strongly opposes any requirement to "lock out" the flexible use portion of the 3.7 GHz band.[86] As discussed below, the Coalition supports opportunistic use of the flexible use portion of the band. P2MP operators should have opportunistic access to the flexible use portion of the band before flexible use services are deployed, in geographic areas where flexible use services are not deployed, and in the guard band between the segmented FSS and flexible use bands. To be more precise, the Commission should not require P2MP devices to be "locked out" of the flexible use portion of the band. Through professional installation, as discussed below, the Coalition believes that effective and efficient spectrum sharing can be permitted, on a "use or share" basis, as the Commission has authorized most recently with respect to General Authorized Access to unused Priority Access License spectrum under the CBRS rules.

G. Eliminate Utilization Requirement

Section 101.141(a)(3)(ii) requires that "traffic loading payload shall exceed 50 percent of payload capacity within 30 months of licensing." As the Commission recognizes, "the minimum traffic loading payload requirement … was designed for symmetrical traffic and … IP traffic is often asymmetrical."[87] Further, as a practical matter, the Commission has no reliable way of measuring link loading. Accordingly, the Coalition supports eliminating the traffic loading requirement for all Part 101 services.

[85] *See id*. at ¶ 128.

[86] *See id*.

[87] *See id*. at ¶ 130.

H. Professional Installation, Equipment Access and RF Exposure

The Coalition supports a requirement that P2MP access points and client devices be professionally installed. Professional installation will ensure that the devices are properly aligned and that client devices are successfully connected to the appropriate access point.

The Coalition submits that P2MP radios will not present an RF hazard. When operated at full power, the RF exposure keep-out zone for P2MP client radios operating at the proposed maximum EIRP level is less than 0.6 meters (2 feet). The Coalition does not object to the Commission's proposal to attach a label to client devices that provides notice regarding potential RF safety hazards.[88] The Coalition submits that referencing the applicable FCC-adopted limits for RF exposure is unnecessary, because consumers do not have the technical knowledge to understand those limits.[89]

I. Automated Frequency Coordination

Coalition members have been involved in the creation of the TV white space database and the SAS for the CBRS band, and emphasize that the 3.7 GHz band does not require either existing method of interference protection. Instead, the existing frequency coordination process can ultimately be automated to implement interference protection criteria for incumbent FSS facilities, incorporate "real-time, real-world" FSS protection criteria, and enable immediate coordination for any new facilities authorized under the proposed rules. As discussed above, a critical element to the accuracy of the database will be to require FSS licensees in the band to certify the operational status of their licensed facilities and update the database as operational circumstances change. Interference protection would not apply if any licensee or registrant, whether FSS, P2P or P2MP, failed to timely submit a notification of completion of construction.

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[88] *See id*. at ¶ 131.

[89] *See id*.

The rules proposed herein can and should be implemented before the automated frequency coordination process is put in place. As with other spectrum management systems, the automated frequency coordination standards would be developed over time by industry stakeholders, including the satellite industry. This multi-stakeholder industry process will benefit all parties and, although an automated coordination mechanism is not necessary in the near term, it will be extremely useful to accommodate the far more intensive and efficient shared use of the band that will result from a Commission order adopting this new P2MP service.

Going forward, the Coalition proposes that terrain shielding and ground clutter be considered in the automated frequency coordination process using tools available or developed by industry stakeholders during the transition period. Spectrum coordination databases that incorporate real-world details on terrain, clutter (trees, buildings), and other GIS data sets can enable far more intensive spectrum use.[90] An automated database informed by real-world GIS datasets does not need to make generic, worst-case assumptions about interference. These considerations will increase spectral efficiency based on "real-world" circumstances.

The Coalition believes that this automated process will improve frequency coordination by mitigating the potential for human error. Most significantly, the database can enable the more efficient use of spectrum by enabling P2MP service in more locations without increasing the potential for harmful interference to authorized FSS facilities, a result that would be in the public interest.

[90] *See* Monica Alleven, "Google and other databases likely to make spectrum sharing easier," *Fierce Wireless*, *available at* https://www.fiercewireless.com/wireless/google-and-other-databases-likely-to-make-spectrum-sharing-easier (last visited Oct. 12, 2017).

VIII. Deployment of Fixed P2MP Broadband Service Will Not Affect Possible Future Clearing of the Band for Flexible Use

A. The Commission Should Segment the 500 Megahertz of Spectrum in the 3.7 GHz Band

The Commission seeks comment "on how permitting fixed wireless would affect the possible future clearing of the band for flexible use and the use of the band for satellite operations."[91] The Coalition emphasizes that its proposals are consistent with other proposals to clear a portion of the 3.7 GHz band for flexible use licensing. Specifically, the Coalition supports segmenting the 500 megahertz of spectrum in the 3.7 GHz band as follows: (1) reserve and clear the lower 200 megahertz for flexible use licensing and a guard band; (2) maintain FSS operations in the upper 300 megahertz; and (3) authorize P2MP to share the upper 300 megahertz with FSS on a frequency coordination basis. The Coalition recognizes that certain "flexible use" services require "clean" spectrum because it is difficult for mobile services to share with FSS downlinks or fixed P2MP broadband.

The Coalition also recognizes that clearing the lower portion of the 3.7 GHz band may require "re-packing" of some FSS earth station operations into the upper portion of the 3.7 GHz band. This re-packing will impact the availability to P2MP operators of certain channels in certain geographic areas. For this reason, the Coalition has proposed that all radios deployed in the 3.7 GHz band be frequency agile, with the ability to operate on any 20-megahertz channel in the band. The Coalition applauds the Commission's efforts to update and improve its IBFS database so that the interference environment can be more accurately assessed and sharing and coordination methodologies can be more readily developed and implemented.

[91] NPRM at ¶ 116.

B. The Commission Should Permit Opportunistic Access to the Lower Portion of the 3.7 GHz Band for Fixed P2MP Operations

The Coalition urges the Commission to authorize opportunistic use by P2MP of that portion of the 3.7 GHz band set aside for flexible use. The Coalition estimates that it will take at least three to four years before the lower portion of the band can be cleared and new terrestrial flexible use service are deployed. Significant time will be needed to actually deploy equipment and service in the cleared portion of the 3.7 GHz band, and the Coalition expects that such deployment will be rolled out over several years. Even then, it could be many additional years, if ever, before the flexible use licensees build out in many rural and other less profitable areas. During this time period, P2MP providers should be permitted to use this spectrum on an opportunistic basis. The public interest requires that the spectrum not be underutilized. In all events, P2MP providers would be required to undertake frequency coordination with incumbent FSS and grandfathered FS providers before deploying in this spectrum and P2MP operators would be required to vacate the spectrum upon deployment of flexible use services in the relevant geographic area.

The Coalition emphasizes that it expects flexible use deployment and P2MP deployment to be largely complementary on a geographic basis. Flexible use operators initially will focus on deployment in densely populated areas to build out a 5G footprint. By contrast, P2MP operators are likely to focus on deployment in rural and other less densely populated areas. The Commission should ensure that the spectrum is used as intensively as possible.

Finally, the Coalition recommends that the Commission permit opportunistic P2MP use of any guard band it may establish between the flexible use and shared use segments. The guard band is required to protect FSS downlink operations from flexible use operations in the lower portion of the band. Unlike flexible use operations, P2MP operations will be able to protect

incumbent FSS operations, assuming successful frequency coordination. Again, the Commission should ensure that the spectrum is used as intensively as possible.

IX. Conclusion

The Coalition's approach to the 3.7 GHz band will result in its best and highest use: simultaneously retaining interference protection for satellite earth stations, making available flexible use spectrum for urban 5G deployments, and enabling fixed wireless providers to provide gigabit service to rural Americans. With a reasonable sharing and licensing regime, the 3.7 GHz band can be transformed from an underutilized band to a band that enables and incents robust broadband service across America.

Respectfully submitted,

BROADBAND ACCESS COALITION

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October 29, 2018

Attachment 1: List of Broadband Access Coalition Members

EXHIBIT 1

BROADBAND ACCESS COALITION MEMBERS
As of October 29, 2018

All Points Broadband

All Points Broadband is a fixed wireless broadband provider serving customers in Virginia, Maryland and West Virginia.

American Library Association

The American Library Association (ALA) is the oldest and largest library association in the world. Founded in 1876, its mission is "to provide leadership for the development, promotion and improvement of library and information services and the profession of librarianship in order to enhance learning and ensure access to information for all."

Amplex Electric

Amplex is a fixed wireless broadband provider serving customers in Northwestern Ohio.

Baicells Technologies

Founded by an LTE pioneer and led by distinguished veterans from the fixed wireless market, Baicells is a disruptive provider of LTE solutions for fixed wireless, small cells, and LTE IoT markets.

Cambium Networks

Cambium Networks is a leading global provider of fixed wireless networking solutions that connect the unconnected – People, Places and Things. Cambium Networks makes it possible for service providers and industrial, enterprise and government network operators to build affordable, reliable, high-performance connectivity.

Consumer Federation of America

The Consumer Federation of America is a national organization of more than 250 nonprofit consumer groups that was founded in 1968 to advance the consumer interest through research, advocacy, and education.

ConVergence Technologies, Inc.

ConVergence Technologies, Inc. provides Telecom, Wireless Broadband and IT infrastructure solutions to organizations throughout United States. ConVergence provides solutions that address all the technology needs of public, private and government organizations.

Cincinnati Bell Inc.

Cincinnati Bell Inc. provides integrated communications solutions – including local and long distance voice, data, high-speed Internet and video – that keep residential and business customers in Greater Cincinnati and Dayton, Ohio connected with each other and with the world.

Ethoplex

Ethoplex is a fixed-wireless operator serving the residential, business, MDU, and educational markets in Southeastern Wisconsin.

ITTA – The Voice of America's Broadband Providers

ITTA serves as the voice of America's broadband providers before federal policymakers in Washington, DC. The members of ITTA provide a broad range of high-quality broadband, wireline and wireless voice, video, and other communications services on a wholesale and retail basis to residential and business customers in predominantly rural areas across nearly all 50 states.

Intelliwave

Intelliwave broadband is a fixed wireless and fiber optic service provider that serves thousands of residential and commercial customers across 15 counties in Appalachian Ohio. Access to additional spectrum will help us speed our goal of serving all the unserved residents of our region.

Intelpath

Intelpath provides Frequency Analysis, Spectrum Management Solutions, and FCC License Procurement for Microwave Service Providers. By maintaining proprietary software and databases, Intelpath engineers select channels that enable optimal use of available spectrum.

JAB Wireless, Inc. dba Rise Broadband

JAB is the largest fixed wireless broadband provider in the United States, with more than 180,000 customers in 16 states.

Mimosa Networks, Inc.

Mimosa Networks is a leading provider of 5G Fixed wireless solutions that enable service providers to connect dense urban and hard-to-reach rural homes at a fraction of the cost of fiber-to-the-premises solutions.

NTCA – The Rural Broadband Association

NTCA – The Rural Broadband Association represents approximately 850 independent, community-based telecommunications companies and cooperatives and more than 400 other firms that support or are themselves engaged in the provision of communications services in the most rural portions of America. All NTCA service provider members are full service rural local exchange carriers ("RLECs") and broadband providers, and many also provide fixed wireless, mobile wireless, video, satellite and/or other competitive services in rural America.

Open Technology Institute at New America

OTI and its Wireless Future Program work at the intersection of technology and policy to promote more open, fast and affordable wireless broadband connectivity and, more generally, universal access to communications technologies that are both open and secure. OTI is part of New America, a nonprofit and nonpartisan policy institute based in Washington, D.C.

Public Knowledge

Public Knowledge is a nonprofit digital rights advocacy organization headquartered in Washington, D.C. Public Knowledge promotes freedom of expression, an open internet, and access to affordable communications tools and creative works. Public Knowledge also works to shape policy on behalf of the public interest.

Quantenna Communications

Quantenna is a global leader and innovator of leading-edge performance Wi-Fi solutions. Quantenna introduced the world's first 10G Wi-Fi technology for a new generation of access points in home, enterprise and public spaces and continues to innovate.

Red Spectrum Communications, LLC

Red Spectrum is a high speed Internet Services Provider owned and operated by the Coeur d'Alene Tribe in North Idaho. Red Spectrum provides services through fixed wireless and fiber optic networks.

Schools, Health & Libraries Broadband Coalition

The SHLB Coalition is a broad-based organization of anchor institutions, commercial companies and non-profit broadband providers, foundations, public interest groups, and others that work together to develop and support policies to improve broadband connectivity for anchor

institutions and their communities in all regions of the country – urban, suburban and especially rural.

Sho-Me Power Electric Cooperative

Sho-Me provides power to nine Rural Electric Cooperatives (RECs) who serve 26 counties in Missouri. Sho-Me Technologies, LLC, a subsidiary of Sho-Me Power, provides broadband services over an advanced optical network in Missouri. Sho-Me Technologies d/b/a Neighborhood Wireless, LLC, is dedicated to providing high-speed wireless Internet in Missouri.

SpeedConnect

SpeedConnect serves customers with wireless broadband internet, DISH TV and telephone service in Arizona, Idaho, Illinois, Iowa, Michigan, Minnesota, Montana, Nebraska, South Dakota and Texas.

Wisper, ISP, Inc.

Wisper ISP is a high-speed Internet provider to more than 12,000 business and residential customers in Illinois, Missouri, Oklahoma, Arkansas and Kansas.

Telrad Networks Ltd

Telrad Networks is a recognized pioneer in the telecom industry, facilitating the connectivity needs of millions of end-users through operators, ISPs and vertical markets around the globe. Our current focus is on LTE products designed to enable wireless broadband connectivity, empowering our customers with solutions that look toward the future – while offering the versatility and affordability required to meet the existing needs of evolving wireless networks.

US Internet

US Internet, located in Minneapolis, Minnesota, is a provider of Internet and Fiber Optic Services. With its roots firmly entrenched in the ISP sector, US Internet offers a dynamic portfolio including the Minneapolis Wireless Network and Data Center services.

WISPA

The Wireless Internet Service Providers Association (WISPA) is a membership-driven trade association that promotes the development, advancement and unity of the fixed wireless Internet service provider industry. WISPA has over 800 members that support WISPA's advocacy, education and other collaborative industry initiatives.