

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

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

To: Chief, Wireless Telecommunications Bureau  
Chief, International Bureau  
Chief, Office of Engineering and Technology  
Chief, Office of Economics and Analytics

**REPLY COMMENTS OF  
THE WIRELESS INTERNET SERVICE PROVIDERS ASSOCIATION**

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## Summary

The C-Band Alliance (“CBA”) derisively compares the efforts of WISPA, Google and Microsoft to introduce coordinated shared use of the C-band for fixed point-to-multipoint (“P2MP”) service to the efforts of Sisyphus, the mythological king sentenced for eternity to roll a large boulder up a hill only for it to roll down the hill when it nears the top.<sup>1</sup> But to rural Americans who lack access to affordable, high-speed broadband, a more apt analogy would be to the plight of Tantalus, the Greek god made to stand in a pool of water beneath a fruit tree, with the fruit ever eluding his grasp and the water receding before he could take a drink.

The attempt by CBA and others to dismiss spectrum sharing in the C-band shows all the more clearly that the Commission should realize how tantalizingly close it is to taking a titanic step to bridging the digital divide. As WISPA explains below, the question is no longer if coordinated shared use of C-band spectrum is *technically* feasible – that question has been answered in the affirmative by the Reed Study and the fact that sharing is already successfully occurring in the 3650-3700 MHz band – and attempts to oppose coordinated sharing vanish when vacuous arguments and self-serving and self-referencing declarative statements are exposed. Rather, the question is whether the Commission will make the right *policy* choice by authorizing sharing to incentivize investment and deployment that will provide high-speed, cost-effective, and spectrally efficient P2MP to millions of rural Americans.

That our Nation has an urban-rural digital divide is well-known. What some commenters believe, however, is that C-band spectrum should not be used to help achieve “the Commission’s top priority” of solving that problem, but should instead remain fallow until some future point in time when the mobile wireless industry will again ask the Commission for more 5G spectrum.

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<sup>1</sup> See Comments of the C-Band Alliance, GN Docket No. 18-122, RM-11791 and RM-11778 (filed Aug. 7, 2019) (“CBA Comments”) at 19.

Commenters taking this view rely not on evidence, but on their own previous statements, as if repeating them somehow gives them any credibility. But in fact, C-band spectrum offers the propagation advantages that will enable broadband coverage to wide swaths of currently unserved rural areas almost as soon as the ink is dry on the Commission's adopting order. By contrast, existing spectrum bands for fixed wireless services are for the most part unlicensed and congested, and do not offer the benefits of frequency coordination or the ability to meet consumer demand for more capacity to accommodate bandwidth-intensive services and applications. The ability of fixed wireless providers to acquire access to new spectrum bands via auction is entirely speculative at this juncture and, in any event, cannot be available within a reasonable timeframe for rural Americans.

A broad and diverse group of commenters indicated their support for the Broadband Access Coalition ("BAC") proposal, as affirmed by the Reed Study's conclusions that earth stations typically require a 10 km radius of protection from *co-channel* P2MP deployments. The commenters opposing the Reed Study misread and misplace arguments, or otherwise overstate claims that sharing should not be permitted because they would have used a different propagation model or assumed different inputs. The Joint Technical Reply Comments being filed today by WISPA, Google, and Microsoft affirmatively rebut these claims. The time to address specific concerns about sharing inputs is during the process by which stakeholders, including satellite interests, develop the automated frequency coordination regime to protect earth stations – not as a means to deny that sharing can occur as a matter of physics. Stripped of rhetoric, claims that sharing is not feasible reveal these commenters' true motive – to preserve the entire C-band indefinitely at the expense of rural Americans.

As the BAC and WISPA have stressed throughout this proceeding, the Commission has the rare opportunity to achieve a “win-win-win” result that clears a significant amount of spectrum for flexible use, authorizes coordinated sharing for P2MP, and protects earth stations from harmful interference. The right solution for the entire 500 megahertz of C-band spectrum is well within the Commission’s grasp.

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## Introduction

<sup>5</sup> See Letter from Wireless Internet Service Providers Association, Google LLC, and Microsoft Corp. to Marlene H. Dortch, FCC Secretary, GN Docket No. 18-122 (filed July 15, 2019) (“WISPA/Google/Microsoft Letter”).

makes the policy choice that will best achieve its “top priority of bridging the digital divide.”<sup>6</sup> Many Comments filed in response to the *Public Notice* reflect broad and diverse support for coordinated sharing. Those few commenters opposing the Reed Study and the proposal advanced more than two years ago by the Broadband Access Coalition (“BAC”)<sup>7</sup> do not question the proven technological *ability* of successful sharing, but instead question the *policy* benefits that P2MP sharing would bring to millions of rural Americans by re-hashing old arguments, unconvincingly questioning a few of the Reed Study’s assumptions, and engaging in the predictable practice of suggesting that more time is needed to study the impact of sharing. Casting a blind eye to reality and the need to make high-speed fixed broadband service available to millions of rural Americans, these commenters instead tout self-serving alternative proposals that relegate rural consumers to more years without the spectrum resources needed to access broadband.

The Reed Study unequivocally shows, even in the limited context of assessing only *co-channel* coexistence, that shared C-band spectrum can enable gigabit or near-gigabit broadband service to more than 80 million Americans, with the preponderance of those located in rural areas where earth stations are less prevalent. Not only is this theoretically possible, but such sharing is happening *today* in the 3650-3700 MHz band and will be occurring in the Citizens Broadband Radio Service (“CBRS”) in the very near future using sophisticated sharing techniques that are orders of magnitude more complex than the simple coordinated sharing that can enable P2MP to coexist with receive-only earth stations. To the extent commenters voice objections to certain assumptions, they utterly fail to offer alternatives. But more importantly,

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<sup>6</sup> *Rural Digital Opportunity Fund*, Notice of Proposed Rulemaking, WC Docket Nos. 19-126 and 10-90, FCC 19-77 (rel. Aug. 2, 2019) (“*RDOF NPRM*”) at 2 (¶ 1).

<sup>7</sup> BAC, Petition for Rulemaking, RM-11791 (filed June 17, 2017) (“BAC Petition”).

these stakeholders should accept the opportunity the BAC offered last year and become part of the process that designs interference protection rules and algorithms.<sup>8</sup> In that manner, they can be assured that the assumptions, inputs, and techniques in the automated frequency coordination (“AFC”) process meet their protection requirements.

Commissioners have repeatedly affirmed the need to bridge the digital divide and to stimulate investment in rural broadband deployment. Chairman Pai has forcefully stated that “[f]rom the beginning of my tenure as head of the [Commission], I’ve made clear that my top priority would be to close the digital divide.”<sup>9</sup> Commissioner O’Rielly recently acknowledged broad agreement on the issue at a Senate oversight hearing, stating that “there is consensus among FCC Commissioners that all Americans – including those living in areas with challenging topography and sparse populations – should have the opportunity to access broadband Internet, if they wish to do so.”<sup>10</sup> Commissioner Carr recently recognized the concerted effort to improve rural broadband when he approved the notice commencing a rulemaking for the Rural Digital Opportunity Fund, stating that “[t]oday’s decision is more good news in our efforts to close the digital divide – to ensure that every American can access next-generation broadband, regardless of where they live.”<sup>11</sup> Commissioner Rosenworcel emphasized the importance of broadband access by stating at a Senate oversight hearing that “no matter who you are or where you live in this country, you need access to modern communications to have a fair shot at 21<sup>st</sup> century

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<sup>8</sup> Comments of BAC, GN Docket No. 18-122 (filed Oct. 29, 2018) at 26, 31-32; Reply Comments of BAC, GN Docket No. 18-122 (filed Dec. 11, 2018) (“BAC Reply Comments”) at 23.

<sup>9</sup> Statement of Ajit Pai, Chairman, FCC, Hearing on Oversight of the FCC, House Energy & Commerce Comm., Subcomm. on Communs. & Tech. (Jul. 25, 2018) at 2.

<sup>10</sup> Statement of Michael O’Rielly, Commissioner, FCC, Hearing on Oversight of the FCC, Senate Comm. on Commerce, Science & Transportation (Jun. 12, 2019) at 3.

<sup>11</sup> *RDOF NPRM* at 62, Statement of Commissioner Brendan Carr.



success.”<sup>12</sup> Commissioner Starks characterized “getting the Internet everywhere” as “one of the most important issues facing America,” adding that “[g]etting broadband everywhere must be one of our very highest priorities.”<sup>13</sup>

Commenters in this proceeding that oppose spectrum sharing appear to ignore this very clearly delineated and unanimous Commission priority. Yet the BAC Petition, as validated by the Reed Study, provides a feasible, fast way to expand broadband to unserved and underserved Americans, and it does so in a way that allows the Commission to avoid “adopt[ing] artificial restrictions through license and auction structure to dissuade some uses or users while promoting others”<sup>14</sup> and avoid “picking winners and losers.”<sup>15</sup> The mid-band spectrum is where the propagation benefits of *coverage* for rural broadband and *capacity* for more densely populated areas converge. There is no reason for the Commission to treat the results of this proceeding as a zero-sum game in which advancing the “race to 5G” is the *only* policy outcome.<sup>16</sup>

The bottom line is this: if the Commission decides to not adopt the BAC coordinated sharing plan that makes a significant portion of the C-band available for P2MP service, it would do so purely for *policy* reasons, not because sharing is *technically* infeasible. And it would do so in contravention of important Congressional and Commission policy priorities seeking to increase broadband access in the large parts of our Nation that remain unserved.

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<sup>12</sup> Statement of Jessica Rosenworcel, Commissioner, FCC, Hearing on Oversight of the FCC, Senate Comm. on Commerce, Science & Transportation (Jun. 12, 2019) at 2.

<sup>13</sup> Remarks of Commissioner Geoffrey Starks, Partnership for Progress on the Digital Divide, Georgetown University (May 22, 2019) at 1.

<sup>14</sup> See *Promoting Investment in the 3550-3700 MHz Band*, Notice of Proposed Rulemaking and Order Terminating Petitions, 32 FCC Rcd 8071, 8111 (2017), Statement of Commissioner Michael O’Rielly.

<sup>15</sup> *Restoring Internet Freedom*, Declaratory Ruling, Report & Order, & Order, WC Docket No. 17-108, Oral Statement of Chairman Ajit Pai (Dec. 14, 2017) at 4 (“What I *am* saying is that the government shouldn’t be in the business of picking winners and losers in the Internet economy”) (emphasis in original).

<sup>16</sup> See Comments of Starry Inc., GN Docket No. 18-122 (filed Oct. 29, 2018) at 8 n.23 (“There should be no basis on which the Commission should conclude that the band cannot be shared between FSS and fixed point-to-multipoint operations. This is not a binary question.”).

## Discussion

### **I. COORDINATED SPECTRUM SHARING WILL HELP ACHIEVE THE COMMISSION'S "TOP PRIORITY" OF BRIDGING THE DIGITAL DIVIDE**

Although the need to accelerate rural broadband deployment through access to more spectrum would appear to be a foregone conclusion, the Satellite Industry Association ("SIA") is apparently unconvinced, deeming "illogical" the fact that "access to more terrestrial fixed P2MP services is needed to help bridge the digital divide."<sup>17</sup> It acknowledges that "WISPs have enjoyed success to date in supplying broadband service in less densely populated areas without the use of C-band FSS frequencies," but then doubles down – in its declarative and unsupported style – by arguing that "there is no apparent reason explaining why they cannot use the same strategies and spectrum to satisfy any remaining unmet need for terrestrial fixed wireless access."<sup>18</sup> Not to be outdone, the C-Band Alliance ("CBA"), citing its own previous reply comments, makes the incredible statement that "claims that P2MP would prove a boon to rural broadband development are unsupported and overstated."<sup>19</sup>

Tellingly, neither SIA nor CBA make any effort to offer alternatives on *how* the documented and pervasive digital divide should be bridged. Rather, they continue to focus on the amount of money that will flow through an auction process and a professed interest in promoting 5G for the mobile wireless industry, and ignore the interests of rural Americans.

#### **A. Rural Americans Continue To Lack Access To Fixed Broadband Service And Competitive Choice**

To the extent the satellite industry questions the existence of a rural divide, the Commission's own data and industry reports throw cold water on this fallacy. As

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<sup>17</sup> Comments of the Satellite Industry Association, GN Docket No. 18-122, RM-11791 and RM-11778 (filed Aug. 7, 2019) ("SIA Comments") at 3.

<sup>18</sup> *Id.*

<sup>19</sup> CBA Comments at 20 (citation omitted).

Cumulus/Westwood One and PISC both make clear, rural Americans continue to lag behind their urban counterparts in accessibility to high-speed broadband.<sup>20</sup> According to the Commission’s *2019 Broadband Progress Report*, “the gap in rural and Tribal America remains notable: over 26% of Americans in rural areas and 32% of Americans in Tribal areas lack coverage from fixed terrestrial 25 Mbps/3 Mbps broadband, as compared to only 1.7% in of Americans in urban areas.”<sup>21</sup> Additional data show that as median household income, population density, and the poverty rate decreases, so does access to high-speed broadband – “on average, deployment is highest in census block groups with the highest median household income, the highest population density and the lowest poverty rate.”<sup>22</sup> Where broadband is available in rural areas, choice is often lacking. Only half 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 36% percent of developed census blocks in the U.S. do not have access to even one provider offering fixed broadband speeds of at least 100 /10 Mbps.<sup>23</sup>

The availability of broadband in rural areas has profound effects on economic development. A 2015 Hudson Institute Report concluded that

In the long run, the economic impact of rural broadband will be more important for the role it plays in changing what the economy is. Information technology

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<sup>20</sup> Comments of Cumulus Media Inc. and Westwood One, LLC, GN Docket No. 18-122, RM-11791 and RM-11778 (filed Aug. 7, 2019) (“Cumulus/Westwood One Comments”) at 3-4; Comments of the Public Interest Spectrum Coalition, GN Docket No. 18-122 (filed Aug. 7, 2019) (“PISC Comments”) at 17-19.

<sup>21</sup> *Inquiry Concerning Deployment of Advanced Telecommunications Capabilities to All Americans in a Reasonable & Timely Fashion*, 2019 Broadband Deployment Report, GN Docket No. 18-238, FCC 19-44 (rel. May 29, 2019) at 16 (¶33) (2019).

<sup>22</sup> *Id.* at 26 (¶ 43); *see also* Fig. 9. *See also* The United States Department of Agriculture, Rural Poverty & Well-Being, last updated Mar. 25, 2019, available at <https://www.ers.usda.gov/topics/rural-economy-population/rural-poverty-well-being/> (last visited Aug. 13, 2019) (“The large majority (301 or 85.3 percent) of the persistent-poverty counties are nonmetro . . .”).

<sup>23</sup> *See* “Internet Access Services: Status as of June 30, 2017,” Industry Analysis and Technology Division, Wireline Competition Bureau (November 2018) (“*2018 Internet Access Report*”), at Fig. 4. 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.

shows an amazing capability to create new services. It has also disrupted the role that location plays in the economy. Broadband networks have nearly erased the cost of moving information. Broadband networks allow that disruptive role to happen. This disruption will reach as far as the broadband speed required to support these uses will allow.<sup>24</sup>

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.”<sup>25</sup> 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.*<sup>26</sup>

Beyond the statistics and probabilities lie the real effects of a lack of fixed broadband access. An article published in *The Post and Courier* 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.”<sup>27</sup> The article continues, stating 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

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<sup>24</sup> Hudson Institute, *The Economic Impact of Rural Broadband* (April 2016) available at <https://s3.amazonaws.com/media.hudson.org/files/publications/20160419KuttnerTheEconomicImpactofRuralBroadband.pdf> (last visited Aug. 12, 2019) at 21 (footnote omitted).

<sup>25</sup> Remarks of FCC Chairman Ajit Pai, “Broadband for All” Seminar, Stockholm, Sweden (Jun. 26, 2017), at 1.

<sup>26</sup> Remarks of FCC Chairman Ajit Pai, American Enterprise Institute, *The First 100 Days: Bringing the Benefits of the Digital Age to All Americans* (May 5, 2017), at 2 (emphasis added).

<sup>27</sup> 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-b069-6fc7645c4377.html](https://www.postandcourier.com/business/half-of-south-carolina-s-rural-promise-zone-doesn-t/article_df05ac94-d624-11e7-b069-6fc7645c4377.html) (last visited Aug. 13, 2019) (“Post and Courier Article”).

and economic opportunity. Their concerns echo through rural corners of the country from coast to coast.”<sup>28</sup>

SIA is so focused on protecting what it views as its prerogatives in C-band that it dismisses the urgent need for action to enable high-speed rural broadband service, an outcome that is much more achievable through cost-effective and spectrally efficient spectrum. But it cannot be legitimately 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. Access to spectrum for fixed broadband service is an essential tool for bridging that gap.

## **B. Spectrum Is Affordable Infrastructure For Fixed Broadband Service**

Aside from the fact that the *Public Notice* sought focused comment on the Reed Study and not repetition of false and facile arguments, WISPA is constrained to point out that SIA’s and CBA’s statements reflect continuing ignorance of the needs of rural Americans and the ability of spectrum – especially mid-band spectrum – to help solve this national problem. In many areas of our country, consumers can obtain access to fixed broadband service only through a 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.<sup>29</sup> The *Wall Street Journal* has 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

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<sup>28</sup> *Id.*

<sup>29</sup> See, e.g., Daisuke Wakabayashi, *Google Curbs Expansion of Fiber Optic Network, Cutting Jobs*, N. Y. TIMES, Oct. 25, 2016, available at [https://www.nytimes.com/2016/10/26/technology/google-curbs-expansion-of-fiber-optic-network-cutting-jobs.html?\\_r=0](https://www.nytimes.com/2016/10/26/technology/google-curbs-expansion-of-fiber-optic-network-cutting-jobs.html?_r=0) (last visited Aug. 13, 2019). See also 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).

internet providers say they can't invest in door-to-door connections with such a limited number of subscribers.”<sup>30</sup>

But investment in fixed wireless service is much more cost-effective. According to a report prepared by The Carmel Group, fixed wireless broadband access can be deployed at one-seventh the capital expense of FTTH and about one-fourth the capital expense of cable broadband.<sup>31</sup> 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.”<sup>32</sup> A Mobile Ecosystem Report stated that, with respect to low density suburban/rural markets,

Historically, these are the areas traditionally underserved or unserved by FBB [fiber- and cable-based fixed broadband]. Wireless Internet Service Providers (WISPs), using unlicensed spectrum, have been successful in some of these areas. The opportunity for licensed FWA in these areas is more case by case. The service must work with mainly lower band LTE spectrum, in conjunction with some mid-band build out in areas where there is a ‘cluster’ of homes, such as a village. *Clearly the case for wireless is most compelling in areas where the existing FBB infrastructure is sub-par and/or lacks a compelling roadmap.*<sup>33</sup>

As Rise Broadband's Jeff Kohler explained, “[t]he economics of the [fixed wireless broadband] business are very favorable. The reason they are is because it costs somewhere between a fifth to

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<sup>30</sup> 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.

<sup>31</sup> See The Carmel Group, *Ready for Takeoff: Broadband Wireless Access Providers Prepare to Soar with Fixed Wireless*, (2017) (“Carmel Report”) available at [http://www.wispa.org/Portals/37/Docs/Press%20Releases/2017/TCG's\\_2017\\_BWA\\_FINAL\\_REPORT.pdf](http://www.wispa.org/Portals/37/Docs/Press%20Releases/2017/TCG's_2017_BWA_FINAL_REPORT.pdf) (last visited Aug. 12, 2019), at 12, Fig. 6.

<sup>32</sup> 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 Aug. 13, 2019).

<sup>33</sup> Mark Lowenstein, *The Business Case for Fixed Wireless Access: Key Market Drivers and a Framework for Evaluation* (September 2018), available at <https://www.netcomm.com/assets/NetComm-Mobile-Ecosystem-5G-business-Case.pdf> (last visited Aug. 12, 2019) at 4.

a tenth of the cost of building a traditional wireline network, be it cable or fiber.”<sup>34</sup> 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.”<sup>35</sup> It is not surprising that 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.”<sup>36</sup>

Contrary to SIA’s and CBA’s naked statements, fixed wireless technology is the most cost-effective last-mile solution in many unserved areas, and mid-band spectrum is the best platform for offering non-line-of-sight capability. The C-band presents a new and immediate opportunity for WISPs to invest in network upgrades to expand the availability and sustainability of affordable broadband access to consumers in areas that are currently underserved. SIA’s and CBA’s casual dismissals of the need for fixed wireless technology to address the digital divide are tone deaf at best and callous at worst. The Commission should instead view the C-band as a vital spectrum resource that can be used to expeditiously change the lives of rural Americans.

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<sup>34</sup> 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 Aug. 13, 2019).

<sup>35</sup> Post and Courier Article. Many WISPs rely on vertical infrastructure such as water tanks and grain silos, in addition to traditional communications towers.

<sup>36</sup> William Lehr, *Analysis of Proposed Modifications to CBRS PAL Framework*, GN Docket No. 17-258 (filed Dec. 28, 2017) at 20-21.

## **II. THE RECORD DEMONSTRATES STRONG SUPPORT FOR COORDINATED SHARING AMONG EARTH STATIONS AND P2MP IN A PORTION OF THE C-BAND**

The Comments submitted in response to the *Public Notice* reflect broad and diverse support for coordinated sharing of C-band spectrum among earth stations and P2MP.

Google explains that shared use of C-band spectrum “would immediately enable gigabit-class fixed wireless broadband” that “would help to close the rural digital divide, augment Internet access competition, and promote available and affordable fixed 5G service offerings.”<sup>37</sup> Google emphasizes that coordinated sharing “would help solidify United States leadership in the development of 5G applications including fixed wireless access, and the deployment of spectrum sharing technologies.”<sup>38</sup>

Several commenters explicitly support the findings presented in the Reed Study and endorse the inputs and key assumptions relied upon to demonstrate that earth stations can be individually coordinated and protected typically within a geographic zone of about 10 km, which would enable broadband service to more than 80 million Americans and 78% of the geographic area of the county.<sup>39</sup>

For example, Google states that the Reed Study “convincingly shows that the current exclusion zones for fixed service transmitters around C-band FSS earth stations are too large.”<sup>40</sup> It observes that the “results of the *Reed Study* are borne out by *actual* co-channel operations between broadband systems and FSS earth stations in the extended C-band.”<sup>41</sup> By adopting

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<sup>37</sup> Comments of Google LLC, GN Docket No. 18-122, RM-11791 and RM-11778 (filed Aug. 7, 2019) (“Google Comments”) at 1-2.

<sup>38</sup> *Id.* at 2.

<sup>39</sup> *See, e.g.*, WISPA/Google/Microsoft Letter at 1-2; Google Comments at 2-3; PISC Comments at 3, 6;

<sup>40</sup> Google Comments at 2-3.

<sup>41</sup> *Id.* at 3 (emphasis in original).



minor changes to the Commission’s rules, Google states that “the recommendations in the Reed Study will enable C-band P2MP systems to achieve their promise and bring fixed wireless broadband access services to 80 million Americans or more on a shared basis in the non-cleared portion of the band, while avoiding harmful interference to incumbent FSS earth station operations.”<sup>42</sup> In particular, Google highlights a key finding of the Reed Study – that the “greatest opportunity for high-capacity, affordable broadband P2MP services would be in areas such as rural and tribal areas, where earth stations are less prevalent and widely dispersed.”<sup>43</sup> The Public Interest Spectrum Coalition (“PISC”) observes that the Reed Study “conclusively demonstrates the feasibility of coordinated sharing between fixed point-to-multipoint (P2MP) operators and existing earth stations on every megahertz of the ongoing FSS band in a majority of rural, Tribal and small town communities where it’s most needed.”<sup>44</sup> Frontier and Windstream, each of which use C-band satellite earth stations to provide content to hundreds of thousands of pay TV subscribers,<sup>45</sup> deems “compelling” the Reed Study’s conclusion that 10 km zones are sufficient to protect earth stations from co-channel interference.<sup>46</sup> Notably, these two traditional wireline carriers are today “deploying wireless broadband, including using mid-band spectrum,”<sup>47</sup> illustrative of the cost and deployment timing benefits of fixed wireless broadband over fiber and other wireline technologies.<sup>48</sup>

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<sup>42</sup> *Id.* at 11.

<sup>43</sup> *Id.* at 9.

<sup>44</sup> PISC Comments at 3, 6.

<sup>45</sup> See <https://www.leichtmanresearch.com/wp-content/uploads/2019/04/LRG-Research-Notes-1Q-2019.pdf> (Frontier Communications has 838,000 pay TV subscribers) (last visited Aug. 13, 2019); <https://broadbandnow.com/Windstream> (Windstream’s cable service “is available to approximately 406,000 people, making it the 27th largest provider of cable broadband in the U.S. by coverage area.”) (last visited Aug. 13, 2019).

<sup>46</sup> Comments of Frontier Communications Corporation and Windstream Services, LLC, GN Docket No. 18-122, RM-11791 and RM-11778 (filed Aug. 7, 2019) (“Frontier/Windstream Comments”) at 3.

<sup>47</sup> *Id.* at 2.

<sup>48</sup> Both Frontier and Windstream are Connect America Fund awardees with annual build-out milestones.

One of the substantial benefits of the coordinated sharing approach that the Reed Study confirms is the ability to “easily and quickly” establish the AFC, certify equipment, and enable deployment.<sup>49</sup> Other proposals, such as the fiber replacement plan proffered by the ACA Connects Coalition, would require at least five years before fiber could be deployed to certain rural areas of the country and then would likely be used only for backhaul rather than the last mile. In particular, Google notes that equipment development for fixed P2MP use in the C-band “can rely on technologies already being used in the adjacent CBRS band, and therefore can occur rapidly.”<sup>50</sup> Airspan Networks and Cambium Networks, two equipment manufacturers that currently provide fixed wireless broadband solutions in the adjacent CBRS band and a variety of other spectrum bands, agree. Cambium explains that its “systems can readily be engineered to support shared, coordinated uses by Part 101 frequency coordinated P2MP operations without causing harmful interference to co-channel Fixed Satellite Service (‘FSS’) earth stations.”<sup>51</sup> Airspan similarly stated that it believes it is “possible to rapidly adapt existing equipment to be used for C-band operation.”<sup>52</sup>

For these same reasons, Cambium and Airspan strongly support coordinated sharing of C-band spectrum and endorsed the findings of the Reed Study. Airspan indicates that the results of the Reed Study demonstrate that “there may be significant opportunities to bring fixed wireless point to multipoint (P2MP) access to tens of millions of Americans in shared C-band spectrum.”<sup>53</sup> Based on its experience implementing spectrum sharing techniques in the CBRS

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<sup>49</sup> Google Comments at 7.

<sup>50</sup> *Id.* at 8.

<sup>51</sup> Comments of Cambium Networks, Ltd., GN Docket No. 18-122, RM-11791 and RM-11778 (filed Aug. 7, 2019) (“Cambium Comments”) at 1.

<sup>52</sup> Comments of Airspan Networks Inc., GN Docket No. 18-122, RM-11791 and RM-11778 (filed Aug. 7, 2019) (“Airspan Comments”) at 2.

<sup>53</sup> *Id.* at 2.

band and coordinating fixed operations in Part 101, Airspan concludes that the Reed Study “results and recommendations are feasible to implement rapidly and cost-effectively.”<sup>54</sup>

Cambium similarly indicates that “its customers, and the Americans they serve, could benefit greatly from the introduction of new point-to-multipoint (P2MP) operations in the C-band.”<sup>55</sup> Cambium supports the conclusions reached in the Reed Study and recommends that the Commission rely on those conclusions regarding the appropriate interference protection for FSS earth stations. In particular, Cambium expresses its agreement with the Reed Study that “careful siting and pointing of P2MP nodes would mitigate the risk of harmful interference.”<sup>56</sup> Cambium also states that the Reed Study’s “use of real-world assumptions, such as the need for earth stations to be pointed upward toward the satellites with which they interact, make the Reed Study a reliable predictor of interference (or the lack thereof).”<sup>57</sup>

### **III. OBJECTIONS TO THE REED STUDY DO NOT QUESTION THE TECHNICAL FEASIBILITY OF CO-CHANNEL SHARING**

Three parties – CTIA,<sup>58</sup> CBA,<sup>59</sup> and SIA<sup>60</sup> – raise concerns over certain aspects of the Reed Study. They generally question whether the Reed Study relied on the appropriate propagation analysis or used valid assumptions to calculate the 10 km radius zone that represents the “real world” area where earth stations should be protected from harmful co-channel interference.

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<sup>54</sup> *Id.*

<sup>55</sup> Cambium Comments at 1.

<sup>56</sup> *Id.* at 2.

<sup>57</sup> *Id.*

<sup>58</sup> Comments of CTIA, GN Docket No. 18-122, RM-11778 and RM-11791 (filed Aug. 7, 2019) (“CTIA Comments”) at 13-15.

<sup>59</sup> CBA Comments at 20-21.

<sup>60</sup> SIA Comments at 6-8.

The separate Joint Technical Reply Comments being filed today, answer all of these allegations and puts to rest any legitimate concerns over the technical feasibility of coordinated sharing.<sup>61</sup> To summarize:

- Sharing among earth stations and P2MP will neither complicate nor encumber repacking of the band, and will not adversely affect frequency use for earth stations.
- The Reed Study relies on a realistic and appropriate propagation model, and considered several other propagation models.
- The analysis assumes that earth stations have access to “full band, full arc.”
- The Reed Study considers P2MP beam patterns, which as expressly stated in the Reed Study “are directional and are designed to place energy where it’s desired.”<sup>62</sup>
- Aggregate interference is unlikely to be a significant factor, but can be considered as part of the network planning and AFC process.
- The Reed Study clearly indicates that the AFC will determine interference protection on a site-by-site basis.

Moreover, the claims of CTIA, CBA, and SIA do not call into question the *feasibility* of sharing, just the *extent* to which co-channel coexistence can occur. CBA essentially concedes this point, reiterating that its Further Technical Statement shows that “150 kilometers should be *the outer bound* for calculating aggregate RF power spectral density from flexible use base stations and TT&C sites and other earth stations remaining in the 3700-3900 MHz portion of the band.”<sup>63</sup> The Reed Study does not establish an “outer bound” that will be used in all circumstances, but rather estimates co-channel protection zones that would be individually

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<sup>61</sup> See WISPA/Google/Microsoft Joint Reply Comments Regarding Technical Comments on the Reed Study, GN Docket No. 18-122 (filed Aug. 14, 2019 (“Joint Technical Reply Comments”).

<sup>62</sup> Reed Study at 21.

<sup>63</sup> CBA Comments at 21 (emphasis added). CBA’s statement appears to take into account aggregate interference from flexible use operations in the lower portion of the band. With guard band and out-of-band emission limits to protect earth stations from mobile operations, such aggregate interference is grossly overstated. See Joint Technical Reply Comments at 4-5.

coordinated before a P2MP licensee could obtain authority to commence operations.<sup>64</sup> Likewise, the Reed Study’s assumptions of a 35-meter base station height and a seven-meter user terminal height do not undermine its credibility just because actual antenna heights may be higher.<sup>65</sup> As the Joint Technical Reply Comments make clear, the heights used in the Reed Study are default values, “and different values from the default can be used.”<sup>66</sup> If a different propagation model or assumptions are used, the analysis would still show that sharing is feasible, but the protection zones might differ when individual P2MP operations are coordinated. So a base station antenna height of 90 meters might need to be located further from the co-channel earth station – assuming non-co-channel frequencies are not available – something AFC has already addressed.

Current coordination practice further supports the analysis and findings of the Reed Study, as co-channel sharing between FSS earth stations and P2MP services is already occurring in the adjacent spectrum band. In 2005, the Commission adopted rules for the 3650-3700 MHz Service.<sup>67</sup> Under a then-novel licensing model, parties could apply for nationwide, non-exclusive licenses and then register individual access points. Pursuant to Section 90.1331(a)(2), “[b]ase and fixed stations may be located within 150 km of a grandfathered satellite earth stations provided that the licensee of the satellite earth station and the 3650-3700 MHz licensee mutually agree on such operation.”<sup>68</sup> The Commission made clear that negotiations for operations within the 150 km zone “must be conducted in good faith by all parties.”<sup>69</sup>

In a recent ex parte letter, WISPA and Google provided an example of a case in Los Angeles where Nextweb, Inc., a 3650-3700 MHz licensee (Call Sign WQND843, Location 158),

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<sup>64</sup> *Id.* at 5.

<sup>65</sup> *See* SIA Comments at 7 (noting that antenna heights may differ).

<sup>66</sup> Joint Technical Reply Comments at 2.

<sup>67</sup> *Wireless Operations in the 3650-3700 MHz Band*, Report & Order, 20 FCC Rcd 6502 (2005).

<sup>68</sup> 47 C.F.R. § 90.1331(a)(2).

<sup>69</sup> 47 C.F.R. § 90.1331(a)(3).

and AT&T, an extended C-band earth station operator (Call Sign KA91), successfully negotiated an arrangement by which the licensee gained permission to operate 10.3 km from the earth station – coincidentally, nearly the same boundary that Dr. Reed estimated in the Reed Study.<sup>70</sup> As Google stated, “[t]his example proves the fundamental assertion of the *Reed Study*: When taking all factors into account, fixed broadband systems can (and already do) co-exist with co-channel earth stations over distances that are a small fraction of the 150-km radius.”<sup>71</sup> The attached Technical Statement of Fred Goldstein shows that this is not unique.<sup>72</sup> In fact,

There are thousands of examples of broadband systems operating normally within the 150 km “exclusion” zones of co-channel FSS after coordination. Sometimes such operations take place within a *few tens of meters*. The conclusion from the Reed Study that properly-engineered broadband systems can operate within about 10 km, on average, of co-channel earth stations accordingly is verified by actual deployments.<sup>73</sup>

All across the country, P2MP licensees in the 3650-3700 MHz Service and earth station operators have acted in “good faith” to negotiate co-channel coexistence of exactly the same type WISPA seeks to have automated here for the benefit of American consumers.

The Commission also should consider coordination in the 3650-3700 MHz band a useful precedent because the band will be merged into the CBRS band and shared with mobile users and satellite incumbents under the management of the Spectrum Access System (“SAS”).<sup>74</sup> The 3650-3700 MHz band thus shows not only that manual coordination between fixed wireless and

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<sup>70</sup> See Google Comments at 16-18. See also Letter from Louis Peraertz, WISPA & Andrew Clegg, Google, to Marlene H. Dortch, FCC Secretary, GN Docket No. 18-122 (filed Aug. 6, 2019), Attachment.

<sup>71</sup> Google Comments at 17.

<sup>72</sup> See Technical Statement of Fred Goldstein, WISPA Technical Consultant, attached hereto as Appendix A.

<sup>73</sup> *Id.* at 11 (emphasis in original).

<sup>74</sup> See *Amendment of the Commission’s Rules with Regard to Commercial Operations in the 3550-3650 MHz Band*, Report & Order & Second Further Notice of Proposed Rulemaking, 30 FCC Rcd 3959, 3978 (¶ 54) (including 3650-3700 MHz band in the Part 96 regime), 4045-4047 (¶¶ 287-291) (adopting protection for incumbent FSS earth stations).

satellite earth stations is possible, but also that Commission policy favors transitioning to an automated system that protects the operations of incumbents. Commscope, which is both an SAS administrator and has provided studies on which both 3650-3700 MHz licensees and earth station operators have relied to demonstrate the extent to which sharing is feasible on an individualized basis, not surprisingly acknowledges that “our experience with Spectrum Access Systems indicates that sharing with FSS systems is possible.”<sup>75</sup>

Similarly, the BAC proposal would simply automate the manual, expensive and time-consuming coordination process using techniques and methodologies advanced in the intervening years. Leveraging the work done to develop the much more sophisticated SAS for CBRS, it essentially replaces negotiated agreements for permissive use with real-time AFC. This substantially reduces transaction costs and lessens the time by which P2MP networks can be deployed. Rather than taking days, weeks or months to negotiate agreements, co-channel P2MP operations can commence as soon as the AFC gives a green light based on the specific parameters of the proposed operation.

The AFC also addresses another concern that opponents raise. WISPA fully appreciates that earth stations must have “the ability to quickly change antenna orientations without the need for regulatory approval” and must be able to “procure an expedited coordination” for things like breaking news and other events.<sup>76</sup> WISPA also understands that new co-channel C-band earth stations may need to be added if the Commission so permits.<sup>77</sup> These parties ignore, however, aspects of the coordinated sharing proposal that are in the record that absolutely address these

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<sup>75</sup> Comments of Commscope, GN Docket No. 18-122, RM-11791 and RM-11778 (filed Aug. 7, 2019) (“Commscope Comments”) at 2.

<sup>76</sup> SIA Comments at 5.

<sup>77</sup> Contrary to the assertions of some commenters that assume a total freeze would be required. *See, e.g.*, Comments of The Church of Jesus Christ of Latter-Day Saints, GN Docket No. 18-122, RM-11791, RM-11778 (filed Aug. 7, 2019) (“Church Comments”) at 5-6.

possibilities. First, since Day One, the BAC has proposed that P2MP equipment be frequency-agile so that it can automatically tune to different “clean” channels if an earth station requires different spectrum.<sup>78</sup> Second, automating this process identifies the P2MP licensee and enables expedited coordination in real time, without the earth station operator having to either determine who may be causing interference or provide any notice to a P2MP licensee. In other words, the combination of frequency-agile equipment and the real-time AFC process provide substantially more certainty than provisions in existing agreements between 3650-3700 MHz Service licenses and extended C-band earth stations, which typically require the earth station to send a message to the licensee, have the licensee determine whether it is the source of the interference, and take whatever steps are necessary to mitigate the interference.<sup>79</sup> AFC vastly improves a time-consuming, manual system that has been in place for 14 years.

Finally, as some commenters point out, the Reed Study also is significant for what it does *not* analyze – non-co-channel coexistence. Unlike mobile wireless operations that will require a significant amount of guard band to protect receive-only earth stations, non-co-channel coexistence is “less challenging”<sup>80</sup> and, in fact, no party has questioned this on technical grounds. As PISC observed, however, the scope and thus the ultimate benefit of non-co-channel sharing cannot be assessed until the Commission determines how much spectrum it chooses to clear for flexible use.<sup>81</sup>

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<sup>78</sup> See BAC Petition at 31.

<sup>79</sup> See Google Comments at 21 (“In the C-band, however, automated coordination is much simpler. With the exception of occasional portable operations, FSS operations are generally static, with the earth stations operating at locations that are known in advance. With the exception of occasional portable operations, new earth stations do not suddenly appear.”).

<sup>80</sup> PISC Comments at 9; Comments of the Broadband Connects America Coalition, GN Docket No. 18-122 (filed Aug. 7, 2019) at 4 (same).

<sup>81</sup> *Id.* at 10.



The CTIA, CBA, and SIA comments thus erect artificial barriers that do not survive technical scrutiny. In apparent self-recognition of its contrived case, SIA takes the additional – and predictable – tack of asking for further analysis of the Reed Study.<sup>82</sup> Commscope similarly asserts that “additional study is needed to determine the appropriate protection zones and sharing criteria.”<sup>83</sup> The suggestion that the Commission should delay consideration of the Reed Study and the BAC proposal is disingenuous on at least three fronts. First, other commenters did not have any problem in understanding the Reed Study and either endorsing it, as Google, Frontier/Windstream, Airspan, and Cambium have, or in making specific, albeit mistaken and misplaced, claims about the assumptions underlying the Reed Study. Second, if SIA truly believes that it had insufficient time to address the Reed Study – a dubious proposition in light of the lengthy Comments it filed – then it should have asked the Commission for additional time to file Comments instead of vaguely suggesting that more time is needed. Third, SIA confuses the process by suggesting that “careful analysis” and study of “impacts” are precursors to moving forward, when in fact the stakeholder-driven AFC development process is itself intended ultimately to accomplish the sharing standards that will protect earth stations from harmful interference.

To this end, WISPA renews its offer to all stakeholders to join in the process to develop the AFC that will govern coexistence in the C-band. Through this process, the satellite industry can absolutely ensure that the interference protection scheme “fully protects C-band earth stations’ ability to access all authorized C-band satellites.”<sup>84</sup> Should these associations and their

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<sup>82</sup> SIA Comments at 2 (“urg[ing] the Commission to conduct a careful analysis to confirm that FSS receivers will not be disrupted and to establish effective terrestrial operational limits and response mechanisms to address any harmful interference.”); *id.* at 7 (“the impacts of more realistic deployments must be studied”).

<sup>83</sup> Commscope Comments at 2.

<sup>84</sup> SIA Comments at 6.

members decline the opportunity to participate or otherwise remain silent, that will be proof positive that their true motive is to have the Commission abandon the C-band sharing proposal, enshrine government-sanctioned warehousing of valuable spectrum, and deny the public the significant benefits that fixed P2MP investment, deployment, and service enables.

Stakeholders may quibble over the assumptions and inputs that go into a coexistence framework – details that stakeholders can resolve in the AFC development process regardless of the extent to which the assumptions and parameters of the Reed Study may be incorporated in the AFC – but that does not undermine the fact that coordinated sharing can be easily implemented. That it has already been occurring in the adjacent band, and will be hallmark of the Commission-approved SAS for CBRS, should quell any discussion to the contrary. Simply put, there is no technical basis for the Commission to reject the proven sharing model urged by the BAC, WISPA, Google, Microsoft, and a host of other parties.

#### **IV. OPPONENTS OF SPECTRUM SHARING DO NOT OTHERWISE PROVIDE ANY ARGUMENTS OR EVIDENCE**

The remaining arguments of commenters opposing spectrum sharing should be given exactly the amount of time and attention that these parties put into these arguments: little to none. The *Public Notice* asked parties for input about specific technical issues, such as “how should protection criteria be calculated and implemented to achieve both in-band and adjacent band Fixed Satellite Service protections through coordination or other protection mechanisms.”<sup>85</sup> Reading these Comments, however, one would think that the *Public Notice* instead asked parties to cut and paste their earlier comments, and to avoid providing any arguments or evidence. Aside from the handful of mistaken and misplaced criticisms refuted above, opponents of spectrum sharing simply rewarmed unfounded assertions they have made numerous times before.

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<sup>85</sup> *Public Notice* at 5.

Clearly, it was possible for parties to engage on the technical issues. Google's Comments provide an excellent example of a party providing pointed, specific replies to the Commission's questions.<sup>86</sup> By contrast, opponents of coordinated C-band sharing simply chose not to do so.

**A. Assertions That Spectrum Sharing Is Impossible Are Not Arguments Or Evidence**

Again and again, opponents of spectrum sharing repeat that P2MP is so difficult that it might just as well be impossible. But they never explain why this is so, much less provide any evidence. The Church of Jesus Christ of Latter-Day Saints (the "Church") states that coordination between C-band and fixed service is "not a workable or efficient use of C-band."<sup>87</sup> The Church does not explain how it believes coordination is unworkable, ignores the Reed Study, ignores the 40-year history of coordination between satellite and fixed wireless operations in the C-band, and ignores the more recent examples of actual sharing occurring in the 3650-3700 MHz band. Verizon states that "C-band satellite operators have shown that allowing [P2MP] will complicate frequency coordination and increase the risk of harmful interference to the video downlink," while T-Mobile vaguely asserts that sharing "would create interference risks and technical impediments that limit the use of the spectrum."<sup>88</sup> How, exactly? Verizon and T-Mobile never say and never have said. They support these assertions by referencing earlier, similarly broad assertions in the record. These references do not provide any clear explanation, nor do they "show" anything.

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<sup>86</sup> Google Comments at 11-22.

<sup>87</sup> Church Comments at 5.

<sup>88</sup> Comments of Verizon, GN Docket No. 18-122 (filed Aug. 7, 2019) ("Verizon Comments") at 17; Comments of T-Mobile USA, Inc., GN Docket No. 18-122 (filed Aug. 7, 2019) ("T-Mobile Comments") at 21.

The Content Companies take the concept a step further, boldly stating that a “repacked C-band could not, *as a matter of physics*, accommodate new fixed wireless broadband uses.”<sup>89</sup> A reader of these comments would normally expect some explanation of how spectrum sharing might violate the laws of physics. But the reader would be wrong. The Content Companies substantiate this statement only by asserting that “[P2MP] transmissions necessarily emit high-powered signals in many directions which greatly increases the difficulty of frequency coordination and the potential for harmful interference to existing C-band usage.”<sup>90</sup> As one might expect by now, the Content Companies do not cite to any study of P2MP systems or other objective data; instead, they cite their own verbatim comments in response to this proceeding’s Notice of Proposed Rulemaking.<sup>91</sup> What do those comments cite as support? Their own comments, using almost exactly the same wording, in response to this proceeding’s Notice of Inquiry.<sup>92</sup> In almost two years, the Content Companies have recycled the same bald assertion twice, failing to perform even the slightest amount of background research to determine whether it is true. As shown in the Reed Study and the Joint Technical Reply Comments, this is demonstrably incorrect: P2MP does not blast radiation indiscriminately, but rather uses directional antennas that can direct energy to customers rather than earth stations.<sup>93</sup> The Content Companies fail to provide any other explanation of the physics behind their statement, provide

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<sup>89</sup> Comments of The Content Companies, GN Docket No. 18-122 (filed Aug. 7, 2019) (“Content Companies Comments”) at 14 (emphasis added).

<sup>90</sup> *Id.*

<sup>91</sup> *Id.* n.33, citing Comments of The Content Companies, GN Docket No. 18-122 (filed Oct. 29, 2018) (“Content Companies NPRM Comments”) at 11 (“[P2MP] transmissions necessarily emit high-powered signals in many directions, which greatly increases the difficulty of frequency coordination and the potential for harmful interference to existing C-band usage.”).

<sup>92</sup> Content Companies NPRM Comments n.24, citing The Comments of The Content Companies, GN Docket No. 17-183 (filed Oct. 2, 2017) at 7 (“[P2MP] transmissions, by their nature, emit signals in many directions, making coordination especially difficult and increasing the potential for harmful interference to existing C-band usage.”).

<sup>93</sup> Joint Technical Reply Comments at 4, citing Reed Study at 21.

any studies or other evidence to substantiate it, or try in any serious way to refute the Reed Study. Wishing something were true – no matter how many times one wishes or for how long – does not make it so.

CBA manages to match and surpass the Content Companies’ breathless hyperbole and lack of persuasive argument stating that spectrum sharing continues to be proposed “despite overwhelming record evidence demonstrating how P2MP would disrupt critical satellite operations and effectively prevent satellite operators from optimally clearing spectrum for terrestrial 5G services.”<sup>94</sup> Again, a reader of this statement would expect CBA to handily present at least a portion of this “overwhelming” record evidence, citing to technical studies, refutations of the Reed Study, or cogent explanations of how coordination has proven ineffective over the last 40 years.<sup>95</sup> Anything that would qualify as “overwhelming” record evidence. But, again, the reader would be wrong. Instead, like a snake swallowing its own tail, CBA’s Comments cite a footnote from their own reply comments from last December, which in turn does nothing more than string cite a bunch of similar broad assertions from spectrum sharing opponents.<sup>96</sup> There is no “overwhelming” record evidence in this docket, much less evidence that “demonstrates” CBA’s points. CBA’s declarative arguments do not magically improve with repetition.

At bottom, the same broad statements repeated and self-referenced again and again over two years do not constitute a convincing or substantiated argument, but rather reveal the absence of any meaningful technical objection. The Commission’s decision regarding spectrum sharing

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<sup>94</sup> CBA Comments at 19 & n.51.

<sup>95</sup> Which, as noted above, would be wrong. Coordination between earth stations and fixed services works just fine and is, in fact, the cornerstone of earth station operators’ interference protection as WISPA explained in its recent comments about earth station operators’ rights. Comments of WISPA, GN Docket No. 18-122 (filed Jul. 3, 2019) at 6-8.

<sup>96</sup> See *id.*; Reply Comments of CBA, GN Docket No. 18-122, GN Docket No. 17-183, RM-11791 and RM-11778 (filed Dec. 7, 2018) at 49 n.180.

is a policy decision, but at this point the decision is a stark choice: allowing spectrum sharing is supported by actual and substantial technical evidence in the record, while rejecting spectrum sharing is not supported by any technical evidence whatsoever and, in fact, is refuted by the examples of successful sharing occurring in other bands. Accepting the opponents' arguments would only be reasonable if the Commission dispensed with technical rigor and instead favored a policy choice that ignores spectrum efficiency, cost-effective broadband deployment and, most of all, the needs of rural Americans lacking access to broadband service.

### **B. Opponents Continue To Assume Away The Substantial Benefits Of Spectrum Sharing**

Absent technical evidence or cogent arguments to back up their statements, opponents of spectrum sharing then place considerable weight on manufactured outrage over the effect spectrum sharing might have on future use of the band. Verizon and T-Mobile state that sharing spectrum would frustrate the goal of repurposing C-band for flexible use services,<sup>97</sup> while CTIA observes that “inserting a new fixed broadband service into the C-band would undermine the goal of clearing existing users and maximizing the amount of spectrum to be repurposed.”<sup>98</sup>

But these kinds of arguments are only persuasive if (1) one is already convinced that providing C-band spectrum for P2MP has no merit, and (2) one believes that the entire C-band will be completely repurposed for mobile broadband, leaving no spectrum for C-band satellite services.

As to the first point, and as was discussed above, WISPA, BAC, Google, Microsoft, the Dynamic Spectrum Alliance, PISC, BCA and others have put substantial evidence into the record, including the Reed Study, substantiating the benefits of coordinated sharing among earth

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<sup>97</sup> Verizon Comments at 17; T-Mobile Comments at 21.

<sup>98</sup> CTIA Comments at 19. CTIA keeps up the theme of supporting current arguments by self-referencing earlier comments, stating that CTIA has “previously observed” this point.

stations and P2MP services. Opponents of spectrum sharing create the false impression that making C-band spectrum available to WISPs, utilities, Industrial Internet of Things, and other businesses is little better than wasting it, when the opposite has been shown to be true. Fixed wireless is a tried and true technology that currently serves over four million Americans, many of whom have no other terrestrial broadband access option. By allowing spectrum sharing, the Commission will put that spectrum to work providing high-speed broadband services to rural Americans immediately, thereby helping to advance the Commission's "top priority."

Deployment for 5G is, of course, important, and WISPA supports an approach that would make a substantial amount of cleared spectrum available across the country in the lower portion of the C-band. Verizon, T-Mobile, and CTIA's preferred approach for the rest of the band would not, however, result in any significant spectrum for mobile broadband in rural areas anytime soon. Verizon, T-Mobile, and CTIA would apparently prefer no one to use that spectrum while they put it on a shelf, on the off chance they eventually decide to deploy C-band spectrum outside of their preferred markets at some undefined point in the far future. Putting the C-band to use rather than depositing it in the wireless operators' spectrum bank is how investment and deployment can be incentivized for the benefit of rural Americans.

As to the second point, it is extremely unlikely that earth stations will ever be completely eliminated from the C-band, at least not in any reasonable timeframe. NAB and the Content Companies want to limit mobile broadband to no more than 200 megahertz in the lower part of the band.<sup>99</sup> A number of other parties also argue that they will need C-band satellite services for the foreseeable future, and so push back on making more than 200 megahertz available.<sup>100</sup> The

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<sup>99</sup> Comments of the National Association of Broadcasters, GN Docket No. 18-122 (filed Aug. 7, 2019) ("NAB Comments") at 1-2; Content Companies Comments at 2.

<sup>100</sup> Comments of the North American Broadcasters Association, GN Docket No. 18-122, RM-11791 and RM-11778 (filed Aug. 7, 2019) at 2-3; Comments of QVC, Inc. and HSN, Inc., GN Docket No. 18-122,

ACA Connects Coalition Proposal contemplates keeping 130 megahertz in the band for a certain class of satellite services. Even the mobile carriers are not in agreement on how much spectrum they need, but – with the exception of T-Mobile’s unworkable incentive auction proposal – none is insisting that the Commission should make all 500 megahertz available.<sup>101</sup> In light of this, whatever approach the Commission ultimately decides to adopt for mobile broadband, the Commission should reject claims that spectrum sharing is the reason why it will not be possible to repurpose all 500 megahertz in the C-band for flexible use mobile services.

And as long as some C-band spectrum remains usable for satellite services, that spectrum can and should be shared with P2MP. Failing to make the minor rule changes to Part 101 that would enable P2MP would sanction spectrum *non-use*, indefinitely, for no good or even defensible reason. Yet this is the outcome that Verizon, T-Mobile, and CTIA prefer.

The absurdity of opponents arguing that up to 300 megahertz of usable spectrum should remain fallow indefinitely is particularly evident in NAB’s Comments. NAB supports the prompt transition of the lower 200 megahertz for flexible use consistent with CBA’s proposal, stating that if the Commission gave in to “unreasonable and “unjustified” demands for more spectrum, it would “no doubt be harming the backbone of our nation’s audio and video content delivery system.”<sup>102</sup> Yet only a few pages later, NAB argues against allowing P2MP to share any spectrum, asserting that “[c]reating an entire new class of existing users in the band would be short-sighted and could risk limiting the Commission’s flexibility in the future.”<sup>103</sup> So does

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RM-11791 and RM-11778 (filed Aug. 7, 2019) at 15; Comments of PSSI Global, GN Docket No. 18-122, GN Docket No. 17-183, RM-11791 and RM-11778 (filed Aug. 7, 2019) at 2-4; Comments of Globecast America, Incorporated, GN Docket No. 18-122, GN Docket No. 17-183, RM-11791 and RM-11778 (filed Aug. 7, 2019) at 7.

<sup>101</sup> See Comments of WISPA, GN Docket No. 18-122 (filed Aug. 7, 2019) at 4 (contrasting the mobile wireless carriers’ positions on the amount of spectrum to clear for flexible use auction).

<sup>102</sup> NAB Comments at 1.

<sup>103</sup> *Id.* at 10.



NAB want to restrict flexible use to 200 megahertz, or keep the remainder of the spectrum open for flexible use? It appears NAB is simply parroting arguments from other commenters, regardless of whether the arguments make sense in light of its larger policy goals. The Commission is far better served by comments from parties like Frontier and Windstream. As discussed above, Frontier and Windstream have significant cable TV operations supported by C-band earth stations, yet nevertheless see the value in opening the C-band to coordinated spectrum sharing with P2MP operations.<sup>104</sup>

Finally, Verizon and AT&T's suggestion to conduct an overlay auction<sup>105</sup> is clearly not a particularly serious proposal, but does warrant brief discussion. In making this proposal, Verizon spends three pages generally describing how an overlay auction might work, but – in the words Verizon uses in the same Comments to criticize the ACA Connects Coalition Proposal – the “proposal raises more questions than it answers at a time when stakeholders should be narrowing issues in the proceeding.”<sup>106</sup> AT&T does not even bother to provide the scant detail Verizon cobbled together, instead just stating that sharing rights should be auctioned.<sup>107</sup>

While the Commission could not possibly implement an overlay auction on the basis of such a showing, it is also important to note that such an auction would run directly counter to the public interest in putting spectrum to work. The practical effect of such a structure would be to spend several years creating, essentially, a “loser’s bracket” in the C-band. There would be inevitable delays while the Commission conducts proceedings to build an accurate database of registered earth stations, considers and adopts auction rules, and conducts the overlay auction – a

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<sup>104</sup> See Frontier/Windstream Comments at 2-3.

<sup>105</sup> Verizon Comments at 18-20; Comments of AT&T, GN Docket No. 18-122, RM-11791, RM-11778 (filed Aug. 7, 2019) at 12-13.

<sup>106</sup> Verizon Comments at 13.

<sup>107</sup> AT&T Comments at 12-13.

multi-year process that keeps valuable spectrum on the sidelines until the large mobile carriers can decide how much additional C-band spectrum will be necessary to meet their 5G needs. Then, when the Commission eventually conducts the overlay auction, there can be little doubt that the mobile wireless operators that had failed to obtain spectrum in the lower, cleared part of the band would use the overlay auction to cherry-pick desirable areas. Should these operators acquire spectrum in the urban areas where they are likely to focus the majority of their 5G spending, then that spectrum might – eventually, after some number of years – be deployed if all of the incumbent earth station operators can be convinced to move or shut down. Spectrum in rural areas might not even be bought at auction, and if it were bought, would only be deployed years and years from now, after cleared C-band spectrum was deployed in urban and rural areas. Presumably, operators would ask for extension after extension as efforts to clear out earth station operators dragged out. In effect, then, Verizon’s overlay proposal would do nothing more than notionally warehouse spectrum for no one’s benefit. There would be no assurance that any significant amount of the spectrum would be used for mobile broadband in urban or rural areas, at least over any time period that would make a difference. All to avoid the possibility of WISPs and others using unused spectrum immediately to extend high-speed broadband to more than 80 million Americans.

Proposing the indefinite, Commission-sanctioned warehousing of hundreds of megahertz of spectrum puts Verizon’s vague proposal in the same class of naked self-interest and cynicism as CBA’s proposal to auction terrestrial rights it does not have so its members can pocket billions of dollars to which they are not entitled. The Commission should reject both proposals in favor of Commission-led policies and processes to put spectrum to work for all Americans.

### **C. Opponents Continue To Ignore Evidence That WISPs Need C-Band Spectrum**

The last assertion repeated by opponents of spectrum sharing is that WISPs have not, in the words of AT&T, “articulated a need for additional spectrum.”<sup>108</sup> Opponents of spectrum sharing are remarkably consistent in their proposals of possible alternative bands: CBRS, 2.5 GHz, 4.9 GHz, and 6 GHz.<sup>109</sup> SIA again repeats its unsupported assertion that WISPs have access to 10 GHz of spectrum, while AT&T is content with asserting a much more modest 650 megahertz.<sup>110</sup> It is hardly surprising that these assertions are supported by citations to the opponents’ own earlier comments – yet another example of their well-worn strategy of repeating bare claims as a substitute for actual argument or evidence.

As it happens, the BAC fully refuted these assertions in December of last year, in its Reply Comments.<sup>111</sup> BAC discredited SIA’s repeated incorrect statement regarding access to 10 GHz by pointing out that much of the spectrum cited by SIA was shared with unlicensed uses, and that the “vast majority” of the 10 GHz was in millimeter wave bands such as 28 GHz, 39 GHz and 40 GHz.<sup>112</sup> Such bands are particularly unsuited to coverage in rural areas because millimeter wave spectrum attenuates over a much shorter distance than mid-band and low-band spectrum. As BAC further explained, use of bands such as 900 MHz, 2.4 GHz, and 5 GHz is severely constrained by congestion and widespread unlicensed use by a panoply of devices – Wi-Fi, routers, wireless phone systems, baby monitors, and other consumer devices.<sup>113</sup> The 5 GHz band is also limited by power limits and line of sight impairments,<sup>114</sup> as well as the need to avoid

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<sup>108</sup> AT&T Comments at 13.

<sup>109</sup> See Verizon Comments at 18; T-Mobile Comments at 21-22; SIA Comments at 3-4; CTIA Comments at 12; AT&T Comments at 13.

<sup>110</sup> SIA Comments at 3; AT&T Comments at 13.

<sup>111</sup> BAC Reply Comments at 23-27.

<sup>112</sup> *Id.* at 25 & n.73.

<sup>113</sup> *Id.* at 24-25.

<sup>114</sup> *Id.* at 25.

certain frequencies to avoid interference with Terminal Doppler Weather Radar operations. Unlicensed spectrum at 500-700 MHz has not been broadly deployed because of uncertainty surrounding repacking and future regulatory treatment of the band.<sup>115</sup> And while the 3650-3700 MHz band is widely used by a number of WISPs, the limited amount of spectrum and the non-exclusive licensing scheme restrict its utility as more and more consumers demand faster speeds and more and more bandwidth.

Nor does the possible future availability of other bands mitigate the need for spectrum in the C-band. Spectrum at 4.9 GHz and 6 GHz cannot be used by WISPs for any last-mile commercial operations. At some point in the future, the Commission may decide to make 50 megahertz in the 4.9 GHz band available for shared use in which first responders and critical information infrastructure uses will retain priority, but this is not guaranteed. Likewise, the terms by which WISPs and others may be able to use 6 GHz spectrum for higher-power use necessary to offer broadband service is the subject of an ongoing proceeding, with no certainty as to the outcome. In both of these bands, the spectrum would be unlicensed which, while of some utility, does not offer the substantial benefits secured through the Part 101 coordinated sharing that WISPA has proposed. Moreover, while channel sizes may be wider, the spectrum is less capable of serving longer distances required in rural areas because the proposed power levels are substantially lower than those proposed for coordinated use in C-band under Part 101.

Likewise, it is possible that WISPs might be able to use General Authorized Access spectrum and acquire Priority Access Licenses in the CBRS band, but there is expected to be significant contention and competition for that spectrum and, again, no guarantee that WISPs will be able to obtain a meaningful amount of spectrum at costs that justify investment and

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<sup>115</sup> *Id.* at 24-25.

deployment to sparsely populated areas. As for the 2.5 GHz band, spectrum is expected to be available in some parts of the country, but not all, so the benefits will inure only to the subset of WISPs that happen to operate in or near the counties where spectrum will be auctioned at some point in the future. That the Commission has not proposed auction rules for either of these two licensed services is testament to the uncertainty of the potential benefits and when they may inure.

WISPs can certainly use other bands if they want to continue to have to deal with spectrum that is incredibly congested or patently unsuitable for rural areas, at a time when they would like to compete with larger companies and as consumers are demanding more and more capacity for video streaming and other bandwidth-intensive services. Spectrum sharing opponents offer to allow WISPs to acquire flexible use licenses in certain bands, but say nothing of the substantial uncertainty as to if and when any licenses will be practically available or usable, or if there would be a sufficient number of WISPs acquiring spectrum to justify commercially available fixed P2MP equipment in such bands. They thus ignore the fact that the record evidence in this proceeding shows that shared use of part of the C-band spectrum provides a unique opportunity for WISPs and others to use wide channels with excellent propagation in order to provide coverage at gigabit or near-gigabit speeds, in a band where fixed wireless has been a co-primary user for decades and where nationwide availability would quickly drive a device ecosystem.<sup>116</sup> Contrary to AT&T's assertion, WISPs have clearly and repeatedly articulated their need for C-band spectrum for the past two years. WISPs need C-band spectrum exactly because there are no suitable or reliable alternatives available, and if they do have access

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<sup>116</sup> See Cambium Comments at 1; Airspan Comments at 2.

to this otherwise unused resource they can affordably and rapidly expand broadband to more than 80 million Americans.

### **Conclusion**

WISPA began these reply comments by pointing out that CBA's tortured use of the Sisyphus myth was not the best mythological reference for this proceeding. But in one respect Sisyphus does provide a useful analogy. WISPA and its members have a renewed sympathy for the king doomed to roll a boulder uphill for eternity, because that experience must be very similar to reading the exact same unsupported positions and assertions from opponents to spectrum sharing that WISPA members have read for the last two years. These positions and assertions remain essentially unchanged, regardless of what evidence might be placed in the record.

WISPA respectfully requests that the Commission adopt spectrum sharing in C-band as has been proposed by BAC, substantiated by the Reed Study, and not effectively rebutted by opponents to the proposal.

Respectfully submitted,

**WIRELESS INTERNET SERVICE  
PROVIDERS ASSOCIATION**

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August 14, 2019

## **Appendix A**

### **Technical Statement of Fred Goldstein, WISPA Technical Consultant**

#### **Broadband Systems are Already Operating in Close Proximity to C-band Earth Stations**

##### **Introduction**

The results of the Reed Study are confirmed by the existence of fixed wireless broadband systems already operating *co-channel* with extended C-band earth stations well within the 150 km exclusion zone distance.

Currently, Part 90 devices are authorized to use some or all of the 3650-3700 MHz band for fixed broadband delivery, using a power level of as much as 50 W EIRP (up to 1 W/MHz EIRP). At the same time, extended C-band earth stations are registered to receive signals below 3700 MHz, typically encompassing all of the 3650-3700 MHz band plus additional bandwidth below.

Many Part 90 systems are already operating well within the 150 km FSS exclusion zones. Some are operating at very close distances to co-channel earth stations. This document examines the statistics and presents some examples.

##### **Part 90 Devices**

There are two databases from which to draw Part 90 information. The first is the FCC's Universal Licensing System (ULS),<sup>1</sup> in which Part 90 devices at fixed locations and operating with a power of greater than 1 W EIRP are registered. There are 81,731 such registrations.

The second database is the Grandfathered Wireless Protection Zone (GWPZ) database.<sup>2</sup> In order for Part 90 systems in 3650-3700 MHz to be protected from CBRN GAA operations in 3550-3700 MHz during a transitional period, they were permitted to register a GWPZ with the FCC.<sup>3</sup> The GWPZ consists of a point, radius, and azimuth range (or omnidirectional), the vertex of which contains the base station and the resulting wedge (or circle) contains all devices communicating with the base station. Each GWPZ will protect one or more Part 90 devices, and not all Part 90 operators registered GWPZs; therefore the number of GWPZs is less than the number of Part 90 devices. There are currently 7,829 GWPZs registered with the Commission.

When using the ULS data, we capture individual devices and some devices that are not associated with any registered GWPZ. However, some of the ULS data could be outdated and may not accurately reflect current actual deployments.

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<sup>1</sup> <https://www.fcc.gov/uls/transactions/daily-weekly#fcc-uls-transaction-files-weekly>.

<sup>2</sup> <https://opendata.fcc.gov/Wireless/ULS-3650-Locations/euz5-46g2/data>.

<sup>3</sup> FCC DA 17-340, released: April 7, 2017.

When using the GWPZ data, we capture accurate data on more-recently-registered systems including a certification by the licensee that the system is truly operational, but we don't capture all individual devices.

## FSS Earth Stations

Similar to the Part 90 data, there are two sources of information on extended C-band earth stations.

The first data source is the FCC's International Bureau Filing System (IBFS). There are 1,053 separate earth station registrations, many of those are for different emission designators for the same physical dish, and for multiple dishes located near each other at the same site. If we assume that any collection of earth stations within 500 m (0.5 km) of one another constitutes one "site," there are just 39 distinct extended C-band sites in the IBFS data. (Because we are comparing the juxtaposition of Part 90 systems compared to the 150 km "exclusion zone," defining a site as being any dishes within 0.5 km of each other is reasonable. For information, if we use 100 m as the site definition instead of 500 m, the number of distinct sites increases only to 50.)

The second data source is a new FCC registration database ("New FSS") created for CBRS. Similar to Part 90 GWPZ protections, any extended C-band earth station requesting protection from CBRS must register in the new separate registration database.<sup>4</sup> Using the same 500 m criterion, there are 14 distinct extended C-band sites.

Similar to the Part 90 data, the IBFS data represent a greater number of earth stations, but some of the data may be outdated. Also, the IBFS earth stations may not qualify for grandfathered protections from CBRS, although that does not impact the analysis here. The new database has fewer sites, but the data are more accurate and up-to-date.

## Source Data Count Summary

Data Source		Number of Entries
Part 90 Broadband	ULS	81,731 individual devices
	GWPZ	7,829 defined protection zones
FSS	IBFS	39 extended C-band sites
	New FSS	14 extended C-band sites

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<sup>4</sup> FCC DA 18-623, released June 15, 2018.



## Discussion

Examples of the juxtaposition of broadband systems and FSS earth stations are shown in this section.

### GWPZs within 150 km of New FSS Registrations

There are 1,151 examples of GWPZs coming within 150 km of the 14 extended C-band sites newly-registered in the “New FSS” database. The closest distance between a GWPZ base station and a C-band earth station is approximately 4 km.

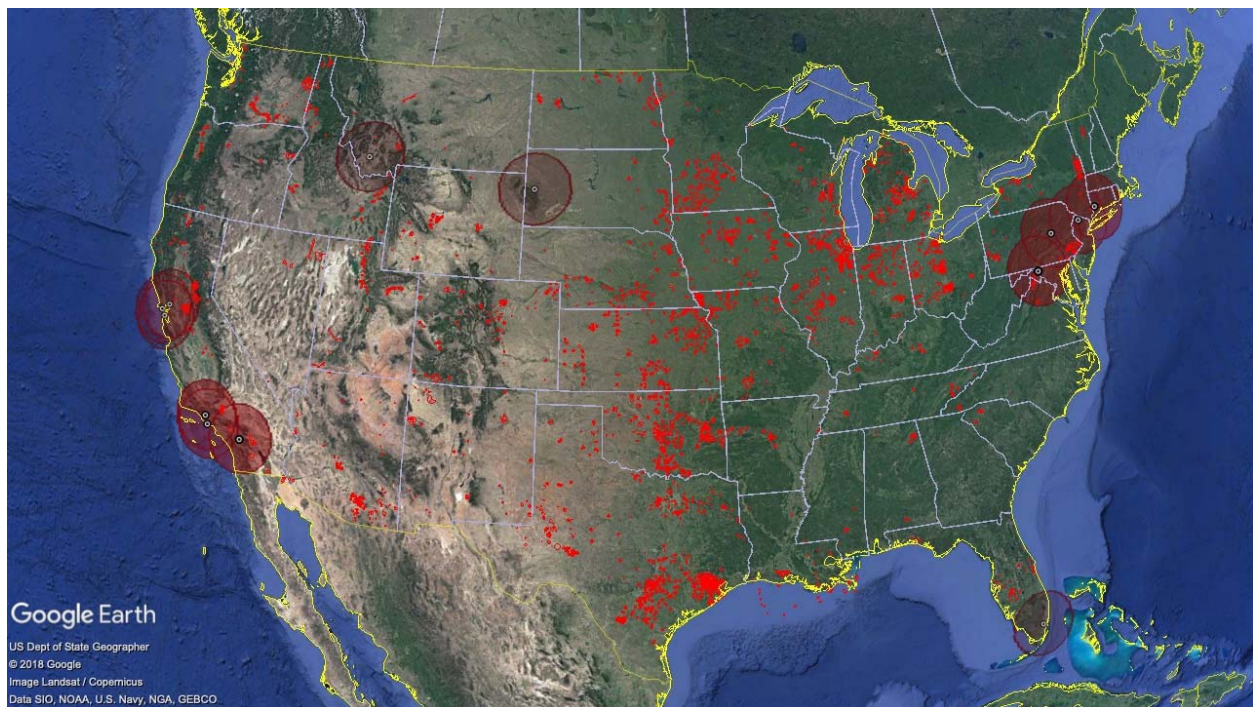


Figure 1: Juxtaposition of GWPZs (bright red wedges, although individually not visible at this scale) to FSS earth stations (white dots surrounded by red circular 150-km “exclusion” zones) derived from the “New FSS” database.

The example below shows a GWPZ base station on a hilltop overlooking San Francisco, with its main beam pointing *directly* at a *co-channel* FSS earth station. The Part 90 device is WQKD604 (location 3), licensed for 5 W EIRP. The co-channel FSS station is E160142, 21.2 km away.

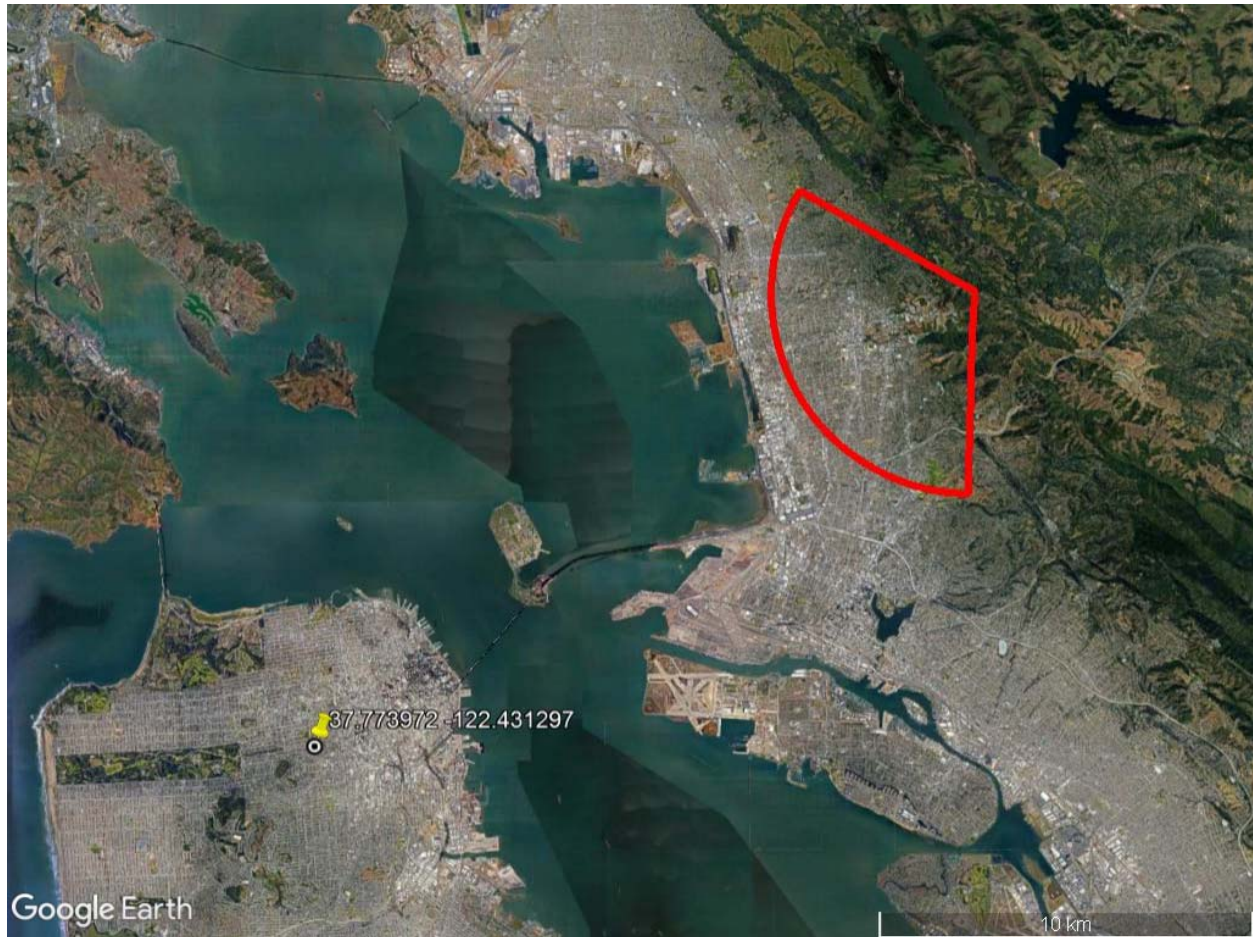


Figure 2: A fixed broadband system overlooking San Francisco with its main beam (red) pointed *directly* at a *co-channel* FSS earth station (pushpin) in the city 21.2 km away.



### GWPZs within 150 km of IBFS Registrations

There are 1,774 examples of GWPZs within 150 km of the 39 extended C-band sites in IBFS. The closest distance between a GWPZ base station and a co-channel earth station is 2.1 km.

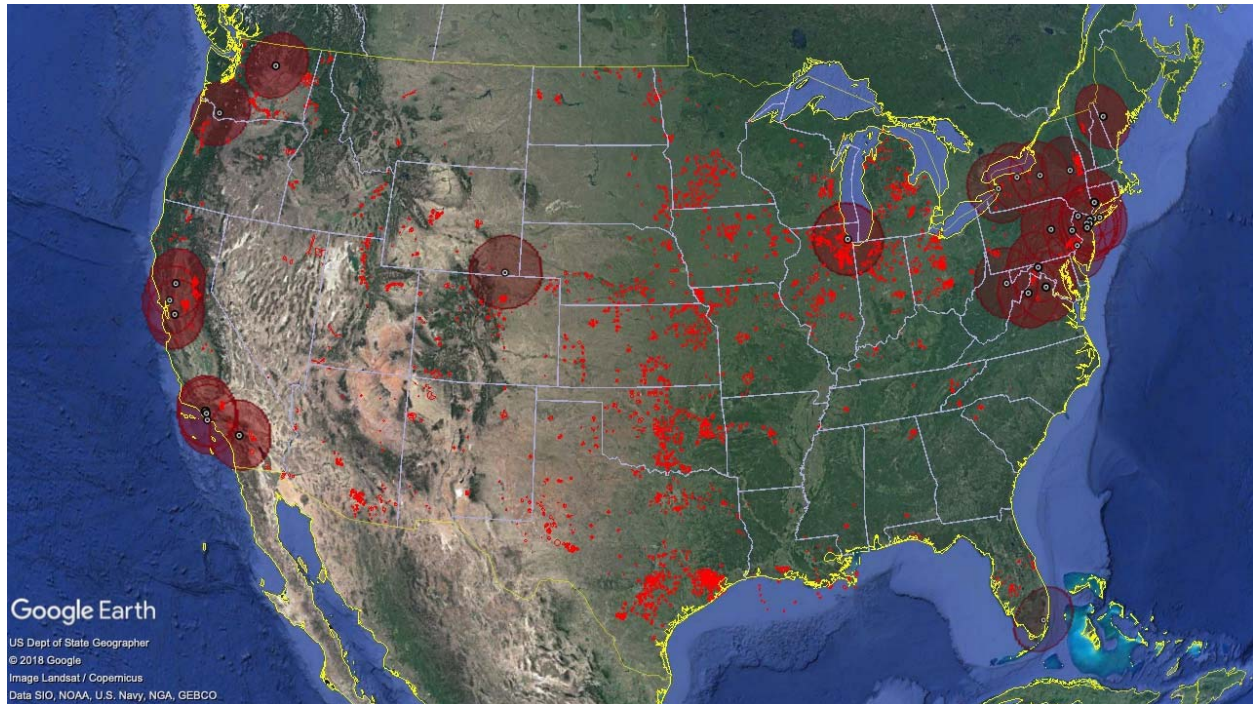


Figure 3: Juxtaposition of GWPZs (as in Figure 1) with FSS site data obtained from IBFS (white dots surrounded by 150 km exclusion zones).

An example of close proximity between the two is shown below. The GWPZ is WQLL491 (location 11), near Williamsport, MD, transmitting 4 W EIRP, with the edge of the main beam of the directional antenna (red wedge) dissecting a major co-channel earth station site E030103 shown in closeup in the second figure.



Figure 4: Co-channel earth station dishes (white dots) on edge of main beam (red wedge) of fixed broadband system about 4 km away.





Figure 5: Close-up of earth station facility in Figure 3. The red line is the edge of the main beam of the fixed broadband system less than 4 km away. The fixed broadband system and these FSS earth stations are co-channel.

### Part 90 ULS within 150 km of New Registrations

There are 20,631 individual Part 90 ULS device registrations that are within 150 km of the 14 co-channel FSS earth station sites in the new FSS database.

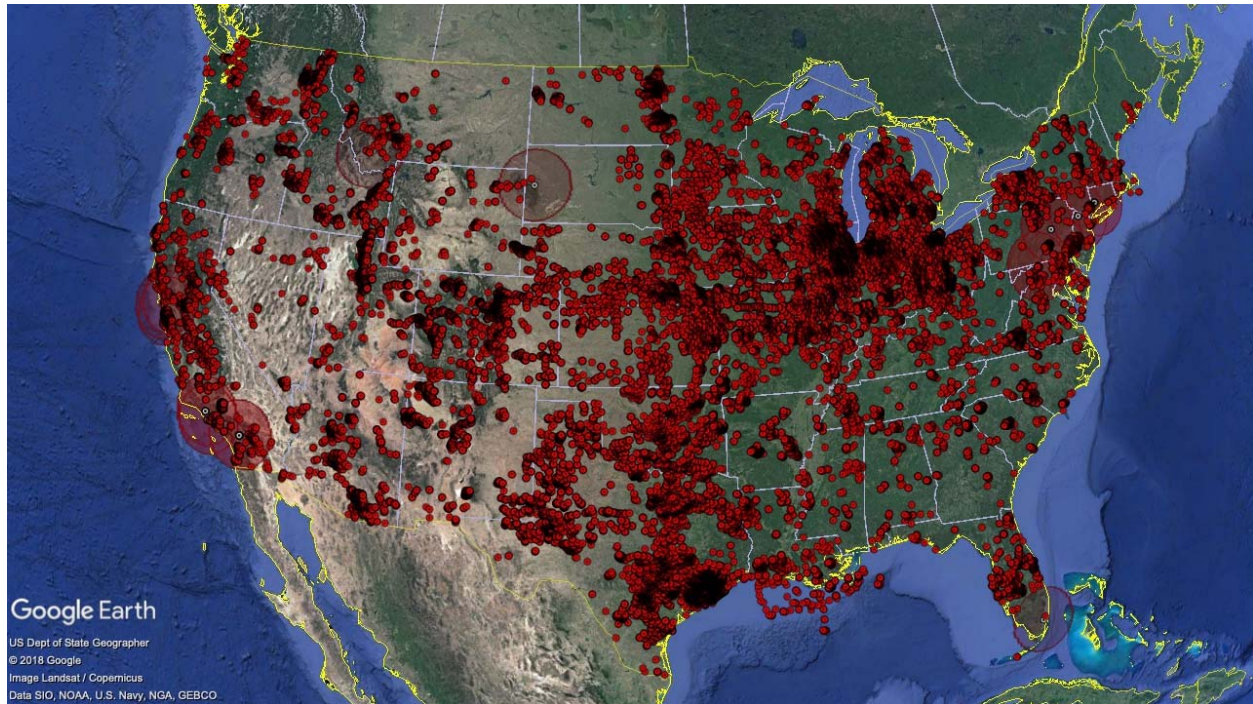


Figure 6: Part 90 ULS individual device registrations (red dots) compared to “New FSS” registrations (white dots surrounded by red circular 150 km exclusion zones)

The closest distance between a Part 90 device and an FSS earth station is 19 meters. The facility is shown below. The Part 90 installation (likely one of the antennas on the tower) is WQMJ539 (location 21), licensed to operate up to 15 W EIRP, at only 19 meters away from the co-channel earth station E555001, based on registration locations, which allow for a certain degree of imprecision. Visual observation shows an actual distance of approximately 65 meters. The systems may be closely coordinated, but they are still operating at an extremely close distance.





Figure 7: A fixed broadband client device is registered as operating only 19 meters from a recently-registered co-channel C-band earth station pictured above. A small tower, below, is visible at the opposite end of the building, approximately 65 meters away:



### Part 90 ULS within 150 km of IBFS Registrations

There are 29,267 individual Part 90 ULS device registrations that are within 150 km of the 39 co-channel FSS earth station sites listed in IBFS.

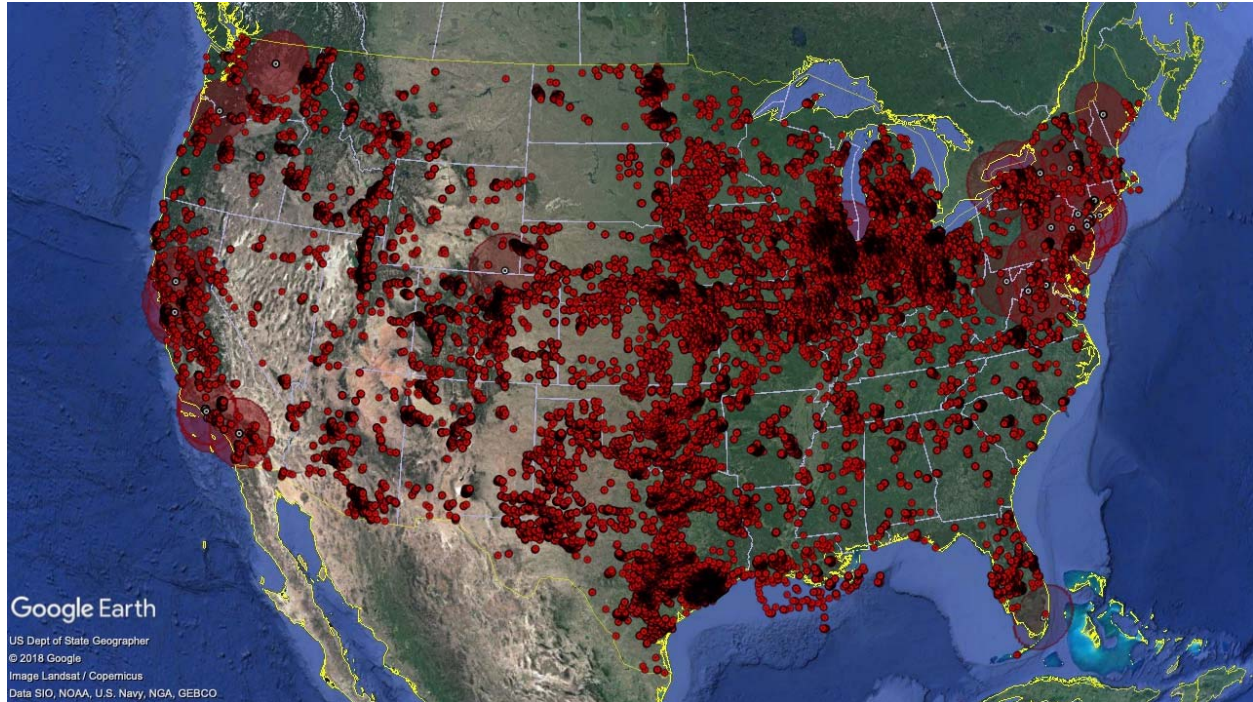


Figure 8: Part 90 ULS individual device registrations (red dots) compared to IBFS FSS registrations (white dots surrounded by red circular 150 km exclusion zones)

The closest distance between a Part 90 device and a co-channel earth station is 152 meters. The Part 90 device is WQKQ592, licensed to operate at over 6 W EIRP, located at the same facility in Hawaii as numerous co-channel earth stations affiliated with FSS licensee KA265. The two systems are likely operated either by the same entity or by different entities in close coordination.





Figure 9: A 6 W EIRP broadband transmitter (red dot) operating *co-channel* with numerous C-band earth stations located as close as *152 meters*.

## Conclusions

There are thousands of examples of broadband systems operating normally within the 150 km “exclusion” zones of co-channel FSS after coordination. Sometimes such operations take place within a *few tens of meters*. The conclusion from the Reed Study that properly-engineered broadband systems can operate within about 10 km, on average, of co-channel earth stations accordingly is verified by actual deployments. Assertions that separation distances of 150 km are needed are absurd and disproven by actual operations.

/s/ Fred Goldstein

Fred Goldstein

Technical Consultant

August 14, 2019