Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, DC 20554

In the Matter of	)	
Expanding Flexible Use of the 12.-12.7 GHz Band	)	WT Docket No. 20-443
Expanding Flexible Use in Mid-Band Spectrum Between 3.7-24 GHz	)	GN Docket No. 17-183

REPLY COMMENTS OF DISH NETWORK CORPORATION

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DISH Network Corporation ("DISH") submits the following reply comments in response to the Commission's Notice of Proposed Rulemaking on how to maximize efficient use of the 12.2-12.7 GHz ("12 GHz") spectrum band.[1]

I. INTRODUCTION AND SUMMARY

Opening up the 12.2-12.7 GHz band to fifth generation ("5G") higher-power two-way terrestrial services is supported strongly and widely. The circle of its proponents is broad enough to encompass many public interest organizations such as New America's Open Technology Institute, Public Knowledge, Next Century Cities, Consumer Federation of America, Center for Rural Strategies, National Digital Inclusion Alliance, Tribal Digital Village, the Institute for Local Self-Reliance, Access Humboldt, and National Consumer Law Center, (the "Ten Public Interest Organizations"), as well as trade associations INCOMPAS, the Competitive Carriers Association, the Computer & Communications Industry Association, and the Rural Wireless Association. In the words of the Ten Public Interest Organizations' joint comments: "expanding

[1] Expanding Flexible Use of the 12.2-12.7 GHz Band, *Notice of Proposed Rulemaking*, 36 FCC Rcd. 606 (2021) ("*12 GHz NPRM*").

non-interfering access in 12 GHz will help maximize the number of potential 5G broadband providers, particularly in rural areas, and increase competitive broadband offerings, which in turn will benefit consumers by improving access, affordability and quality of service."[2] The proponents also include industry stakeholders such as Federated Wireless, and other companies with significant expertise in building 5G networks such as T-Mobile. The 5G skeptics, by contrast, account for a minority of all comments received, and are largely confined to the usual circle of competing licensees.

On the question of sharing between satellite and higher-power two-way terrestrial services, there is thus either full-throated support (from, among others, one of the three largest mobile carriers, and one of the two principal satellite service providers in the band, DISH itself), or opposition that is muted and nuanced rather than firm and absolute. Even the incumbents who profess concern about the introduction of 5G services stop short of asserting that sharing is impossible. Instead, they carefully confine their objections to stating that the 5G proponents have yet to meet their burden of proving feasibility. Indeed, even some in the minority of skeptics acknowledge that sharing is feasible. SpaceX itself appears amenable to a service transmitting at a higher power than MVDDS is allowed to today.[3]

The main disagreements are not about whether, but about how and to what extent, sharing the band with 5G services is feasible—disagreements that can and should be resolved in favor of allowing a meaningfully higher power two-way service in the band for 5G.

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[2] Comments of New America's Open Technology Institute, Public Knowledge, Next Century Cities, Center for Rural Strategies, Consumer Federation of America, National Digital Inclusion Alliance, Institute for Local Self-Reliance, Tribal Digital Village, Access Humboldt, and National Consumer Law Center, WT Docket No. 20-443, GN Docket No. 17-183, at 2 (May 7, 2021) ("Ten Public Interest Organizations Comments").

[3] Comments of Space Exploration Holdings, LLC, WT Docket No. 20-443, GN Docket No. 17-183, at 27 (May 7, 2021) ("SpaceX Comments").

DBS/5G Sharing. The record is devoid of any substantive rebuttal of the 2016 studies conducted by expert engineer Tom Peters. These studies demonstrated that higher-power two-way terrestrial service will not generate even the potential for interference for the vast majority of Direct Broadcast Satellite ("DBS") dishes, even assuming that DBS dishes are omnipresent, with one dish every one or two square meters in the two markets studied by Mr. Peters—Indianapolis, Indiana and Washington, D.C. While a couple of commenters question these studies, they do not explain why they are questionable. AT&T and SES simply cite back to prior filings that misunderstood the studies' methodology. For example, AT&T nods to its past criticism that the 2016 studies "cherry-pick" areas with few DBS dishes,[4] even though Mr. Peters had assumed dishes were *ubiquitous* in these areas.

NGSO/DBS/5G Sharing. On this question, too, the record contains compelling engineering studies on one side of the ledger, and rhetoric on the other. First, as to the obligation of non-geostationary satellite orbit Fixed-Satellite Service ("NGSO FSS") systems to protect DBS dishes, DISH has shown that at least one of the NGSO operators, SpaceX, would exceed the equivalent power flux density ("EPFD") limits intended to protect DBS users, even with the condition of only one satellite focused on a given area at a time (a so-called "Nco" of 1), which the Commission has imposed on SpaceX's authorization.[5] SpaceX has failed to respond to DISH's expert studies. This means that SpaceX is seeking protection from 5G for a service that itself does not adequately protect DBS service, as it is required to do.

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[4] *See* Letter from Michael P. Goggin, AT&T, to Marlene Dortch, RM-11768 (June 14, 2018) ("AT&T 2018 Letter").

[5] Space Exploration Holdings, LLC Request for Modification of the Authorization for the SpaceX NGSO Satellite System, *Order and Authorization and Order on Reconsideration*, FCC-21-48 ¶ 97(e) (Apr. 27, 2021) ("*SpaceX Third Modification Order*").

And, as to sharing between 5G and NGSO FSS services, RS Access has similarly submitted a comprehensive study by RKF Engineering showing that 5G transmissions would comply with the ITU's interference-to-noise standard in all but less than 1% of NGSO locations, and that few, if any, of this tiny subset of terminals would experience service interruption, or even degradation.[6] Events since the RKF Study was submitted in May 2021 further corroborate these results and the conservatism of the RKF Study's assumptions. A review of the Starlink service by a prominent technology site reveals that the service is of unacceptable quality at low elevation angles.[7] This means that, to provide acceptable service, SpaceX will likely need to confine its system to higher elevation angles for the sake of its own customers, making sharing with terrestrial services even less problematic. Similarly, the RKF Study's assumption that NGSO systems would have some urban users is too generous, as shown by the SpaceX CEO's firm disavowal of any plan to take on "telcos"—i.e., compete with them in the cities: "I want to be clear, it's not like Starlink is some huge threat to telcos. I want to be super clear it is not."[8] It is thus no surprise that, in Australia, SpaceX is only authorized to operate in the 12 GHz band in low density and remote areas.[9]

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[6] *See* Comments of RS Access, LLC, WT Docket No. 20-443, GN Docket No. 17-183, App. A (May 7, 2021) ("RS Access Comments") (attaching RKF Engineering Solutions, LLC, *Assessment of Feasibility of Coexistence between NGSO FSS Earth Stations and 5G Operations in the 12.2 – 12.7 GHz Band* (May 2021)) ("RKF Study").

[7] *See* Nilay Patel, *Starlink Review: Broadband Dreams Fall to Earth*, Verge (May 14, 2021), https://www.theverge.com/22435030/starlink-satellite-internet-spacex-review.

[8] Via Satellite Magazine, *Elon Musk, Founder & Chief Engineer, SpaceX - SATELLITE 2020 Opening Day Keynote*, YouTube, at 15:26-26:23 (Mar. 9, 2020), https://www.youtube.com/watch?v=HPV8Xp3pEpI ("We'll have some small number of customers in LA. But we can't do a lot of customers in LA because the bandwidth per cell is simply not high enough.") ("Musk Keynote").

[9] *See* Comments of DISH Network Corp., WT Docket No. 20-443, GN Docket No. 17-183 at 61 (May 7, 2021) ("DISH Comments").

International allocation and standardization. The stars are aligned internationally for a new U.S. terrestrial allocation in the 12 GHz band. This would bring the U.S. Table of Allocations in conformity with the band's nearly global co-primary Mobile Service allocation. Some commenters object to the introduction of 5G in the band due to the lack of 3GPP standardization. This is a Catch-22. Commission allocation of the 12 GHz band to terrestrial higher-power two-way service would be a catalyst for prompt inclusion and completion of the 3GPP process, as it will motivate carriers and vendors to support it. This is what happened in the case of the 700 MHz and AWS-4 bands. It is beyond doubt that the standardization process for both bands was spurred by the Commission's actions in establishing service rules.

MVDDS License Modification. The Ten Public Interest Organizations support modification of the MVDDS licenses to include the provision of terrestrial higher-power two-way service. They correctly view that modification as no gift to the licensees, as it would be accompanied by tough use-it-or-lose it milestones, an idea that DISH supports. As the Ten Public Interest Organizations put it, "[c]onditioning new terrestrial uses on a commitment to aggressive build out requirements and an enforcement mechanism will properly incentivize licensees wishing to take advantage of their expanded use right to quickly deploy[] within the band."[10]

Many factors support an MVDDS license modification to increase power and allow two-way services and preclude an auction, which would be based on an imaginary "greenfield" band currently lying fallow—the reverse of reality for this particular spectrum. First and foremost, as the Ten Public Interest Organizations emphasize, it will increase competitive broadband

[10] Ten Public Interest Organizations Comments at 11.

offerings and bring benefits to consumers;[11] none of the MVDDS licensees are affiliated with any of the three large mobile broadband carriers. Second, it will save substantial time in building higher-power two-way networks, with the speed advantage safeguarded by enforced milestones. Third, ever since the inception of the MVDDS service rules, the Commission has acknowledged the possibility of higher-power two-way service by MVDDS licensees through a waiver. A modification would merely generalize what the Commission entertained from the start on a case-by-case basis.

The Commission should resist the analogies with the C-band proceeding attempted by some commenters. There, the Commission agreed to reimburse costs and make an incentive payment for prompt relocation of incumbents that did not want to continue to use all of the spectrum—put simply, they wanted out. There, the existing licensees wanted to be compensated, leave quickly, and allow others to provide 5G services. Here, by contrast, it is the *existing* licensees who want to provide 5G service. In the words of the D.C. Circuit when it affirmed the AWS-4 license modification, there was "no reason to second-guess the Commission's decision to choose a functioning wireless broadband network over a possible influx of cash."[12] The circumstances here warrant a license modification, and preclude a re-auction, even more strongly than they did in the AWS-4 case. Here, the spectrum has already been auctioned to existing licensees and built out under existing rules; in the C-band proceeding, no auction had taken place, and no terrestrial licenses had been issued. There is nothing "initial" about licenses to use the 12 GHz band.

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[11] *Id.* at 4.

[12] *NTCH, Inc. v. FCC*, 950 F.3d 871, 881 (D.C. Cir. 2020).

Equally flimsy is the idea that the Commission should reallocate all of the MVDDS licensees' authorized spectrum on the ground they have "warehoused" it. In fact, the notion is so far-fetched that SpaceX's evidence of warehousing consists of the fact that DISH charges customers of its MVDDS service "up to $400" for the equipment—*less* than what SpaceX charges for its own Starlink equipment. And of course, licensees do not have to give equipment away for free to meet substantial service requirements. As for SES, it ironically accuses MVDDS licensees of not using the 12 GHz band, no matter that both of SES's 12 GHz satellites are used by one company—DISH. As to AT&T's claims of lackluster investment in the band, it is DISH that has invested in the band many times more than any other company, and it is AT&T's DIRECTV that has all but abandoned the 12 GHz band, diverting its investments to other spectrum.

Finally, reclaiming all of the MVDDS licensees' spectrum would be a major modification that could not be properly undertaken without recourse to the requirements of 47 U.S.C. § 316, and could amount to a license revocation that does not meet the requirements of 47 U.S.C. § 312.

II. A BROAD SPECTRUM OF PUBLIC INTEREST AND BUSINESS ENTITIES, INCLUDING DISINTERESTED ENTITIES, SUPPORTS 5G IN THE BAND

A large chorus of commenters, accounting for the vast majority of all comments received, support opening up the 12 GHz band to terrestrial 5G. They include the Ten Public Interest Organizations; neutral clearinghouses such as Federated Wireless; companies with expertise in mobile broadband such as T-Mobile; as well as MVDDS licensees.[13]

- The Ten Public Interest Organizations state that "expanding non-interfering access in 12 GHz will help maximize the number of potential 5G broadband providers, particularly in

[13] Comments of MVDDS Licensees, WT Docket No. 20-443, GN Docket No. 17-183, at 3 (May 7, 2021) ("MVDDS Licensees Comments").

rural areas, and increase competitive broadband offerings, which in turn will benefit consumers by improving access, affordability and quality of service."[14]

- INCOMPAS and CCIA "urge the Commission to update its restrictive rules for MVDDS and expand terrestrial use of the shared band for two-way communications and mobile services that will spur more competitive choice and 5G opportunity."[15]

- The Competitive Carriers Association ("CCA") agrees that "the decades-old rules and limitations imposed on co-primary 12 GHz terrestrial licensees—including a one-way transmission requirement and severe power constraint that preclude Internet service offerings—have inhibited investment and innovation in this 500-megahertz swath of spectrum."[16]

- Federated Wireless "strongly supports the Commission's efforts to expand use of the 12 GHz Band for new terrestrial broadband services, including fixed and mobile 5G wireless services."[17]

- T-Mobile "applauds the Commission initiating this NPRM," and points out that "[t]he rules for this spectrum were adopted before there was an urgent national need to make more spectrum available for 5G mobile services[.]"[18]

Most of the 5G proponents also support modification of the existing MVDDS licenses, none of which is held by one of the three dominant carriers in the mobile broadband market. For example, the Ten Public Interest Organizations recognize that:

> If the Commission truly wants to help DISH reach its potential as a viable fourth competitor, then the Commission must also ensure that DISH has access to sufficient spectrum to compete aggressively with incumbent providers. Adding 500 megahertz of mid-band spectrum will enhance DISH's chances of success.[19]

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[14] Ten Public Interest Organizations Comments at 2.

[15] Comments of INCOMPAS and CCIA, WT Docket No. 20-443, GN Docket No. 17-183, at 3 (May 7, 2021) ("INCOMPAS/CCIA Comments").

[16] Comments of Competitive Carriers Association, WT Docket No. 20-443, GN Docket No. 17-183, at 1 (May 7, 2021) ("CCA Comments").

[17] Comments of Federated Wireless, Inc., WT Docket No. 20-443, GN Docket No. 17-183, at 1 (May 7, 2021).

[18] Comments of T-Mobile USA, Inc., WT Docket No. 20-443, GN Docket No. 17-183, at 1-2 (May 7, 2021) ("T-Mobile Comments").

[19] Ten Public Interest Organizations Comments at 7.

III. THE PROPOSAL'S FEW OPPONENTS DO NOT CLOSE THE DOOR TO 5G IN THE BAND

While some users of the band express concern about complicating the 12 GHz sharing environment, most stop short of asserting that sharing between 5G and other incumbent services is impossible. Even SpaceX supports the study of terrestrial services in the band, stating that "SpaceX welcomes further study of whether low-power indoor use of the band may be possible without harming consumers of existing services."[20] The question is not if, but how, and subject to what parameters.

Others frame it as a question of the burden of proof. AT&T states that the burden lies with "proponents of this expanded terrestrial use."[21] Intelsat maintains that "MVDDS proponents have yet to provide any convincing evidence," and states "it is imperative that the interference potential between 5G transmitters and satellite receivers first be carefully thought through and analyzed."[22] While Intelsat argues that the answer to whether sharing is feasible "appears to be 'no' in light of the principle 'first do no harm,'"[23] it does not shut the door to the possibility of such a showing. And according to OneWeb, "[t]here is currently no technical study or demonstration in the record before the Commission" that sharing between NGSO FSS

[20] SpaceX Comments at 27; *id.* at 28 ("While the characteristics of the 12 GHz Band mean that transmissions at high power can cause interference through obstructions like walls, at lower power, some indoor use may be possible under certain circumstances.").

[21] Comments of AT&T Services, Inc., WT Docket No. 20-443, GN Docket No. 17-183, at 6 (May 7, 2021) ("AT&T Comments").

[22] Comments of Intelsat License LLC, WT Docket No. 20-443, GN Docket No. 17-183, at 3 (May 7, 2021).

[23] *Id.* at 2 n.4.

and high-powered terrestrial mobile operators is feasible.[24] Of course, this changed on the very day when OneWeb filed its comments, with the submission of the RKF Study.

IV. SHARING IS EMINENTLY FEASIBLE

DISH agrees that the proponents of expanded terrestrial use must carry the burden of proving co-existence is feasible, and submits that they have successfully carried that burden. On the question of sharing between higher-power two-way services and DBS, there is almost zero rebuttal of the two 2016 studies submitted by the MVDDS 5G Coalition, where former Wireless Bureau Chief Engineer Tom Peters showed it to be feasible by carefully analyzing the prospects for coexistence of the two services in the areas of Indianapolis, Indiana, and Washington, D.C.

Likewise, on the question of sharing between higher-power two-way services and NGSO FSS Services, not only does the RKF Study show that coexistence is eminently possible; SpaceX's own statements and reviews of the Starlink service confirm that the assumptions of the RKF Study were overly conservative, and therefore sharing is even more feasible than the study concludes.

A. Sharing Is Possible Between Higher-Power Two-Way Terrestrial Services and DBS

The record is devoid of any substantive rebuttal of the 2016 studies conducted by Mr. Peters demonstrating that higher-power two-way terrestrial interference will not even generate the potential for interference for the vast majority of DBS dishes. Mr. Peters' studies were conservative in a number of respects.

Ubiquitous DBS dishes. The studies assumed that DBS dishes are far more densely deployed than in real life, with one dish every one or two square meters in the two markets

[24] Comments of OneWeb, WT Docket No. 20-443, GN Docket No. 17-183, at 3 (May 7, 2021) ("OneWeb Comments").

studied by Mr. Peters—Indianapolis, Indiana and Washington, D.C. Specifically, Mr. Peters assumed one dish every square meter for the small-cell "urban canyon" configurations in the downtown areas, and one dish every two square meters in a largely rural area about 20 miles outside Indianapolis.[25]

To put this into perspective, the study area in Washington, D.C. covers 4 square kilometers, or 4 million square meters.[26] As Mr. Peters explains in the attached Supplemental Declaration,[27] the total area of the rooftops covered 1,385,884 square meters (about 35% of the total study area). At one dish per square meter, this would translate into almost 1.4 million dishes. While the study did not assume a dish per rooftop square meter in the entirety of cases, it eliminated only rooftop locations that are steeper than 35 degrees or that do not have a view of any operational DBS slot.[28] In Washington, D.C. these eliminated locations are very few: "the flat rooftops that characterize the vast majority of downtown Washington, DC meant that very few pixels of the study area were filtered from the analysis."[29]

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[25] Comments of MVDDS 5G Coalition, RM-11768, Attach. 1 at 7 (June 8, 2016) (attaching Tom Peters, MVDDS 12.2-12.7 GHz Co-Primary Service Coexistence (June 8, 2016)) ("First Peters Study").

[26] Reply Comments of the MVDDS 5G Coalition, RM-11768, Appendix A, at 3 (June 23, 2016) (attaching Tom Peters, *MVDDS 12.2-12.7 GHz Co-Primary Service Coexistence II* (June 23, 2016)) (Washington, D.C.) ("Second Peters Study").

[27] Supplemental Declaration of Tom Peters (attached as Exhibit 1).

[28] *See* Second Peters Study at 6 ("[W]e filtered out roofs with a pitch greater than 35 degrees, including gabled structures, domes, spires and other rooftop architectures that . . . feature such a steep pitch that the surface does not offer a suitable location for DBS satellite receive-antenna installations."); First Peters Study at 11 ("In effect, this methodology excluded only those areas in which the view to all otherwise visible DBS satellites serving the United States was blocked by terrestrial clutter.").

[29] Second Peters Study at 7. The study did assume the existence of dishes on "building parapets," even though they are generally unsuitable locations for such dishes. *See id.* at 9.

The entirety of Washington, D.C. covers 177 million square meters, about 44 times the study area. Since the study assumed almost 1.4 million DBS dishes in the study area, this is equivalent to assuming almost 62 million dishes (44 times 1.4 million) in the entire city[30]—almost three times the actual number of DBS households *nationwide* (about 22 million).[31] Assuming conservatively an average two-member family,[32] that would mean almost 124 million DBS users in Washington. Washington D.C. has a population of 689,545 according to the 2020 Census. Mr. Peters thus conservatively assumed a number of Washington, D.C. DBS users that is almost 180 times the number of Washington residents, and still discovered minimal potential for interference.

Service to each user from all DBS slots. Mr. Peters also assumed that all of these ubiquitous dishes received service from all visible operational DBS slots.[33] As Mr. Peters confirms in his supplemental Declaration, these slots are: 61.5°, 72.7°, 77°, 101°, 110°, 119°, and 129° W.L.[34] In fact, Mr. Peters calculated the EPFD level for each possible angle and then used the highest one. In other words, the studies assumed that each dish was pointed at the satellite

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[30] Of course, that simple extrapolation does not account for Federal parks and buildings. Still, it illustrates the extreme DBS dish density assumed by Mr. Peters.

[31] DISH Network Corp. Annual Report (Form 10-K), at 1 (Feb. 22, 2021) (8.8 million DISH TV subscribers); Press Release, *Major Pay-TV Providers Lost About 5,120,000 Subscribers in 2020*, Leichtman Research Group, (Mar. 4, 2021), https://www.leichtmanresearch.com/major-pay-tv-providers-lost-about-5120000-subscribers-in-2020 (13 million DIRECTV subscribers).

[32] The average household size is 2.53. *Historical Households Tables*, U.S. Census Bureau (Dec. 2020), https://www.census.gov/data/tables/time-series/demo/families/households.html (Table HH-4. Households by Size: 1960 to Present) (Dec. 2020).

[33] First Peters Study at 10 ("DBS satellites serving the United States in the 12.2-12.7 GHz band may be located in various geostationary orbital slots. . . Therefore, the analysis considered each of the possible visible DBS antenna orientations separately in addition to the DBS receive antenna's geospatial location on Earth, and assumed a hypothetical DBS antenna was located at each pixel of the analysis.").

[34] Exhibit 1 at 1.

that produced the worst case EPFD level based on the resulting azimuth and elevation angle relative to the configuration of the surrounding 5G cell sites. Say, for example, that the worst EPFD level for a particular one-square-meter area was calculated for transmissions to that area from the 129° W.L. orbital location, a slot used by DISH. In that case, the studies would assume automatically that this area received service from that slot, the most vulnerable one. The studies made that worst-case assumption, no matter that a large part of any random geographic pool of U.S. DBS users are pointed to satellites that produce lower EPFD and that a large portion of DBS users are attributable to DIRECTV.

Service to each user on all DBS spectrum. Mr. Peters similarly assumed that all of these dishes received service on each channel of each slot. In other words, the studies found minimal potential for interference even though they assumed that every single DBS user subscribes to both DIRECTV and DISH and receives all of the services of each provider. Mr. Peters also assumed that terrestrial mobile user equipment would transmit at its maximum power.[35]

While a couple of commenters question these studies, they do not explain why they are questionable. In fact, all objections to date form an echo chamber that misleadingly magnifies one single substantive filing—a 2018 submission by AT&T, which demonstrates a misunderstanding of Mr. Peters' studies.

In its 12 GHz Comments, AT&T confines itself to a vague complaint about "inaccurate baseline assumptions" and "cherry-picked use cases,"[36] referencing the 2018 filing (as well as a 2020 letter that regurgitated the 2018 discussion). According to AT&T, Mr. Peters had inappropriately looked at a "snapshot" because consumers have to change the dish location if a

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[35] *See* First Peters Study at 9. See below at 15.

[36] *See* AT&T Comments at 8.

new building is constructed in their previous line of sight to the satellite.[37] But this does not matter, precisely because Mr. Peters assumed the ubiquitous presence of DBS dishes.[38] This means that the possible changes in the location of an actual dish were already accounted for by the studies. And, as for the charge that the studies cherry-picked the Washington D.C. area near the Capital One Arena because not many dishes are found there, that is irrelevant for the same reason—the studies assumed that *millions* of DBS dishes *were* found there.

Other points made by AT&T in 2018 are no more availing. The 2018 AT&T letter erroneously suggested that the 2016 studies had considered only one DBS orbital location: as mentioned, they had in fact considered *all* seven operational DBS slots then, as now, serving the U.S. That included all of DIRECTV's orbital locations, whether DIRECTV uses them or not. In fact, DIRECTV appears to make minimal or no use of two of its three DBS orbital locations, 110° and 119° W.L., which makes the 2016 studies even more conservative. In effect, the studies confirm that DBS users are adequately protected even for the purpose of receiving transmissions that DIRECTV does not appear to make.

AT&T also purports to criticize the limitations of LIDAR, but it cannot help acknowledging in the same breath that "high-resolution clutter data is an important piece of accurate EPFD analyses."[39] AT&T's supposed "beef" with LIDAR data is unpersuasive. It consists of the same argument that buildings are built and demolished as time goes by, and of the complaint that LIDAR data do not tell us if a building is made of wood, concrete, glass, etc.—a

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[37] AT&T 2018 Letter, Technical Appendix at 5.

[38] First Peters Study at 7. While it is true that buildings may be demolished and somewhat change the sharing environment, such changes are generally inconsequential especially in metropolitan areas, and AT&T does not point to any relevant demolitions in Mr. Peters' two study areas of Indianapolis, Indiana, or Washington, D.C.

[39] AT&T 2018 Letter, Technical Appendix at 2.

complaint that betrays how much LIDAR data *do* tell us. Nor does AT&T propose a better, or any, alternative—in fact, there is no better alternative for considering clutter in a sharing environment than the actual LIDAR data.

And AT&T's statement that "the technical studies' mobile use analysis also fails to assess the impact of actual mobile operation"[40] is misleading. As Mr. Peters has explained, the study "considered five mobile locations per base station and assumed that each was at the edge of coverage where the mobile devices would transmit at their maximum power."[41] While AT&T complains of "stationary" devices, this assumption effectively simulates the worst case in which all mobile units are at the cell edge, transmitting at their maximum power. Any movement of the mobile units to other locations will either improve the coverage conditions so that power control will reduce the power, or reduce the coverage so that the link is broken and mobile transmissions no longer occur. In any event, base station transmissions are a much more significant factor in the interference analysis than lower-power mobile transmissions.

AT&T also faults the 2016 studies for using artificially low effective isotropically radiated power ("EIRP") levels compared to 5G applications at lower bands.[42] In light of their conservatism, the 2016 studies strongly suggest that, even at higher power than assumed by Mr. Peters, terrestrial transmissions would have an immaterial effect on a tiny percentage of DBS antennas. But DISH's and the 12 GHz Coalition's proposal, which preserves the EPFD limits for the band, totally disposes of AT&T's objection. If EPFD limits are exceeded at a higher EIRP level, then terrestrial transmissions at that level would not be allowed in the band.

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[40] *Id.* at 5.

[41] First Peters Study at 23.

[42] AT&T 2018 Letter, Technical Appendix at 2-3.

The same response disposes of AT&T's criticism directed at the four-to-five meter height the studies have assumed for base stations.[43] If a greater height were to result in an EPFD level exceeding the limit, transmissions from that height would be disallowed. And AT&T does not take into account the fact that even the minimal portion of the hypothetically ubiquitous dishes that would be exposed to the potential for interference can be totally protected by simple coordination, including base station siting procedures. These procedures, already required by the rules, would continue to apply, with some streamlining.

AT&T is in a position to replicate the two 2016 studies using the characteristics of its own DBS dishes to calculate the EPFD levels generated by terrestrial transmissions at these dishes. All parameters of the 2016 studies are known to AT&T and the public. AT&T has not done so, which suggests the results would not likely be materially different.

SES's objection is even more threadbare—it adds no substantive discussion whatsoever. SES devotes two lines to point to what "SES and others observed," including again the notorious charge of "cherry-picked examples."[44] But the observations of SES "and others" turn out to be no more than another cursory paragraph from SES's three-page 2016 comments, and the previously expressed position of one other party—AT&T. The 2016 studies also take into account DBS transmissions from SES's Ciel and QuetzSat satellites. DISH leases virtually all of the capacity on these satellites from SES. This means that DISH is the only affected party, and would be the first to cry foul, if the concerns expressed by SES in connection with these satellites were justified.

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[43] *See* AT&T 2018 Letter, Technical Appendix at 3; *see also* First Peters Study at 19 (four meter height); Second Peters Study at 8 (five meter height).

[44] Comments of SES S.A., WT Docket No. 20-443, GN Docket No. 17-183, at 6 (May 7, 2021).

The conclusions of Mr. Peters' studies obviate any need for spectrum separation, repacking, or exclusion zones, and therefore moot AT&T's claims of difficulty. So, while DISH agrees with AT&T that DBS needs to be protected, this need not entail the suppression of a higher-power two-way 5G service. DISH also welcomes in principle the willingness of Federated Wireless and the Dynamic Spectrum Alliance to assist with automated and dynamic spectrum sharing processes and location database support. Such initiatives can reduce the cost of sharing and enhance efficiency, even though they are not necessary to enable sharing.

B. Sharing is Possible Between Higher-Power Two-Way Terrestrial Services and NGSO FSS

As to sharing between NGSO systems and other users of the band, the record contains compelling engineering studies on the one side of the ledger, and mostly rhetoric on the other. First, as to the obligation of NGSO systems to protect DBS dishes, DISH has shown that at least one of the NGSO operators, SpaceX, would exceed the EPFD limits intended to protect DBS users, even with the condition of only one satellite focused on a given area at a time (a so-called "Nco" of 1),[45] which the Commission has imposed on SpaceX's authorization.[46] SpaceX has not responded to DISH's expert studies, shrugging them off on the ground that the EPFD limits are unnecessarily constraining on NGSO operations: "the EPFD rules with which SpaceX complies are likely overly restrictive of NGSO operations[.]"[47] This means that SpaceX is seeking protection from 5G for a service that itself does not adequately protect DBS service.

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[45] DISH Comments at 55-56.

[46] *SpaceX Third Modification Order* ¶ 97(e).

[47] Letter from David Goldman, SpaceX, to Marlene Dortch, FCC, IBFS File No. SAT-MOD-2020417-00037, WT Docket No. 20-443, at 2 (Feb. 25, 2021).

SpaceX and other NGSO proponents have likewise offered no evidence to date to support the view that sharing between 5G and NGSO FSS services is impossible. The NGSO interests in general have little to say about the dramatic technical advances achieved over the past 5 years, such as beamforming, and the role of these advances in facilitating sharing between higher power two-way terrestrial service and satellite services. SpaceX, for example, claims DISH refers to "new unnamed antenna technologies,"[48] instead of presenting technical evidence as to why, in its view, those (very real) technologies make sharing impossible. Just a partial list of technology developments over the past five years includes massive MIMO, adaptive beamforming (including beam steering and beam forming), aggregation of three or more carriers, device technology advancements, optimized power consumption, self-organization and optimization to avoid interference, and advancements in architecture (such as network virtualization, densification, and Open RAN).

Advanced beam management techniques such as beam steering and beamforming use multiple antennas to create directional transmissions that accurately point at the receiving device. They incorporate channel feedback to manipulate the beam shape and direction in real time. Spatial multiplexing combined with beamforming increases signal robustness with the added advantage of improved throughput. Beam steering focuses the direction and width of a radiation pattern—it changes the direction of the signal while beam refinement narrows the width of the transmitted signal. Both actions are typically performed by manipulating the phase shift of the signal through an array of multiple antenna elements. Beamforming applies different phase

[48] SpaceX Comments at iv.

shifts to each antenna element to shape and provide discrete control of the direction of a transmitted beam. [49]

Here are just a few of the ways that advanced antenna systems have significantly improved 5G/NGSO sharing:

- Improvements in beamforming and beam management (such as beam switching, recovery and refinement) techniques increase coverage and capacity across more control and broadcast channels (compared to LTE), with radios of up to 64 or more transceiver and antenna elements.
- Massive MIMO adds even more capacity without adding more antenna elements, by increasing degrees of freedom an antenna array has available to modify a transmitted signal even for multiple users and antennas.
- Advances resulting from fully integrated radio arrays that can include more than 100 transceiver and antenna elements.

C. The RKF Study is Corroborated by Reviews of Starlink's Service and SpaceX's Own Statements

The RKF Study's assumptions are shown to be too conservative by the first reviews of Starlink's service as well as prior statements by SpaceX's Chief Executive Officer, Elon Musk. One of these assumptions was that NGSO satellites would transmit at elevation angles as low as 25 degrees. But recent reviews show that Starlink service is of unacceptable quality at low angles anyway, suggesting SpaceX may need to avoid lower angles for the sake of its own customers, and making sharing even easier than found by RKF.

Starlink's website states that "even small obstructions (single tree, pole, etc.) can interrupt your service."[50] This proves to be all too true when Starlink is deployed in the real

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[49] *See generally, Advanced Antenna Systems for 5G*, 5G Americas (Aug. 2019), https://www.5gamericas.org/wp-content/uploads/2019/08/5G-Americas_Advanced-Antenna-Systems-for-5G-White-Paper.pdf; Mohamed Nadder Hamdy, *Beamformers Explained*, CommScope (2020), https://www.commscope.com/globalassets/digizuite/542044-Beamformer-Explained-WP-114491-EN.pdf.

[50] FAQ, Starlink, https://www.starlink.com/faq (last visited July 6, 2021).

world. One reviewer found that "Starlink requires near-perfect line of sight to its satellites, which are often fairly low in the sky" and that "even *a single tree* blocking the dish's line of sight to the horizon will degrade and interrupt your Starlink signal."[51] That reviewer had the dish "60 feet away from my house with clear views of the sky, and it is still obstructed for two hours a day because of the very top of my house and the trees behind it."[52] Another reviewer found that "checking for obstructions can be a tricky process. We placed the dish in an open area but found the dish aiming at a northern portion of the sky (versus south, where satellite TV dishes need to be aimed). So not surprisingly, we received an 'Obstructions are blocking your internet connection around 9 hours each day' message . . . The culprit: trees that are hundreds of feet away but manage to occlude the view."[53]

SpaceX was only recently authorized to operate at the lower angle of 25 degrees,[54] so it seems likely that, when these reviews were being conducted, Starlink was still operating at angles no lower than 40 degrees. Either way, SpaceX will likely have to avoid 25-degree angles in its service for reasons totally unrelated to any interference from terrestrial transmissions. And, with batches of additional satellites launched apparently every nine days, SpaceX will have less need to resort to low 25-degree angles. This will be a win-win. It will mean better service. It

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[51] Nilay Patel, *Starlink Review: Broadband Dreams Fall to Earth*, Verge (May 14, 2021), https://www.theverge.com/22435030/starlink-satellite-internet-spacex-review (emphasis in original).

[52] *Id.*

[53] John R. Quain, *Starlink Review (Hands On): How Good is Elon Musks's Satellite Internet Service*, Tom's Guide, https://www.tomsguide.com/reviews/starlink (last visited July 6, 2021) ("The Starlink smartphone app has an option for checking for obstructions as you move it around using the phone's camera. But placing the phone exactly in the proposed position of the dish and following the on-screen instructions for aiming the camera up or down is tricky, if not impossible because the camera needs to be at knee height. We tried lying on the ground to get a better look.").

[54] *SpaceX Third Modification Order* ¶ 1 n.3.

will also mean even greater immunity to 5G transmissions than the exceptional rate of immunity (99.12% of Starlink-type dishes unaffected) found by the RKF Study.[55]

RKF also assumed that a Starlink-like system would find some users in urban areas.[56] This means that terrestrial transmissions would have to avoid interference into NGSO terminals in densely populated areas, too. But this seems unnecessary in light of Mr. Musk's explicit reluctance to compete in cities. As Mr. Musk has stated: "I want to be clear . . . it's not like Starlink is some huge threat to telcos. I want to be super clear it is not."[57] Mr. Musk doubled down on this assurance just recently. At the 2021 Mobile World Congress, he stated: "it's really meant for sparsely populated regions because our spot size is quite big, so we're well suited for low to medium density areas but not high density areas. In high density areas we will be able to serve a limited number of customers."[58] More generally, Cowen estimates that once all 12,000 satellites are launched, Starlink will be able to serve a total addressable market of at most 1.5 million users (assuming that each satellite can handle 200 simultaneous streams at 100 Mbps, or 485K simultaneous U.S. data streams at 100 Mbps).[59] By contrast, the RKF Study generously assumes 2.5 million Starlink-like terminals throughout the nation—yet another way in which sharing will in fact be even easier than shown in the RKF Study.[60]

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[55] *See* RKF Study at ii.

[56] *Id.* at i (using a "textured population model" rather than a "high-level, simplistic urban-rural divide," and weighting satellite terminals towards areas that are eligible for Rural Digital Opportunity Fund subsidies, meaning that more densely populated areas are not excluded.).

[57] Musk Keynote at 15:20.

[58] CNET Highlights, *WATCH: Elon Musk discuss Starlink Internet at MWC 2021 - Livestream*, YouTube, at 4:34-39 (June 29, 2021), https://youtu.be/RcnVTgrgThE.

[59] Mike Dano, *Starlink's Network Faces Significant Limitations, Analysts Find*, LightReading (Sept. 23, 2020), https://www.lightreading.com/4g3gwifi/starlinks-network-faces-significant-limitations-analysts-find/d/d-id/764159.

[60] RKF Study at 16.

D. NGSO Operators Do Not Need the 12 GHz Band

DISH has highlighted the NGSO operators' questionable need for the 12 GHz band, given the vast swaths of other spectrum to which they have access. No NGSO has convincingly rebutted this fact. SpaceX, for example, has (or is seeking) access to an astounding 25,550 MHz of spectrum, of which 15,550 MHz is already licensed.[61] This means that the 12 GHz band accounts for 2% of SpaceX's total spectrum allotment, 3% of its already licensed spectrum, and 6% of its licensed downlink spectrum alone.[62] Many commenters agree, pointing out that NGSO systems hardly need the 12 GHz band in the first place. As INCOMPAS and CCIA point out, "the 500 megahertz of spectrum in the 12 GHz band represents approximately *three* percent of the total spectrum available to NGSO FSS provider SpaceX."[63] Here is T-Mobile's take: "there is no evidence in the record that those other bands are insufficient to meet NGSO's business plans."[64] And as the MVDDS Licensees point out, Amazon's Kuiper system "convincingly demonstrates that an NGSO operator may provide a robust satellite broadband service *without* use of the 12 GHz Band," as its Commission authorization does not even include the 12 GHz band.[65]

According to OneWeb, DISH is wrong that the 12 GHz band accounts for a tiny portion of the spectrum available to NGSO operators. This is like disagreeing with the principles of

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[61] DISH Comments at 5.

[62] *Id.* at 46.

[63] INCOMPAS/CCIA Comments at 14.

[64] T-Mobile Comments at 9.

[65] MVDDS Licensees Comments at 13; *see also* Kuiper Systems, LLC Application for Authority to Deploy and Operate a Ka-band Non-Geostationary Satellite Orbit System, IBFS File No. SAT-LOA-20190704-0057 (July 4, 2019); Kuiper Systems, LLC Application for Authority to Deploy and Operate a Ka-band Non-Geostationary Satellite Orbit System, *Order and Authorization*, 35 FCC Rcd. 8324 (2020).

arithmetic—there is no doubt that DISH's sums are correct. OneWeb and the other NGSO commenters argue only that much of this additional spectrum is encumbered. Thus, OneWeb cites constraints on spectrum it is authorized to use in the Ka-band, Q/V-band, and E-band.[66]

OneWeb builds a strawman and then throws stones at it. DISH has never claimed that only the 12 GHz band spectrum is encumbered for NGSO operations, and that all other NGSO spectrum is totally unencumbered. But one encumbrance can be very different from another. The 12 GHz band is the only band in which NGSO operators must avoid causing interference into a residential pay-TV service received in the United States by more than 22 million families. Moreover, OneWeb and the NGSO commenters gloss over the cleanliness of the 500 MHz of downlink Ka-band spectrum between 18.8 and 19.3 GHz. This spectrum has been fenced by the Commission, with NGSO operators protected from all interference.[67] OneWeb likewise admits, as it must, that the 11.7-12.2 GHz band downlinks are "not constrained by other terrestrial services . . ."[68]

In any event, OneWeb exaggerates the constraints to which NGSO systems are subject in other bands. OneWeb states that the 10.7-11.7 GHz band is encumbered by the "requirement to protect Radio Astronomy Service."[69] But two pages later, OneWeb acknowledges that the Radio Astronomy Service actually operates in the 10.6-10.7 GHz band. Indeed, OneWeb's authorization only requires that, "in the 10.7-11.7 GHz band, operations must be coordinated with the radio astronomy observatories listed in 47 CFR § 2.106, n.US131, to achieve a mutually acceptable agreement regarding the protection of the radio telescope facilities operating in the

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[66] One Web Comments at 15; *see also* SpaceX Comments at 24-25.

[67] *See* DISH Comments at 47-49.

[68] OneWeb Comment at 18.

[69] *Id.* at 16.

10.6-10.7 GHz band."[70] Footnote US131 of the Table of Frequency Allocations, in turn, only refers to ten astronomy observatories in the continental United States.[71] In other words, the requirement affects only the lowest extreme of OneWeb's 10.7-12.2 GHz licensed Ku-band spectrum, and then only at a small number of locations. OneWeb fails to explain how this requirement, limited both geographically and in terms of how much bandwidth it encumbers, is somehow tantamount to having to protect 22 million DBS dishes throughout the nation as well as throughout the 500 MHz of the 12 GHz band. OneWeb even admits that its system has been designed to work within these constraints.[72] OneWeb next claims that the 10.7-11.7 GHz band is too encumbered because it must operate on a co-primary basis with the Fixed Service.[73] But again, OneWeb states it has already designed its system to operate consistent with this allocation. In sum, OneWeb is wrong that the "12 GHz band represents 50% of the least constrained half of the 10.7-12.7 GHz range."[74] In fact, that band is subject to far stricter requirements on NGSO operators than the other 75% of the 10.7-12.7 GHz Ku-band (i.e., 10.7-12.2 GHz).

What is more, the NGSO commenters do not go as far as to state that the 12 GHz band will be essential for them to meet demand projections for NGSO FSS broadband service. In that vein, SpaceX does not deny a key point first made by DISH on April 23, 2021, some two weeks

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[70] WorldVu Satellites Limited Petition for a Declaratory Ruling Granting Access to the U.S. Market for the OneWeb NGSO FSS System, *Order and Declaratory Ruling*, 32 FCC Rcd. 5366, 5376 ¶ 24(b) (2017).

[71] 47 CFR § 2.106 n.US131. The footnote also lists one location in each of Puerto Rico, Hawaii, and the U.S. Virgin Islands.

[72] OneWeb Comments at 17 ("The OneWeb system has been designed with flexibility to work within these constraints and, in specific geographical areas, to avoid frequencies that cannot be used for regulatory reasons or that are susceptible to interference from terrestrial stations of other co-primary services. Such flexibility is vital for a commercially viable NGSO service.").

[73] *Id.* at 16.

[74] *Id.*

before SpaceX filed its opening comments in this proceeding: SpaceX does not use the 12 GHz band, or uses it subject to severe restrictions, in many key international jurisdictions. As DISH has shown:[75]

- In Australia, SpaceX cannot use the 12 GHz band in most of the country's large metropolitan areas.
- In India, SpaceX is not licensed at all, and regulators are reportedly investigating reports that SpaceX is preselling beta service without authorization.
- In Brazil, despite accepting reservations for its service, SpaceX has no authorization.

And as mentioned, despite occasional SpaceX boasts of universal service, Mr. Musk has repeatedly acknowledged that SpaceX will not be a meaningful competitor in urban areas.[76]

Indeed, SpaceX tacitly admits the restrictions and constraints identified by DISH for various important jurisdictions, claiming only that these examples "have no bearing whatsoever on the core issue before the Commission,"[77] But the implication is as clear as it is relevant: SpaceX can make do without unfettered use of the 12 GHz band, here just as elsewhere.

V. THE 12 GHZ BAND IS ESPECIALLY SUITABLE FOR 5G

There is extensive evidence both that more mid-band spectrum is needed for terrestrial 5G services and that the 12 GHz band is ideally suited for terrestrial 5G. In the words of CCA, for example: "[t]he 12 GHz band could be described as 'high mid-band' spectrum—with higher frequencies than some of the mid-band spectrum that has been the subject of recent Commission action, yet with better propagation characteristics than the millimeter wave frequencies that the

[75] Letter from Pantelis Michalopoulos, Counsel for DISH, to Marlene Dortch, WT Docket No. 20-443 et al. (Apr. 23, 2021).

[76] See above at 21.

[77] SpaceX Comments at 26.

Commission has allocated for 5G services."[78] T-Mobile agrees: "making available additional spectrum, particularly in higher mid-band frequencies, is important for the continued deployment of 5G."[79]

But where mobile broadband experts see a Goldilocks combination of coverage and capacity, OneWeb sees a worst-of-all-worlds situation, where coverage is worse than that for lower band spectrum, and capacity is worse than available in the millimeter wave bands. This is not just a case of seeing the glass as nearly half-empty rather than nearly full. It turns the facts on their head.

As DISH previously explained, the 12 GHz band has twice the signal range and four times the coverage area of the 24 GHz band, and more than three times the signal range and more than ten times the coverage area of the 39 GHz band.[80] Just as significant, the all-important spectral efficiency metric for the 12 GHz band (57.1 bits/Hz) is much closer to that for the 3.7 GHz band (77.1 bits/Hz) than to that for the 28 GHz band (15.2 bits/Hz). That metric depends on a number of factors, including not only free space path loss, but also foliage loss, terrain effects, human losses, scattering, etc., and also reflects use of massive MIMO and multi-user (MU) MIMO technology.

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[78] CCA Comments at 3; *see also* RS Access Comments at 2 ("The 500-megahertz block of spectrum in the 12 GHz band is the *only* candidate between 6 and 24 GHz that can be quickly harnessed to turbocharge 5G deployment in the United States."); MVDDS Licensees Comments at 7 ("[A]fter completion of the 3.45-3.55 GHz and 2.5 GHz auctions, there will be limited opportunities for additional spectrum auctions – and no opportunities, other than the one presented by the *NPRM*, that would allow 500 MHz of contiguous, mid-band spectrum to be newly deployed for 5G.").

[79] T-Mobile Comments at 5.

[80] DISH Comments at 12.

This ideal balance of traits is shown by the technical data compiled by the ITU and summarized by RS Access about the 12 GHz's band performance. These data show that "the 12 GHz band is uniquely situated, offering (1) multiple 100-megahertz channels, (2) propagation characteristics similar to the C-band, (3) capacity closer to the millimeter-wave bands, (4) lower deployment costs compared to millimeter-wave bands, and (5) a relatively straightforward implementation path to bring the band into the 5G ecosystem."[81] The NGSO proponents submit no evidence or technical studies of their own to show why, in their view, the band is undesirable for 5G. Indeed, SpaceX devotes only a single conclusory sentence to the band's use for 5G: "claims that the 12 GHz Band is suitable for 5G are misguided and inconsistent with the facts."[82] The record shows otherwise.

Finally, contrary to Microsoft's speculation, the availability of the 12 GHz band will directly boost DISH's 5G plans. As discussed in greater detail below, DISH's 5G network is being built, with DISH planning to start its own facilities-based 5G service in Las Vegas later this year. Naturally, this phase of DISH's buildout does not include the 12 GHz band. But, it could if the FCC updates the rules. In anticipation of putting additional spectrum in service, DISH has been able to negotiate tower agreements that provide it with the capability to co-locate 12 GHz radios in existing RAD centers on leased towers.

VI. THE STARS ARE ALIGNED INTERNATIONALLY FOR 5G SERVICE IN THE 12 GHZ BAND

The Commission has the chance to embrace innovation by championing a new terrestrial 5G service in the 12 GHz band. Such action would leverage the existing near-global co-primary

[81] RS Access Comments at 16; *see id.* at 13-22.

[82] SpaceX Comments at 19.

Mobile Service allocation of that spectrum and catalyze standardization as well as give the United States an advantage in the race for 5G leadership.

Microsoft argues that productive use of a new terrestrial 12 GHz authorization would be limited by the fact that neither the ITU nor 3GPP "has adopted or even begun work on rules or international standards for 5G use of the 12 GHz band."[83] But this is a chicken-and-egg argument that would paralyze the allocation of additional spectrum sorely needed for 5G in the United States. Commission action is needed to galvanize these international processes; conversely, Commission inaction will likely result in delay or failure on the international standardization front, too. It is for that reason that the Commission has repeatedly refused to entertain similar pleas to wait.

Had the Commission decided to wait on an ITU International Mobile Telecommunications ("IMT") designation, the 600 MHz spectrum would likely have been auctioned a year or more later than it was. There, the Commission had issued a Notice of Proposed Rulemaking to allocate and license the spectrum for mobile services, and had issued a Report and Order in 2014.[84] The ITU gave the 600 MHz band its IMT designation a year later, at WRC-15, with the United States leading the charge. If the Report and Order had been delayed until 2015 or later, the 2017 auction would have been delayed until 2018 or later. And if the United States had not taken the lead, the band might still be waiting for an IMT designation to this day. Moreover, while Microsoft characterizes the creation of an IMT designation by the

[83] Comments of Microsoft Corporation, WT Docket No .20-443, GN Docket No. 17-183, at 9 (May 7, 2021) ("Microsoft Comments").

[84] Expanding the Economic and Innovation Opportunities of Spectrum Through Incentive Auctions, *Report and Order*, 29 FCC Rcd. 6567 (2014).

ITU as "several years" away,[85] it ignores the fact that the band's near-global primary allocation is available already, and *no cumbersome ITU process needs to be undertaken to effectuate it.*

Similarly, Microsoft misinterprets the 3GPP standardization process when it asserts that the "lack of internationally harmonized rules for a 12 GHz terrestrial service will likely deter manufacturers from making" the investment necessary to develop 12 GHz radio transmitters vital to the success of a 12 GHz terrestrial mobile service.[86] The 3GPP process is not a top-down mandate; it is a contribution-driven process, bringing together telecommunications carriers and equipment manufacturers from all over the world, along with several regional standards bodies to establish international standards for 5G on a consensus basis.[87] The standards adopted by 3GPP are a result of the innovations brought to it; not by a decree from the organization before a service is deployed or authorized. In fact, the 3GPP process is typically not even deployed to standardize a new band class until service rules (and any accompanying technical restrictions) are adopted by one or more key administrations. Without such regulatory action, vendors and operators alike are unlikely to devote the significant resources required for standardization of a new band class. Commission allocation of the band to higher-power, two-way mobile services,

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[85] Microsoft Comments at 10.

[86] *Id.* at 11.

[87] *See generally About 3GPP*, 3GPP, https://www.3gpp.org/about-3gpp; Stefan Parkvall, *How Does 5G NR Standardization Work?*, Ericsson Blog (May 28, 2018), https://www.ericsson.com/en/blog/2018/5/how-does-5g-nr-standardization-work. The organizational partners of 3GPP are the Association of Radio Industries and Businesses; the Alliance for Telecommunications Industry Solutions; China Communications Standards Association; the European Telecommunications Standards Institute; Telecommunications Standards Development Society; Telecommunications Technology Association; and Telecommunication Technology Committee. Once 3GPP specifications are adopted in a release, manufacturers supply equipment based on such specifications to carriers. The standards bodies also work to adopt them as standards globally.

and adoption of service rules, will act as a catalyst for prompt initiation and completion of the 3GPP process.

This is what happened in the case of the AWS-4 band. There, too, some opposed the AWS-4 allocation on 3GPP grounds. Sprint, for example, had argued that it would complicate the 3GPP work.[88] But if these types of arguments had been given credence in the AWS-4 proceeding, the AWS-4 band would not be available for 5G today. The Commission refused to make its decision based on 3GPP concerns: "the Commission has historically not based its decisions regarding the appropriate technical rules for a wireless service merely on the potential of those decisions to delay the development of private party technical standards."[89] Additionally, "a decision [to design equipment] to wait until 3GPP has established final standards is an internal business decision, not a delay imposed by the Commission's development of technical rules for the service."[90]

The standardization of the AWS-4 spectrum was largely due to the Commission's promulgation of rules governing the band. Progress towards AWS-4 standardization had been stymied at 3GPP. Once the FCC acted, the 3GPP process opened up, and DISH was able to overcome the resistance of certain incumbents and secure 3GPP specifications and 5G standards for AWS-4 band equipment.[91] Commission action in the 12 GHz band would catalyze

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[88] *See* Letter from Lawrence Krevor, Sprint Corporation, to Marlene Dortch, FCC, WT Docket No. 12-70, at 2-6 (Sept. 17, 2012)

[89] Service Rules for Advanced Wireless Services in the 2000-2020 MHz and 2180-2200 MHz Bands, *Report and Order and Order of Proposed Modification*, 27 FCC Rcd. 16102, 16143 ¶ 94 (2012).

[90] *Id.*

[91] Press Release, *3GPP Approves DISH Wireless Spectrum Standards*, DISH Network Corp. (Nov. 14, 2012), https://about.dish.com/news-releases?item=122730.

international standardization as well as give the United States an advantage over other countries, just as it did with the AWS-4 band.

The Commission's leadership likewise proved a dramatic boon for 3GPP standardization for the 700 MHz band, with Commission action precipitating the commitment of intense 3GPP activity. This happened with respect to band classes 12, 13, 14, and 17. 3GPP work on the first three classes started in the fall of 2007, shortly after the Commission finalized and established technical rules for the new 700 MHz band plan in August 2007.[92] Work on band class 17 came later, but again followed relevant Commission actions showing the seriousness of the United States about the band. As the Commission explained, "[a]fter the conclusion in March 2008 of Auction 73, Motorola initiated steps to have 3GPP establish a new industry standard (later designated as Band Class 17) that would be limited to the Lower 700 MHz B and C Blocks . . . 3GPP finalized the initial standards and specifications for Band Class 17 five months after its introduction in September 2008."[93]

In any event, significant preparatory standardization work for the band has already commenced. Earlier this year, 3GPP completed and released a "technical report for the study item on [the] 7.125-24.250 GHz frequency range, covering the regulatory framework study, general RF aspects, as well as BS [Base Station] and UE [User Equipment] specific aspects."[94] The outstanding processes will likely be significantly enhanced by the availability of

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[92] Service Rules for the 698-746, 747-762, and 777-792 MHz Bands, *Second Report and Order*, 22 FCC Rcd. 15289 (2007).

[93] Promoting Interoperability in the 700 MHz Commercial Spectrum; Requests for Waiver and Extension of Lower 700 MHz Band Interim Construction Benchmark Deadlines, *Report and Order and Order of Proposed Modification*, 28 FCC Rcd. 15122, 15126 ¶ 9 (2013).

[94] 3GPP TR 38.820 V16.1.0, 3rd Generation Partnership Project; Technical Specification Group Radio Access Network; NR; 7 - 24 GHz frequency range (Release 16), at 8 (Mar. 2021) ("3GPP Release 16").

specifications in both the lower and higher spectrum bands. In many cases, DISH believes that standardization of the band may simply be a matter of picking and choosing between already developed specifications for the below 6 GHz and 24 GHz bands.[95] In the words of the 3GPP technical report, "an important question for [the] 7-24 GHz range is whether all of the impacted RAN1 procedures are the same as for FR1 [410 MHz to 7,125 MHz] or FR2 [24,250 MHz to 52,600 MHz], or whether it is the case that some procedures are like one of the FRs and other procedures are more like the other FR, or different to either FR. If the latter is the case (i.e. not all procedures can be inherited from an FR), then a new FR seems needed, whereas if the former is the case then from a RAN1 perspective the FR could be extended."[96]

Many other conclusions of the 3GPP report are anchored on the ability to draw from existing specifications:

- "However, if the new frequency range would inherit most of its properties from either FR1 or FR2, it would be preferabl[e] from [a] signaling point of view to reuse those existing terms (and hence the signaling structure). This would minimize the changes to the RAN2 specifications and hence the work-load and possibly also the time to market."[97]
- "If frequency sub-range 2 reaches to 16 GHz, the conducted RF requirements (FR1-like) can be considered[.] If frequency sub-range 2 reaches up to 18 GHz, the radiated RF requirements (FR2-like) can be considered[.] Some combination of both approaches is not precluded."[98]

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[95] *See id.* at 30-31.

[96] *Id.* at 31. RAN1 is the working group within 3GPP responsible for specifications of the physical layer of radio interfaces. *See* RAN1 - Radio Layer 1 (Physical layer), 3GPP, https://www.3gpp.org/specifications-groups/ran-plenary/ran1-radio-layer-1.

[97] 3GPP Release 16 at 31. RAN2 is the working group within 3GPP responsible for radio interface architecture and protocols. *See RAN2 - Radio layer 2 and Radio Layer 3 Radio Resource Control*, 3GPP https://www.3gpp.org/specifications-groups/ran-plenary/ran2-radio-layer-2-and-radio-layer-3-rr.

[98] 3GPP Release 16 at 58.

- "Current RF front-end technology used for > 3.3 GHz TDD bands and Wi-Fi can be extended at least up to 12 GHz," which, of course, includes the 12.2-12.7 GHz band.[99]

- "Technology used for LNA [low noise amplifiers] and switches are already suitable for both FR1 and FR2 with only more aggressive lithography used at higher frequencies[;] these can naturally support any approach within the 7.125-24.25 GHz range."[100]

All in all, DISH expects these specifications to be developed in about 18 to 21 months through the 3GPP's standardization and consultation processes.[101] This timeline should allow licensees a reasonable planning horizon for meeting even aggressive buildout milestones.

And it is not just 5G that the Commission should consider for the future of the 12 GHz band—it is 6G as well. While 6G is only in the research phase, it will likely arrive by the end of the decade.[102] 6G performance will be even more advanced than 5G—some estimates indicate 6G will be around 100 times faster than 5G, with speeds as fast as 1TB per second, or 8,000 gigabits per second—the equivalent of downloading 142 hours of Netflix movies in that time.[103] Advanced services enabled by 6G could include high-fidelity holograms, communications between swarms of small unmanned airborne vehicles, robots coordinating to perform complex assembly and repairs, support for thousands of radios per user, and widespread use of artificial

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[99] *Id.* at 65.

[100] *Id.*

[101] *See* Lorenzo Casaccia, *Understanding 3GPP – Starting with the Basics*, OnQ Blog (Aug. 2, 2017), https://www.qualcomm.com/news/onq/2017/08/02/understanding-3gpp-starting-basics (describing the steps involved in the 5G standardization process).

[102] *See generally*, Andy Boxall & Tyler Lacoma, *What Is 6G, How Fast Will It Be, and When Is It Coming?*, Digital Trends (Mar. 29, 2021), https://www.digitaltrends.com/mobile/what-is-6g.

[103] *Id.*

intelligence.[104] The United States must have a long-term spectrum strategy that not only takes into account 5G but looks even further into the future.

The 12 GHz band should be a component of that long-term strategy. While the 12 GHz band is expected to be included in future 3GPP 5G releases,[105] it will be part of the essential "new frontier" (the 7-24 GHz range) of 6G spectrum with the capabilities to handle the systems and services that will be deployed with that new generation of technology.[106] Many of the same characteristics that make the 12 GHz an excellent candidate for 5G also mean that it will be ideal for 6G as well. These features include 500 MHz of contiguous spectrum, no federal encumbrances, an existing global mobile allocation, and significant channel size combined with excellent propagation characteristics.[107] Providing for a domestic mobile service allocation in the 12 GHz band is the first step in an effective and forward-looking 6G strategy.

VII. THE COMMISSION SHOULD AUTHORIZE EXPANDED USE BY MVDDS LICENSEES, AND MODIFY MVDDS LICENSES TO THAT END

A. The Commission Has the Authority to Allocate the 12 GHz Band Under § 303(y)

Since expanded use does not threaten harmful interference, the Commission has unhampered authority to allocate the band under 47 U.S.C. § 303(y). Indeed, this allocation is warranted by international treaty, one of the statutory criteria set forth in Section 303(y).

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[104] Nishith D. Tripathi & Jeffrey H. Reed, *5G Evolution – On the Path to 6G*, Rohde & Schwarz, at 33 (Mar. 2020), https://www.mobilewirelesstesting.com/wp-content/uploads/2019/10/5G-evolution-on-the-path-to-6G-_wp_en_3608-3326-52_v0100.pdf

[105] *Id.* at 4.

[106] Mark Racek, *Why the U.S. Needs Mid-Band Spectrum to Win at 5G*, Ericsson Blog (July 31, 2020), https://www.ericsson.com/en/blog/6/2020/us-needs-midband-spectrum-for-5g.

[107] Shahed Mazumder, *5G Spectrum Series: What is Happening with 12 GHz?*, LinkedIn Pulse (Aug. 10, 2020), https://www.linkedin.com/pulse/5g-spectrum-series-what-happening-12-ghz-shahed-mazumder.

Allocating the 12 GHz band for flexible, mobile 5G use would be consistent with the requirements of Section 303(y) of the Communications Act. As a threshold matter, such use is consistent with international agreements to which the United States is a party. The ITU Radio Regulations allocate the 12 GHz band in Region 2 to "Mobile except Aeronautical Mobile" use.[108] 5G is a subset of mobile use, and a more-narrowly-tailored allocation of the band for "5G" or "International Mobile Telecommunications" is not required to ensure the consistency required by Section 303(y).[109] In fact, it is the United States' failure to add a mobile service allocation for the 12 GHz band that resulted in the current deviation of the domestic Table of Allocations from the international rules, which were themselves enacted pursuant to a treaty that binds the United States.[110] The U.S. rightly discourages this practice, and the Commission should update its rules to add such mobile allocation.

Additionally, contrary to the contentions of Microsoft and TechFreedom, terrestrial mobile 5G use of the band will not result in harmful interference among users.[111] Microsoft cites its "technical judgment" as the authority for its contention that sharing between NGSO operators and terrestrial mobile users is not possible, but provides no technical analysis or evidence in support.[112] Rather, the only technical interference evidence in the record—the RKF analysis—demonstrates the opposite: coexistence between robust deployments of 12 GHz spectrum for 5G

[108] ITU RR Vol. 1 at 143 (2020); 47 C.F.R. § 2.106.

[109] *See 12 GHz NPRM*, 36 FCC Rcd. at 615 ¶ 21 n.66.

[110] DISH Comments at 78.

[111] Microsoft Comments at 19; TechFreedom Comments at 15-16.

[112] Microsoft Comments at 19.

and NGSO FSS broadband are "achievable in nearly all deployment scenarios – even without coordination."[113]

For similar reasons, the RKF Study alleviates commenter concerns that allocating the 12 GHz band for 5G use would not be in the public interest. The RKF model did not rely on a simplistic rural-urban divide, but weighted its analysis to account for real-world commitments and factors affecting rural deployment, such as SpaceX's Rural Digital Opportunity Fund winnings.[114] Thus, a flexible use allocation for the 12 GHz band would not limit the ability of NGSO operators to deploy rural broadband connectivity;[115] it would allow them to implement their current plans while at the same time allowing two-way mobile 5G services to thrive. Furthermore, because deployment of NGSO services will remain largely unaffected, investments in these services are unlikely to decrease.[116] Indeed, far from a reduction in operator spectrum rights, the Commission explicitly conditioned NGSO FSS licenses on the outcome of this rulemaking about the 12 GHz band, which makes up only a small portion of NGSO systems' licensed spectrum.[117] Authorizations to use the myriad other frequencies, such as the Ka-band, which are free from the heavy restrictions applicable to the 12 GHz band, would remain unaffected.

Finally, allocating the 12 GHz band for two-way mobile use based on this evidence would be consistent with court precedent involving Section 303(y). TechFreedom argues that, unlike the broad authority granted to the Commission under Section 303(c), Congress

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[113] RKF Study at i.

[114] *Id.* at 3-6.

[115] *See* Microsoft Comments at 18.

[116] *See id.* at 18-19

[117] DISH Comments at 5-6.

specifically constrained the FCC's ability to reallocate spectrum for flexible use, and therefore the FCC and MVDDS advocates bear a "heavy burden" to demonstrate consistency with Section 303(y).[118] But neither of the decisions TechFreedom cites—the D.C. Circuit's decisions in *Community Television* and *PSSI*—concludes that the FCC had acted inconsistent with Section 303(y), articulates any burden of proof for the FCC, or suggests that the technical study evidence submitted in this proceeding would be insufficient. Further, TechFreedom places too much importance on certain unique factors bearing on the *C-band Order* at issue in *PSSI*—that is, (1) Congressional instruction to reallocate the C-band, (2) a repacking of the band from 500 MHz to 200 MHz, and (3) incentive payments to existing users. These factors are not required under Section 303(y), and the *PSSI* court's analysis did not actually consider any of them in its short discussion of Section 303(y).[119] Here, the RKF study sufficiently demonstrates that 5G mobile services could operate without harmful interference to existing users, and is otherwise in the public interest, consistent with Section 303(y).

B. MVDDS License Modification Is the Best, and Likely the Only, Lawful Way Forward

1. Almost All Public Interest Commenters Support Modification of MVDDS Licenses

The Ten Public Interest Organizations support expanding the spectrum use rights of existing licensees as being in the public interest and necessary to increase broadband competition. They emphasize that broadband competition leads to lower cost of service, better quality of service, and increased access.[120] With the T-Mobile-Sprint merger leaving only three

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[118] TechFreedom Comments at 16-18 ((citing *Cmty Television, Inc. v. FCC*, 216 F.3d 1133 (D.C. Cir. 2000) and *PSSI Global Services, LLC v. FCC*, 983 F.3d 1 (D.C. Cir. 2020)).

[119] *PSSI*, 983 F.3d at 9.

[120] Ten Public Interest Organizations Comments at 5.

national wireless carriers, DISH is gearing up to become the fourth. As explained below, DISH is on track towards realizing that goal. But as the Ten Public Interest Organizations recognize, the 12 GHz band could bolster DISH's competitive entry: "[i]f the Commission truly wants to help DISH reach its potential as a viable fourth competitor, then the Commission must also ensure that DISH has access to sufficient spectrum to compete aggressively with incumbent providers. Adding 500 megahertz of mid-band spectrum will enhance DISH's chances of success."[121]

To be sure, the Ten Public Interest Organizations also opine that "[t]he Commission should balance expanding the spectrum rights of existing licensees in the 12 GHz band with aggressive build out requirements and allow opportunistic, shared access to fallow spectrum. These policies will help incentivize build out and ensure that the 12 GHz band meets its full potential."[122] This is a reasonable balance.

In that respect, DISH commits to submit to the milestone schedule adopted by the Commission in the Spectrum Frontiers proceeding. In that proceeding, the Commission adopted a series of metrics, tailored for each type of service a licensee might choose to offer.[123] Licensees can fulfill their performance requirements by showing that they meet their choice of any one of the listed standards, or a combination of several. This framework is intended to provide enough certainty to licensees to encourage investment and deployment in these bands as soon as possible, while retaining enough flexibility to accommodate both traditional services and new or innovative services or deployment patterns.

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[121] *Id.* at 7.

[122] *Id.* at 2.

[123] Use of Spectrum Bands Above 24 GHz for Mobile Radio Services, *Report and Order and Further Notice of Proposed Rulemaking*, 31 FCC Rcd. 8014, 8088 ¶ 203 (2016).

DISH also welcomes the suggestions made by the public interest organizations for permitting an opportunistic and unlicensed underlay, "to the extent technically feasible," including low-power fixed point-to-multipoint use and low-power indoor use.[124] These suggestions deserve careful study.

2. License Modification Serves the Public Interest

Many factors support an MVDDS license modification to increase power and allow two-way services and preclude an auction, which would be based on an imaginary "greenfield" band currently lying fallow—the reverse of reality for this particular spectrum. First, as the Ten Public Interest Organizations recognize, it would promote broadband competition.[125] None of the MVDDS licensees are currently affiliated with one of the three largest mobile broadband carriers. Second, it will save substantial time in building higher-power two-way networks, with the speed advantage safeguarded by enforced milestones. The protests of MVDDS licensees against being relocated to other as yet not identified spectrum, the development of auction rules, and the administration of the auction would add several years before the 5G buildout can even commence. Third, ever since the inception of the MVDDS limits on power and restrictions on two-way operation, the Commission has acknowledged the conservatism of these limits, and viewed waivers as a safety valve to compensate for their severity. A modification would merely generalize what the Commission entertained from the start on a case by case basis. Relaxation of the limits is thus baked into the calculus for these licensees from the start, not some unexpected present.

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[124] *Id.* at 3.

[125] Ten Public Interest Organizations Comments at 4.

Two commenters—AT&T and T-Mobile, both of them dominant mobile broadband providers—argue for an auction, invoking the C-band and lower 3 GHz proceedings. They, as well as the NGSO proponents, also claim that MVDDS licensees have warehoused the spectrum, making them ineligible stewards for licenses in the band. But this proceeding is not about incumbent licensees, who received their spectrum licenses for free, receiving payment to stop using the spectrum. Instead, it is about existing licensees—who have already bought their licenses at auction and built out that spectrum under existing rules—being permitted to use the spectrum more productively. As for the warehousing claims, they come from commenters that have abandoned investments in the band even as DISH has intensified them (AT&T), or that owe their own use of the band to DISH's use of their satellites (SES), or that fault DISH for service characteristics that their own service shares (SpaceX).

The *C-band Order* was about licensees wanting out, not going all in. T-Mobile misinterprets the statement in the *C-band Order* that the incumbent satellite operators may not be "the sole conveyors of newly-created flexible use rights in the band."[126] There, the incumbent satellite operators were specifically seeking the ability to convey flexible use rights, and the FCC rejected two specific proposals for permission to do so—the ability for the satellite licensees to: (1) negotiate agreements to relinquish their interference rights with prospective new flexible-use licensees; and (2) sell newly-assigned flexible-use rights on the secondary market.[127] Here, existing 12 GHz licensees are not seeking rights to convey anything; they themselves want to provide two-way 5G services in the band. In addition, the Commission was not wresting the

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[126] *See* T-Mobile Comments at 9-10 (citing Expanding Flexible Use of the 3.7-4.2 GHz Band, *Report and Order and Order of Proposed Modification*, 35 FCC Rcd. 2343, 2363 ¶ 40 n.124 (2020) ("*C-band Order*")).

[127] *See C-band Order*, 35 FCC Rcd. at 2363 ¶ 40 n.124.

spectrum from the existing licensees to hand it over to the new 5G users. Rather, the C-band incumbents were pleading to hand over the spectrum and the main questions were how and how much they would be paid.

There are also significant differences between the 12 GHz and lower 3 GHz proceedings. First, MVDDS operators are co-primary with DBS and NGSO operators.[128] In contrast, the incumbent licensees who were relocated in the lower 3 GHz proceeding were secondary, non-federal licensees.[129] The Commission decided to apply the *Emerging Technologies* framework[130] because the secondary users provided an important public safety service, had very few licensees to relocate, posed a low cost of reimbursement, and faced relatively minimal limitations from existing federal primary users.[131] As the Commission itself recognized, this was a "unique instance" that justified using the *Emerging Technologies* framework.[132]

Second, the lower 3 GHz proceeding applied the *Emerging Technologies* framework because there were only seven active licenses that operated in a few locations.[133] The total cost

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[128] *See* 47 C.F.R. § 2.106.; *see also 12 GHz NPRM*, 36 FCC Rcd. at 607 ¶ 3.

[129] Facilitating Shared Use in the 3100-3550 MHz Band, WT Docket No. 19-348, *Second Report and Order, Order on Reconsideration, and Order of Proposed Modification*, FCC 21-32 ¶ 8 (Mar. 18, 2021) ("*3 GHz Order*") ("The 3.45 GHz band currently is allocated on a primary basis for federal radiolocation services. The 3.5-3.55 GHz portion of that band also is allocated for federal aeronautical radionavigation services on a primary basis.") (footnote omitted); *id*. ¶ 155 ("In order to ensure the speedy clearing of the 3.3-3.55 GHz band and minimize disruptions to the weather radar systems operated by secondary radiolocation users, we will require new flexible-use licensees in the 3.45 GHz Service to reimburse secondary, non-federal radiolocation licensees for reasonable costs related to the relocation of those operations to the 2.9-3.0 GHz band, including the costs of a relocation clearinghouse's administration of the reimbursement.").

[130] Redevelopment of Spectrum to Encourage Innovation in the Use of New Telecommunications Technologies, *First Report and Order and Third Notice of Proposed Rulemaking*, 7 FCC Rcd. 6886, 6890 ¶ 24 (1992) ("*Emerging Technologies Framework*").

[131] *3 GHz Order* ¶¶ 155-58.

[132] *Id.* ¶ 154.

[133] *Id.* ¶¶ 156, 158.

of relocation was estimated to be about $3 million.[134] In contrast, MVDDS licenses cover the entire country and are poised to offer 5G service. The MVDDS licensees have invested hundreds of millions of dollars in auctions and equipment to build out services. They are eager and ready to invest more in 5G offerings in the 12 GHz band. Indeed, it is difficult to imagine how the *Emerging Technologies* framework could fairly compensate the MVDDS licensees for their substantial investment.

Third, T-Mobile proposes relocating the MVDDS licensees but does not specify *where* the MVDDS licenses would be relocated to. In the lower 3 GHz proceeding, the secondary, non-federal licensees were relocated to the 2.9-3.0 GHz band to allow for 5G in the 3.45 GHz band.[135] Here, though, there is no other band available where the MVDDS licensees could provide 5G service. Nor is there any contiguous 500 MHz of mid-band spectrum with a global terrestrial service allocation and freedom from federal uses. Any relocation would effectively be a major modification of the licenses, as MVDDS providers could no longer provide the service they intend to provide.

Fourth, the posture of the licenses in the lower 3 GHz proceeding is different than the posture of the MVDDS licensees. The lower 3 GHz incumbents had no desire to or ability to change their licenses to provide 5G.[136] In contrast, the MVDDS licensees themselves are capable of and want to provide 5G services and simply need modification of their licenses. T-Mobile itself stated that "[t]he *Emerging Technologies* framework appropriately balances the interests of new licensees with incumbent licensees' desire to experience as little disruption as

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[134] *Id.* ¶ 157.

[135] *Id.* ¶ 155.

[136] *See id.*

possible while also being made whole."[137] Such a statement makes no sense in the context here where the MVDDS licensees are incumbents petitioning for rule changes to facilitate more robust use of the band.

The 12 GHz proceeding is also distinguishable in several important respects from other proceedings where the Commission has reallocated or reauctioned mid-band spectrum. In the Citizens Broadband Radio Service ("CBRS") proceeding, the Commission established the three-tiered Spectrum Access System for the 3.55-3.7 GHz band in circumstances where:

- one goal was to protect localized federal users, non-federal satellite earth stations, and site-specific terrestrial operations, rather than incumbent ubiquitous services;
- the incumbents had not acquired their licenses at auction;
- operations of the new Priority Access CBRS licensees were encumbered from the beginning (pre-auction); and
- the Commission believed at the time that it "cannot predict with certainty what the demand for spectrum will be."[138]

These circumstances are all absent from the 12 GHz band.

As for the 2.5 GHz band (2496-2690 MHz) proceeding:

- the Commission set out to solve the problem of spectrum that "ha[d] lain fallow for more than twenty years"[139] for reasons that had nothing to do with power limitations;
- incumbent Educational Broadband Service ("EBS") licenses had not been acquired at auction either; and
- the Commission itself recognized the specificity of the solution it chose: "EBS presents two special challenges which are largely not present in other bands: a

[137] T-Mobile Comments at 12.

[138] Amendment of the Commission's Rules with Regard to Commercial Operations in the 3550-3650 MHz Band, *Report and Order and Second Further Notice of Proposed Rulemaking*, 30 FCC Rcd. 3959, 3978 ¶ 55 (2015).

[139] Transforming the 2.5 GHz Band, *Report and Order*, 34 FCC Rcd. 5446, 5447 ¶ 3 (2019).

> longstanding failure to make spectrum available, particularly in rural areas, and an unusual licensing scheme."[140]

The 12 GHz band does not suffer from such underutilization, but rather is the most intensively used satellite band,[141] with incumbent terrestrial licensees, too, already providing services and well-positioned to make quick and efficient use of the band for 5G services.

3. DISH Has Used the 12 GHz Band and Other Licensed Spectrum Intensively

As the nation's fourth and newest wireless carrier, DISH is in the process of building out the first cloud-native, Open RAN-based 5G broadband network in the United States. DISH is partnering with leading technology companies including Amazon, Dell, Palo Alto Networks, Mavenir, Altiostar, VMware, Qualcomm, Intel, Oracle, and Nokia, among many others to build its network. DISH will operate its 5G network on Amazon Web Services, which will enable developers to build innovative 5G applications using standard application programming interfaces ("APIs").[142] DISH also has selected Oracle to enable a service-based architecture ("SBA") for its 5G network core.[143] SBA, part of the 3GPP 5G standard, enables network services to be rapidly incorporated into new applications.[144] And DISH is using a solution from Nokia to safeguard 5G network slices, which will be provisioned to support enterprise and

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[140] *Id.* at 5449 ¶ 8.

[141] DISH Comments at 2.

[142] Press Release, *DISH and AWS Form Strategic Collaboration to Reinvent 5G Connectivity and Innovation*, DISH Network Corp. (Apr. 21, 2021), https://about.dish.com/news-releases?item=123502.

[143] Press Release, *DISH Wireless Selects Oracle for 5G Core Service-Based Architecture*, Oracle Corp. (May 14, 2021), https://www.oracle.com/news/announcement/dish-wireless-selects-oracle-for-5g-core-service-based-architecture-2021-05-14.

[144] *Id.*

wholesale customers.[145] DISH plans to launch service in Las Vegas later this year, with additional cities to follow, as it works to meet its buildout commitments, including by offering 5G broadband to 20 percent of the U.S. population by June 2022 and 70 percent by June 2023.[146]

DISH is also making productive use of its MVDDS licenses. DISH currently offers customers live, 24-hour linear programing of weather information and news from WeatherNation.[147] Access to live weather news provides a valuable public safety information service. Subscribers to this service require the installation of an MVDDS receiving system at their location. DISH also offers a live video monitoring service using MVDDS spectrum. A live camera feed is transmitted wirelessly across MVDDS frequencies to a monitoring location, which is then visible to a remotely-located authorized user. This service has been deployed in several markets and is available throughout DISH's MVDDS footprint.

Each MVDDS transmitting system consists of a 90-degree sector antenna and other equipment manufactured by Cambridge Broadband Networks. Among other things, each MVDDS site includes a CBNL VectaStar Gigabit ODU-S integrated radio, modem and network interface unit, all connecting directly to the sector antenna. The WeatherNation channel is collected from a standard DISH DBS receive satellite dish, decrypted via proprietary customized equipment, and reformatted as an Internet Protocol (IP) data feed before being fed to the MVDDS transmitting equipment. Each customer receiving setup consists of an outdoor roof-

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[145] Press Release, *Nokia Software Selected by DISH to Safeguard 5G Network Slices*, DISH Network Corp. (Apr. 7, 2021), https://about.dish.com/news-releases?item=123500.

[146] Press Release, *DISH and AWS Form Strategic Collaboration to Reinvent 5G Connectivity and Innovation*, DISH Network Corp. (Apr. 21, 2021), https://ir.dish.com/news-releases/news-release-details/dish-and-aws-form-strategic-collaboration-reinvent-5g; Bevin Fletcher, *Dish to Launch 5G Network in Las Vegas This Year*, Fierce Wireless (Apr. 21, 2021), https://www.fiercewireless.com/operators/dish-to-launch-5g-network-las-vegas-year.

[147] Details about the channel can be found at: http://www.weathernationtv.com.

mounted 12-inch receive antenna and remote terminal, which outputs video via an Ethernet port. Customer receive equipment includes a CBNL VectaStar Gigabit ODU-S remote terminal. Both the transmitter and customer receive equipment are professionally installed, either by DISH or an authorized partner.

DISH has a team of customer service representatives specially trained to speak with interested customers. As a start-up service with a limited scope, DISH MVDDS service has seen modest adoption. In an attempt to tarnish DISH's MVDDS service, SpaceX apparently launched a sting operation. It used undercover supposed shoppers who inquired about subscribing to DISH's MVDDS services, tried (unsuccessfully) to show that it was hard to sign up, and attempted to elicit damaging statements from DISH's customer service representatives. But the scheme did not work

First, SpaceX protests that "not one address tested provided the ability for the tester to sign up immediately," accusing DISH of instead emailing SpaceX's agents that "one of our friendly agents will contact you shortly."[148] Yet SpaceX admits that DISH lived up to its promise: SpaceX's agents did in fact "receive follow up calls from DISH representatives."[149] This is consistent with DISH's process. Service availability is confirmed based on the prospective customer's address. DISH's customer service agents then contact customers who are interested in MVDDS service to discuss a potential installation of equipment with the customer. DISH will offer to conduct a site survey to verify line of sight at the customer's address.

SpaceX's accusations become progressively more paper-thin, as SpaceX faults DISH for requiring a site survey. What goes unmentioned is that the survey is free, and that none of

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[148] SpaceX Comments at 11.

[149] *Id.*

SpaceX's operatives appear to have taken advantage of it. Then SpaceX reports on conduct of its agents that really looks like entrapment. According to SpaceX, a DISH customer service representative "acknowledge[d]" that the MVDDS antennas would make the house "look like 'Mickey Mouse'"—the phrasing making clear that the cartoon figure was suggested by the SpaceX agent.[150]

SpaceX continues by complaining that DISH is charging "up to $400" for MVDDS equipment and that "[a]pparently, DISH only plans to deploy MVDDS service if customers themselves pay for the network infrastructure."[151] Yet SpaceX's own base station costs $500,[152] and SpaceX is accepting payments for beta service that it does not commit to actually offering. In fact, DISH charges customers $300 for the MVDDS receive equipment, including installation, and $400 if an additional transmit site is needed.

SpaceX also complains that the WeatherNation service is otherwise available for free. But this is true only for customers with existing broadband connections. As SpaceX itself often points out, many Americans do not have reliable Internet connections, and the MVDDS service allows customers to receive WeatherNation *without* needing an Internet connection at all. Finally, SpaceX notes that the term "MVDDS" does not appear on DISH's main website. "MVDDS" is not a term that an ordinary consumer would use, just as she would not use "DBS"; so it is no surprise that the term does not appear on DISH's website. The term "NGSO" likewise does not appear on the Starlink site.

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[150] *Id.* at 12.

[151] *Id.*

[152] *Starlink*, https://www.starlink.com (enter address to see price) (last visited July 6, 2021).

4. An Auction Is Foreclosed

T-Mobile and AT&T suggest that, if the Commission were to add a mobile allocation to the 12 GHz band, it should auction the mobile terrestrial rights.[153] But there are no "initial" licenses to auction – the MVDDS auctions took place in 2002 and 2004. Even if there were, the Commission has ample discretion "to forgo an auction," so long as it acts "in the public interest."[154] And precedent shows that licenses have been modified in comparable circumstances without an auction, and that doing so here would be in the public interest. In the AWS-4 proceeding, for example, the Commission concluded that license modification was the "best and fastest method for bringing this spectrum to market," even where the modification would result in increased value for the licensee.[155] In upholding the Commission's decision, the D.C. Circuit concluded that there was "no reason to second-guess the Commission's decision to choose a functioning wireless broadband network over a possible influx of cash."[156] Indeed, while T-Mobile points to "depriv[ing] the U.S. Treasury of revenue" as primary grounds for refraining from granting flexible use rights on MVDDS licensees,[157] Section 309(j) prohibits the Commission from electing to auction licenses based on this factor: "the Commission may not base a finding of public interest, convenience, and necessity on the expectation of Federal revenues from the use of a system of competitive bidding under this subsection."[158]

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[153] *See* T-Mobile Comments at 11-13; AT&T Comments at 10.

[154] *M2Z Networks, Inc. v. FCC,* 558 F.3d 554, 563-64 (D.C. Cir. 2009).

[155] *NTCH, Inc. v. FCC*, 950 F.3d 871, 876 (D.C. Cir. 2020).

[156] *Id.* at 881.

[157] T-Mobile Comments at 10.

[158] 47 U.S.C. § 309(j)(7)(A).

In fact, no authority exists for the Commission to auction the existing MVDDS licenses under Section 309. Section 309(j) requires competitive bidding for mutually exclusive applications.[159] But "[n]othing in Section 309(j) requires the Commission to accept mutually exclusive applications in the first place,"[160] and the Commission must "use engineering solutions, negotiation, threshold qualifications, service regulations, and other means in order to *avoid mutual exclusivity* in application and licensing proceedings."[161] The RKF analysis demonstrates that engineering solutions are available here, and thus mutually exclusive applications are not needed. That study employed a probabilistic, Monte Carlo analysis to identify and quantify the interference risk between nationwide 5G deployment of 12 GHz spectrum and SpaceX's user terminals, and determined that coexistence between robust deployments of 12 GHz spectrum for 5G and NGSO FSS broadband is "achievable in nearly all deployment scenarios—even without coordination."[162]

In addition, reclaiming all of the MVDDS licensees' spectrum for auction would create an impermissible "fundamental change" to these licenses that exceeds the Commission's authority under Section 316.[163] The D.C. Circuit has indicated that impairing the ability of a licensee to provide the same services as those enabled by the original license would be

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[159] 47 U.S.C. § 309(j)(1).

[160] Improving Public Safety Communications in the 800 MHz Band, *Report and Order, Fifth Report and Order, Fourth Memorandum Opinion and Order, and Order*, 19 FCC Rcd. 14969, 15013-14 ¶ 69 (2004).

[161] 47 U.S.C. § 309(j)(6)(E) (emphasis added).

[162] RKF Study at i.

[163] *See, e.g.*, *MCI Telecommunications Corp. v. AT&T*, 512 U.S. 218, 228 (1994) (holding that statutory "authority to 'modify' does not contemplate fundamental changes").

considered a fundamental change.[164] While T-Mobile claims that Section 316 authorizes the Commission to modify MVDDS licensees' authorizations and relocate them to other bands if they can provide the same service as they currently do, the record contains no proposals of such alternative bands, or any analysis of the feasibility of providing MVDDS services in other bands.[165]

In reality, stripping MVDDS licensees of their ability to use the 12 GHz band would be well in excess of an "impairment" of their ability to provide service; the MVDDS licensees would no longer have any spectrum licenses, and thus could not provide any service at all. This is akin to a license revocation that does not meet the requirements of 47 U.S.C. § 312 or the Administrative Procedure Act.[166]

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[164] *Cmty Television, Inc. v. FCC*, 216 F.3d 1133, 1140-41 (D.C. Cir. 2000), *cert. denied*, 531 U.S. 1071 (2001).

[165] *See* T-Mobile Comments at 11-12.

[166] 47 U.S.C. § 312 (enumerating reasons why the Commission may revoke a station license or construction permit, and requiring the Commission to issue an order to show cause why an order of revocation should not be issued, prior to making any revocation); 5 U.S.C. § 558(c) ("Except in cases of willfulness or those in which public health, interest, or safety requires otherwise, the withdrawal, suspension, revocation, or annulment of a license is lawful only if, before the institution of agency proceedings therefor, the licensee has been given–(1) notice by the agency in writing of the facts or conduct which may warrant the action; and (2) opportunity to demonstrate or achieve compliance with all lawful requirements.").

VIII. CONCLUSION

For the foregoing reasons and those set forth in DISH's comments, the Commission should allow MVDDS licensees to provide a higher-power, two-way terrestrial service in the 12 GHz band.

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July 7, 2021

Exhibit 1

Supplemental Declaration of Tom Peters

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1. On June 8th and June 23rd, 2016, the MVDDS 5G Coalition filed coexistence studies in FCC docket RM-11768 to support a Petition for Rulemaking requesting that Multichannel Video Distribution and Data Service ("MVDDS") spectrum be made available for 5G deployments.[1] I authored both studies. The studies assumed that DBS dishes are far more densely deployed than they actually are in reality—I assumed one dish every one or two square meters in the two markets I studied—Indianapolis, Indiana and Washington, D.C. Specifically, I assumed one dish every square meter for the small-cell "urban canyon" configurations in the downtown areas, and one dish every two square meters in a largely rural area about 20 miles outside Indianapolis.

2. The study area in Washington, D.C. covers 4 square kilometers, or 4 million square meters.[2] The total area of the rooftops covered 1,385,884 square meters, or about 35% of the total study area.

3. I also assumed that these ubiquitous dishes received service from all visible operational DBS slots. These orbital slots are: 61.5°, 72.7°, 77°, 101°, 110°, 119°, and 129° W.L. A terrestrial transmission produces a different equivalent power flux density ("EPFD") level depending on the angle at which each dish receives the DBS signal from each of these seven slots that is visible to the dish. I calculated the resulting EPFD level for every one of these angles provided the rooftop location had visibility to each orbital slot. I then used the highest of these EPFD levels. In other words, the studies assumed that each dish was pointed at the satellite that produced the worst case EPFD level resulting from the terrestrial transmissions based on the resulting azimuth and elevation angle relative to the configuration of the surrounding 5G cell sites.

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[1] Comments of MVDDDS 5G Coalition, RM-11768, Attachment 1 (filed June 8, 2016); Reply Comments of MVDDDS 5G Coalition, RM-11768, Appendix A (filed June 23, 2016) ("Washington, D.C. Study")

[2] Washington, D.C. Study at 3.

The foregoing declaration has been prepared using facts of which I have personal knowledge or based upon information provided to me. I declare under penalty of perjury that the foregoing is true and correct to the best of my current information, knowledge, and belief.

/s/ Tom Peters

Tom Peters

July 7, 2021