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

COMMENTS OF DISH NETWORK CORPORATION

Jeff Blum, Executive Vice President,
External & Legislative Affairs
Alison Minea, Director & Senior Counsel
Hadass Kogan, Director & Senior Counsel
DISH NETWORK CORPORATION
1110 Vermont Avenue, N.W., Suite 450
Washington, D.C. 20005
(202) 463-3702

Pantelis Michalopoulos
Christopher Bjornson
Andrew M. Golodny
Matthew R. Friedman
STEPTOE & JOHNSON LLP
1330 Connecticut Avenue, N.W.
Washington, D.C. 20036
(202) 429-3000

Counsel for DISH Network Corporation

May 7, 2021

Table of Contents

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

COMMENTS OF DISH NETWORK CORPORATION

The 12 GHz band is the spectrum band that keeps giving. The band has already been a success story for Direct Broadcast Satellite ("DBS") services, and by initiating this rulemaking, the Commission has begun writing its next chapter. The band can help the U.S. remain a leader in 5G by immediately unleashing 500 megahertz of terrestrial 5G spectrum for commercial investment and innovation. This outcome would be a substantial boon for the nation's economy and security, and it can be achieved without upending existing services. Higher-power two-way mobile and fixed services are possible and fully consistent with protecting DBS in the band. The time is now for the Commission to update the rules for 12 GHz and enable the band's full potential.

DISH, the company with the most to lose if 5G in the 12 GHz band interferes with its own DBS service, is confident that the two services can coexist. An additional analysis conducted by RKF Engineering Solutions, LLC ("RKF") shows that coexistence is also possible between 5G and non-geostationary satellite orbit Fixed-Satellite Service ("NGSO FSS") systems, especially in light of advances in technology, the significant amount of spectrum to which NGSOs have access and the heavy restrictions on use of the 12 GHz band they have had to

accept in other countries. In the words of one NGSO operator, Space Exploration Technologies Corporation ("SpaceX"), about another frequency band: "[w]ith this goal of co-existence in mind, the Commission should adopt an 'all-of-the-above' approach that allows multiple services to flourish and serve consumers."[1] We agree.

Building on Success. The 12 GHz band is not fallow spectrum, and this proceeding is different from situations where the Commission has repurposed underutilized frequencies. Far from it, this is the most intensively used satellite band. It has been utilized by millions of households, without interruption, for 25 years. What started as an uncertain hope to deliver 32 analog video channels out of an orbital slot blossomed into compelling and diverse video distribution services by two DBS companies, each offering hundreds of digital channels. As a result of the competition DBS introduced in the pay-TV market, today more than 22 million households receive service from the nation's two DBS providers. Through this rulemaking, the Commission can increase the utility of the 12 GHz band yet again by establishing updated and carefully tailored rules to permit sharing between satellite and terrestrial flexible use services. Such rules will help unleash still more from the band—the benefits of 5G—and promote competition to incumbent broadband carriers, all while protecting existing DBS services.

Broad support for a Mobile Service allocation. A large and diverse range of stakeholders support enabling terrestrial 5G in the 12 GHz band, including existing licensees and 5G proponents, commercial actors large and small, and prominent representatives of the public interest community. More than 20 of these supporters have redoubled their efforts by forming the 5G for 12 GHz Coalition,[2] whose mission is to unleash the power of 5G by making the

[1] Letter from David Goldman, SpaceX, to Marlene Dortch, FCC, WT Docket No. 20-133, at 1 (May 3, 2021).

[2] *See* 5G for 12 GHz Coalition, https://5gfor12ghz.com.

12 GHz band available for terrestrial wireless services. Coalition members range from Multichannel Video and Data Distribution Service ("MVDDS") licensees such as Go Long Wireless and RS Access; to trade associations INCOMPAS, the Computer & Communications Industry Association, and the Rural Wireless Association; to public interest groups including the Open Technology Institute and Public Knowledge. This broad support is not an accident: it springs from, and further validates, the significant benefits of authorizing 5G in the 12 GHz band.

Sharing between 5G and DBS services—first, do no harm. DISH would be the first to object if terrestrial 5G services posed a serious risk to DBS. DISH has invested billions of dollars into the 12 GHz band through auctions (directly or indirectly) or other transactions. DISH has built, purchased, or leased more than 20 satellites (13 of them operating today), to provide service to millions of households using the 12 GHz band. DISH has offered this service without interruption since March 5, 1996. Moreover, DISH makes by far the heaviest use of this spectrum today. By contrast, the other DBS operator, DIRECTV, has moved most of its direct-to-home service to Ka-band satellites, with only one fully used satellite in the 12 GHz band.

DISH would thus be the most vocal opponent of introducing 5G in the band if protection of DBS service were not possible. But the feasibility of sharing between DBS and 5G is demonstrated by two studies commissioned by the MVDDS 5G Coalition and prepared by expert satellite engineer Tom Peters, a former Chief Wireless Engineer of the Commission.[3] Mr. Peters examined the effects on DBS dishes from both 5G base stations and mobile devices in three different configurations—point-to-point, outdoor small cell (the "urban canyon" scenario), and

[3] Comments of MVDDS 5G Coalition, RM-11768, Attach. 1 (June 8, 2016); Reply Comments of MVDDS 5G Coalition, RM-11768, Appx. A (June 23, 2016) (the "2016 Studies").

indoor small cell—in the areas of Indianapolis, Indiana, and Washington, D.C. The studies are conservative in many respects. For example, Mr. Peters assumed the existence of a DBS dish every one or two square meters, and captured a worst-case snapshot. Still, the studies show that the 5G transmissions would not exceed EPFD limits in the vast majority of locations, that the potential for exceedance existed in only a tiny minority of locations, and that many of these locations were unlikely to house a satellite dish in the first place.

In a Declaration accompanying these Comments, Mr. Peters reaffirms the results of these studies and adds that subsequent technical advances have "further facilitated coexistence between terrestrial 5G networks and DBS receivers."[4] Mr. Peters is working on additional studies that will introduce further refinements to the 5G/DBS sharing analysis.

The strong evidence that DBS and 5G can share the spectrum should allay any of DIRECTV's concerns. DIRECTV's use of the band, limited though it may be, is also protected by DISH's self-interest. The two DBS operators do not have geographically separate clusters of subscribers, and sharing measures on the part of terrestrial service operators that protect one group of DBS subscribers will also generally protect the other. For these reasons, the Commission should modernize the rules for terrestrial service in the 12 GHz band. The Commission should specifically eliminate the effective isotropically radiated power ("EIRP") limit currently applicable to MVDDS, which was imposed as a "belt-and-suspenders" precaution, as the equivalent power flux density ("EPFD") limits are extremely unlikely to be exceeded in the first place.

Sharing between 5G and NGSO FSS Services—eminently possible. The main opposition to expanding terrestrial use of the 12 GHz band comes from NGSO FSS system

[4] Declaration of Tom Peters at 1 (May 7, 2021) ("Peters Declaration") (attached as Exhibit 1).

operators for whom this spectrum is one sliver among thousands of megahertz of other authorized frequencies. The NGSO system proponents have access to vast amounts of spectrum. For example, SpaceX has (or is seeking) access to an astounding 25,550 MHz of spectrum, of which 15,550 MHz is already licensed. For SpaceX, this means that the 12 GHz band accounts for 2% of its total spectrum allotment, 3% of its already licensed spectrum, and 6% of its licensed downlink spectrum alone. That spectrum includes the Ka-band, which has always been intended by the Commission to be NGSO systems' main and most hospitable home.[5]

Not only is the 12 GHz band a small portion of NGSO systems' licensed spectrum, it is a relatively inconsequential frequency for them. NGSO use of the band has always been subject to heavy restrictions: the International Telecommunication Union ("ITU") and the Commission alike have required NGSO FSS systems to operate without interfering with DBS operations. Interference is prohibited so long as it is "unacceptable"; it does not even have to be "harmful." Yet, as DISH has shown, at least one of the proposed NGSO systems, SpaceX's Starlink constellation, will likely exceed the applicable EPFD limits and have an unacceptable impact on DISH's DBS service. In other words, SpaceX is trying to protect a system that likely does not comply with its own obligation to protect DBS consumers.

[5] In fact, the Commission has deliberately freed up a portion of that spectrum for NGSO FSS systems' preferential use, relocating terrestrial services in the process. SpaceX is, understandably, requesting authority from the Commission to add user downlinks in the Ka-band to 1.8 GHz of its already licensed Ka-band spectrum, and other NGSO system proponents such as New Spectrum, OneWeb, and Kuiper already possess that authority. *See* Application of Space Exploration Holdings, LLC for Satellite Space Station Authorizations, IBFS File No. SAT-LOA-20200526-00055, Technical Attachment, at 4 (filed May 26, 2020). The Commission should grant SpaceX's request, which will enable SpaceX to equip all of its under construction Starlink satellites with suitable Ka-band user antennas and add the Ka-band to its user terminals, if necessary in its judgment to meet projected demand for its service.

Because of NGSOs' subservient status to DBS, there has never been an investment-backed expectation that NGSO use of the 12 GHz band would be unconstrained. In the United States, the Commission explicitly conditioned NGSO FSS licenses on the outcome of subsequent rulemakings about the 12 GHz band. And internationally, some or all of the band is allocated to the terrestrial Mobile Service in all three ITU regions; the Mobile Service has co-primary status for most of the spectrum in most of the world, including all of Region 2. This means that NGSO operators could not have counted on the worldwide availability of this band free of mobile service. Thus, the limitations on the use of the 12 GHz band militate for the intensive use of the other downlink spectrum allocated to NGSO use—not only the Ka-band but also the extended (10.7-11.7 GHz) and conventional (11.7-12.2 GHz) Ku-bands.

NGSO operators' plea for full and unconstrained use of the 12 GHz band in the United States is also at odds with the limitations placed on NGSO operations in the 12 GHz spectrum internationally. The 12 GHz rights of SpaceX, for example, are limited or nonexistent in many key countries. Thus, despite protestations of the need for the 12 GHz spectrum, SpaceX will in fact have to make do with limited, if any, access to that spectrum in many countries.

Finally, NGSO system proponents are once again asking the Commission to follow an overly prophylactic approach in the name of the potential for a large number of systems that may in the future need to share the spectrum among themselves, which might theoretically require lower elevation and azimuth angles from the minimum angles than the NGSO systems have imposed upon themselves to ensure reliable service today.[6] As the Teledesic and Skybridge

[6] *See, e.g.,* Letter from David Goldman, SpaceX, to Marlene Dortch, FCC, RM-11768, at 4-5 (Dec. 3, 2020) ("[B]ecause NGSO FSS systems must share the available spectrum, they rely upon satellite diversity – i.e., the ability to access a number of satellites in view at all angles from an earth station – to avoid in-line interference events with other NGSO systems operating in the same band.").

experiences teach, these expectations have failed to materialize in the past, and the Commission should not make decisions today that could hamper 5G service in the name of the hypothetical emergence of a large number of systems at some point in the future.

Nevertheless, co-existence of 5G and NGSO services appears eminently possible. A study prepared by RKF shows that transmissions from a well-developed 5G network, including macro-cell and small-cell base stations, user equipment, and backhaul transmitters, can coexist with NGSO systems.

***Targeted Rules*.** The Commission should add a Mobile Service allocation to the 12 GHz band, which would bring the U.S. Table of Allocations in conformity with the international Table for Region 2. The Commission should allow higher-power two-way service by eliminating the outdated power limits of the current rules, which correspond to a small fraction of the power of a light bulb and would preclude 5G service. The Commission should also modify the existing MVDDS authorizations to allow the provision of mobile and fixed two-way service. This is consistent with past license modifications that have allowed licensees to put their licenses to broader and more flexible use.

I. The 12 GHz Band Is Ideal for 5G

While the Commission has made additional spectrum available for 5G in the years since the MVDDS 5G Coalition first requested this rulemaking,[7] the need for more 5G spectrum continues to grow. The 12 GHz band represents a unique opportunity to propel the U.S. to undisputed leadership in the race to 5G. The band contains 500 megahertz of contiguous mid-

[7] *See* Expanding Flexible Use of the 12.2-12.7 GHz Band, *Notice of Proposed Rulemaking*, 36 FCC Rcd. 606, 611 ¶ 14 n.33 (2021) ("*12 GHz NPRM*").

band spectrum that, if used for terrestrial flexible use (including 5G wireless broadband), could help unlock the full potential of 5G in the U.S. for decades to come.

A. American Leadership in 5G Requires Additional Spectrum

The importance of a U.S. victory in the breakneck 5G race among nations, and concerns that the U.S. may be lagging behind, appear to be views that enjoy rare bipartisan support. With foresight, it was seven years ago that then-Commissioner Rosenworcel was among the first to talk about a 5G race: "the race to 5G is on—and our mobile future depends on it."[8] Flash forward to the present: Secretary of Commerce Gina Raimondo declared in her confirmation hearing that "the race is on for 5G. I want America to win and lead, and that requires spectrum."[9] Throughout the years, other Commissioners have agreed. In 2018, Commissioner Carr noted that: "the race to 5G is on. Winning this race will mean more broadband for more Americans."[10] He further warned that the U.S. failure to win the race during earlier transitions—in the 2G and 3G transitions—resulted in "drained capital" and "less efficient spectrum use."[11] Commissioner Starks expressed the same sentiment in 2018 Senate testimony: "the race to 5G is on and the U.S., I believe, needs to maintain its leadership here."[12] These views are consistent with the guidance of President Biden, who has identified ensuring widespread 5G deployment as a

---

[8] Jessica Rosenworcel, *The Race to 5G Is On*, Vox (Oct. 27, 2014), https://www.vox.com/2014/10/27/11632314/the-race-to-5g-is-on.

[9] Todd Shields & Eric Martin, *Biden Pick for Commerce Chief Calls for U.S. 5G Airwaves Policy*, Bloomberg (Jan. 26, 2021), https://www.bloomberg.com/news/articles/2021-01-26/biden-pick-for-commerce-chief-calls-for-u-s-5g-airwaves-policy.

[10] Remarks of Commissioner Brendan Carr at CTIA's Race to 5G Summit (Apr. 19, 2018), https://www.fcc.gov/document/commissioner-carr-remarks-race-5g-summit.

[11] *Id.* at 2.

[12] Monica Alleven, *FCC Nominee Starks Says Spectrum, Deployment Key to 5G Leadership*, Fierce Wireless (June 21, 2018), https://www.fiercewireless.com/wireless/fcc-nominee-starks-says-spectrum-deployment-key-to-5g-leadership-0.

national priority, as it is both a competitive demand and an equitable concern.[13] Likewise, in sponsoring the MOBILE NOW Act of 2018, Senator John Thune (R-South Dakota) stated that the law would "help[] secure America's leadership in the future of communications technology."[14]

Freeing up additional spectrum is essential for the United States to win the 5G race.[15] Analysts predict that "[m]obile data traffic is projected to increase by eight times over the next six years."[16] A tremendous amount of spectrum, including the 12 GHz band, will be required to support this growth in mobile traffic.

A number of 5G experts have recognized that America's appetite for wireless broadband service is surging. 5G applications will require substantial bandwidth, because they need to respond to, and will further spur, a corresponding increase in demand. According to Cisco, North American mobile traffic grew 44 percent in 2016 and will continue to grow at a near 35

---

[13] *The Biden Plan to Build a Modern, Sustainable Infrastructure and an Equitable Clean Energy Future*, https://joebiden.com/clean-energy ("Expanding broadband, or wireless broadband via 5G, to every American – recognizing that millions of households without access to broadband are locked out of an economy that is increasingly reliant on virtual collaboration. Communities without access cannot leverage the next generation of 'smart' infrastructure. As the COVID-19 crisis has revealed, Americans everywhere need universal, reliable, affordable, and high-speed internet to do their jobs, participate equally in remote school learning and stay connected. This digital divide needs to be closed everywhere, from lower-income urban schools to rural America, to many older Americans as well as those living on tribal lands. Just like rural electrification several generations ago, universal broadband is long overdue and critical to broadly shared economic success.") (last visited May 6, 2021).

[14] Press Release, *President Signs MOBILE NOW Act, Other Key Technology Bills into Law*, U.S. Senate Committee on Commerce, Science, & Transportation (Mar. 23, 2018), https://www.commerce.senate.gov/2018/3/president-signs-mobile-now-act-other-key-technology-bills-into-law.

[15] *America's 5G Future*, FCC, https://www.fcc.gov/5G (last visited May 6, 2021).

[16] *Securing the Right Spectrum for 5G*, Ericsson, at 2 (June 2018), https://www.ericsson.com/4add36/assets/local/mobility-report/documents/2018/emr-june-2018-securing-the-right-spectrum-for-5g.pdf.

percent compound annual growth rate through the end of this year. Ericsson predicts that between 2016 and 2022 the data traffic generated by smartphones in North America will increase by a factor of six.[17]

B. The 12 GHz Band Has Unique Attributes that Make It Attractive for 5G Deployment

More mid-band spectrum is needed most acutely for 5G. It is for that reason that the Commission directly tied a boost to the nation's economy, not only to 5G in general, but to "licensing mid-band spectrum for flexible use" in particular in its *C-Band Order*.[18] The Commission has identified mid-band spectrum as "well-suited for next generation wireless broadband services due to the combination of favorable propagation characteristics (compared to high bands) and the opportunity for additional channel re-use (compared to low bands)."[19]

Mid-band spectrum strikes the sweet spot for 5G, on the continuum from coverage to capacity or densification of spectrum. Low spectrum bands (below 1 GHz) are suitable for wide coverage, in light of the spectrum's low attenuation and corresponding excellent propagation characteristics.[20] On the other hand, the same characteristics make low bands comparatively

---

[17] Expanding Flexible Use of the 3.7 to 4.2 GHz Band, *Order and Notice of Proposed Rulemaking*, 33 FCC Rcd. 6915, 6917 ¶ 3 (2018) ("*C-Band NPRM*") (footnotes omitted); *see also* Updating the Commission's Rule for Over-the-Air Reception Devices, *Notice of Proposed Rulemaking*, 34 FCC Rcd. 2695, 2695 ¶ 1 (2019) ("The deployment of 5G wireless networks and other advanced wireless technologies holds the potential to bring enormous benefits to American consumers by delivering faster speeds and lower latency and by supporting the development of advanced applications like the Internet of Things, smart cities, and telehealth.").

[18] Expanding Flexible Use of the 3.7 GHz to 4.2 GHz Band, *Report and Order and Order of Proposed Modification*, 35 FCC Rcd. 2343, 2353 ¶ 20 (2020) ("*C-Band Order*").

[19] *C-Band NPRM*, 33 FCC Rcd. at 6917 ¶ 5.

[20] 2020 Communications Marketplace Report, GN Docket No. 20-60, FCC-20-188, at 20 ¶ 29 n.88 (Dec. 31, 2020) ("Spectrum below 1 GHz (low-band spectrum) has certain propagation advantages for network deployment over long distances, and for penetrating buildings and urban canyons, while spectrum above 1 GHz (mid-or high-band spectrum) allows for the better transmission of large amounts of information. In this sense, low-band spectrum may be thought

poor candidates for spectrum reuse, which in turn is important for densification and securing the high bandwidth capacity necessary for 5G.[21] At the other end of the continuum, high-band spectrum (above 24 GHz) allows densification but does so at a very high cost.[22] Higher frequency bands experience larger path loss, atmosphere loss, rain attenuation, foliage blocking, and outdoor-to-indoor penetration loss.[23] The 70/80 GHz bands, for example, have "comparatively poor propagation and atmospheric absorption characteristics," meaning that operations "typically require high power and directional gain in order to achieve significant range."[24] Higher-frequency signals also experience greater attenuation, and clutter plays an

---

of as 'coverage' spectrum, and higher band spectrum may be thought of as 'capacity' spectrum. Service providers deploy their spectrum bands differently depending on the nature of the service, geography, density, or other factors in their network build-out.") (internal citations omitted).

[21] NTIA, Identifying Key Characteristics of Bands for Commercial Deployments and Applications, Subcommittee Final Report and Recommendations Commerce Spectrum Management Advisory Committee, at 7 (Nov. 17, 2017), https://www.ntia.doc.gov/files/ntia/publications/key_characteristics_sub-committee_final_report_nov_17_2017.pdf ("The main 'con' [of lower frequencies] is that the ability of the radio waves to travel farther and through objects can be a negative when capacity is the goal (i.e. these characteristics inhibit spectrum reuse).").

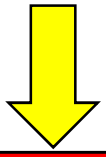
[22] Remarks of Commissioner Jessica Rosenworcel at Mobile World Congress Americas, Los Angeles, California, at 2 (Oct. 22, 2019), https://www.fcc.gov/document/rosenworcel-remarks-mobile-world-congress-americas ("[R]ecent commercial launches of 5G service across the country using millimeter wave spectrum are confirming what we already know—that commercializing high-band spectrum will not be easy or cheap, given its propagation challenges. The network densification these airwaves require is substantial. That means high-band 5G service is unlikely outside only the most populated urban areas.").

[23] *See* Samsung 5G Vision 28 GHz Mobile Technologies, Samsung, at 10-13 (2016), https://www.nttdocomo.co.jp/binary/pdf/corporate/technology/rd/tech/5g/5GTBS2016_TECH_WORKSHOP_SAMSUNG.pdf; *see also* Comments of Ericsson, GN Docket No. 14-177, at 25 (Jan. 26, 2016) (Higher frequency bands face "greater challenges" in transmissions between outdoor and indoor points); Comments of Google Inc. and Google Fiber Inc., GN Docket No. 14-177, at 7 (Sept. 30, 2016) ("Google Comments").

[24] Google Comments at 3.

important role in system design and coexistence.[25] As shown in the diagram below, the 12 GHz band has twice the signal range and four times the coverage area of the 24 GHz band. The comparison of the 12 GHz and 39 GHz bands is even more lopsided: the 12 GHz band covers more than three times the signal range and more than *ten* times the coverage area of the 39 GHz band.[26] For a terrestrial system, this entails tremendous cost advantages, as fewer towers are necessary.

Comparison of 12 GHz relative to mmWave frequencies	24 GHz	28 GHz	39 GHz
Signal Range	200%	**233%**	325%
Coverage Area	400%	**544%**	1056%



Why Does it Matter?
A mmWave system deployment at 28 GHz is expected to need 5X or more base stations compared to a 12 GHz system

[25] *See* Comments of EchoStar Satellite Operating Corporation and Hughes Network Systems, LLC, GN Docket No. 14-177, at 11 (Sept. 30, 2016).

[26] Figures derived from: Technical feasibility of IMT in bands above 6 GHz, Rep. ITU-R M.2376-0 (Section 4) (07/2015).

And real-world conditions must account for fading and attenuation losses. The 12 GHz band is much closer to the C-band than the 28 GHz band with respect to attenuation performance:

Attenuation in dB / km	C-Band	12-GHz	28 GHz
Rain	0.0015	0.006 (4X)	0.08 (53X)
Atmosphere	0.005	0.007 (1.4X)	0.02 (4X)

Propagation attenuation relative to the baseline C-Band is shown in parentheses.[27]

As a result of the characteristics of millimeter wave spectrum, parties seeking to manufacture appropriate equipment for the bands face obstacles, including greater cost and difficult technical and engineering challenges.[28] In addition, the millimeter wave bands face issues around lack of semiconductor readiness and power consumption. More time and development are needed before manufacturing processes can support large scale production and equipment becomes available in sufficient volumes and at low enough prices to support a broad 5G rollout. It is the mid-band spectrum that allows spectrum reuse, densification, and high bandwidth capacity at relatively low cost.[29] Thus, the country with the largest reserves of mid-band spectrum available for 5G is the best positioned to win the 5G race.

[27] Data derived from Attenuation by Atmospheric Gases, Rec. ITU-R P.676-9, Figure 5 (02/2012).

[28] *See* Comments of MVDDS 5G Coalition, GN Docket No. 14-177, at 12-18 (Sept. 30, 2016).

[29] Mark Racek, *Why the U.S. Needs Mid-Band Spectrum to Win at 5G*, Ericsson (July 31, 2020), https://www.ericsson.com/en/blog/6/2020/us-needs-midband-spectrum-for-5g ("While 5G offers tremendous investment opportunity, the critical component that is missing in the U.S. is access to mid-band spectrum. Mid-band offers a balance of low-band capabilities (favorable signal range and indoor penetration) and higher-band benefits (increased capacity for faster speeds and lower latency). Mid-band spectrum is well-suited for robust, wide-area macro 5G offerings.").

The Government Accountability Office has recognized that "mid-band spectrum is highly congested, leading to an insufficient amount available for carriers to deploy their 5G networks in the United States." A group of experts convened by GAO from academia, industry, and consumer groups stated that "to avoid delays in 5G deployment, the commercial sector needs access to more mid-band spectrum."[30] Specifically, while the United States has allocated some mid-band spectrum to 5G, such as 280 MHz in the 3.7-4.2 GHz band,[31] other countries have allocated 460 MHz (China), 790 MHz (United Kingdom), and 1000 MHz (Japan) of mid-band spectrum.[32] The gap in available mid-band 5G resources between the U.S. and other nations shows how much more work in identifying additional 5G spectrum resources remains to be done.[33]

The 12 GHz band answers this need for more 5G mid-band spectrum. *First*, it has no federal government incumbents that need to be moved. *Second*, 500 MHz of available contiguous spectrum will allow for high-peak data transmission rates.[34] *Third*, the near-global Mobile Service allocation allows for potentially harmonized global use of the band.[35] *Fourth*,

---

[30] *5G Deployment: FCC Needs Comprehensive Strategic Planning to Guide Its Efforts*, Government Accountability Office, at 2 (June 2020), https://www.gao.gov/assets/710/707530.pdf.

[31] *C-Band Order*, 35 FCC Rcd. at 2345 ¶ 4.

[32] Janette Stewart, Chris Nickerson & Tamlyn Lewis, *5G Mid-Band Spectrum Global Update*, Analysys Mason, at 2 (Mar. 2020), https://api.ctia.org/wp-content/uploads/2020/03/5G-mid-band-spectrum-global-update-march-2020.pdf.

[33] *Id.* (finding that while the U.S. is "is expected to have assigned 350 MHz of licensed mid-band spectrum by 2022, it will still lag behind several other leading markets (including Canada, China, Hong Kong, Japan, South Korea, and the UK), which have moved and/or are continuing to move aggressively in terms of mid-band spectrum assignment").

[34] *See, e.g.*, Petition of MVDDS 5G Coalition for Rulemaking, RM-11768, at 4 (Apr. 26, 2016) ("MVDDS Petition").

[35] *See id.* at 8.

the existing manufacturing ecosystem for the 12 GHz band will help reduce the production costs for new 5G equipment in the band. *Fifth*, the band is not balkanized by being apportioned among a large number of licensees. In fact, the band is used by a finite number of licensees, each of which has access to its entirety, either in a local market or for the entire nation. *Finally*, as discussed below, co-frequency sharing among existing licensees is feasible, subject to safeguards that need not threaten the viability of each service.

By comparison, the Commission would not be able to harvest any of the specific frequency bands identified in the *Mid-Band Spectrum NOI* for 5G services as readily as the 12 GHz band, as the Commission has not yet developed a record around flexible mobile use for any of the bands identified in this NOI.[36] Moreover, each band identified in the *Mid-Band Spectrum NOI* contains thousands of incumbent operators who have used the licensed frequencies for years and are not likely to reach sharing arrangements readily or agree to relocate existing operations.[37]

In addition, the Spectrum Frontiers bands identified by the Commission doubtless represent a valuable component of the full package of spectrum carriers will need for robust 5G

[36] Expanding Flexible Use in Mid-Band Spectrum Between 3.7 and 24 GHz, *Notice of Inquiry*, 32 FCC Rcd. 6373 (2017) ("*Mid-Band Spectrum NOI*").

[37] Specifically, approximately 48 satellites, 4,700 registered earth stations, potentially thousands of unregistered earth stations, and 119 fixed service stations operate in the 3.7-4.2 GHz band. *See Mid-band Spectrum NOI*, 32 FCC Rcd. at 6378-79 ¶¶ 14-15 (2017). In addition, approximately 1,535 earth stations, including a number of earth stations on vessels which do not operate in fixed locations, and 27,000 fixed point-to-point stations, many of which support critical infrastructure communications, *e.g.*, railroads, natural gas and oil pipelines, electric grids, and communications backhaul, operate in the 5.925-6.425 GHz band. *See id*. 6381-82 ¶¶ 24-25. Furthermore, hundreds of mobile licensees in the broadcast auxiliary service and cable auxiliary relay service and tens of thousands of fixed point-to-point stations, many of which also provide critical infrastructure communications, operate in various segments of the 6.425-7.125 GHz band. *See id*. 6384 ¶ 35. The band is allocated in the United States for non-Federal use on a primary basis for FS (6.525-7.125 GHz), mobile service (6.425-6.525 and 6.875-7.125 GHz), and FSS (6.425-6.700 GHz and 7.025-7.075 GHz). *See id*. 6384 ¶¶ 32-35.

networks.[38] But the technical challenges of these bands, including the propagation characteristics and equipment supply issues, will require significant time and money to overcome.

C. Leadership in 5G Is Crucial for American National Security and American Jobs, and Will Help Bridge the Digital Divide

It is thus clear that leadership in the 5G race requires mid-band spectrum in general and the 12 GHz band in particular. But why is it important to win that race? National security, American jobs, and closing the digital divide are some of the critical benefits that can be unlocked by winning the race to 5G.

National Security. A modern national security apparatus requires both technological prowess and economic leverage, in addition to military strength.[39] As the Council on Foreign Relations' Independent Task Force concluded: "[c]ountries that can harness the current wave of innovation, mitigate its potential disruptions, and capitalize on its transformative power will gain economic and military advantages over potential rivals."[40] And, Commissioner Starks recently explained that: "[w]e can no longer think of our country's economic success, our security, and

---

[38] *See* Use of Spectrum Bands Above 24 GHz For Mobile Radio Services, *Notice of Proposed Rulemaking*, 30 FCC Rcd. 11878 (2015) ("*Spectrum Frontiers NPRM*").

[39] *See The Power of America's Example: The Biden Plan for Leading the Democratic World to Meet the Challenges of the 21st Century*, Biden for President, https://joebiden.com/americanleadership (last visited May 6, 2021) ("Joe Biden believes that economic security is national security."); *Attorney General William P. Barr Delivers the Keynote Address at the Department of Justice's China Initiative Conference*, Department of Justice (Feb. 6, 2020), https://www.justice.gov/opa/speech/attorney-general-william-p-barr-delivers-keynote-address-department-justices-china ("It has been America's technical prowess that has made us prosperous and secure.").

[40] James Manyika & William H. McRaven, *Innovation and National Security: Keeping Our Edge*, Independent Task Force Report No. 77, Council on Foreign Relations, at 4 (2019), https://www.cfr.org/report/keeping-our-edge/pdf/TFR_Innovation_Strategy.pdf.

our geo-political relations as distinct issues"; the United States must prioritize leveraging economic interdependence and its critical infrastructure in order to ensure national security.[41]

China, for its part, has recognized this reality and is heavily investing in 5G.[42] China is likely to deploy the world's first 5G wide-area network, and Chinese companies have become well-positioned as 5G suppliers—Huawei, for example, has signed contracts for the construction of 5G infrastructure in around 30 countries.[43] A recent study showed that the U.S. currently ranks last among 13 major wireless markets in the availability of 5G mid-band spectrum.[44] Even after the C-band auction, the U.S. remains behind China. As the Congressional Research Service found, "China is the current leader in [low-band and mid-band] technologies and is likely to deploy the world's first 5G wide-area network."[45] But opening up 500 MHz of the 12 GHz band to 5G would allow the U.S. to pole-vault over China.[46] Successfully meeting the challenges presented by China will require a significant investment in, and broadening of, U.S. digital and technological infrastructure—specifically and especially in 5G.

Not winning the race to 5G not only means lacking an important national advantage, it would also inflict a critical handicap. Control over 5G infrastructure would enable other

---

[41] Statement of Commissioner Geoffrey Starks at the Center for American and International Law, Institute for Law and Technology, *Speech*, at 1 (Dec. 4, 2019), https://www.fcc.gov/document/commissioner-starks-center-american-and-international-law.

[42] *See* David H. McCormick, Charles E. Luftig & James M. Cunningham, *Economic Might, National Security, and the Future of American Statecraft*, 3(3) Texas National Security Review 50, at 55 (2020), http://dx.doi.org/10.26153/tsw/10222.

[43] *National Security Implications of Fifth Generation (5G) Mobile Technologies*, Congressional Research Service, at 1 (Jan. 26, 2021), https://fas.org/sgp/crs/natsec/IF11251.pdf.

[44] Janette Stewart, Chris Nickerson & Tamlyn Lewis, *5G Mid-Band Spectrum Global Update*, Analysys Mason, at 2 (Mar. 2020), https://api.ctia.org/wp-content/uploads/2020/03/5G-mid-band-spectrum-global-update-march-2020.pdf.

[45] *Id.*

[46] *Id.*

countries to further their own national strategic goals such as network security vulnerabilities that facilitate espionage[47] to the detriment of U.S. economic and national security interests by developing both 5G technology and 5G standards in their favor,[48] and through access to the critical data that traverses that infrastructure. As a recent article noted: "5G appears to be a winner-take-all sector where control of the infrastructure equates to control of data—data that will drive the emerging global economy and prove essential to effective national defense."[49]

American Jobs. American leadership is essential because 5G promises competitive benefits to the nation that first achieves widespread deployment. As the Commission stated in the *C-Band Order*, "American leadership in 5G is important because 5G networks will power a digital economy of applications and services that themselves will transform our economy, boost economic growth, and improve our quality of life."[50] In the *T-Mobile/Sprint Order*, the

---

[47] Peter Harrell, *5G: National Security Concerns, Intellectual Property Issues, and the Impact on Competition and Innovation*, Testimony Before the Senate Committee on the Judiciary (May 14, 2019), https://www.judiciary.senate.gov/imo/media/doc/Harrell%20Testimony.pdf ("[T]he U.S. has an enormous strategic interest in reducing the vulnerabilities of communications networks in the United States and in allied countries to cyber espionage by China and other competitor nations.") ("Harrell Testimony").

[48] Milo Medin & Gilman Louie, *The 5G Ecosystem: Risks and & Opportunities for DoD*, Defense Innovation Board, at 7 (Apr. 3, 2019), https://media.defense.gov/2019/Apr/03/2002109302/-1/-1/0/DIB_5G_STUDY_04.03.19.PDF ("5G will also enhance the Internet of Things (IoT) by increasing the amount and speed of data flowing between multiple devices, and may even replace the fiber-optic backbone relied upon by so many households. The country that owns 5G will own many of these innovations and set the standards for the rest of the world.").

[49] *See* David H. McCormick, Charles E. Luftig, James M. Cunningham, *Economic Might, National Security, and the Future of American Statecraft*, 3(3) Texas National Security Review 50, at 54-55 (2020), http://dx.doi.org/10.26153/tsw/10222. As Peter Harrell stated in his testimony before the United States Senate Committee on the Judiciary, "a number of allied intelligence agencies have expressed sharp concerns that global 5G telecommunications networks that depend on Chinese equipment could pose significant cyber security risks." Harrell Testimony at 2-3.

[50] *C-Band Order*, 35 FCC Rcd. at 2345 ¶ 3.

Commission stated that "[e]xpanding 5G access to all Americans will also enhance the benefits of 5G innovation for the overall United States economy and will support American technological leadership. The larger the United States' 5G user base, and the broader its nationwide coverage, the greater the opportunity for entrepreneurs and innovators."[51]

As Acting Chairwoman Rosenworcel explained, 5G "technology could become an input in everything we do—improving agriculture, education, healthcare, energy, transportation, and more."[52] As one example, the number of connected IoT devices worldwide is anticipated to jump 12 percent on average annually, from nearly 27 billion in 2017 to 125 billion in 2030.[53]

And mid-band spectrum is the rare earth that alchemizes these contributions. According to the Commission, it is "clear that licensing mid-band spectrum for flexible use will lead to substantial economic gains, with some economists estimating billions of dollars in increases on spending, new jobs, and America's economy."[54] Acting Chairwoman Rosenworcel has stated that 5G will unlock an estimated 4.5 million new jobs.[55] One analysis estimated that operators "are expected to invest approximately $275 billion in infrastructure, which could create up to 3

---

[51] Applications of T-Mobile US, Inc., and Sprint Corporation, *Memorandum Opinion and Order, Declaratory Ruling, and Order of Proposed Modification*, 34 FCC Rcd. 10578, 10582 ¶ 8 (2019).

[52] Statement of Commissioner Jessica Rosenworcel, Protecting Against National Security Threats to the Communications Supply Chain Through FCC Programs, *Second Report and Order*, 35 FCC Rcd. 14284, 14422 (2020).

[53] *Number of Connected IoT Devices Will Surge to 125 Billion by 2030, IHS Markit Says*, IHS Markit (Oct. 24, 2017), https://news.ihsmarkit.com/prviewer/release_only/slug/number-connected-iot-devices-will-surge-125-billion-2030-ihs-markit-says.

[54] *See C-Band Order*, 35 FCC Rcd. at 2353 ¶ 20.

[55] News Release, Acting Chairwoman Rosenworcel Proposes Framework to Free Up Mid-Band Spectrum for 5G, FCC (Feb. 23, 2021), https://docs.fcc.gov/public/attachments/DOC-370205A1.pdf ("5G will foster new economic activity, unlocking an estimated 4.5 million new jobs and adding $1.5 trillion in economic growth.").

million jobs and boost GDP by $500 billion."[56] Another analysis predicted that "5G deployment will contribute $1.4 trillion to $1.7 trillion to United States GDP, and create 3.8 to 4.6 million jobs."[57]

At work here is the well-known multiplier effect. It is well-settled that 5G is a powerful lever. As the Bureau of Economic Analysis, which regularly publishes economic multipliers (called "RIMS II"), explains:

> [A]n initial change in economic activity results in other rounds of spending—for example, building a new road will lead to increased production of asphalt and concrete. The increased production of asphalt and concrete will lead to more mining. Workers benefiting from these increases will spend more, perhaps by eating out at nicer restaurants or splurging more on entertainment.[58]

One study used RIMS II to estimate the combined economic effect of making 300 MHz of additional spectrum available to mobile broadband providers over a five-year period. In the study, the RIMS II multiplier accounts for three types of economic effects: (1) direct effects, including the impacts on employment and output as a result of the initial investments made by companies acquiring direct access to the newly available spectrum; (2) indirect effects, including the employment and output impacts on other firms, such as vendors, from purchases made by the companies who are making investments as a result of their acquisition of newly available spectrum; and (3) induced effects, including economic impacts generated by expenditures made

---

[56] Accenture, *Smart Cities: How 5G Can Help Municipalities Become Vibrant Smart Cities* (2017), https://newsroom.accenture.com/content/1101/files/Accenture_5G-Municipalities-Become-Smart-Cities.pdf.

[57] Enrique Duarte Melo, Antonio Varas, Heinz Bernold, and Xinchen Gu, *5G Promises Massive Job and GDP Growth in the US*, Boston Consulting Group, at 3 (Feb. 2021), https://api.ctia.org/wp-content/uploads/2021/01/5G-Promises-Massive-Job-and-GDP-Growth-in-the-US_Feb-2021.pdf.

[58] Welcome to RIMS II Online Order and Delivery System, U.S. Dept. of Commerce, Bureau of Economic Analysis, http://commercedataservice.github.io/BEA_RIMS_Redesign (last visited May 6, 2021).

by employees of the firms that benefit from the direct and indirect effects.[59] The study found that there would be incremental capital spending of $26.6 billion by the fifth year after the spectrum auction, or about $75.4 billion over five years, and an increase in GDP of over $231 billion.[60] The study also found that an average 307,619 jobs would be created per year over the five-year period.

Another study used RIMS II multipliers to examine the economic impact of reallocating 400 MHz of mid-band spectrum between 3.45 GHz and 4.2 GHz for 5G networks.[61] The study found that the 5G mid-band spectrum buildout would create about 1.3 million U.S. jobs, or 190,000 jobs annually, for a total boost to U.S. GDP of $274 billion over seven years.[62] This conclusion is consistent with a study by Accenture, which found that every job created by 5G within the information and technology sector will create another 1.8 jobs, for a total of up to 2.8

[59] David Sosa & Marc van Audenrode, *Private Sector Investment and Employment Impacts of Reassigning Spectrum to Mobile Broadband in the United States*, Analysis Group (Aug. 2011), https://www.analysisgroup.com/globalassets/content/news_and_events/news/sosa_audenrode_spectrumimpactstudy_aug2011.pdf.

[60] *Id*. at 6.

[61] David W. Sosa & Greg Rafert, *The Economic Impacts of Reallocating Mid-Band Spectrum to 5G in the United States*, Analysis Group (Feb. 2019) (attached to Letter from Scott K. Bergmann, CTIA, to Marlene Dortch, GN Docket Nos. 18-122, 17-258 (Feb. 7, 2019)), https://ecfsapi.fcc.gov/file/10207544423614/190207%20CTIA%20Ex%20Parte.pdf.

[62] *Id.* at 3-4.

jobs throughout the economy.[63] Another estimate predicts an even more stunning addition of 8.5 million jobs between 2019 and 2025, as compared to a 4G-only world.[64]

The expected scale of job growth from 5G makes sense. Nearly double today's number of skilled tower technicians and telecommunications crews are needed to complete the United States' 5G network.[65] And the employment increase will arrive at a critical time. As the U.S. continues to recover from the COVID-19 pandemic, many of the approximately 10 million unemployed may fill jobs enabled by 5G.[66]

Even these analyses appear to understate the multiplier effect because they look upstream—to the asphalt needed for the road—more than downstream—to the economic activity generated by the use of the road and the opportunities it opens up. Commissioner Carr touched on that aspect of 5G's multiplier effects when he testified: "jobs created from building the 5G

---

[63] *See* Jefferson Wang, Hillol Roy, Syed Alam, Tejas Rao, Samir, Ahshrup & William McClusky, *The Impact of 5G on the United States Economy*, Accenture, at 6 (Feb. 22, 2021), https://www.accenture.com/_acnmedia/PDF-146/Accenture-5G-WP-US.pdf#zoom=50 ("[F]or every job introduced by the direct effect of 5G in ICT, an additional 1.8 jobs will be created elsewhere throughout the economy, for a multiplier effect of 2.8 on the total number of jobs.").

[64] James E. Prieger, *An Economic Analysis of 5G Wireless Deployment: Impact on the U.S. and Local Economies*, ACT—The App Association (Feb. 2020), https://actonline.org/wp-content/uploads/ACT-Report-An-Economic-Analysis-of-5G-FINAL.pdf.

[65] News Release, FCC, *Carr Praises 5G Workforce Bill*, at 1 (Feb. 2, 2021), https://docs.fcc.gov/public/attachments/DOC-369662A1.pdf ("To complete America's 5G build, we need nearly to double the number of skilled tower techs and telecom crews working in this country. Doing so would not only advance U.S. leadership in 5G and create thousands of new jobs, it would help ensure that we have the workforce in place to extend the reach of highspeed Internet services at a time when so many Americans are relying on the Internet to work from home and utilize services such as telehealth and remote learning.").

[66] Jefferson Wang, Hillol Roy, Syed Alam, Tejas Rao, Samir, Ahshrup & William McClusky, *The Impact of 5G on the United States Economy*, Accenture (Feb. 22, 2021), https://www.accenture.com/_acnmedia/PDF-146/Accenture-5G-WP-US.pdf.

platform [will] have a multiplier effect, as in turn, jobs and services are created using 5G networks."[67]

The jobs created by 5G will benefit those communities that have been hurt hardest by the pandemic, and which suffer the most from the digital divide. For example, African-Americans and Hispanics are likely to benefit from additional jobs resulting from 5G deployment and use.[68] Widespread access to 5G will also help close the digital divide that disproportionately affects minority populations, resulting in new business opportunities for small, mid-sized, and minority-owned businesses.[69]

---

[67] Testimony of Brendan Carr, Commissioner, FCC, Before the Subcommittee on Communications and Technology of the United States House of Representatives Committee on Energy and Commerce, at 2 (Dec. 5, 2019), https://docs.house.gov/meetings/IF/IF16/20191205/110284/HHRG-116-IF16-Wstate-CarrB-20191205.pdf.

[68] Nicol Turner Lee, *Enabling Opportunities: 5G, the Internet of Things, and Communities of Color*, Brookings Institution (Jan. 9, 2019), https://www.brookings.edu/research/enabling-opportunities-5g-the-internet-of-things-and-communities-of-color ("African-Americans and Hispanics are also positioned to directly benefit from the workforce opportunities resulting from 5G deployment and use. A recent report from Accenture estimates that the transition to 5G will create 50,000 new construction jobs in the U.S. to install new wireless infrastructure over a seven-year period.").

[69] Remarks of Commissioner Geoffrey Starks, *The Future of Work: Black-Owned Businesses and the Digital Divide* (Feb. 11, 2021), https://docs.fcc.gov/public/attachments/DOC-370185A1.pdf ("Research also shows that many Black-owned businesses lack the resources needed to digitize their companies and respond to the moment so that consumers can access their services and products via online platforms. We must remember that rebuilding our economy means ensuring that Black businesses get connected."); Hector V. Barreto, *What the 5G Revolution Can Do for Latino Businesses and Minorities*, Morning Consult (Mar. 30, 2018), https://morningconsult.com/opinions/what-the-5g-revolution-can-do-for-latino-businesses-and-minorities ("Attendees steadfastly agreed that by providing widespread access to rapidly approaching 5G wireless, we will incentivize private investments that yield new business opportunities for Latinos and ultimately make these small and mid-sized businesses more competitive. Attendees also agreed this advanced technology could be the key to reverse America's digital divide.").

D. 5G Use Cases Have Been Expanding in a Virtuous Circle and Will Continue to Do So

Increasing availability, use, and lower costs of 5G will create a virtuous circle, leading to development of new applications and use cases that do not exist today. As Acting Chairwoman Rosenworcel put it: "our 5G future is about connecting everything. It is about moving to a new networked world that will open up possibilities for communications that we cannot even fully imagine today. By exponentially increasing the connections between people and things around us, this technology could become an input in everything we do—improving agriculture, education, healthcare, energy, transportation, and more."[70] These new services will ultimately benefit all American consumers and the economy as a whole. In addition to broad-brush categories of 5G such as mobile broadband, fixed wireless access, and IoT, some specific use cases are outlined below.

- Backhaul for small cell antennas in dense urban areas. This would reduce the need for fiber, and such facilities, for example, could be compatible with DISH's planned base stations for other frequency bands.

- Augmented and virtual reality can change the way consumers interact with public spaces, such as museums and stores, but will also require the high-quality video and low latency that 5G will offer.[71]

- Beyond consumer use, 5G supported augmented and virtual reality use will change work environments across a variety of industries.[72] A reliable connection and low

[70] Remarks of Acting Chairwoman Jessica Rosenworcel, *Accelerating 5G in the United States*, Center for Strategic and International Studies (Mar. 18, 2021), https://www.csis.org/events/accelerating-5g-united-states.

[71] James Sanders, *How 5G Will Affect Augmented Reality and Virtual Reality*, ZDNet (Oct. 2, 2019), https://www.zdnet.com/article/how-5g-will-affect-augmented-reality-and-virtual-reality.

[72] Joe McKendrick, *5G Will Boost AR and VR on the Frontlines*, RT Insights (Nov. 18, 2020), https://www.rtinsights.com/5g-will-boost-ar-and-vr-on-the-frontlines.

latency can allow for hands-on training and remote operation of large machinery in hazardous professions such as construction, mining, emergency services, and more.[73]

- Factories can also use 5G to increase safety and efficiency. Connecting various machines and components on a factory floor to a 5G network can allow better coordination where even a microsecond of latency could create safety issues or damage the product.[74]

- Accessible remote healthcare. 5G will enable a range of solutions to make healthcare more accessible. 5G enabled wearable devices can also help doctors remotely monitor patients or provide information that informs preventative care.[75]

- 5G for smart cities can improve traffic management, parking, waste management, and other municipal services to boost quality of life and benefit businesses and residents.[76] Traffic management systems could also reduce carbon emissions from idle cars. A smart electric grid can also save energy costs by using data for more efficient energy use and triaging repairs that need to be made, especially after a storm.[77]

These use cases, and the introduction of 5G in the 12 GHz band, will be greatly facilitated by Open RAN. As DISH has explained in the Commission's 5G Open RAN proceeding,[78] by using an Open RAN model, with standardized, open and interoperable interfaces between the radio unit, central unit, and distributed unit, operators can enable a more

---

[73] *What is 5G Anyway?*, Israel Ministry of Communications (Mar. 9, 2020), https://www.gov.il/en/departments/general/03092020_1.

[74] 5G Alliance for Connected Industries and Automation, *Key 5G Use Cases and Requirements: From the Viewpoint of Operational Technology Providers*, at 5-6 (May 2020), https://www.5g-acia.org/fileadmin/5G-ACIA/Publikationen/5G-ACIA_White_Paper_Key_5G_Use_Cases_and_Requirements/Key_5G_Use_Cases_and_Requirements_DOWNLOAD.pdf.

[75] Marco Stracuzzi, *4 Revolutionary Use Cases of 5G in Healthcare*, Telit (Aug. 25, 2020), https://www.telit.com/blog/4-revolutionary-use-cases-5g-healthcare.

[76] Bill Detwiler, *5G Will Bring Smart Cities to Life in Unexpected Ways*, Tech Republic (Feb. 3, 2020), https://www.techrepublic.com/article/5g-will-bring-smart-cities-to-life-in-unexpected-ways.

[77] Accenture, *Smart Cities: How 5G Can Help Municipalities Become Vibrant Smart Cities*, at 7 (2017), https://www.accenture.com/t20170222T202102__w__/us-en/_acnmedia/PDF-43/Accenture-5G-Municipalities-Become-Smart-Cities.pdf.

[78] Promoting the Deployment of 5G Open Radio Access Networks, GN 21-63.

rapid deployment of new spectrum. Through advances in radio and antenna technologies, as well as disaggregated hardware and software, radios are able to carry multiple spectrum bands. This will allow 5G infrastructure to be leveraged and additional spectrum, including the 12 GHz band, to be deployed and integrated into 5G networks.[79]

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 can leverage that network to make the most of the 12 GHz band for fixed, mobile, and backhaul services if the Commission updates the rules. DISH plans to launch service in Las Vegas later this year, with additional cities to follow, all as it works to meet its FCC commitments, including by offering 5G broadband to 20 percent of the population by June 2022 and 70 percent by June 2023.[80]

E. Facts and Science Must Drive the Commission's Decision

President Biden has made clear that "science, facts, and evidence are vital to addressing policy and programmatic issues across the Federal Government," and therefore "it is the policy of my Administration to make evidence-based decisions guided by the best available science and data."[81] Facts and science must drive the fundamentals of all U.S. foreign and domestic policy across sectors in advancing critical policy priorities for the American people, including this

---

[79] *See generally* Comments of DISH Network Corporation, GN Docket No. 21-63 (Apr. 28. 2021).

[80] 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.

[81] *Memorandum on Restoring Trust in Government Through Scientific Integrity and Evidence-Based Policymaking*, White House (Jan. 27, 2021), https://www.whitehouse.gov/briefing-room/presidential-actions/2021/01/27/memorandum-on-restoring-trust-in-government-through-scientific-integrity-and-evidence-based-policymaking.

rulemaking for such a crucial spectrum band for America's 5G future. The scientific and engineering evidence submitted in this proceeding will show that the best use of the 12 GHz band is achieved by adding terrestrial wireless applications.

II. Allowing DBS and Terrestrial Flexible Use to Coexist Will Continue the 12 GHz Band's History of Success and Unleash Further Innovation

To unlock the 5G potential of the 12 GHz Band, the Commission should consider previous regulatory decisions that have limited the band's utility. Some of the Commission's predictive judgments have been a resounding success, such as allocating the 12 GHz band for DBS. And, many years ago, the Commission made certain technical choices for terrestrial use of the 12 GHz band that were designed to protect DBS, which by then was a flourishing competitive video offering. But technology has continued to evolve, making the previous rules unnecessary to protect DBS and therefore inconsistent with the United States' 5G interests.

A. The 12 GHz Band Has Been the Home of DBS for Forty Years

Some forty years ago,[82] the Commission acted on the hope that a then untested celestial technology would use the 12 GHz band, yielding a grand total of 32 analog channels out of each of eight orbital locations allotted to the United States by appendices 30 and 30A of the international Radio Regulations. The Commission named the new service DBS and it has since become so closely identified with the 12 GHz band that the Commission later defined it by reference to that spectrum: "[a] radiocommunication service in which signals transmitted or

[82] The Commission added the DBS allocation in the early 1980s. *See* Inquiry into the Development of Regulatory Policy in Regard to Direct Broadcast Satellites for the Period Following the 1983 Regional Administrative Radio Conference, *Report and Order*, 90 FCC 2d 676 (1982) ("*1982 DBS Order*"), *vacated in part on other grounds*, *National Association of Broadcasters v. FCC*, 740 F.2d 1190 (1984).

retransmitted by Broadcasting–Satellite Service space stations in the 12.2–12.7 GHz band are intended for direct reception by subscribers or the general public."[83]

In the early 1980s, the Commission acted despite great uncertainty over whether its hope for DBS would ever be realized.[84] Out of a crowded field of some 18 optimistic permittees,[85] two succeeded—DIRECTV and DISH. DISH acquired the stock or assets of many other permittees or their successors—Directsat, DBSC, and Continental; DISH also acquired both of the DBS orbital locations that were successfully auctioned by the Commission, either directly at the 1996 Commission auction or from the auction winner.[86] DIRECTV, for its part, acquired the stock or assets of USSB and Tempo.[87]

With digital compression technology, the 32 DBS channels became many hundreds. The service was launched in the mid-1990s and quickly became a formidable threat to cable

---

[83] 47 C.F.R. § 25.103.

[84] *See 1982 DBS Order*, 90 FCC 2d at 707 ¶ 81 ("[W]e cannot predict with any certainty [the likely nature of this new service] at this early stage.").

[85] Early permittees included DISH predecessors EchoStar-Hughes Communications Galaxy, Satellite Television Corporation, CBS, Direct Broadcasting Satellite Corporation, Graphic Scanning Corporation, RCA American Communications, United States Satellite Broadcasting Company, Video Satellite Systems, Western Union Telegraph Company, Focus Broadcast Satellite Company, Continental Satellite Corporation, Directsat Corporation, Orbital Broadcasting Company, Tempo Satellite, Advanced Communications Corporation, Dominion Satellite, and R/L DBS. *See id.* at 678 ¶ 5. Applications of Advance, Inc., et al. for the Establishment of Interim Direct Broadcast Satellite Systems in the 12.12-12.7 GHz Frequency Bands, *Memorandum Opinion and Order*, 88 FCC 2d 100 (1981).

[86] DISH, then known as EchoStar, won the license for the 148° W.L. orbital location for $52.295 million. *Wireless Telecommunications Bureau Announces Winners of DBS Auction* (Jan. 29, 1996). MCI/News Corp. won the license for the 110° W.L. slot for $682.5 million, and DISH bought it from MCI/News Corp. for equivalent consideration in 1999. Application of MCI Telecommunications Corporation and EchoStar 11 Corporation, *Order and Authorization*, 16 FCC Rcd. 21608 (1999).

[87] United States Satellite Broadcasting Co., Inc. and DirecTV Enterprises, Inc., *Order and Authorization*, 14 FCC Rcd. 4585 (1999); Tempo Satellite Inc. and DirecTV Enterprises, Inc., *Order and Authorization*, 14 FCC Rcd. 7946 (1999).

television operators, leading to lower prices for consumers' multi-channel video packages. In six years, the two DBS providers grew to serve 13 million households by 2000.[88] Today, and notwithstanding the tremendous churn attributable to "cord-cutting" and the rise of over-the-top (OTT) competitors, they serve about 22 million customers between them.[89]

B. Initial Technical Rules for MVDDS Erred on the Side of Caution in the Face of Uncertainty

The next stage for the band was the addition of a terrestrial service, MVDDS, in the early 2000s. The Commission imposed restrictions on this "new kid on the block," including frequency coordination procedures, one-way use, interference protection criteria, and limitations on signal emissions, transmitter power levels, and transmitter locations. For example, MVDDS licensees may not begin operating unless they could ensure that the EPFD from a proposed transmitting antenna did not exceed the applicable EPFD limit at any DBS subscriber location.[90] Further, the MVDDS licensee has to resolve all complaints of interference to DBS customers of record during a one-year period after commencement of operation.[91] And, most constraining, the

[88] Annual Assessment of the Status of Competition in the Market for the Delivery of Video Programming, Seventh Annual Report, 16 FCC Rcd. 6005, 6008 ¶ 8 (2000).

[89] DISH Network Corp. Annual Report (Form 10-K), at 1 (Feb. 22, 2021) (8.8 million DISH TV subscribers); Press Release, Leichtman Research Group, *Major Pay-TV Providers Lost About 120,000 Subscribers in 3Q 2020* (Nov. 17, 2020), https://www.leichtmanresearch.com/major-pay-tv-providers-lost-about-120000-subscribers-in-3q-2020 (13.6 million DIRECTV subscribers).

[90] Amendment of the Commission's Rules to Authorize Subsidiary Terrestrial Use of the 12.2-12.7 GHz Band by Direct Broadcast Satellite Licensees and Their Affiliates, *Memorandum Opinion and Order*, 17 FCC Rcd. 9614, 9642 ¶ 71 (2002) ("*MVDDS Rules Order*").

[91] *Id.* at 9755 ¶ 93.

Commission imposed an EIRP limit that confines MVDDS operators to 14 dBM per 24 MHz—a standard light bulb has 4,000 times the power.[92]

Importantly, the Commission's goal in imposing these restrictions was not to curb the flexibility of MVDDS operators. To the contrary, the intent was to give the new terrestrial service providers as much flexibility as possible so long as they did not interfere with the primary use of the band—DBS service. As the Commission explained: "we believe that the approach to technical sharing of MVDDS with DBS as outlined above strikes a reasonable balance between protecting incumbent licensees and their subscribers and providing sufficient flexibility for new service providers to deploy."[93] The Commission added that "[t]his balance will result in an efficient reuse of spectrum and the provision of a new service to the public."[94] The Commission hoped to "foster competition, promote innovation, and encourage the delivery of additional or improved services to consumers."[95]

A stark example of the Commission's desire to let the new MVDDS service succeed without hamstringing it was its treatment of households subscribing to DBS after the siting of a terrestrial base station. Once an MVDDS provider has notified the DBS operators of its proposed operation and taken appropriate measures to protect existing DBS subscribers, "later

---

[92] 14 dbm is equivalent to 25 milliwatts, or 0.025 watts; the power of a typical light bulb is 100 watts.

[93] *MVDDS Rules Order*, 17 FCC Rcd. at 9651 ¶ 85.

[94] *Id*. at 9617 ¶ 2.

[95] *Id.* at 9664 ¶ 126; *see also id*. at 9630 ¶ 36 ("[W]e find that sharing of the 12 GHz band presents a unique situation that, while technically challenging, has the potential for significant benefit to the public in the provision of a new service. Therefore, we find that the Commission's decision to authorize MVDDS in the 12 GHz band is consistent with its continuing effort to find the highest and most efficient use of spectrum that is supported by the record in a given proceeding.").

installed DBS receive antennas shall have no further rights of complaint against the notified MVDDS transmitting antenna(s)."[96]

The Commission's across-the-board EIRP restriction was a blunt instrument to which the Commission resorted in light of the uncertainty that prevailed at the time about the new service. The main concern, of course, was that signals from the MVDDS base stations would interfere with reception at the DBS dishes.[97] The methods then proposed for mitigating these problems could today be viewed as crude, and even then contradicted one another. Indeed, the technology's initial proponent, Northpoint, took its name from the idea that positioning the terrestrial towers to the north of a population center would be almost a cure-all.[98] By contrast, MITRE, the engineering consultant to which the Commission turned for technical assistance,

---

[96] 47 C.F.R. § 101.1440(e).

[97] Amendment of Parts 2 and 25 of the Commission's Rules to Permit Operation of NGSO FSS Systems Co-Frequency with GSO and Terrestrial Systems in the Ku-Band Frequency Range, *First Report and Order and Further Notice of Proposed Rulemaking*, 16 FCC Rcd. 4096, 4174 ¶ 206 (2000) ("*Ku-band NGSO FSS Allocation Order*") ("We also note that the main source of potential interference to a DBS receiver occurs when an MVDDS signal transmitted from a northerly direction enters the backlobe of a DBS receiver antenna, which is pointed in a southerly direction. Due to this phenomenon, the interference arguments of the parties have focused on the extent to which buildings, trees, or other obstacles will shield these backlobes.").

[98] Comments of Northpoint Technology, Ltd., Amendment of Parts 2 and 25 of the Commission's Rules to Permit Operation of NGSO FSS Systems Co-Frequency with GSO and Terrestrial Systems in the Ku-Band Frequency Range; Amendment of the Commission's Rules to Authorize Subsidiary Terrestrial Use of the 12.2-12.7 GHz Band by Direct Broadcast Satellite Licensees and Their Affiliates, ET Docket No. 98-206, at 4 (Mar. 2, 1999) ("DBS satellites orbit over the equator. This means that all North American DBS dishes point generally south. The Northpoint technology relies on this southern orientation of domestic DBS dishes and contemplates that Northpoint consumers must use a dish pointed generally to the north to receive signals from Northpoint directional terrestrial transmitters pointed to the south."); Petition for Rulemaking, Northpoint Technology, Ltd., Petition for Rule Making to Modify Section 101.147(p) of the Commission's Rules to Authorize Subsidiary Terrestrial Use of the 12.2-12.7 GHz Band by Digital Broadcast Satellite Licensees and Their Affiliates, RM-9245, at 4 (Mar. 6, 1998).

disputed that solution, finding instead that interference was often mitigated when the terrestrial tower signals came from the south.[99]

Showing its recognition of the EIRP limit's draconian nature, the Commission went out of its way to emphasize the possibility of two-way services[100] and also mention the possibility of a waiver.[101] The Wireless Bureau later granted a limited waiver to MDS Operations for operations at a single site in New Mexico.[102] Thus, ever since the early days of MVDDS, the Commission did not view a relaxed EIRP limit as necessarily involving a modification of these licenses. Rather, the Commission considered giving permission to exceed the limit on a waiver basis.

At the time the MVDDS rules were considered, DISH's main concern was the protection of its nationwide DBS consumer service. For that reason, DISH had initially opposed the allocation of the band to a ubiquitous terrestrial consumer service. But, after the Commission

---

[99] MITRE Corporation, Analysis of Potential MVDDS Interference to DBS in the 12.2-12.7 GHz Band, Amendment of Parts 2 and 25 of the Commission's Rules to Permit Operation of NGSO FSS Systems Co-Frequency with GSO And Terrestrial Systems in the Ku-Band Frequency Range, ET Docket No 98-206, at 6-2-6-3 (Apr. 23, 2001) ("Pointing the MVDDS transmitting antenna away from the satellites, rather than towards them as generally envisioned, could have beneficial effects in many situations . . . When the satellites are generally to the south and their elevation angle is reasonably high, as in Denver, dramatic improvements in interference protection appear possible when the MVDDS transmitting antenna points north . . . north-pointing seems to yield significant benefits in all locales where it has been simulated.").

[100] 47 C.F.R. § 101.1407 ("Two-way services may be provided by using other spectrum or media for the return or upstream path.").

[101] *See MVDDS Rules Order*, 17 FCC Rcd. at 9704 ¶ 236 ("MVDSS [sic] applicants are not limited to using technology that complies with the operating parameters adopted here. However, any entity seeking to employ a terrestrial service technology that does not comply with our technical rules must file a waiver petition, on which public comment will be sought.").

[102] *See* MDS Operations, Inc., Request for Waiver of Certain Multichannel Video Distribution and Data Service Technical Rules for One Station in Sandia Park, New Mexico, *Order*, 25 FCC Rcd. 7963 (2010) (granting waiver request for MVDDs to operate one transmitting site in New Mexico at an EIRP up to 22 dBm per 24 megahertz of spectrum, which was lower than the requested 36 dBm to ensure protection of DBS users).

put in place the technical restrictions on MVDDS mentioned above, DISH reconsidered the feasibility of sharing, and decided to participate in the MVDDS auction. DISH made that decision with two objectives: first, to build a terrestrial network and compete in providing the developing new service; and second, to mitigate the risks of interference to its existing DBS service by managing the interference and ensuring sharing between the two services.

C. The MVDDS Auction Was a Success

In January 2004 and December 2005, the Commission auctioned a total of 214 MVDDS licenses, one for each of 214 market areas.[103] Despite Northpoint's decision not to participate, the auctions were a success. They attracted bids of just over $137 million from some 16 qualified bidders, 12 of which won licenses.[104]

South.com LLC (now owned by DISH) won MVDDS licenses covering 37 out of 214 market areas at that auction. With the Commission's approval, DISH also acquired control over the 45 MVDDS licenses of another bidder, DTV Norwich, in 2013.[105] As a result, DISH now holds licenses covering 82 of the nation's 214 market areas.[106]

---

[103] *See generally Auction 53: Multichannel Video Distribution & Data Service (MVDDS)*, https://www.fcc.gov/auction/53; *Auction 63: Multichannel Video Distribution & Data Service (MVDDS)*, https://www.fcc.gov/auction/63. Specifically, licenses were auctioned for the 210 Nielsen Designated Market Areas plus American Samoa, Guam, the Northern Mariana Islands, and Puerto Rico and the U.S. Virgin Islands.

[104] *Id.*

[105] Public Notice, Wireless Telecommunications Bureau Assignment of License Authorization Applications, Transfer of Control of Licensee Applications, De Facto Transfer Lease Applications and Spectrum Manager Lease Notifications, Designated Entity Reportable Eligibility, Report No. 8421, at 7 (Jan. 30, 2013) (granting assignment from DTV Norwich, LLC to DISH Network L.L.C.).

[106] DISH Network Corp., Annual Report (Form 10-K), at 10 (Feb. 22, 2021).

D. MVDDS Faces Continuing Challenges from Restrictive Technical Rules

The initial promise of the MVDDS service and enthusiasm shown by the 12 auction winners soon collided with the challenges of dealing with restrictive technical and operational rules, including prohibitions on using MVDDS spectrum for two-way communications and on offering mobile service, stringent power limitations, and extensive coordination procedures.

Since the MVDDS auctions, MVDDS licensees have worked to put that spectrum to use.[107] Licensees have explored a range of options, including point-to-multi-point fixed services using the MVDDS spectrum as downlink, and other spectrum as uplink, and are continuing to explore options like wireless backhaul. But technical and operational limitations have so constrained these uses of the spectrum that manufacturers have been deterred from developing equipment for the band.

Based on showings of headwinds beyond the licensees' control, the Commission has twice found good cause to extend the buildout milestones for MVDDS licensees. Between July 2008 and July 2009, ten MVDDS licensees filed requests for waivers and extensions of the five-year interim substantial service milestone deadline.[108] The Commission granted the waivers and extensions because it found that "the record demonstrates that there is a lack of viable, affordable equipment for MVDDS that can be deployed in the 12.2-12.7 GHz band."[109] The Commission noted that the commercially available equipment did not "comply with Commission's MVDDS rules, and absent significant modifications, cannot be deployed in the United States."[110] As a

---

[107] *See* Requests of Ten Licensees of 191 Licenses in the Multichannel Video and Data Distribution Service for Waiver of the Five-Year Deadline for Providing Substantial Service, *Order*, 25 FCC Rcd. 10097, 10103 ¶ 11 (2010).

[108] *Id*. at 10099 ¶ 5.

[109] *Id.* at 10102 ¶ 10.

[110] *Id.* at 10103 ¶ 11.

result, the Commission found that the "licensees have met the requirements of Section 1.946(e) because it is well-established that the lack of viable, affordable equipment is a factor beyond a licensee's control."[111] In 2014, the Commission granted DISH a further extension of its milestone requirements because of its inability to obtain equipment due to the interference restrictions.[112] The Commission agreed with DISH that the only MVDDS licensees who had offered service had done so by using custom equipment and operating on a small scale, and granted the extension request.[113]

Many MVDDS licensees have persevered despite these adverse circumstances. DISH and South.com certified meeting their buildout and substantial service milestones, which had been extended to July, August, or September of 2019, depending on the license. In July 2019, DISH and South.com filed notifications that they had completed construction with substantial service showings.[114] DISH is providing live, 24-hour linear weather information and breaking

[111] *Id.* at 10102 ¶ 10.

[112] Public Notice, Wireless Telecommunications Bureau Market-Based Applications Action, Report No. 10263, at 1-2, 5-7 (Feb. 4, 2015) ("Report No. 10263 Public Notice") (granting DISH's requests for extension); *see also* South.com L.L.C. and DISH Network L.L.C., Request for Extension of Time, WQAW335, ULS File No. 0006310688, at 11 (granted Jan. 26, 2015) ("DISH Extension Request") ("Precisely because the continued and increasingly difficult interference mitigation issues in the MVDDS band have inhibited widespread deployment of MVDDS, manufacturers cannot take advantage of economies of scale to produce 'off the shelf' solutions for MVDDS operators.").

[113] *Id.* at 11 ("DISH understands, for instance, that DTVN was forced to order customized equipment in order to roll out its now defunct OMGFast service in Florida, and that MDSO has been using custom equipment using its proprietary technology for its operations in Albuquerque, NM. Because of the small scale of these operations, this customized equipment has not become more widely or more affordably available.").

[114] *See, e.g.,* DISH Network LLC, WQAR665, ULS File No. 0008735865, Build-Out Demonstration (July 24, 2019); South.com LLC, WQAW335, ULS File No. 0008736076, Build-Out Demonstration (July 22, 2019).

news from WeatherNation, as well as live video monitoring services, using its MVDDS spectrum.[115]

Other MVDDS licensees and coalition partners are providing consumer offerings through partnerships as well. For example, four licensees have joined forces to provide extended WiFi service, using their 12 GHz spectrum for the downlink and unlicensed 5 GHz spectrum for the uplink.[116] They serve veterans at Veterans of Foreign Wars halls, tower owners with maintenance requirements, and GymGo fitness centers.[117]

While these licensees are providing services to consumers, the full potential of the 12 GHz band remains untapped by terrestrial services because of restrictions that are no longer necessary. Recognizing these challenges, DISH determined early on that relaxed power limits and two-way links were necessary to increase utilization of the band, and acted on that realization.[118] In 2012, DISH received experimental Special Temporary Authority, extended in 2013, to test higher-power, two-way service.[119] The tests that DISH conducted under this authorization in Wyoming helped cement DISH's belief that sharing between its DBS service

---

[115] DISH Network LLC, WQAR665, ULS File No. 0008735865, Build-Out Demonstration, at 2 (July 24, 2019); South.com LLC, WQAW335, ULS File No. 0008736076, Build-Out Demonstration, at 2 (July 22, 2019).

[116] Cass Cable TV, Inc., WQAR488, ULS File No. 0008755701, Substantial Service Amendment at 2 (Apr. 24, 2020); Vision Broadband, LLC, WQAR716, ULS File No. 0008754245, Substantial Service Amendment at 2 (Apr. 24, 2020); Story Communications, LLC, WQAR509, ULS File No. 0008754906, Substantial Service Amendment, at 2 (Apr. 24, 2020).

[117] *Id.*

[118] *See* DISH Extension Request at 2-7, 11-14, 16 (discussing efforts to determine the feasibility of a point-to-point wireless backhaul service in the MVDDS spectrum); Report No. 10263 Public Notice at 1-2, 5-8 (granting DISH's requests for extension).

[119] South.com, LLC, Request for Part 5 Experimental Special Temporary Authority, OET File No. 0864-EX-ST-2012 (granted Nov. 20, 2012) (STA to evaluate whether wireless backhaul is a viable MVDDS service offering); South.com, LLC, Request for Part 5 Experimental Special Temporary Authority, OET File No. 0407-EX-ST-2013 (granted Apr. 30, 2013).

and a higher-power, two-way service was indeed feasible. Several MVDDS licensees have also filed waiver requests to permit the use of 12.2-12.7 GHz spectrum for two-way, point-to-point operation at an EIRP level of up to 55 dBm.[120]

E. The MVDDS Coalition Files Its Rulemaking Petition

In 2016, a group of almost all MVDDS licensees came together to form the MVDDS 5G Coalition ("the MVDDS Coalition").[121] The MVDDS Coalition filed a Petition for Rulemaking asking the Commission to explore authorizing MVDDS licensees to use their 12 GHz spectrum to provide two-way mobile broadband service.[122]

First, the MVDDS Coalition asked the Commission to add a domestic Mobile Service allocation to the 12 GHz band, consistent with the International Table of Frequency Allocations for Region 2.[123] The Coalition argued that doing so would offer substantial public benefits and provide globally harmonized spectrum.[124]

Second, the MVDDS Coalition asked the Commission to update the MVDDS operational rules to permit MVDDS licensees to provide two-way mobile broadband service.[125] The MVDDS Coalition argued that new technology allows two-way mobile broadband services to be

---

[120] *See* Wireless Telecommunications Bureau Seeks Comment on Petitions of Seven Licensees for Waiver of Multichannel Video Distribution and Data Service Technical Rules, Public Notice, 30 FCC Rcd. 9953 (2015).

[121] The MVDDS Coalition was composed of 11 out of 12 MVDDS licensees, including Braunston Spectrum LLC, Cass Cable TV, Inc., DISH Network LLC, Go Long Wireless, Ltd., MDS Operations, Inc., MVD Number 53 Partners, Satellite Receivers, Ltd., South.com LLC, Story Communications, LLC, Vision Broadband, LLC, and WCS Communications, Inc.

[122] *See generally* MVDDS Petition.

[123] *Id.* at 16.

[124] *Id.* at 17.

[125] *Id.* at 17.

offered over MVDDS without harmful interference to DBS.[126] Advanced antenna techniques like "beamforming" and "beamsteering" allow better control of transmitter energy and enable transmissions to be more narrowly focused to desired locations (and away from receivers with which they might interfere) dynamically.[127]

Third, the MVDDS Coalition asked the Commission to update the MVDDS technical rules to enable a viable 5G service while protecting DBS operations from harmful interference.[128] The MVDDS Petition referenced the restrictions placed on MVDDS, including the EIRP limitation and the requirement to meet specified EPFD levels.[129] The MVDDS Coalition argued that, with appropriate EPFD limits, the additional transmitter power restriction would not be required to protect DBS receivers.[130] Additionally, the EPFD limits initially imposed 20 years ago were "overly conservative."[131] The MVDDS Coalition also argued for a streamlined EPFD compliance process that would identify all DBS customer of record locations that would affect the introduction of MVDDS service.[132]

In the same vein, the MVDDS Coalition asked the Commission to consider additional rule changes to facilitate the most efficient and beneficial uses of MVDDS spectrum.[133] They included: relaxation of out-of-band emission limits, elimination of field strength limits to mitigate interference among multiple MVDDS operators; elimination of MVDDS annual

---

[126] *Id.* at 17-18.

[127] *Id.* at 18.

[128] *Id.* at 19.

[129] *Id.* at 19.

[130] *Id.* at 19.

[131] *Id.* at 20.

[132] *Id.* at 21.

[133] *Id.* at 24.

reporting requirements; replacement of "substantial service" requirements with a more flexible milestone framework; and the authorization of partitioning and disaggregation of the spectrum to increase efficient spectrum use.[134]

Fourth, the MVDDS Coalition asked the Commission to delete or designate as secondary the existing unused NGSO FSS allocation at 12.2-12.7 GHz (while preserving the adjacent co-primary allocation for NGSO FSS at 11.7-12.2 GHz), and eliminate or modify MVDDS rules designed to protect NGSO FSS.[135] The MVDDS Petition argued that NGSO FSS applicants have allocations in other spectrum bands and have long been on notice that they would have to protect any first-in-time MVDDS operations in the 12.2-12.7 GHz spectrum band.[136]

More than four years later, the MVDDS Coalition's requests have only become more relevant and timely, indeed urgent, with one modification: the Coalition has now been able to reassess the feasibility of sharing between NGSO and terrestrial services, in light of technical advances in the wireless industry as well as the experience of modern day NGSO systems. Among other things, NGSO systems have come to approximate geostationary operations by following highly elliptical orbits and eschewing low elevation and azimuth angles. This means that, in contrast with the MVDDS Coalition's expectation in 2016, NGSO earth stations no longer have to receive satellite transmissions from nearly every point in the sky—the key characteristic that informed the MVDDS Coalition's 2016 view that sharing between NGSO FSS and 5G was not feasible. Specifically, high elevation angles and azimuths mean that there is greater angular distance than initially thought between terrestrial transmissions (whether from

[134] *Id.* at 24-27.

[135] *Id.* at 22-24.

[136] *Id.* at 23.

base stations or from consumer terminals), whose path is "flatter," and satellite downlinks, whose trajectory is "steeper." The NGSO customer premises equipment looks up towards the sky, not sideways towards the 5G base station. That helps insulate the receive earth stations of the NGSO system from the terrestrial transmissions, and conversely also helps protect the terrestrial receivers from the satellite downlinks. This reduction in geometric diversity and use of high minimum elevation angles allows directional, upward-facing NGSO receive antennas, greatly improving antenna discrimination. In addition, the replacement of the free-space loss assumption used in early studies with real atmospheric attenuation mitigates further the risk of interference from 5G transmitters. This real-life deployment experience now shows that coexistence is eminently possible.[137]

The Commission recognized the concerns of the MVDDS Coalition when it initiated this rulemaking, noting that "the Commission has long been committed to ensuring that spectrum is put to its highest and best use. As such, we commence this rulemaking proceeding to consider whether the current rules for the use of 12 GHz best serve the public interest."[138]

F. A Broad Cross-Section of Industry and Public Interest Groups Have Supported This Rulemaking

Because of the complexities described above, and the need for a reevaluation of the 12 GHz rules, the concept of a flexible-use mobile service allocation has already gained support from a broad alliance of trade associations, public interest groups, and MVDDS licensees. More than 20 of these stakeholders recently formed the 5G for 12 GHz Coalition, whose mission is

[137] *12 GHz NPRM*, 36 FCC Rcd. at 615 ¶ 20; Letter from Jeffrey Blum, DISH Network LLC, to Marlene Dortch, FCC, RM-11768, at 4 (Nov. 12, 2020).

[138] *12 GHz NPRM*, 36 FCC Rcd. at 614 ¶ 19.

unleash the power of 5G in the 12 GHz band.[139] In the coalition's words, "unlocking the 12 GHz band for 5G will help secure America's global leadership, protect national and economic security interests, and bolster competition and choices for the American public and businesses."[140]

Another "group of groups," including some of the best-respected public interest organizations in the space, wrote that, "[b]y granting flexibility in this band, the Commission could more than double the nationwide mid-band spectrum available for 5G mobile and fixed broadband deployment and further close the digital divide."[141] And another group of public interest organizations stated that, "[b]y adding the 12 GHz Band to the Commission's 5G FAST Plan, the Commission can make an additional 500 megahertz of contiguous spectrum available for two-way fixed and mobile 5G wireless broadband services, while protecting incumbent satellite uses (including satellite broadband) from harmful interference."[142]

Businesses large and small have also weighed in to support the request for a rulemaking. A group of small wireless providers noted that "a series of developments have resoundingly

---

[139] *See* 5G for 12 GHz Coalition, https://5gfor12ghz.com. Members of the coalition include INCOMPAS, Public Knowledge, DISH, Computer & Communications Industry Association (CCIA), RS Access, Open Technology Institute at New America, Federated Wireless, AtLink, Cambridge Broadband Networks Group Ltd. (CBNG), Center for Education Innovations (CEI), Center for Rural Strategies, Etheric Networks, GeoLinks, Go Long Wireless, Granite Telecommunications, mmWave Tech, Resound Networks, Rise Broadband, Rural Wireless Association (RWA), Tel Net Worldwide, Tilson, White Cloud Technologies, Xiber, and X-Lab.

[140] *See* Letter from Chip Pickering and Joe Lockhart, 5G for 12 GHz Coalition, to Marlene Dortch, FCC, WT Docket No. 20-443, at 1 (Apr. 28, 2021).

[141] Letter from Alexi Maltas, Competitive Carriers Association, et al. to Marlene Dortch, FCC, RM-11768, at 2 (May 26, 2020). The groups submitting the filing were CCA, CCIA, INCOMPAS, Public Knowledge and the Open Technology Institute at New America.

[142] Letter from Harold Feld, Public Knowledge, and Michael Calabrese, Open Technology Institute at New America, to Marlene Dortch, FCC, RM-11768, at 1 (July 9, 2020). The groups submitting the filing were Access Humboldt, Center for Rural Strategies, Consumer Federation of America, Institute for Local Self-Reliance, Next Century Cities, National Consumer Law Center, National Digital Inclusion Alliance, Open Technology Institute at New America, Public Knowledge, Tribal Digital Village, and X-Labs.

supported initiation of the requested rulemaking proceeding to consider the allowance of flexible use of the 12 GHz Band to enable mobile 5G services."[143] WeLink Communications wrote that "the 12 GHz Band has significant potential for 5G fixed and mobile broadband services and that advances in technology as proven by technical studies can provide for flexible uses while protecting incumbent uses."[144] Michael Dell, the much-admired information technology visionary, "encouraged the Commission to continue identifying spectrum for 5G wireless deployment, including the 12.2-12.7 GHz band."[145]

Industry associations have followed suit. The Competitive Carriers Association wrote: "[c]onsidering the current spectrum crunch, the Commission should make the 12.2-12.7 GHz band available for the deployment of Fifth Generation ('5G') networks."[146] RS Access told the Commission that "the 12 GHz Band is *the* timely and compelling solution to meet America's burgeoning need for 5G spectrum. It provides a unique opportunity for channel blocks of 100 megahertz or more that can be rapidly deployed for 5G services."[147] And the Computer and Communications Industry Association views the rulemaking as "an ideal opportunity for [the Commission] to open up new avenues of spectrum that can accommodate the needs of 5G."[148]

---

[143] Letter from Bruce E. Fox, Go Long Wireless, Ltd., Cass Cable TV, Inc., Story Communications, LLC, and Vision Broadband, LLC, to Marlene Dortch, FCC, RM-11768, at 5 (Aug. 14, 2020).

[144] Letter from Kevin Ross, WeLink Communications, LLC, to Marlene Dortch, FCC, RM-11768 (June 26, 2020).

[145] Letter from Trey Hanbury, Hogan Lovells LLP, to Marlene Dortch, FCC, RM-11768 (Nov. 2, 2020) (on behalf of Michael S. Dell, Chairman and CEO of Dell Technologies, Inc.).

[146] Comments of Competitive Carriers Association, RM-11768, at 1 (June 8, 2016).

[147] Letter from V. Noah Campbell, RS Access, LLC, to Marlene Dortch, FCC, RM-11768, at 1 (June 11, 2020).

[148] Letter from John A. Howes, Jr., Computer & Communications Industry Association, to Marlene Dortch, FCC, RM-11768, at 1 (June 8, 2016).

The positions of each of these stakeholders may differ, but they are all united in the belief that the 12 GHz MVDDS rules should be relaxed, to a smaller or greater degree, to permit 5G services.

G. Technological Advances Further Improve the Prospects for Sharing Between DBS and Flexible-Use MVDDS

As the MVDDS Coalition foreshadowed, there have been many technological advances since MVDDS was first authorized nearly twenty years ago that will enable sharing the 12 GHz band between terrestrial flexible use, on the one hand, and DBS as well as NGSO FSS, on the other. These developments, such as targeted small-cell deployments, and advanced antenna techniques such as massive multiple input multiple output ("Massive MIMO") antennas, advanced beamforming and beamsteering, all allow better control of transmitter energy and therefore can protect DBS and NGSO systems from interference. They achieve this by making 5G approximate a point-to-point service, as they allow a surgical beam no larger than necessary to close a link, and generate very little diffuse, unfocused radiation.

Other advances include channel bonding to better integrate discrete bands of spectrum across large ranges of frequency, and dynamic spectrum sharing to increase efficiency associated with moving from prior generation to next-generation networks. In the face of these developments, the uncertainties about MVDDS that caused the Commission to err on the side of caution are obsolete. The belt-and-suspenders approach that may have been prophylactically appropriate in 2001 to protect DBS from terrestrial MVDDS from interference is no longer necessary and it impedes the potential of MVDDS today.

The feasibility of sharing between DBS and 5G is demonstrated by two 2016 studies commissioned by the MVDDS 5G Coalition and prepared by expert satellite engineer Tom

Peters.[149] Mr. Peters examined the effects on DBS dishes from both 5G base stations and mobile devices, in three different configurations—point-to-point, outdoor small cell (the "urban canyon" scenario), and indoor small cell—in the areas of Indianapolis, Indiana, and Washington, D.C. The studies are conservative in many respects. For one thing, using high-resolution light detection and ranging ("LIDAR") data, Mr. Peters assumed that every square meter (or two square meters for one case) in the area of the experiment is home to a potential dish. Actual dish populations are of course less ubiquitous both because of a less-than-universal take rate, and because some building locations are unlikely places for installing a dish. These studies are conservative in other crucial respects: they ignore remedial measures such as shielding, and capture a worst-case snapshot. Mr. Peters also assumed 5G transmissions at an EIRP of as much as 48 dBm per 100 MHz, which translates into 42 dBm per 24 MHz, or some 28 dB higher than the power currently allowed under the Commission's rules.

Still, for all that conservatism, the studies show that the 5G transmissions would not exceed EPFD limits in the vast majority of locations, that they would do so only in a tiny minority of locations and only in the worst possible case, and that many of these locations are building parapets (not the rooftops where DBS dishes are generally located), or buildings under construction (devoid of protective walls that would attenuate the 5G signal). For the vast majority of locations, the EPFD limits would never be exceeded, even in the worst case.

In his attached Declaration reaffirming the results of the 2016 studies, Mr. Peters also points to subsequent developments such as beamforming and beamsteering technologies that

[149] Comments of MVDDS 5G Coalition, RM-11768, Attach. 1 (June 8, 2016); Petition to Deny of the MVDDS 5G Coalition, IBFS File No. SAT-LOI-20160428-00041, RM-11768, Ex. 1 (Aug. 15, 2016) (the "2016 Studies").

narrowly focus the 5G beam and minimize diffuse radiation.[150] In Mr. Peters' words, these technologies "have provided operators with a remarkable set of tools that can be used to mitigate interference and ensure coexistence between disparate services in the same band,"[151] and "can easily be put to use in the 12 GHz band to increase the efficient use of 500 megahertz of spectrum by allowing it to provide two-way, high-power 5G services to the U.S. population."[152] Mr. Peters is working on additional studies that will introduce further refinements to the 5G/DBS sharing analysis.

III. Higher-Power Two-Way Terrestrial Service Can Share the 12 GHz Band with NGSO FSS

The opponents of expanding terrestrial use of the spectrum are operators for which the 12 GHz band represents just a sliver of available spectrum. For example, SpaceX has (or is seeking) access to an astounding 25,550 MHz of spectrum, of which 15,550 MHz is already licensed.[153] SpaceX's application for its second-generation system identified additional bands for user downlinks in the Ka-band and gateway downlinks in the E-band, as shown in the following chart from that application:[154]

[150] Peters Declaration ¶ 6.

[151] *Id*. ¶ 10.

[152] *Id.*

[153] *See* Letter from Jeffrey Blum, DISH, to Marlene Dortch, FCC, File No. SAT-MOD-20200417-00037, at 7 (July 14, 2020); Partial Opposition of Dish Network Corporation, Petition of Starlink Services, LLC for Designation as an Eligible Telecommunications Carrier, WC Docket No. 09-197 at 9 (Feb. 22, 2021).

[154] Application of Space Exploration Holdings, LLC for Approval of Orbital Deployment and Operating Authority for the SpaceX Gen2 NGSO Satellite System, File No. SAT-LOA-20200526-00055, Legal Narrative at 11 (May 26, 2020).

Type of Link and Transmission Direction	Frequency Ranges
User Downlink Satellite-to-User Terminal	10.7 – 12.75 GHz[17] 17.8 – 18.6 GHz 18.8 – 19.3 GHz 19.7 – 20.2 GHz
Gateway Downlink Satellite to Gateway	17.8 – 18.6 GHz 18.8 – 19.3 GHz 71.0 – 76.0 GHz
User Uplink User Terminal to Satellite	12.75 – 13.25 GHz[18] 14.0 – 14.5 GHz 28.35 – 29.1 GHz 29.5 – 30.0 GHz
Gateway Uplink Gateway to Satellite	27.5 – 29.1 GHz 29.5 – 30.0 GHz 81.0 – 86.0 GHz
TT&C Downlink	12.15 – 12.25 GHz 18.55 – 18.60 GHz
TT&C Uplink	13.85 – 14.00 GHz

For SpaceX, this means that the 12 GHz band accounts for 2% of its total spectrum allotment, 3% of its already licensed spectrum, and 6% of its licensed downlink spectrum alone. That spectrum includes the Ka-band, which has always been intended by the Commission to be NGSO systems' main and most hospitable home.

Not only is the 12 GHz band a small portion of NGSO systems' licensed spectrum, but it is a relatively inconsequential frequency for them. NGSO use of the band has always been subject to heavy restrictions, and NGSO systems have always been aware of that fact. This is no surprise—the 12 GHz spectrum is the only frequency band out of the many they are licensed to use that is already used for a ubiquitous consumer service. It is for that reason that the ITU and the Commission have required NGSO FSS systems to operate without interfering with DBS operations. Interference is prohibited so long as it is "unacceptable," it does not even have to be

"harmful." Yet, as DISH has demonstrated, at least one of the proposed NGSO systems, SpaceX's Starlink constellation, will likely exceed the applicable EPFD limits and have an unacceptable impact on DISH's DBS service. In other words, SpaceX is trying to protect a system that likely does not comply with its own obligation to protect DBS consumers.

A. The 12 GHz Band Is Not the Primary Home of NGSO FSS

The ITU and the Commission gave NGSO systems access to the 12 GHz band in the early 2000s on the condition that these systems cannot cause "unacceptable" interference (let alone harmful interference) into DBS services.[155] That restriction makes the 12 GHz band one of the least hospitable frequency bands among the more than 25,000 MHz of spectrum available to NGSO systems today. In fact, the Commission intended the Ka-band to be the primary home of NGSO FSS systems, and has allocated 500 MHz of Ka-band spectrum between 18.8 and 19.3 GHz for primary use by NGSO FSS downlinks.

Back in the 1990s, the Commission and the U.S. government freed up the 18.8-19.3 GHz portion of the Ka-band (a total of 500 MHz, plus another 500 MHz in paired uplinks between 28.6 and 29.1 GHz) for NGSO user downlinks.[156] The elimination of NGSO FSS systems'

---

[155] ITU RR 5.487A; 47 C.F.R. § 2.106 n. 5.487A ("Non-geostationary-satellite systems in the fixed-satellite service shall not claim protection from geostationary-satellite networks in the broadcasting-satellite service operating in accordance with the Radio Regulations, irrespective of the dates of receipt by the Bureau of the complete coordination or notification information, as appropriate, for the non-geostationary-satellite systems in the fixed-satellite service and of the complete coordination or notification information, as appropriate, for the geostationary-satellite networks, and No. 5.43A does not apply. Non-geostationary-satellite systems in the fixed-satellite service in the above bands shall be operated in such a way that any unacceptable interference that may occur during their operation shall be rapidly eliminated.").

[156] *See* ITU Resolution 118 (WRC-95); Rulemaking to Amend Parts 1, 2, 21, and 25 of the Commission's Rules to Redesignate the 27.5-29.5 GHz Frequency Band, to Reallocate the 29.5-30.0 GHz Frequency Band, to Establish Rules and Policies for Local Multipoint Distribution Service and for Fixed Satellite Services, *First Report and Order and Fourth Notice of Proposed Rulemaking*, 11 FCC Rcd. 19005, 19013 ¶ 23 (1996); ITU Resolution 132 (WRC-97). Back then, the Ka-band was the next frontier for satellite systems. Unlike the Ku-band, it was not

secondary status paved the path to upgrade that status further to sole primary, with GSO FSS relegated to a secondary allocation. The Commission did so in 1996, consistent with the actions of WRC-95 and in anticipation of those of WRC-97.[157] The Commission also gave NGSO systems secondary access to the rest of the FSS Ka-band allocations—the 17.7-17.8 and 17.7-20.2 GHz portions for downlinks.[158] As the Commission stated: "significantly, this 500 MHz designation preserves the possibility that competitive NGSO/FSS systems may be implemented in this band."[159]

And the work of the Commission to create prime spectrum for NGSO FSS operations did not end there. Under the 18.8-19.3 GHz band's terrestrial Fixed Service allocation, the band was already licensed to a number of microwave licensees as well as Digital Electronics Messaging Services, known as "DEMS," which spanned the country's largest markets.[160] To safeguard the band for NGSO use, the Commission proceeded to relocate the DEMS licensees altogether from the 18.82-18.92 GHz and 19.16-19.26 GHz bands to the 24 GHz band (24.25-24.45 GHz and 25.05-25.25 GHz).[161] The Commission explained that Teledesic, the sole NGSO FSS system

---

being used by dozens of satellites spaced two degrees from one another and serving the United States; and unlike the 12 GHz band, it was not starting to be used for a ubiquitous consumer satellite service—DBS.

[157] *Id.* at 19030 ¶ 59. This downlink spectrum was paired with 500 MHz of uplink spectrum for NGSO FSS on a sole primary basis at 28.6-29.1 GHz. *Id.* at 19024 ¶ 42.

[158] *Id.* at 19036 ¶¶ 77-78.

[159] *Id.* at 19030 ¶ 59.

[160] Amendment of the Commission's Rules to Relocate the Digital Electronic Message Service from the 18 GHz Band to the 24 GHz Band and to Allocate the 24 GHz Band for Fixed Service, *Memorandum Opinion and Order*, 13 FCC Rcd. 15147, 15149 ¶ 6 (1998) ("In the early 1990s, a small number of companies, including Associated, DSC, MSI and FirstMark, began acquiring licenses in approximately thirty of the country's largest markets.").

[161] Amendment of the Commission's Rules to Relocate the Digital Electronic Message Service from the 18 GHz Band to the 24 GHz Band and to Allocate the 24 GHz Band for Fixed Service, *Order*, 12 FCC Rcd. 3471, 3471 ¶ 1 (1997).

proponent at the time, had an "interest in relocating DEMS from the 18 GHz band due to interference with its Earth station downlinks in the 18 GHz band."[162] To help clear the band, Teledesic "agreed to reimburse licensees which are required to modify existing equipment in order to operate in the 24 GHz band being offered by the Government."[163]

Teledesic's license, received in 1997, allowed it to build and operate a system initially envisioned at 840 satellites. Touting itself as "Internet-in-the-sky," Teledesic promised it would "enable affordable access to fiber-like telecommunications capability anywhere in the world" and "radically transform the economics of telecommunications infrastructure to enable universal access to the Information Age."[164] But, despite having 1,000 MHz of spectrum cleared for its use for user links and 1.6 GHz for gateway terminals, Teledesic launched only a single satellite.[165] It filed a series of requests for modification, reducing its planned fleet of satellites to 288,[166] and then further reducing to just 28 satellites. Before the Commission could act on its latest modification request, Teledesic surrendered its authorization entirely, and ultimately went out of business.[167] Teledesic never cited the lack of sufficient spectrum as a reason for this

---

[162] *Id*. at 3474 ¶ 10.

[163] *Id*.

[164] Daniel M. Kohn, *Providing Global Broadband Internet Access Using Low-Earth-Orbit Satellites*, Teledesic Corp., https://web.archive.org/web/19970729040646/http://www.isoc.org/inet97/proceedings/F5/F5_2.HTM (last visited May 6, 2021).

[165] *Before Google's Broadband Space Project, There Was Teledesic*, New Space Global (June 26, 2014), https://newspaceglobal.com/googles-broadband-space-project-there-was-teledesic.

[166] Teledesic LLC Application for Authority to Construct, Launch, and Operate a Ka-band Satellite System in the Fixed-Satellite Service, *Order and Authorization*, 16 FCC Rcd. 2501, 2502 ¶ 2 (2001).

[167] Teledesic, LLC, IBFS File No. SAT-MOD-20020201-00011 (June 27, 2003) (surrendering authorization).

failure. At the time, Teledesic simply was unable to convince investors that broadband to the home from a system of hundreds of satellites was a viable business proposition.

But Teledesic's efforts were not for naught. Teledesic single-handedly funded the DEMS relocation costs. Today's NGSO systems can thus take advantage of a spectrum clearing accomplished at the expense of another party long ago. In fact, even the microwave Fixed Service licenses using the 18.8-19.3 GHz band in the 1990s, which the Commission had viewed as "constraints" on NGSO FSS systems, were eventually relocated to the 17.7-18.3 and 19.3-19.7 GHz bands.[168]

The first NGSO proponent to request access to the Ku-band in the U.S. was Skybridge. Skybridge's interest in using that band alongside the Ka-band triggered another WRC footnote allocation, another Commission rulemaking, and another license processing round in the early 2000s. The 2000 WRC promulgated international footnote RR 5.487A. Under that footnote, the 12 GHz band in Region 2 is allocated to NGSO FSS on a primary basis, on the condition that NGSO FSS "shall not claim protection from geostationary-satellite networks in the broadcasting-satellite service operating in accordance with the Radio Regulations, irrespective of the dates of receipt by the Bureau of the complete coordination or notification information." The footnote further specifies that "non-geostationary-satellite systems in the fixed-satellite service in the above bands shall be operated in such a way that any unacceptable interference that may occur during their operation shall be rapidly eliminated." This provided "the basis to allow NGSO FSS

[168] Rechannelization of the 17.7-19.7 GHz Frequency Band for Fixed Microwave Services under Part 101 of the Commission's Rules, *Report and Order*, 21 FCC Rcd. 10900, 10901 ¶ 1 (2006).

operations to share successfully the 12.2-12.7 GHz band with BSS operations without causing unacceptable interference."[169]

In 2000, based on "the work of the ITU-R study groups and WRC-2000,"[170] the Commission adopted that footnote domestically. The Commission explained that the footnote "sought to ensure that NGSO FSS operations do not cause unacceptable interference to existing users and do not unduly constrain future growth of incumbent services."[171] The Commission continued: "throughout this proceeding, we have focused on the ability of NGSO FSS operations to coexist with existing operations in several spectrum bands without causing unacceptable interference to those services."[172] To that end, the Commission adopted "technical criteria so that NGSO FSS operations can share spectrum with incumbent services without causing unacceptable interference to them and without unduly constraining future growth of incumbent services or NGSO FSS system flexibility."[173]

The rules to protect DBS from NGSO FSS were accordingly quite strict. The Commission required an NGSO FSS applicant to "demonstrate prior to becoming operational that it meets the operational EPFD down limits to protect GSO BSS operations."[174] Specifically, NGSO FSS proponents were required to demonstrate that "they meet the operational limits at test

[169] *Ku-band NGSO FSS Allocation Order,* 16 FCC Rcd. at 4162 ¶ 170.

[170] *Id.*

[171] *Id.* at 4104 ¶ 10.

[172] *Id.* at 4160-61 ¶ 166.

[173] *Id.* at 4099 ¶ 1.

[174] *Id.* at 4170 ¶ 195.

points that represent the worst case scenario, everywhere in Alaska (or the entire United States, as the case may be) all of the time."[175]

Shortly after it granted NGSO systems access to the Ku-band spectrum, including the 12 GHz band, the Commission placed Skybridge's NGSO FSS application on public notice, established a cut-off date for other NGSO FSS system applications in the Ku-band, and received applications for six additional NGSO FSS systems requesting access to all or some portion of the Ku-band.[176]

As a result of that process, the Commission granted a license to Skybridge, whose rulemaking petition had in fact been the catalyst for the rulemaking and the new allocation. The license similarly made clear that Skybridge's operations in the 12 GHz band were to be undertaken on a basis of not causing harmful interference into DBS services.[177] Like Teledesic before it, Skybridge was not able to construct its system either, for reasons unrelated to spectrum availability.

The Commission's sensible precautions carried through to the modern era of NGSO FSS, triggered by OneWeb's 2016 Petition for a Declaratory Ruling seeking Commission authority to provide FSS using its proposed NGSO satellite constellation.[178] OneWeb sought to operate a constellation of 720 satellites in the 10.7-12.7 GHz, 14.0-14.5 GHz, 17.8-18.6 GHz, 18.8-19.3

---

[175] *Id.* at 4167 ¶ 184.

[176] Application of SkyBridge L.L.C. For Authority to Launch and Operate a Global Network of Low-Earth Orbit Communications Satellites Providing Broadband Services in the Fixed-Satellite Service, *Order and Authorization*, 20 FCC Rcd. 12389, 12389-90 ¶ 3 (2005).

[177] *Id.* at 12396-97 ¶ 26.

[178] Petition for Declaratory Ruling, WorldVu Satellites Limited, Petition for Declaratory Ruling Granting Access to the U.S. Market for the OneWeb System, IBFS File No. SAT-LOI-20160428-00041 (Apr. 28, 2016).

GHz, 27.5-28.35 GHz, 28.35-29.1 GHz, and 29.5-30.0 GHz bands.[179] In the same public notice accepting the OneWeb petition, the Commission initiated a processing round for additional applications and petitions to permit operation in those same bands by NGSO satellite systems.[180] The Commission granted OneWeb's petition along with the applications of Telesat Canada, Space Norway AS, Audacy Corporation, SpaceX, and ViaSat, Inc. and granted in part the applications of O3b Limited, LeoSat MA, Inc., Karousel LLC, Kepler Communications Inc., and Theia Holdings A, Inc.[181]

In 2017 and 2020, the Commission opened two further processing rounds.[182] The Commission has now granted a license to Kuiper, while other applications remain pending.[183]

There is a significant degree of uncertainty about the ability of all of the NGSO FSS proponents to become fully operational. Of the 11 NGSO FSS proponents with current Commission authorizations, only one—SpaceX—offers a beta service at the current time, and

[179] Public Notice, OneWeb Petition Accepted for Filing, IBFS File No. SAT-LOI-20160428-00041; Cut-Off Established for Additional NGSO-Like Satellite Applications or Petitions in the 10.7-12.7 GHz, 14.0-14.5 GHz, 17.8-18.6 GHz, 18.8-19.3 GHz, 27.5-28.35 GHz, 28.35-29.1 GHz, and 29.5-30.0 GHz Bands, 31 FCC Rcd. 7666, 7666 (2016).

[180] *Id.*

[181] *See* WorldVu Satellites Limited Petition for a Declaratory Ruling Granting Access to the U.S. Market for the OneWeb NGSO FSS System, *Declaratory Ruling and Order*, 32 FCC Rcd. 5366, 5367 ¶ 3 n.7 (2017) ("*WorldVu Order*") (collecting applications).

[182] *See* Public Notice, Satellite Policy Branch Information Applications Accepted for Filing, Cut-Off Established for Additional NGSO-Like Satellite Applications or Petitions for Operations in the 12.75-13.25 GHz, 13.85-14.0 GHz, 18.6-18.8 GHz, 19.3-20.2 GHz, and 29.1-29.5 GHz Bands, 32 FCC Rcd. 4180, 4183 (2017); Public Notice, Satellite Policy Branch Information Cut-off Established for Additional NGSO FSS Applications or Petitions for Operations in the 10.7-12.7 GHz, 12.75-13.25 GHz, 13.8-14.5 GHz, 17.7-18.6 GHz, 18.8-20.2 GHz, and 27.5-30 GHz Bands, 35 FCC Rcd. 2881, 2881 n.3 (2020).

[183] *See* 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, 8326 ¶ 9 (2020).

another—OneWeb—has reported it plans to provide commercial service in 2021. Most of the other 11 NGSO constellations licensed by the Commission as a result of the 2016 processing round have yet to launch a single satellite.

The chance that all of the NGSO licensees will launch their systems is extremely low based on precedent that includes not only the failure of Teledesic and Skybridge but also the aftermath of the "Big LEO" (low earth orbit) Mobile-Satellite Service ("MSS") processing round of 1994. Six applicants received MSS licenses in 1994.[184] But by 2002, only two MSS providers, Globalstar and Iridium, had begun commercial operations.[185] Globalstar was authorized to launch and operate 48 low earth satellites,[186] but its fleet only consists of half that amount (24 satellites).[187] And while Iridium's system includes 66 satellites, it temporarily suspended commercial operation in 2000, and barely survived a bankruptcy and "imminent destruction."[188]

---

[184] Loral/Qualcomm Partnership, L.P. (Globalstar), Motorola, Inc. (Iridium), TRW Inc. (Odyssey), Constellation Communications, Inc. (Aries), Mobile Communications Holdings, Inc. (Ellipsat), and American Mobile Satellite Corporation (AMSC). *See* Amendment of the Commission's Rules to Establish Rules and Policies Pertaining to a Mobile Satellite Service in the 1610-1626.5/2483.5-2500 MHz Frequency Bands, *Report and Order*, 9 FCC Rcd. 5936, 5941-42 ¶¶ 6-7 (1994).

[185] *Globalstar, Inc. v. FCC*, 564 F.3d 476, 480 (D.C. Cir. 2009).

[186] Application of Loral/Qualcomm Partnership, L.P. For Authority to Construct, Launch, and Operate Globalstar, a Low Earth Orbit Satellite System to Provide Mobile Satellite Services in the 1610-1626.5 MHz/2483.5-2500 MHz Bands, *Order and Authorization*, 10 FCC Rcd. 2333 ¶ 25 (1995).

[187] 2018 Communications Marketplace Report, 33 FCC Rcd. 12558, 12677-78 ¶ 225 (2018).

[188] Review of the Spectrum Sharing Plan Among Non-Geostationary Satellite Orbit Mobile Satellite Service Systems in the 1.6/2.4 GHz Bands, *Report and Order, Fourth Report and Order and Further Notice of Proposed Rulemaking*, 19 FCC Rcd. 13356, 13366 ¶ 22 (2004)*; see also Iridium Files for Chapter 11 Bankruptcy*, CNET (Jan. 2, 2002), https://www.cnet.com/news/iridium-files-for-chapter-11-bankruptcy.

B. Some NGSO FSS Operations Will Likely Cause Unacceptable Interference to DBS

NGSO use of the 12 GHz band creates serious threats to the DBS service. DISH has submitted unrebutted evidence that SpaceX's operation will exceed the EPFD limits adopted by the ITU and the Commission for the protection of millions of DBS dishes receiving service in the 12 GHz band. While the Commission has subjected a modification to SpaceX's authorization on the condition that SpaceX "not use more than one satellite beam from any of its satellites in the same frequency in the same or overlapping areas at a time,"[189] this so-called "Nco 1" condition only tackles a small portion of the problem. DISH has demonstrated that SpaceX's Starlink constellation, as modified, would nonetheless violate the EPFD limits, for two reasons. First, using real-life data about DISH's satellites and receive dishes instead of a simulation, expert NGSO satellite engineer Marc Dupuis has concluded that SpaceX, even operating with no more than one co-frequency beam focused on an area, (*i.e.,* a so-called Nco of 1), will exceed the EPFD limits for receive dishes used by millions of DBS customers including the commonly-used 45 cm and 60 cm antennas.[190] Second, the effect on DBS customers will in fact be even worse.

[189] 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*").

[190] Letter from Jeffrey Blum, DISH, to Marlene Dortch, FCC, IBFS File No. SAT-MOD20200417-00037; WT Docket No. 20-443 (Feb. 15, 2021) (attaching *EPFD Assessment of SpaceX into DISH Ku-band GSO Networks*) ("DISH Feb. 15 EPFD Study"); Letter from Jeffrey Blum, DISH, to Marlene Dortch, FCC, IBFS File No. SAT-MOD20200417-00037; WT Docket No. 20-443 (Mar. 25, 2021) (attaching *EPFD Assessment of SpaceX into DISH Ku-band GSO networks located in the United States*).

Mr. Dupuis has explained that, with a nominal Nco of 1, the *effective* Nco will be at least 3, and perhaps much more.[191]

Mr. Dupuis arrives at this conclusion by estimating the cumulative effect of two sources of interference not taken into account by the software used by SpaceX to calculate EPFD levels: (1) satellites located outside the GSO exclusion zone and serving neighboring areas (*i.e.*, satellites that are above the 25° minimum operational elevation angle to the GSO DBS site being considered); and (2) the energy that is still produced by many of the satellites that are located at low elevations (*i.e.*, below 25°), and thus do not serve any neighboring areas.[192] Mr. Dupuis specifically concludes that, "with effective Nco values of between 3 and 4, the Starlink system will generate excess power into commonly used DBS antenna sizes (*i.e.*, between 45 cm and 60 cm) ***between 10% and 100% of the time*** at all of the five locations that the study considered."[193] Mr. Dupuis has also shown, based on reasonable inferences about the Starlink system's capacity, that SpaceX would have to use more than one satellite co-frequency beam to satisfy demand from more than 10 simultaneous active users in an area, even at speeds of 300 Mbps.[194] At the service speed of 10 Gbps that SpaceX has touted to the Commission,[195] the same simple calculations show that SpaceX cannot provide service to even *one* user in an area unless it focuses more than one satellite beam on it. SpaceX has not rebutted Mr. Dupuis' findings.

---

[191] *See* Letter from Jeffrey Blum, DISH, to Marlene Dortch, FCC, IBFS File No. SAT-MOD20200417-00037, at 1-2 (Apr. 23, 2021) (attaching *EPFD Assessment of SpaceX with multiple frequency reuse into DISH Ku-band GSO receivers located in the United States*).

[192] *Id.* at 1-2.

[193] *Id*. at 2.

[194] DISH Feb. 15 EPFD Study at 21-22.

[195] *See* Letter from David Goldman, SpaceX, to Marlene Dortch, FCC, IBFS File No. SAT-MOD-20200417-00037, Attachment at 2 (Jan. 22, 2021).

And SpaceX still has not explained how it proposes to satisfy demand *without* using more than one satellite beam co-frequency in an area. The disconnect becomes even more pointed if it means that SpaceX has to choose between violating its license and violating its obligations as a carrier hoping to receive payments of almost $1 billion in subsidies from the Rural Digital Opportunity Fund ("RDOF"). If the demand that SpaceX is required to meet in a rural area requires the use of more than one co-frequency satellite beam, the satisfaction of SpaceX's RDOF obligations would require a violation of its Nco = 1 commitment. As Viasat has pointed out in connection with SpaceX's application to become eligible for RDOF payments, with respect to geographic areas that contain 13% of SpaceX's provisionally awarded RDOF locations, "SpaceX cannot satisfy *both* the Nco = 1 commitment underlying its pending modification application *and* its RDOF service obligations."[196] The Commission should not provide any leeway for SpaceX to deviate from its Nco = 1 commitment by resorting to such supposed exigencies. Instead, SpaceX should be required to show it can meet its RDOF obligations from other frequency bands without violating the Nco = 1 condition for the 12 GHz band.

In addition, if SpaceX can truly meet demand with an Nco of 1, this highlights SpaceX's attenuated need for the 12 GHz band in the first place, in light of the vast other spectrum (some 25,550 MHz of authorized or requested frequencies) to which it has access. Perhaps this is why SpaceX has avoided offering an explanation of its plans to date.

SpaceX's violation of the EPFD limits is especially concerning because it is too early to tell what the results will be on the ground in terms of hours, days, or weeks of lost service for

[196] Letter from Amy Mehlman, Viasat, to Marlene Dortch, FCC, AU Docket No. 20-34, at 2 (Apr. 5, 2021).

DBS customers. Only a fraction of SpaceX's fleet has been deployed, and demand for SpaceX's service is still in its very early stages.

C. NGSO Operations Do Not Have an Investment-Backed Expectation to Use the 12 GHz Band in the U.S. or Abroad

Because of NGSO's subservient status to DBS throughout the world, there has never been an investment-backed expectation that NGSO use of the 12 GHz band would be unconstrained, either in the United States or internationally.

United States. The Commission has repeatedly conditioned NGSO FSS licenses on the outcome of subsequent rulemakings about the 12 GHz band. In granting OneWeb access to the 12 GHz band, the Commission emphasized that "we are granting the OneWeb petition subject to the outcome of the pending MVDDS Coalition Petition for Rulemaking . . . Accordingly, any investments made toward operations in this band by OneWeb in the United States assume the risk that operations may be subject to additional conditions or requirements as a result of such Commission actions."[197] As the Commission explained in the *12 GHz NPRM*, subsequent orders granting NGSO FSS permission to use the 12 GHz band included the proviso that "any investments made toward operations in the bands authorized in the United States assume the risk that operations may be subject to additional conditions or requirements as a result of any future Commission actions, and all of the orders directly or indirectly referenced the MVDDS 5G Coalition Petition."[198] For example, the SpaceX authorization states:

> The MVDDS 5G Coalition expresses concerns regarding protection of current and potential future MVDDS operations in the 12.2-12.7 GHz band . . . Such concerns are addressed in paragraphs 40(e) and 40(r) below, requiring SpaceX to comply with

[197] *WorldVu Order*, 32 FCC Rcd. at 5369 ¶ 6; *see also id.* at 5378 ¶ 26 ("This grant of U.S. market access and any earth station licenses granted in the future are subject to modification to bring them into conformance with any rules or policies adopted by the Commission in the future.").

[198] *12 GHz NPRM*, 36 FCC Rcd. at 613 ¶ 16.

> established pfd limits in this band and subjecting the authorization to modification to conform it to any future rules or policies adopted by the Commission in pending rulemaking proceedings.[199]

Paragraph 40 in turn states:

> This authorization is subject to modification to bring it into conformance with any rules or policies adopted by the Commission in the future. Accordingly, any investments made toward operations in the bands authorized in this order by SpaceX in the United States assume the risk that operations may be subject to additional conditions or requirements as a result of any future Commission actions.[200]

The Commission reiterated this point in its order modifying SpaceX's authorization:

> This authorization is subject to modification to bring it into conformance with any rules or policies adopted by the Commission in the future. Accordingly, any investments made toward operations in the bands authorized in this order by SpaceX in the United States assume the risk that operations may be subject to additional conditions or requirements as a result of any future Commission actions. *This includes, but is not limited to, any conditions or requirements resulting from any action in the proceedings associated with IB Docket 18-818392 and WTB Docket 20-443.*[201]
>
> Just like SpaceX and OneWeb, all other 12 GHz band NGSO authorizations are also

conditioned on the outcome of this rulemaking.[202]

---

[199] Space Exploration Holdings, LLC Application for Approval for Orbital Deployment and Operating Authority for the SpaceX NGSO Satellite System, *Memorandum Opinion, Order, and Authorization*, 33 FCC Rcd. 3391, 3401 ¶ 26 n.88 (2018).

[200] *Id.* at 3407 ¶ 40(r).

[201] *SpaceX Third Modification Order* ¶ 97(e) (emphasis added).

[202] Space Norway AS Petition for a Declaratory Ruling Granting Access to the U.S. Market for the Arctic Satellite Broadband Mission, *Order and Declaratory Ruling*, 32 FCC Rcd. 9649, 9654-55 ¶ 13 (2017) ("As indicated above, we defer consideration of broadly applicable matters to . . . other future rulemakings, and we condition grant of the Space Norway Petition on the outcome of any rulemaking proceedings . . . We note that, as with the *OneWeb Order*, grant of the Space Norway Petition will not prejudge any decision, including a contrary action, in any pending or future rulemaking proceeding. Rather, decisions of general applicability in such proceedings will be based on the totality of comments and proposals in those proceedings. In any event, Space Norway will not receive any special exemptions to determinations made in these rulemakings based solely on this grant, should Space Norway choose to accept it."); Kepler Communications Inc. Petition for Declaratory Ruling to Grant Access to the U.S. Market for Kepler's NGSO FSS System, *Order and Declaratory Ruling*, 33 FCC Rcd. 11453, 11455 ¶ 4 n.17 (2018) ("Although it did not file comments on the Kepler Application, the MVDDS 5G

Abroad. NGSO operators could not possibly have counted on the worldwide availability of this band free of mobile service. Most of the band has a global primary allocation to the Mobile Service, and all of it has a near-global primary allocation. The only exception is Region 1, and for only some of the band—the 200 MHz between 12.5 and 12.7 GHz. But even that exception is limited by footnotes that give the Mobile Service primary status even in that portion of the band in certain Region 1 countries.[203] Thus, contrary to claims made by a small minority

---

Coalition has expressed concern in other proceedings regarding protection of current and potential future MVDDS operations in the 12.2-12.7 GHz band . . . Such concerns are addressed in paragraphs 24(d) and 29 below, requiring Kepler to comply with established PFD limits in this band and subjecting the authorization to modification to conform it to any future rules or policies adopted by the Commission in pending rulemaking proceedings."); Karousel Satellite LLC Application for Authority to Launch and Operate a Non-Geostationary Earth Orbit Satellite System in the Fixed Satellite Service, *Memorandum Opinion, Order and Authorization*, 33 FCC Rcd. 8485, 8486 ¶ 3 n.14 (2018) ("Although it did not file comments on the Karousel Application, the MVDDS 5G Coalition has expressed concern in other proceedings regarding protection of current and potential future MVDDS operations in the 12.2-12.7 GHz band . . . Such concerns are addressed by paragraphs 24(e) and 24(v) below, requiring Karousel to comply with established PFD limits in this band and subjecting the authorization to modification to conform it to any future rules or policies adopted by the Commission in pending rulemaking proceedings."); Theia Holdings A, Inc. Request for Authority to Launch and Operate a Non-Geostationary Satellite Orbit System in the Fixed-Satellite Service, Mobile-Satellite Service, and Earth-Exploration Satellite Service, *Memorandum Opinion, Order and Authorization*, 34 FCC Rcd. 3526, 3527 ¶ 3 n.13 (2019) ("Although it did not file comments on the Theia Application, the MVDDS 5G Coalition has expressed concern in other proceedings regarding protection of current and potential future MVDDS operations in the 12.2-12.7 GHz band . . . To the extent they would be applicable here, such concerns are addressed in paragraph 55f below, requiring Theia to comply with established PFD limits in this band and subjecting the authorization to modification to conform it to any future rules or policies adopted by the Commission in pending rulemaking proceedings.").

[203] The 12.5-12.75 GHz band also has a primary allocation in a large number of Region 1 countries (Algeria, Saudi Arabia, Bahrain, Cameroon, the Central African Republic, Congo, Cote d'Ivoire, Djibouti, Egypt, the United Arab Emirates, Eritrea, Ethiopia, Gabon, Ghana, Guinea, Iraq, Israel, the Libyan Arab Jamahiriya, Jordan, Kuwait, Lebanon, Madagascar, Mali, Morocco, Mongolia, Nigeria, Oman, Qatar, the Syrian Arab Republic, the Dem. Rep. of the Congo, Somalia, Sudan, South Sudan, Chad, Togo and Yemen). ITU RR 5.494. It also has a primary allocation in yet another group of Region 1 countries (Austria, Azerbaijan, Kyrgyzstan and Turkmenistan), provided that Mobile Service licensees do not cause harmful interference into FSS earth stations of other countries. ITU RR 5.496.

of stakeholders,[204] the factor of global harmonization militates strongly in favor of the new domestic allocation. And the limitations on the NGSO use of the 12 GHz band counsel for intensive use of the other downlink spectrum allocated to NGSO use—not only the Ka-band but also the extended (10.7-11.7 GHz) and conventional (11.7-12.2 GHz) Ku-bands.

NGSO operators' request for full and unconstrained use of the 12 GHz band in the United States is moreover at odds with the constraints placed on NGSO operations in the 12 GHz spectrum internationally. As an example, the 12 GHz rights of SpaceX are heavily constrained or nonexistent in many key countries. Despite protestations of absolute need for the 12 GHz spectrum, the NGSO proponents will have to make do with limited, if any, access to that spectrum in many countries.

Below, DISH provides more detail on SpaceX's licenses in certain selected countries for which DISH has thus far been able to obtain information.

Australia. In Australia, SpaceX cannot use the 12 GHz band in most of the country's large metropolitan areas including Sydney, Melbourne, Perth, Adelaide, and others; it may only provide service in "low density and remote areas." These limited licenses were issued following warnings of a "catastroph[e]" expressed to the regulator by Foxtel, a satellite licensee that provides direct-to-home DBS service in Australia using the 12 GHZ band, just as DISH does in the United States.

[204] *See, e.g.*, Opposition of Intelsat, Petition for Rulemaking to Permit MVDDS Use of the 12.2-12.7 GHz Band for Two-Way Mobile Broadband Service, RM-11768, at 3 (June 3, 2016) ("[T]he ITU has not identified the 12.2-12.7 GHz band for 'International Mobile Telecommunications' (IMT, the ITU's term for new mobile spectrum) at WRC-15. And, Intelsat is not aware that any regional body is considering introducing terrestrial mobile use into any of the world's BSS bands, which are different in Europe and Africa than in the United States for mobile use.").

The licensing of foreign satellite systems in Australia consists of three layers. First, the satellite operator must obtain permission to be included in Schedule 1 of the Radiocommunications (Foreign Space Objects) Determination.[205] That in turn opens the path for the operator to apply for a space license (to transmit downlinks) and a space receive license (to receive uplinks). Finally, once these licenses have been obtained, consumer earth stations generally become automatically eligible to communicate with these satellites under one of the class licenses that are available.[206] In that sense, Australia's regime is more streamlined than that of the United States, which has not established blanket licenses for transmit/receive earth stations across operators. Still, even under that light-handed regulatory regime, SpaceX's earth stations are unable to use the 12 GHz band except in limited circumstances.

When SpaceX requested inclusion in Australia's "Foreign Space Objects" list, the request proved controversial. The Australian Communications and Media Authority ("ACMA") sought public comment on that request in October 2019. Foxtel submitted a warning of a "catastrophic business impact of interference" from SpaceX.[207] In Foxtel's words:

> Foxtel utilises GSO systems in the Ku Band DTH 11.7 - 12.7 GHz for the delivery of our products to our satellite customers. This is a crucial link in our product delivery chain, and the consequences of interference, outages or degradations of margin are at the highest end of the spectrum of consequences for a business such as Foxtel. We hold very high levels of concern regarding the interference potential of NGSO constellations.[208]

---

[205] *Radiocommunications (Foreign Space Objects) Determination 2014* (Cth) (Austl.), https://www.legislation.gov.au/Details/F2020C00139.

[206] *Radiocommunications (Communication with Space Object) Class Licence 2015* (Cth) (Austl.), https://www.legislation.gov.au/Details/F2020C00197.

[207] Letter from Holly Brimble, Foxtel, to Australian Communications and Media Authority, Update to Foreign Space Objects Determination, IFC 34/2019 (Nov. 19, 2019), https://www.acma.gov.au/consultations/2019-10/update-foreign-space-objects-determination-consultation-342019#submissions.

[208] *Id.*

Foxtel's views align with Australia's broader effort to protect video transmission in metropolitan areas when planning radiofrequency spectrum domestically, consistent with the goal of the Australia Radiocommunications Act to "provide a regulatory environment that maximizes opportunities for the Australian communications industry in domestic and international markets."[209]

The result? All of SpaceX's Australia space licenses allowing satellites to transmit in the 12 GHz band are restricted to the "low density" and "remote density" areas,[210] categories that exclude the cities of Sydney, Melbourne, Brisbane, Perth, Adelaide, and Newcastle, representing approximately 70% of Australia's population.[211] This means that the areas covered by SpaceX's 12 GHz space licenses account for just 30% of Australia's population.[212]

New Zealand. SpaceX has announced the launch of a beta service in New Zealand.[213] While the service appears to involve use of the 12 GHz band, SpaceX enjoys no protection from

---

[209] *Radiocommunications Act 1992* (Cth) pt 1.2 (Austl.), https://www.legislation.gov.au/Details/C2021C00046.

[210] Starlink Internet Services Pte. Ltd, Apparatus Licence, Licence No. 11178931/1 (issued Jan. 19, 2021) and 11181002/1 (issued Jan. 8, 2021), Australian Communications and Media Authority, https://web.acma.gov.au/rrl/register_search.main_page (enter license number in "Licence No." field). *See generally* ACMA Access Area Map, Australian Communications and Media Authority, https://web.acma.gov.au/rrl/access_area_search.map?pAREA_CODE=74 (last visited May 6, 2021).

[211] *Radiocommunications (Transmitter Licence Tax) Determination 2015* (Cth) (Austl.), https://www.legislation.gov.au/Details/F2021C00231.

[212] *See* Regional Population, Australian Bureau of Statistics, Reference Period 2019-20 Financial Year (released Mar. 30, 2021), https://www.abs.gov.au/statistics/people/population/regional-population/2019-20.

[213] Starlink's beta service is currently active in the South Island of New Zealand. *See* Official Starlink Account (u/DishyMcFlatface), *Starlink rolling out in Germany and New Zealand, expanding in the UK*, Reddit (Mar. 9, 2021), https://www.reddit.com/r/Starlink/comments/m1ga2i/starlink_rolling_out_in_germany_and_new_zealand (last accessed May 6, 2021).

any authorized users of the band. Specifically, SpaceX has no licenses to use the 12 GHz band. Rather, its affirmative authorizations are all for the use of the Ka-band, ranging from 17.825 to 29.750 GHz.[214] While SpaceX may still use the 12 GHz band for downlinks on an unlicensed basis, the lack of a license means a lack of protection. In fact, SpaceX's 12 GHz operations, if any, are likely to be severely limited. There are currently four active licensees with as many as thirteen licenses authorized to use the 12 GHz band in New Zealand,[215] including Sky Network Television and Television New Zealand, which provide broadcasting satellite service from two GSO satellites (Optus B1 and D1). This means that these licensees enjoy priority over SpaceX in the 12 GHz band under the applicable Region 3 footnote.[216]

India. India's telecom regulators, the Department of Telecommunications and the Telecommunications Regulatory Authority ("TRAI"), appear not to have licensed the Starlink system at all, and regulators are reportedly investigating reports that SpaceX is preselling beta service in India without authorization. SpaceX's attempt to presell its services for $99, which SpaceX has couched as an invitation to "reserve" service,[217] was odd to begin with; SpaceX itself has recognized in a letter to TRAI, that "SpaceX is not now an active service provider in India," and that India, unlike the United States, does not issue "blanket licenses" for an operator's earth

---

[214] Register of Radio Frequencies, Radio Spectrum Management, New Zealand Ministry of Business, Innovation and Employment, https://rrf.rsm.govt.nz/smart-web/smart/page/-smart/domain/licence/SelectLicencePage.wdk (search Licensee = "Starlink New Zealand").

[215] Register of Radio Frequencies, Radio Spectrum Management, New Zealand Ministry of Business, Innovation and Employment, https://rrf.rsm.govt.nz/smart-web/smart/page/-smart/domain/licence/SelectLicencePage.wdk (search Frequency (From) = "12200" and To Frequency = "12700").

[216] ITU RR 5.484A.

[217] Tanay Singh, *Starlink Broadband Can be Reserved for $99 in India Right Away*, Telecom Talk (Feb. 26, 2021), https://telecomtalk.info/starlink-broadband-booked-india-full-details/338007.

stations using the Ku-band.[218] India's Department of Telecommunications is "examining whether Elon Musk-led SpaceX's offer to pre-sell its Starlink satellite internet service in India flouts any of the country's existing telecom and technology laws."[219] As a Department of Telecommunications official reportedly stated to the Economic Times: "DoT has no objections to SpaceX offering the Starlink satellite internet service in India, but it must comply with the laws of the land and seek an appropriate licence and other authorisations before offering the service to Indian consumers."[220] And, a senior official at TRAI "said that the matter would be examined."[221] SpaceX's apparent plans to presell unauthorized service were the subject of a complaint by the Broadband India Forum, a group that includes broadband providers. The Broadband India Forum specifically wrote to India's regulators asking that Starlink be stopped from preselling its service in India. The letter points out that Starlink does "not have either its own ground/earth stations in India, nor a satellite frequency authorisation" required to provide beta service.[222]

---

[218] Letter from Patricia Cooper, SpaceX to the Secretary, Telecommunications Regulatory Authority of India, at 5, 7 (Sept. 21, 2020), https://www.trai.gov.in/sites/default/files/SpaceX_10112020.pdf.

[219] Kalyan Parbat, *Telecom Department Begins Scrutiny of Elon Musk's Starlink Internet Offer to India*, Economic Times (Apr. 13, 2021), https://economictimes.indiatimes.com/industry/telecom/telecom-news/dot-begins-scrutiny-of-elon-musks-starlink-internet-offer/articleshow/82042321.cms.

[220] Kalyan Parbat, *India to ask SpaceX to Seek Permit for Offering Satellite Internet Service*, Economic Times (Apr. 23, 2021), https://economictimes.indiatimes.com/tech/technology/india-to-ask-spacex-to-seek-permit-for-offering-satellite-internet-service/articleshow/82207792.cms.

[221] Kalyan Parbat, *Elon Musk's Satellite Net Plan in India Hits a Bump*, Economic Times (Apr. 1, 2021), https://economictimes.indiatimes.com/industry/telecom/telecom-news/elon-musks-satellite-net-plan-in-india-hits-a-bump/articleshow/81797649.cms.

[222] *See id.*

Brazil. While Starlink reportedly intends to provide service in Brazil and, as in India, is accepting advance reservations,[223] it apparently has not yet received authorization to do so in that key jurisdiction either. In fact, on March 9, 2021, Brazil's National Telecommunications Agency ("ANATEL") stated that there is no application in progress at ANATEL for a satellite landing right license, or for an authorization to operate associated telecommunications services for Starlink or its Brazil affiliates.[224] Nor is the path to a potential future license easy or short. In Brazil, the 12 GHz band is allocated to: (i) Pay-TV service, on a primary basis (which entails protection from interference) and non-exclusive basis (which allows sharing), (ii) sound and picture transmission applications and (iii) distribution of television and audio broadcasting signals by satellite (DTH), on a primary basis.[225] ANATEL has stated categorically that, until further regulation is enacted, those interested in the use of the 12 GHz for the provision of telecom services using space capacity must present a proposal containing criteria aimed at avoiding interference with the existing systems in this band.[226]

---

[223] Rafael Rigues, *SpaceX Already Accepts Internet Reservations from Starlink, Even from Brazil*, Olhar Digital (Feb. 10, 2021), https://olhardigital.com.br/en/2021/02/10/noticias/spacex-comeca-a-aceitar-reservas-para-internet-da-starlink.

[224] Plataforma Integrada de Ouvidoria e Acesso à Informação Detalhes da Manifestação [Integrated Ombudsman and Access to Information Platform Manifestation Details], Acesso à Informação [Access to Information], ANATEL, NUP 01217.001005/2021-10, at 2 (filed Mar. 1, 2021) (Braz.), https://sei.anatel.gov.br/sei/modulos/pesquisa/md_pesq_documento_consulta_externa.php?NMLZh5iV6nbOCmPPhjssYO7ecW3Ia5ZtxFzuL_reIqZ8L3mCXpDwpWj43Y64iTm1DEA9jNIPIyHBKZq354jBP49FDML67ow_t0hSJIm33F9B3O2ZRvgWtm6bzkLu7IKv.

[225] Resolução No. 563, de 30 de março de 2011, Diário Oficial da União [D.O.U.] de 1.4.2011 (Braz.), https://informacoes.anatel.gov.br/legislacao/resolucoes/2011/37-resolucao-563 ("Resolution No. 563/2011"); Resolução No. 648, de 11 de fevereiro de 2015, Diário Oficial da União [D.O.U.] de 12.2.2015 (Braz.), https://informacoes.anatel.gov.br/legislacao/resolucoes/2015/788-resolucao-648; Resolução No. 716, de 31 de outubro de 2019, Diário Oficial da União [D.O.U.] de 4.11.2019 (Braz.), https://informacoes.anatel.gov.br/legislacao/resolucoes/2019/1351-resolucao-716.

[226] Resolution No. 563/2011.

Canada. In Canada, SpaceX is apparently licensed to use specific Ku-band frequencies, possibly covering the 12 GHz band. But Canada, like the United States, has adopted international Region 2 footnote 5.487A, which prohibits NGSO systems from causing unacceptable interference into GSO Broadcasting-Satellite Service satellites.[227] Further, while DISH understands that the Department of Innovation, Science and Economic Development ("ISED") has given SpaceX approval under an interim approach for authorizing network of identical earth stations using Ku-band frequencies (including the 12 GHz band), these approvals, and any additional conditions attached to them, have yet to be made public.

Canada believes that frequencies higher than the 12 GHz band are a more suitable home for NGSO FSS systems, especially for ubiquitous deployments. Importantly, Canada also believes that NGSO systems should generally share the spectrum with commercial mobile services. The ISED's spectrum outlook for 2018 to 2022 reads in relevant part:

> For FSS and BSS in higher frequencies, the demand for bandwidth-intensive applications, congestion in the Ku-band, the expected Ka-band demand and the emergence of new NGSO systems all lead ISED to believe that there will be a need to consider additional spectrum for these types of satellite services. ISED also recognizes the increasing trend for commercial mobile services in higher frequency bands, as mentioned in section 6.2. As such, ISED will be looking to find ways to facilitate sharing between satellite and commercial mobile services in certain frequency bands, where feasible. ISED does, however, recognize the need for dedicated spectrum for satellite services, particularly for ubiquitous deployments, and will be considering such designations in the higher frequency bands.[228]

Thus, the NGSO proponents' claims of a need for a global, complete, and unconstrained access to the 12 GHz band are baseless, and should not stand in the way of the Commission implementing a flexible Mobile Service allocation in the 12 GHz band.

---

[227] *See* Canadian Table of Frequency Allocations, (12.2 - 12.7 GHz) (2018), https://www.ic.gc.ca/eic/site/smt-gst.nsf/eng/sf10759.html.

[228] Innovation, Science and Economic Development Canada, *Spectrum Outlook 2018 to 2022*, ¶ 75 (2018), https://www.ic.gc.ca/eic/site/smt-gst.nsf/eng/sf11403.html.

D. Sharing Between 5G and NGSO FSS Systems Is Eminently Possible in the 12 GHz Band

As stated above, NGSO operators do not need the 12 GHz band, which was never the primary home for their services, and pose a serious threat of interference to millions of DBS customers if they use this band. These are important issues that need to be addressed. But, while the subject of sharing between 5G and NGSO FSS justified concern five years ago, the RKF study shows that coexistence is eminently possible today. RKF notes that this is the expected result of a number of recent technical advances and developments, including the surgically narrow beams that 5G transmitters can deploy thanks to beamforming.

More analysis can be conducted. DISH cannot rule out the possibility that some restrictions on NGSO operators, such as restrictions on low elevation angles and certain types of user terminals, may be desirable to enhance coexistence. But the analysis to date shows that coexistence is achievable.

IV. The Commission Should Adopt New Rules for the 12 GHz Band

The Commission can establish the 12 GHz band as a robust source of services, jobs, competition, and other public benefits by implementing targeted rule changes for the MVDDS service. Specifically, the Commission should open the band for higher power two-way mobile and fixed 5G service. To that end, the Commission should add a Mobile Service allocation to the band, eliminate the MVDDS EIRP limit, and make other changes to ease the burdens that have complicated deployment until now.

A. The Commission Should Add a Mobile Service Allocation in the 12 GHz Band

The Commission should revise the U.S. allocations table under Section 2.106 of its rules to add a primary Mobile (except Aeronautical Mobile) Service allocation to the 12 GHz band.[229] The 12 GHz band is already allocated to the Mobile Service on a co-primary basis for Region 2 under the International Radio Regulations.[230] The addition of this allocation to the domestic table would therefore bring it into conformity with international rules. And while the development of 5G standards for the band has not commenced yet, an almost uniform global allocation is too critical and scarce an asset to waste. The Commission should seize the moment, and the U.S. should spearhead global standardization, which has rightly been recognized as critical to extracting the greatest benefit out of the available spectrum.[231]

B. The Commission Should Update the MVDDS Operational Rules to Permit MVDDS Licensees to Provide Two-Way Mobile Broadband Service

The Commission should revise the MVDDS rules to provide licensees with the same regulatory flexibility that it has already provided to flexible-use licensees in other bands, consistent with the flexibility it adopted providing in the Spectrum Frontiers proceeding.[232]

---

[229] *See* 47 C.F.R. § 2.106.

[230] Under the International Table of Frequency Allocations, the 12.2-12.7 GHz band is allocated on a co-primary basis to mobile (except aeronautical) services in Regions 2 and 3. Additionally, in Region 1, there is a similar co-primary mobile allocation at 12.2-12.5 GHz (throughout the entire region) and at 12.5-12.7 GHz (in numerous countries within the region). *See* ITU RR 5.494; 47 C.F.R. § 2.106 n. 5.494.

[231] *See* Facilitating Shared Use in the 3100-3550 MHz Band, *Report and Order and Further Notice of Proposed Rulemaking*, 35 FCC Rcd. 11078, 11083 ¶ 13 (2020).

[232] 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, 16189 ¶¶ 228-29, 16190-91 ¶¶ 231-34 (2012) ("*AWS-4 Order*"); Use of Spectrum Bands Above 24 GHz for Mobile Radio Services, *Report and Order and Further Notice of Proposed Rulemaking*, 31 FCC Rcd. 8014, 8018 ¶ 2 (2016).

Today, the rules allow MVDDS spectrum to be used for any digital, fixed, non-broadcast service. However, mobile services are specifically banned and two-way service is permitted only "by using other spectrum or media for the return or upstream path."[233] In adopting these restrictions nearly 20 years ago, the Commission concluded that both mobile and two-way operations would unnecessarily complicate the sharing environment between MVDDS and incumbent DBS operators.

As technology has evolved, however, it is now possible for two-way broadband services to be offered over MVDDS while still protecting DBS from harmful interference. For example, with the emergence of 5G, spectrum bands can be used to provide much needed broadband capacity relief using targeted, small cell deployments (such as in buildings and at urban street level locations) that present a lower interference potential than traditional wide-area macrocell deployments in lower frequency bands. Additionally, advanced antenna techniques like "beamforming" and "beamsteering" allow better control of transmitter energy, enabling transmissions to be more narrowly focused to desired locations (and away from receivers with which they might interfere) dynamically.[234]

Accordingly, the Commission should revise its rules to allow a licensee "to provide any fixed or mobile service." Additionally, the rules should be revised to allow licensees the flexibility to provide any common carrier or non-common carrier service (or a combination thereof). These revisions will permit the full array of fixed and mobile service offerings without undue regulatory restraint, and will allow consumer demand and the business judgment of licensees to shape the nature of their services. In providing for such an open and flexible

[233] 47 C.F.R. § 101.1407.

[234] *See* Claes Tidestav, *Massive Beamforming in 5G Radio Access*, Ericsson Research Blog (Mar. 19, 2015), https://www.ericsson.com/en/blog/2015/3/massive-beamforming-in-5g-radio-access.

regulatory framework, the Commission will enable full and efficient spectrum use, promote deployment of innovative broadband services, and spur investment in those services.

C. The Commission Should Update Its Technical Rules to Enable a Viable 5G Service While Safeguarding DBS Operations

The Commission should make changes to the MVDDS technical rules to promote a viable 5G two-way broadband service while protecting DBS from harmful interference. These rules should be similar to the technical rules applicable to other bands used for 5G, with modifications as needed to ensure co-existence with DBS operations. Crucially, the current rules embrace a belt-and-suspenders approach by imposing two power restrictions on MVDDS transmissions—restricting both the power originating from the MVDDS transmitter and the power at the receive (DBS) earth station whose protection is sought.[235] The first subjects MVDDS licensees to an EIRP limitation of 14 dBm per 24 MHz.[236] The second requires MVDDS licensees to meet specified EPFD levels, at each DBS receive earth station location, which vary by region of the United States depending on climate and topography ranging from −168.4 dBW/m 2/4kHz to −172.1 dBW/m 2/4kHz.[237] But these redundant precautions are no longer necessary. What matters for purposes of avoiding interference into a DBS earth station is the effect at the earth station. If an MVDDS transmission complies with the EPFD limits, it does not matter what the power of the transmitter is.

---

[235] *See MVDDS Rules Order*, 17 FCC Rcd. at 9641-42 ¶ 68, 9653 ¶¶ 88-89.

[236] 47 C.F.R. §§ 101.113(a), 101.147(p).

[237] *Id.* § 101.105(a)(4)(ii)(B). The regions and corresponding EPFD limits are: East: -168.4 dBW/m2/4kHz, Midwest: -169.8 dBW/m2/4kHz, Southwest: -171.0 dBW/m2/4kHz, and Northwest: -172.1 dBW/m2/4kHz. *Id.*

D. The Commission Should Consider Additional Rule Changes to Facilitate More Efficient and Beneficial Uses of MVDDS Spectrum

The Commission should also adopt the following rule changes to ease the restrictions on MVDDS to enable licensees to offer consumers a viable two-way 5G mobile broadband service:

Emission Limits. The Commission should revise the out-of-band emission mask set forth in Section 101.111(a)(2), so as to specify a limit of 43 + 10 log10(P) dB. For mobile systems operating above 1 GHz, the Commission has found that this limit is sufficient to protect adjacent-band operations and is consistent with ITU recommendations.[238] The Commission should simply apply the same out-of-band emission limit to ensure interference protection of adjacent-band operations at the 12.2-12.7 GHz band edges.

Coordination Among MVDDS Operators. The Commission should adopt a maximum predicted or measured median field strength limit of 47 dBμV/m at service area boundaries to mitigate interference among multiple MVDDS operators, unless the affected licensees agree otherwise. This limit is consistent with that employed in other mobile services.[239] The Commission should also eliminate Section 101.1421, which governs the mitigation of interference among MVDDS operators, as that provision would be obviated by the adoption of the median field strength limit.

Annual Reporting. The Commission should eliminate Section 101.1417 of its rules, which requires MVDDS licensees to file an annual report with subscriber numbers, total annual hours of service, and periods when no service is offered. The rule was adopted at a time when

---

[238] *See, e.g.*, 47 C.F.R. § 22.359 (Public Mobile Services); 47 C.F.R. § 24.238 (Broadband PCS); *see also Spectrum Frontiers NPRM*, 30 FCC Rcd. at 11959 ¶ 281 n.477 ("For bands over 1 GHz, for example PCS and AWS-1, the Commission has typically set the OOBE limit at 43 dBW/MHz (13 dBm/MHz).").

[239] *See* 47 C.F.R. § 24.238 (Broadband PCS); 47 C.F.R. §§ 27.55(a)(1),(3),(4) (Wireless Communications Services).

the Commission thought MVDDS licensees would offer services similar to multichannel video programming distribution ("MVPD"), and sought to impose similar requirements to assess trends and competition in the MVPD marketplace.[240] That goal is obsolete in view of the proposed flexible use of MVDDS spectrum. Nor are similar requirements imposed on other providers of mobile service on a frequency band basis. MVDDS providers should only be subject to reporting requirements applicable to all providers across bands.[241]

V. The Commission Has Authority to Implement These Proposed Rule Changes

A. The Commission Has Ample Legal Authority to Modify the MVDDS Licenses to Allow for More Robust Two-Way Use of the 12 GHz Band

The Commission has ample legal authority to align the allocations of the 12 GHz band to those for Region 2 by adding a primary Mobile Service allocation, and modify MVDDS licenses: "Title III of the Act provides the Commission with broad authority to manage spectrum[.]"[242] As the Commission noted in the *12 GHz NPRM*, Section 303(y) specifically provides the Commission with authority to provide for flexibility of use if: "(1) such use is consistent with international agreements to which the United States is a party; and (2) the Commission finds, after notice and opportunity for public comment, that (A) such an allocation would be in the public interest; (B) such use would not deter investment in communications services and systems, or technology development; and (C) such use would not result in harmful interference

[240] *See MVDDS Rules Order*, 17 FCC Rcd. at 9687-88 ¶ 186.

[241] *See, e.g.*, Establishing the Digital Opportunity Data Collection, *Third Report and Order*, 36 FCC Rcd. 1126, 1130 ¶ 9 (2021) (discussing procedures for fixed and mobile service coverage reporting).

[242] Reexamination of Roaming Obligations of Commercial Mobile Radio Service Providers and Other Providers of Mobile Data Services, *Second Report and Order*, 26 FCC Rcd. 5411, 5440 ¶ 62 (2011).

among users."[243] Section 303(y) encompasses the authority to increase the number of allocations in a band.[244] It also authorizes the Commission to allow licensees of a spectrum band to "utilize the spectrum for any terrestrial use permitted by the United States Table of Frequency Allocations contained in Part 2 of the Commission's rules, provided that the licensee complies with the applicable service rules."[245]

The Commission's authority to enable flexible spectrum use derives from other sources, too. The Commission has used the public interest mandate in Section 303(b) to increase the flexibility of spectrum use by "establish[ing] flexible service rules within the established allocations for the band," and thereby "help[ing] ensure that spectrum is put to its most efficient and beneficial use."[246] Such rules, when adopted through a notice and comment rulemaking like

[243] *12 GHz NPRM*, 36 FCC Rcd. at 615 ¶ 21 (citing Balanced Budget Act of 1997, Pub. L. No. 105-33, 111 Stat 251, 268-69 sec. 3005 Flexible Use of Electromagnetic Spectrum (codified at 47 U.S.C. § 303(y))).

[244] *See* Expanding Access to Broadband and Encouraging Innovation Through Establishment of an Air-Ground Mobile Broadband Secondary Service for Passengers Aboard Aircraft in the 14.0-14.5 GHz Band, *Notice of Proposed Rulemaking*, 28 FCC Rcd. 6765, 6779-80 ¶ 48 (2013) ("*Air-Ground Mobile Broadband NPRM*").

[245] *AWS-4 Order*, 27 FCC Rcd. at 16187 ¶ 222 ("In order to promote innovative broadband services and encourage the flexible and efficient use of the AWS-4 band, we will allow a licensee of AWS-4 authority to utilize the spectrum for any terrestrial use permitted by the United States Table of Frequency Allocations contained in Part 2 of the Commission's rules, provided that the licensee complies with the applicable service rules.").

[246] *Air-Ground Mobile Broadband NPRM*, 28 FCC Rcd. at 6779-80 ¶ 48; *see* 47 U.S.C. § 303(b) (the Commission may "[p]rescribe the nature of the service to be rendered by each class of licensed stations and each station within any class").

this one, can modify retroactively the operating authority in existing Commission authorizations.[247] Courts have sustained such retroactive application when reasonable.[248]

The Commission may also use its waiver authority to promote rapid, flexible deployment of services. Under Section 1.925 of its rules, the Commission may grant a waiver if it is shown that either (1) the underlying purpose of the rules would not be served by application to the instant case, and that a grant of the requested waiver would be in the public interest; or (2) because of special circumstances, application of the rules would be inequitable, unduly burdensome or contrary to the public interest, or the applicant has no reasonable alternative.[249] The Commission previously relied on this authority to grant a waiver of the MVDDS power limits and allow operation at higher power levels, finding that such waiver would promote the development of MVDDS service.[250]

In addition, Section 316 authorizes the Commission to modify incumbent licenses subject to certain procedural safeguards and its determination that "such action will promote the public

---

[247] *See* Amendment of Sections 90.365 and 90.377 of the Commission's Rules to Change the Co-Channel Mileage Separation and Frequency Loading Standards for Conventional Land Mobile Radio Systems in the Bands 806-821 and 851-866 MHz, *Notice of Proposed Rulemaking*, 71 FCC 2d 1356, 1358-59 ¶ 7 (1979).

[248] *General Telephone Co. of Southwest v. United States*, 449 F.2d 846, 863 (5th Cir. 1971) (explaining that "[i]n a complex and dynamic industry such as the communications field, it cannot be expected that the agency charged with its regulation will have perfect clairvoyance"); *see also United States v. Storer Broadcasting Co.*, 351 U.S. 192 (1956); *American Airlines v. Civil Aeronautics Board*, 359 F.2d 624 (D.C. Cir. 1966); *Air Line Pilots Ass'n v. Quesada*, 276 F.2d 892 (2d Cir. 1960); *WBEN, Inc. v. United States*, 396 F.2d 601 (2d Cir. 1968).

[249] 47 C.F.R. § 1.925.

[250] MDS Operations, Inc., Request for Waiver of Certain Multichannel Video Distribution and Data Service Technical Rules for One Station in Sandia Park, New Mexico, *Order*, 25 FCC Rcd. 7963, 7971-72 ¶ 22 (2010); South.com, LLC, OET File No. 0864-EX-ST-2012 (granted Nov. 20, 2012).

interest, convenience, and necessity[.]"[251] As the D.C. Circuit explained, "Section 316 grants the Commission broad power to modify licenses; the Commission need only find that the proposed modification serves the public interest, convenience and necessity."[252] The Commission may exercise its Section 316 authority through a rulemaking proceeding.[253]

Section 316 does not permit the Commission to make a "fundamental change" to a license, such as effective revocation of the license or causing a substantial disruption to a licensee's ability to provide service.[254] But courts have repeatedly found that, if a licensee can continue to provide substantially the same service, a modification to that license is not a fundamental change.[255] Moreover, adding a new service to a licensee is permitted under Section 316. The Commission has repeatedly done just that. For example, the Commission has given Ancillary Terrestrial Component rights to MSS licensees in a number of bands.[256] In one of these bands, the 2 GHz spectrum, the Commission has gone further and relied on Section 316 to

---

[251] 47 U.S.C. § 316(a)(1).

[252] *California Metro Mobile Communications Inc. v. FCC*, 365 F.3d 38, 45 (D.C. Cir. 2004).

[253] *See Celtronix Telemetry, Inc. v. FCC*, 272 F.3d 585, 589 (D.C. Cir. 2001) (citing cases and noting that the Commission retains the power "to alter the term[s] of existing licenses by rulemaking").

[254] *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").

[255] *See Community Television Inc. v. FCC*, 216 F.3d 1133, 1140-41 (D.C. Cir. 2000) (holding transitory additional channel for broadcasters was not a "fundamental" change, given that "[b]roadcasters will begin and end the transition period broadcasting television programming to the public under very similar terms"); *see also Cellco Partnership v. FCC*, 700 F.3d 534, 543-44 (D.C. Cir. 2012) (rejecting the argument that imposing an obligation to offer data roaming agreements to other mobile data providers on "commercially reasonable" grounds is a "fundamental change").

[256] *See* Flexibility for Delivery of Communications by Mobile Satellite Service Providers in the 2 GHz, Band, the L-Band, and the 1.6/2.4 GHz Bands, *Report and Order and Notice of Proposed Rulemaking*, 18 FCC Rcd. 1962, 1965-66 ¶ 3 (2003) ("*2 GHz MSS Order*") (allowing 2 GHz MSS, L-band, and Big LEO operators to seek authority to integrate ATCs into existing and planned systems).

"modify the 2 GHz MSS licenses to add terrestrial rights,"[257] including flexible use fixed and mobile services. The preconditions to a proper license modification under Section 316 can be easily met here: notification of the licensees who licenses would be modified, and opportunity to protest.[258]

B. Expanding Rights to Terrestrial Flexible Use to Current Licensees Serves the Public Interest and Is Consistent with International Authorizations

Allocating the 12 GHz band for mobile, two-way use is squarely in the public interest. The Commission has recognized that the public interest benefits of flexible use are manifold.[259] "[T]he establishment of maximum feasible flexibility in both allocations and service rules [is] a critical means of ensuring that spectrum is put to its most beneficial use."[260] Indeed, "[i]n the majority of cases, efficient spectrum markets will lead to use of spectrum for the highest value end use,"[261] and spur technology development and investment in communications services and systems.

The Commission has also acknowledged that allocating bands for both fixed *and* mobile services facilitates the development of advanced services that promote the public interest.[262]

---

[257] *See AWS-4 Order*, 27 FCC Rcd. at 16168 ¶ 174.

[258] *See* 47 U.S.C. § 316(a).

[259] *See* Service Rules for Advanced Wireless Services in the 1915-1920 MHz, 1995-2000 MHz, 2020-2025 MHz and 2175-2180 MHz Bands, *Notice of Proposed Rulemaking*, 19 FCC Rcd. 19263, 19269-70 ¶ 12 (2004).

[260] Services Rules for Advanced Wireless Services in the 2000-2020 MHz and 2180-2200 Bands, *Notice of Proposed Rulemaking and Notice of Inquiry*, 27 FCC Rcd. 3561, 3593 ¶ 101 (2012).

[261] Principles for Reallocation of Spectrum to Encourage the Development of Telecommunications Technologies for the New Millennium, *Policy Statement*, 14 FCC Rcd. 19868, 19870 ¶ 9 (1999).

[262] Reallocation and Service Rules for the 698-746 MHz Spectrum Band (Television Channels 52-59), *Report and Order*, 17 FCC Rcd. 1022, 1030 ¶ 15 (2002); Service Rules for the 746-764 and 776-794 MHz Bands, and Revisions to Part 27 of the Commission's Rules, *First Report and*

Two-way mobile service is consistent with international agreements to which the United States is a party. That the 12 GHz band has not been proposed at the ITU for 5G or International Mobile Telecommunications (IMT) use at this time is of little significance.[263] The ITU Radio Regulations allocate the 12 GHz band in Region 2 to "Mobile except Aeronautical Mobile" use.[264] This is the same allocation that the Commission adopted for the 3.7-3.98 GHz band, which will be used for 5G services.[265] In addition, the Commission can, and does, ensure that authorized services are consistent with international agreements through licensing conditions. Current MVDDS licenses, for example, are subject to conditions of International Footnote 5.490 of the Table of Allocations and future international agreements with Canada or Mexico, and contain prohibitions and restrictions affecting operations near the Canadian or Mexican borders.[266] In fact, the addition of a Mobile Service allocation would cure the current deviation of the domestic Table of Allocations from the international rules, which were themselves enacted pursuant to a treaty that binds the U.S. While such deviations are countenanced by the ITU community provided that the deviating administration accepts, and does not cause, interference owing to its departure from the international norm, the U.S. rightly discourages this practice for other countries and itself alike.

The Commission has also recognized the public interest benefits of two-way mobile services. The Commission amended Parts 21 and 74 of its rules to provide licensees in the

---

Order, 15 FCC Rcd. 476, 486 ¶ 22 (2000) (concluding that a flexible use broadcast and fixed and mobile allocation satisfied the requirements of Section 303(y)).

[263] *12 GHz NPRM*, 36 FCC Rcd. at 615 ¶ 21 n.66.

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

[265] *C-Band Order*, 35 FCC Rcd. at 2370-71 ¶ 55.

[266] *See* DISH Network L.L.C., ULS File No. 0005462793 (granted July 26, 2004).

Multipoint Distribution Service ("MDS") and Instructional Television Fixed Service ("ITFS"), which had formerly provided primarily one-way video services, to provide a wide range of high-speed, two-way services to a variety of users.[267] The Commission explained that doing so provided the licensees with substantially increased operational and technical flexibility.[268] As the Commission explained in the *AWS-4 Order*, granting terrestrial authority to operate in the AWS-4 band to the current 2 GHz MSS licensees, through Section 316 license modifications, served the public interest.[269] The Commission concluded that this approach provided the "best and fastest method for bringing this spectrum to market."[270] Additionally, the Commission recognized that the assignment of "terrestrial use rights must be made to the existing MSS authorization holders to allow coordination and prevention of harmful interference."[271]

Here too, modifying existing MVDDS licenses to permit two-way mobile services is the best and fastest approach. The MVDDS licensees are also already operating in the band today and have already engaged in efforts to avoid and resolve interference issues in the band. Further, DISH—as one of the two DBS providers in the band and a provider of MVDDS—is uniquely positioned to understand and prevent harmful interference between the satellite and terrestrial services—just as the existing MSS licensees were in the AWS-4 proceeding. Because DISH and

[267] Amendment of Parts 1, 21 and 74 to Enable Multipoint Distribution Service and Instructional Television Fixed Service Licensees to Engage in Fixed Two-Way Transmissions, *Report and Order on Further Reconsideration and Further Notice of Proposed Rulemaking*, 15 FCC Rcd. 14566, 14567 ¶ 1 (2000).

[268] *Id.*

[269] *AWS-4 Order*, 27 FCC Rcd. at 16167 ¶ 169.

[270] *Id.* at 16170 ¶ 178.

[271] *Id.* at 16120 ¶ 45.

DIRECTV provide their DBS services in a similar manner, DISH's ability to protect against interference with its DBS services also applies to DIRECTV's services.

C. The Requested Flexibility Does Not Require a Re-Auction of the Spectrum

The Commission is not required to auction any additional terrestrial rights created though this proceeding. First of all, the Commission's auction authority and duty is preconditioned on the existence of an initial license or construction permit.[272] No initial licenses or construction permits would be made available here. The initial licenses for terrestrial services in the band are the ones already bid for and won by MVDDS licensees.[273]

The Commission has broad authority under the Communications Act to "consider the public interest in deciding whether to forgo an auction."[274] Section 309(j) requires competitive bidding for mutually exclusive applications, but "[n]othing in Section 309(j) requires the Commission to accept mutually exclusive applications in the first place."[275] In addition, Section 309(j)(6)(E) makes clear that the auction provision does not relieve the Commission of the obligation in the public interest to continue to use "other means" to avoid mutual exclusivity.[276]

---

[272] 47 U.S.C. § 309(j)(i).

[273] Service Rules for Advanced Wireless Services in the 2000-2020 MHz and 2180-2200 MHz Bands, *Order on Reconsideration*, 33 FCC Rcd. 8435, 8442-43 ¶ 18 (2018); *see also 2 GHz MSS Order*, 18 FCC Rcd. at 2070 ¶ 224 ("We also reject the argument that we are required to treat ATC authorizations as initial licenses subject to the auction requirements of section 309(j). We agree with those commenters who argue that, because the terrestrial rights associated with a grant of ATC authority to MSS operators will be directly linked to existing MSS authorizations, there will be no separate 'initial' authorizations, and therefore no requirement to use competitive bidding to assign such rights.").

[274] *See M2Z Networks, Inc. v. FCC*, 558 F.3d 554, 563 (D.C. Cir. 2009) (upholding the Commission's determination to forgo an auction).

[275] 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) ("*800 MHz Order*").

[276] *See* 47 U.S.C. 309(j)(6)(E).

The Commission's modification of Nextel's license to permit operations in the 1.9 GHz band, as part of the *800 MHz* proceeding, is one representative example. There, the Commission recognized that "[w]here a modification would be so major as to dwarf the licensee's currently authorized facilities and the application is mutually exclusive with other major modifications or initial applications, [then] the Commission will consider whether these applications are in substance more akin to initial applications and treat them accordingly for purposes of competitive bidding."[277] But the Commission concluded that it would not open the spectrum to completive applications: the nature of the modification did not work a major change because it left Nextel in a "comparable position to that which it now occupies."[278] The authorizations that Nextel would hold as a result of the restructuring process did not "differ significantly enough–in terms of rights and responsibilities–from Nextel's existing authorizations so as to warrant treatment as the issuance of an initial license rather than as a modification of license."[279] Moreover, and importantly, the Commission decided in its discretion that there would be no competing applications to consider: the Commission had not "authorized the filing of applications for this spectrum, ha[d] never proposed to do so, and . . . conclude[d] that it is not in the public interest to open the spectrum for competitive applications."[280]

Modifying MVDDS licenses to allow two-way mobile service leaves these licensees in a "comparable position." No change in the amount of spectrum available for use by the current MVDDS licensees would occur. The MVDDS licensees would also remain subject to similar restrictions on their rights—including having to protect DBS.

---

[277] *See 800 MHz Order*, 19 FCC Rcd. at 15014 ¶ 70.

[278] *Id.* at 15015 ¶ 72.

[279] *Id.* at 15015 ¶ 72 n.236.

[280] *Id.* at 15014-15 ¶ 71.

Finally, any benefit would not constitute a windfall. As in the 2 GHz MSS proceeding, the license modifications here would be accompanied by limitations to, and significant costs for, the MVDDS licensees, and thus would not "rise to a level that constitutes unjust enrichment or requires that [the Commission] consider the modification . . . as the assignment of initial licenses."[281] In fact, the technical interference protections and spectrum efficiencies in DISH's proposal create benefits and increase the value of all existing licenses.

VI. Conclusion

The Commission should secure essential mid-band spectrum for 5G by allocating the 12.2-12.7 GHz band to flexible Mobile Service in conformity with the international Table of Frequency Allocations for Region 2. In order to ensure the trifecta of three services sharing the spectrum, the Commission should also establish rules that recognize the benefits of a flexible terrestrial service while protecting the 22 million households receiving DBS service, and enabling coexistence with NGSO operations.

Jeff Blum, Executive Vice President,
External & Legislative Affairs
Alison Minea, Director & Senior Counsel
Hadass Kogan, Director & Senior Counsel
DISH NETWORK CORPORATION
1110 Vermont Avenue, N.W., Suite 450
Washington, D.C. 20005
(202) 463-3702

/s/
Pantelis Michalopoulos
Christopher Bjornson
Andrew M. Golodny
Matthew R. Friedman
STEPTOE & JOHNSON LLP
1330 Connecticut Avenue, N.W.
Washington, D.C. 20036
(202) 429-3000

Counsel for DISH Network Corporation

May 7, 2021

[281] *2 GHz MSS Order*, 18 FCC Rcd. at 2071 ¶ 228.

Exhibit 1

Declaration of Tom Peters

DECLARATION OF TOM PETERS

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 submitted in April 2016 requesting that Multichannel Video Distribution and Data Service ("MVDDS") spectrum be made available for 5G deployments.[1] I authored both studies. The results demonstrate that a two-way terrestrial mobile service in the 12.2-12.7 GHz band ("12 GHz band") can operate at higher power levels (equivalent isotropically radiated power, or "EIRP") than currently allowed and meet the Equivalent Power Flux Density ("EPFD") limits designed to protect Direct Broadcast Service ("DBS") operations.[2] This declaration reaffirms the results of those studies and discusses subsequent technological and operational developments that have occurred since June 2016, which have further facilitated coexistence between terrestrial 5G networks and DBS receivers.

2. The 2016 studies were deterministic, worst-case analyses. They assumed that a DBS antenna (1) may be located in any 1x1 square meter area of any rooftop that could support a DBS antenna, even though of course, actual dish populations are far less ubiquitous, both because of a less-than-universal take rate, and because some building locations are unlikely places for installing a dish, and (2) would have a view to any of seven DBS satellites for which the antenna's location had line-of-sight, and assumed the worst-case satellite pointing direction in the EPFD calculation. Although the MVDDS EPFD levels are extremely stringent, the studies found that 12 GHz terrestrial deployments can coexist with DBS.

3. Both 2016 studies considered outdoor small cells in an urban area (the "urban canyon" scenario) in downtown Indianapolis and the central business district of downtown Washington, DC. The studies showed that the 5G transmissions would not ever exceed EPFD limits in the vast majority of locations, that they would do so only in a small

[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).

[2] 47 C.F.R. § 101.105(a)(4)(ii)(B).

minority of locations and only in the worst possible case, and that many of these locations were building parapets (not the rooftops where DBS dishes are generally located), or buildings under construction (devoid of protective walls that would attenuate the 5G signal). For the vast majority of locations, the EPFD limits would never be exceeded, even in the worst case.

4. The 2016 studies also considered two indoor deployment case studies (the indoor small cell scenario), first in a multi-level mall in downtown Indianapolis and then in a large sports arena in Washington, D.C. Both studies assumed that multiple indoor antennas were installed on multiple levels of the venues to provide seamless indoor coverage and capacity. In both cases, the penetration losses of the walls and windows kept EPFD levels on nearby rooftops within the required limits while providing valuable mobile broadband capacity to patrons in these crowded venues.

5. Finally, the first coexistence report also considered a point-to-point link in a rural area outside Indianapolis, since the 500 megahertz of the 12 GHz band is a prime band for wireless backhaul. The study found that the very narrow beamwidth of the transmit antennas focused energy where it was needed and did not exceed EPFD levels on rooftops in and around the area of the link.

6. In the nearly five years since those reports were submitted, technology has advanced significantly, with beamforming and beamsteering of 5G base stations progressing from theoretical concepts to a commercially practical reality. Current 5G equipment supports these technologies today such that the phased array panel antennas used by wireless base stations can transmit narrowly focused beams, with very little unfocused radiation. These beams are capable of tracking mobile devices such that the transmitted energy is directed only where it is wanted and not where it could cause excessive EPFD levels or create interference.

7. In contrast, the 2016 studies assumed a 5G deployment consisting of omnidirectional small cells with relatively low power. To meet the stringent EPFD levels, the height and power needed to be relatively low because the energy from base stations was transmitted in all

directions. However, with current 5G technology, it may be possible to meet the current EPFD restrictions with higher and more powerful base station transmissions.

8. One key to successful coexistence between terrestrial 5G and DBS will be identifying spectrum availability. As stated above, the 2016 studies assumed that a DBS antenna pointed at the worst-case satellite would be located in each square meter rooftop area that was capable of supporting an antenna. It is unrealistic and unnecessary to protect receivers that are not physically present. Although the 2016 studies showed that this highly conservative approach was possible, there are more sophisticated and efficient ways to achieve even more meaningful coexistence. One such way is to enlist a secure database managed by a neutral third-party host who would identify spectrum availability whenever required. The FCC's current rules, by contrast, include an antiquated "paper" process through which DBS operators and MVDDS licensees are expected to coordinate their deployments by an iterative exchange of letters.[3] Nearly 20 years later, this months-long process can easily be replaced with a modern cloud-based database that can achieve the same result in fractions of a second.

9. With a database of spectrum availability, 5G technology can be configured to protect those specific locations where DBS receivers exist. The system would supply the information necessary to ensure EPFD levels are met only where they need to be met and perhaps even *when* they need to be met. For example, antenna technology can confirm that nulls between beams are always steered toward nearby DBS antennas to ensure that the received power at that location is low and EPFD limits are met. If necessary, other means can be used to ensure compliance with the EPFD limits, including modifying base station parameters or even providing physical shielding.

10. Recent technology developments have provided operators with a remarkable set of tools that can be used to mitigate interference and ensure coexistence between disparate services in the same band. These tools can easily be put to use in the 12 GHz band to increase the efficient use of 500 megahertz of spectrum by allowing it to provide two-way, high-power

[3] *See* 47 C.F.R. § 101.1440.

5G services to the U.S. population. The 2016 studies showed that this was feasible even without modern antenna technology and assuming the worst-case coexistence scenarios, but the recent advances in 5G technology provide even greater assurance that coexistence in the 12 GHz band is feasible.

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