Before the
Federal Communications Commission
Washington, DC 20554

In the Matter of	)	
Upper C-band (3.98 to 4.2 GHz)	)	GN Docket No. 25-59
	)	

To: The Commission

COMMENTS OF
OPEN TECHNOLOGY INSTITUTE AT NEW AMERICA
AND PUBLIC KNOWLEDGE

New America's Open Technology Institute
740 15th Street, NW Suite 900
Washington, DC 20005

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The Open Technology Institute at New America and Public Knowledge ("OTI & PK") hereby submit these comments in response to the Notice of Inquiry in the above-referenced proceeding.[1] As discussed below, our groups urge the Commission to propose changes that make all of the 3.98-4.2 GHz band available for more intensive licensed and shared use. The Commission can achieve this through a combination of consolidating incumbents to enable a new flexible use allocation in the lower portion of the band, and by authorizing shared use by mobile satellite and/or fixed wireless services in the upper portion of the band.[2]

I. INTRODUCTION AND SUMMARY

OTI & PK commend the Commission for requesting comment on "whether, and if so, how to introduce new operations in the Upper C-band" and on "other possible approaches, and the costs and benefits of such approaches, that we should consider in addition to those discussed

[1] *Upper C-band (3.98 to 4.2 GHz)*, Notice of Inquiry, GN Docket No. 25-59, FCC 25-13 (rel. Feb. 28, 2025) ("*NOI*").

[2] OTI & PK have also joined separate comments submitted by the National Congress of American Indians and other tribal advocates that support a Tribal Licensing Window for any future auction of Upper C-Band spectrum.

in this *NOI*."[3] Our groups urge the Commission to adopt changes that make all of the 3.98-4.2 GHz band available for more intensive licensed and shared use. The Commission can achieve this through a combination of consolidating Fixed Satellite Service (FSS) incumbents – enabling a new flexible use allocation in the lower portion of the band – and by authorizing shared use by mobile satellite and/or fixed wireless services in the upper portion of the band.

The pending merger of FSS incumbents SES and Intelsat, if approved, creates the opportunity for further consolidation of the band, potentially freeing up another substantial tranche of prime mid-band spectrum. However, while a similar consolidation could clear and repurpose a substantial portion of the band without displacing the incumbent FSS operators entirely (e.g., 100 megahertz), we believe that the diminishing demand for geostationary satellite (GSO) services as a conduit for broadcast, cable and other content that relies on C-Band justifies either a potential transition to new technologies that substitute for C-Band as a downlink for FSS or, at a minimum, additional allocations for coordinated shared use of the remaining FSS portion of the band.

During the original C-Band proceeding, our groups proposed that any portion of the band that remained allocated to FSS could be coordinated for sharing by fixed links – both point-to-point and point-to-multi-point (PtMP) – with no risk of harmful interference and tremendous benefits for broadband coverage and capacity in predominantly rural areas. The Commission deferred that opportunity, explaining that authorizing coordinated sharing on a secondary basis could "complicate the repacking and relocation of FSS operations." Going forward, the proven effectiveness of database-assisted frequency coordination should allow the Commission to authorize fixed PtMP providers to coordinate shared use across the whatever portion of the band

[3] *NOI* at ¶¶ 2, 16; *see also id*. at ¶ 7.

remains in use for FSS. With the benefit of a streamlined frequency coordination system, this approach can maximize the public interest benefits of the band, promoting enhanced rural connectivity while ensuring protection for incumbent FSS and adjacent band altimeters.

More recently, direct-to-device (D2D) connectivity by MSS operators has emerged as a major opportunity to facilitate seamless connectivity, innovation and competition that will benefit consumers and enterprises alike. Regardless of how much of the Upper C-Band can be repurposed for flexible use after the merger of SES and Intelsat, any remaining FSS portion of the band will be lightly used no matter how vital it is to its video programming and other customers. This creates a timely opportunity to add an allocation to the Mobile Satellite Service (MSS). We urge the Commission to consider adding a new MSS allocation in the Upper C-Band rather than waiting years to see if rulemakings on sharing the narrow and currently occupied MSS bands in the 2 GHz range can coordinate in additional operators.

We believe that now is the time to put the entire remainder of C-Band to work for improved connectivity, boosting capacity and competition among both terrestrial and non-terrestrial networks.

II. THE COMMISSION SHOULD SEEK TO REPURPOSE OR MORE INTENSIVELY SHARE THE ENTIRE UPPER C-BAND FOR A COMBINATION OF NEW TERRESTRIAL AND SATELLITE SERVICES

OTI & PK urge the Commission to adopt the goal of making all of the 3.98-4.2 GHz band available for more intensive licensed and shared use. The Commission can achieve this through a combination of consolidating incumbents to enable a new flexible use allocation in the lower portion of the band, and by authorizing shared use by MSS operators and/or fixed wireless services in the upper portion of the band.

During the original C-Band proceeding, our groups proposed that any portion of the band that remained FSS could be coordinated for sharing by fixed links – both point-to-point and point-to-multipoint – with no risk of harmful interference and tremendous benefits for broadband coverage and capacity in predominantly rural areas. The Commission deferred that opportunity in its *2020 C-Band R&O*. More recently, direct-to-device (D2D) connectivity by MSS operators has emerged as a major opportunity to facilitate seamless connectivity, innovation and competition that will benefit consumers and enterprise alike.

Our groups believe that now is the time to put the entire remainder of C-Band to work for improved connectivity, boosting capacity and competition among both terrestrial and non-terrestrial networks. Authorizing additional shared use of the lightly-used FSS portions of the Upper C-Band is also consistent with the Commission's 2023 Policy Statement on Efficient Use of Spectrum for New Services.[4] As the Commission explained there, it is necessary to revisit previous rules based on outdated technologies in order to facilitate the delivery of new services.

A. FSS Incumbents Can Again Consolidate Higher in the Band, Clearing the Lower Portion for Flexible Use

In its 2020 C-Band *Report & Order* the Commission correctly concluded that the 500 megahertz band assigned almost exclusively to the Fixed Satellite Service (FSS) was wildly underutilized and could be consolidated, freeing up the lower 280 megahertz for a traditional public overlay auction.[5] The impending merger between the two FSS incumbents, which together

[4] Principles for Promoting Efficient Use of Spectrum and Opportunities for New Services, Promoting Efficient Use of Spectrum Through Improved Receiver Standards, 38 FCC Rcd 3682 (2023).

[5] *Expanding Flexible Use of the 3.7 to 4.2 GHz Band*, GN Docket No. 18-122, Report and Order and Order of Proposed Modification, 35 FCC Rcd 2343, 2353–90, at ¶ 24 (2020) (*2020 C-Band R&O*).

account for more than 90% of the band's limited use,[6] creates another valuable opportunity to clear and reallocate a substantial portion of the Upper C-Band. However, the Commission should not limit its policy goals to another round of consolidation and auction for terrestrial flexible use. Just five years later, technology and market trends suggest that this approach can be repeated and taken further, both clearing substantial portions of the Upper C-Band for reallocation to flexible use *and* authorizing more intensive and coordinated shared use for mobile satellite services and/or fixed wireless broadband in the upper most portion of the band that FSS incumbents continue to occupy, or which are not feasible for high-power terrestrial use.

1. The Commission Should Consider the Degree to Which Fiber or Satellite Services can Meet the Needs of FSS Incumbents

In the *2020 C-Band R&O*, the Commission facilitated the consolidation of incumbent services into the 4.0-4.2 GHz portion of the band by requiring winning bidders in the auction to "reimburse the reasonable relocation costs of eligible incumbent FSS space station operators, FSS earth station operators, and FS licensees," a process managed by a third-party Relocation Payment Clearinghouse.[7] Now the Commission "seek[s] comment on whether similar authorization and transition mechanisms could be used."[8]

At a minimum, it appears that the pending merger of FSS incumbents SES and Intelsat, if approved, creates the opportunity for further consolidation of the band, potentially freeing up

[6] In 2020 then-Chairman Pai noted that "[t]he two largest satellite operators, Intelsat and SES . . . together account for more than 90% of the services provided" in the C-band. Letter from Ajit Pai, Chairman, FCC, to The Honorable Bill Posey (Aug. 11, 2020), available at https://docs.fcc.gov/public/attachments/DOC-366309A1.pdf.

[7] *NOI* at ¶ 4.

[8] *NOI* at ¶ 7.

another substantial tranche of prime mid-band spectrum.[9] However, while a similar consolidation could clear and repurpose a substantial portion of the band without displacing the incumbent FSS operators entirely (e.g., 100 megahertz), our groups encourage the Commission to consider "alternatives to Upper C-band spectrum for the provision of broadcast, media, and communications services, such as fiber, wireless backhaul, or Ku/Ka-band spectrum."[10] Since the merger itself is a symptom of the diminishing demand for geostationary satellites (GSOs) as a conduit for broadcast, cable, and other content that relies on C-Band, a transition to new technologies that substitute for C-Band as a downlink for FSS seems entirely feasible.

For example, in formulating the clearing and transition framework adopted in 2020, the Commission considered a cable industry proposal to use a portion of the auction revenues to build a fiber network as an alternative to FSS content delivery.[11] The ACA Connects Coalition proposed to transition the transmission of all cable video programming to fiber, thereby making an additional 90 megahertz available for repurposing (370 megahertz in total).[12] The

[9] The SES/Intelsat merger deal reportedly includes contingent value rights that entitle Intelsat shareholders to receive 42.5% of any future spectrum sale proceeds from a combined total of up to 100 MHz of C-band spectrum. *See* SES-Intelsat Transaction Deal Terms and Frequently Asked Questions, Intelsat (Apr. 30, 2024), https://www.intelsat.com/resources/blog/ses-intelsat-transaction-deal-terms-and-frequently-asked-questions/.

[10] *NOI* at ¶ 7.

[11] *See 2020 C-Band R&O* at ¶ 19; Letter from Ross Lieberman, Counsel to ACA Connects, Alexi Maltas, Counsel to CCA, and Elizabeth Andrion, Counsel to Charter, to Marlene H. Dortch, Secretary, FCC, GN Docket No. 18-122 (July 2, 2019) ("ACA Connects Coalition Proposal"); Letter and Cartesian Study from Pantelis Michalopoulos, Counsel for ACA Connects, to Marlene H. Dortch, Secretary, FCC, GN Docket No. 18-122 (July 9, 2019).

[12] *See* Letter from Ross Lieberman, Counsel to ACA Connects, Alexi Maltas, Counsel to CCA, and Elizabeth Andrion, Counsel to Charter, to Marlene H. Dortch, Secretary, FCC, GN Docket No. 18-122 (filed July 2, 2019) (ACA Connects Coalition Proposal); Letter and Cartesian Study from Pantelis Michalopoulos, Counsel for ACA Connects, to Marlene H. Dortch, Secretary, FCC, GN Docket No. 18-122 (July 9, 2019).

Commission rejected this approach, finding that the "ACA Connects Coalition proposal brings with it a bevy of challenges," both legal and practical.[13]

One set of problems relates to the Commission's legal authority. The plan would have set aside auction revenue to pay for a multi-year fiber buildout, which the Commission found would violate the Section 309(j) requirement that all auction proceeds must be deposited in the U.S. Treasury.[14] Moreover, and most relevant here, the ACA Connects plan would have not merely consolidated FSS operations into a smaller sub-band (as the Commission ultimately did), while preserving their existing service; it would have required incumbent FSS operators "to relinquish spectrum usage rights in exchange for a share of the auction proceeds."[15] The Commission explained that although its incentive auction authority is an exception to the rule requiring all proceeds to be deposited in the Treasury, that authority requires it to conduct a reverse auction among competing licensees (as it did with broadcast licensees in 2016). And inasmuch as the entire C-Band (3700-4200 GHz) was a satellite band with access and use rights shared equally among any and all FSS incumbents, the Commission lacked the authority to conduct an incentive auction in this context.[16] The Commission also rejected T-Mobile's proposal for an overlay incentive auction, concluding it suffered from that same legal infirmity.[17]

If Congress simply extends the Commission's incentive auction authority without change, this restriction remains with respect to a complete clearing of the Upper C-Band (4.0-4.2

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[13] *2020 C-Band R&O* at ¶ 53.

[14] *Id*. at ¶ 52.

[15] *Id*.

[16] *Id*. ("because space station operators have non-exclusive rights the full C-band nationwide, an incentive auction in this band would fail to satisfy the Section 309(j)(8)(G) requirement that at least two competing licensees must participate in the reverse auction.")

[17] *Id*. at ¶ 43 ("T-Mobile's proposal exceeds our incentive auction authority").

GHz) currently allocated for shared use by MSS providers. Section 316 of the Communications Act gives the Commission broad authority to modify licenses "if in the judgment of the Commission such action will promote the public interest, convenience, and necessity."[18] As the Commission concluded in its *2020 C-Band R&O,* it has ample precedent and authority to consolidate an incumbent service – voluntarily or involuntarily – into a smaller portion of a band (as it did with FSS in 2020), to rearrange licensees within a band, or even to move an incumbent to a different band.[19]

However, the Commission cannot simply terminate an ongoing incumbent service, or even make a modification that amounts to a "fundamental change" to a licensee's ability to continue its service.[20] As the Commission acknowledged in its *2020 C-Band R&O*: "we agree that eliminating an incumbent space station operator's right to transmit entirely would not be a modification."[21] On the other hand, "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."[22] Accordingly, in its *2020 C-Band R&O* the Commission found that "the upper 200 megahertz of spectrum we are reserving for future FSS operations is sufficient to continue the services . . ."[23]

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[18] 47 U.S.C. § 316. *See also California Metro Mobile Commc'ns, Inc. v. FCC*, 365 F.3d 38, 45 (D.C. Cir. 2004) ("Section 316 grants the Commission broad power to modify licenses.").

[19] *2020 C-Band R&O* at ¶¶ 111, 126-127.

[20] *See 2020 C-Band R&O* at ¶ 129; *MCI Telecommunications Corp. v. AT&T*, 512 U.S. 218, 228 (1994) (holding that statutory "authority to 'modify' does not contemplate fundamental changes"). "Does the Commission have authority not just to modify but to eliminate the interference protection rights of an entire class of earth station registrants entirely? If so, under what statutory provision and what are the limits of such authority?" *2020 C-Band R&O* at ¶ 53.

[21] *Id*. at ¶ 137.

[22] *2020 C-Band R&O* at ¶ 129.

[23] *Id*. at ¶ 130.

As a result, in this proceeding, a mandate that effectively moves customers of the current FSS incumbents to a different mode of transmission (e.g., fiber, fixed wireless) would run afoul of this limitation. On the other hand, the Commission can consider whether it would be feasible for the MSS incumbents – after a transition and with cost reimbursement – to provide substantially the same service from a different set of satellite frequency bands, or in a small portion of the same band that could be coordinated with an additional service (discussed further below).

Another set of problems identified in the *2020 R&O* were more practical. In its *2020 C-Band R&O*, the Commission also cited the potential delay and uncertainty (for both bidders and the current customers relying on FSS) involved in completely replacing satellite delivery with fiber while ensuring that consumers would not lose access to programming.[24] The *Order* concludes that a band reorganization and consolidation led by the incumbent FSS providers would likely provide greater certainty for all stakeholders and ensure that "all incumbent C-band users are adequately transitioned and able to continue receiving C-Band services . . .."[25]

In addition, not all current users of the upper C-band are similarly situated. As the *NOI* states, C-Band satellites "primarily deliver programming content to television and radio broadcasters throughout the country, as well as providing telephone, data, and satellite communications services to customers on a contractual basis, including federal users."[26] While

[24] *Id*. at ¶¶ 50-51. "FSS operations in the C-band are critical to the delivery of television and radio programming, as well as many other services, for tens of millions of American and it is in the public interest to ensure that these services are not disrupted." *Id*. at ¶ 161.

[25] *2020 C-Band R&O* at ¶ 50 ("we find that our approach will more effectively ensure that all incumbent C-band users are adequately transitioned and able to continue receiving C-band services after the introduction of new terrestrial wireless operations in the 3.7 GHz Service").

[26] *NOI* at ¶ 5.

the ACA Connects proposal contemplated fiber to cable headend locations as a comparable (or better) substitute, a wholesale clearing of the 4.0-4.2 GHz band would need to identify an alternative for these users as well, including federal agency systems.

Moreover, as the *NOI* acknowledges, it remains unclear what sort of frequency separation would need to be maintained between any relatively high-power terrestrial flexible use operations and the aircraft altimeters operating in the adjacent band 4.2-4.4 GHz band.[27] Although the interference concerns surrounding the current 220 megahertz separation between full-power mobile carrier operations and aircraft altimeters are being resolved with technology, it seems quite likely that wide-area and high-power mobile use will continue to be subject to a substantial frequency separation.

In sum, even if some combination of fiber and satellite services operating in Ku/Ka-band spectrum could eventually provide a complete substitute for the services of the current FSS licensees relying on C-Band, it may be more legally sound and practical to again consolidate and repurpose the lower portion of the band (e.g., 4.0-4.1 GHz), while maintaining an FSS allocation in 4.1-4.2 GHz together with one or more allocations for compatible shared use.

2. Incumbents Must be Reimbursed for Costs, But in No Event Should Receive 'Acceleration' Payments that Would Reduce Auction Proceeds to the U.S. Treasury

If the Commission relies on its *Emerging Technologies* framework as authority to repurpose another large portion of the band by auction, OTI & PK urge the Commission to again require winning bidders to equitably share the reasonable costs of relocation, but to *not* mandate additional, so-called "acceleration payments" to the FSS incumbent licensees. To motivate a

[27] *See id*. at ¶¶ 6, 11-12.

more expedited clearing process, the *2020 C-Band R&O* required the payment of up to $9.7 billion in acceleration payments over and above the reimbursement of actual relocation costs – and on top of their winning bids in the public auction. We urge the Commission to be very reluctant to duplicate this framework in a manner that effectively uses the value of the public airwaves to give an unnecessary windfall to licensees that are being relocated because they are not making the highest and best use of the spectrum they occupy. The *2020 C-Band R&O* created a precedent that is rife with moral hazard, and which should be replicated only to serve compelling public interest objectives.

In its *2020 C-Band R&O*, it is notable that part of the Commission's rationale for adopting a public auction – and rejecting a private sale of rights to the band by incumbent space station operators – was the acknowledgement that it would be inconsistent with the Commission's auction authority and precedents to grant FSS incumbents new, far more valuable flexible use terrestrial licenses that they could then immediately transfer through privately-negotiated sales in return for a windfall.[28] And yet the $9.7 billion in "acceleration payments," although described as an incentive to achieve an accelerated timeline that would yield even larger benefits to mobile carriers eager to deploy 5G services, also effectively paid the MSS incumbents to *voluntarily* vacate spectrum they didn't actually need to deliver the same services. But this is the same outcome the Commission asserted it had the clear authority to impose *involuntarily* under Section 316 and D.C. Circuit court cases upholding its *Emerging Markets*

[28] *See id*. at ¶ 40 *("*"Under the C-Band Alliance proposal, the Commission would be granting incumbent space station operators new flexible-use rights *solely* for the purpose of allowing the incumbents to sell those rights on the secondary market, without actually requiring them to meet any buildout requirements or initiate terrestrial service.").

approach.[29] Moreover, while the Commission had previously authorized "incoming licensees [to] offer 'premium payments or superior facilities, as an incentive to the incumbent to relocate quickly'," it had never mandated it.[30]

The *2020 C-Band R&O* did articulate public interest considerations that the Commission believed justified acceleration payments, albeit in broad brush.[31] And the Commission described three types of market failure that it believed justified making the acceleration payments mandatory.[32] The *Order* then concluded that "[b]ased on the unique circumstances of the band," it "would best serve the public interest, . . . to condition new licenses on making acceleration payments to satellite incumbents . . .".[33]

While the "unique circumstances" that justified mandatory premium payments to satellite operators five years ago arguably hold true today, there are reasons the Commission should be reluctant to resort to "acceleration" payments for an auction of spectrum today. One is that since a renewal of FCC auction authority is pending now in Congress, the Commission should – as it must – follow the plain language of the renewed authorization. If Congress intends to allow incentive auction authority to include the ability to impose the cost of mandatory incentive

[29] Although a transition greased with $9.7 billion in incentive payments was more likely to occur on schedule, in a footnote the Commission stated that it would have provided for a five-year transition timeline with or without acceleration payments. *Id*. at ¶ 187, n. 498 ("While the acceleration payment should enable an earlier transition, the absence of an acceleration payment would not undermine any conclusion in this order supporting a five-year transition.").

[30] *Id*. at ¶ 184 [citation omitted].

[31] *Id*. at ¶ 185 (noting "the significant public interest benefits of clearing terrestrial, mid-band spectrum more quickly, which would bring next-generation services like 5G to the American public years earlier and help assure American leadership in the 5G ecosystem" and citing two economic studies).

[32] *Id*. at ¶ 186 (describing holdout, free rider and coordination problems).

[33] *Id*. at ¶ 187.

payments on new licensees, it can easily say so. Considering the bipartisan opposition to reports back in 2019 that the FCC might authorize a private market transaction for C-band, yielding an enormous windfall for satellite companies that never paid for spectrum, the Commission should seek more clear legal authority for mandating premium payments.

In addition, the Commission's unprecedented rationale for acceleration payments in 2020 is far less pressing at a time when the growth of commercial mobile service data consumption is rapidly decelerating and the mobile industry has so much surplus C-band spectrum it is using it for an entirely different service: fixed wireless access. Recent reports indicate a steadily slowing growth rate in mobile data usage. For example, Ericsson reported last November that the growth rate for mobile data use has slowed steadily, from 80% in 2019 to 21% in 2024.[34] In contrast, *indoor* wireless data consumption continues its rapid growth, both in absolute and relative terms, as the share of mobile device data traffic offloaded to Wi-Fi (and thus bypassing cellular networks) exceeds 80% in the U.S. and reportedly exceeds 90% in Europe.[35] In fact, the economics of indoor use over shared spectrum allows Comcast, Charter, and Cox to support more than 18 million subscribers with a high-capacity *mobile* service that relies on Wi-Fi for

[34] Ericsson, "Ericsson Mobility Report," at 8 (Nov. 2024), available at https://www.ericsson.com/en/reports-and-papers/mobility-report/reports/november-2024; *See generally* William Webb, "The End of Telecoms History," at pp. 39-49 (July 2024), available at https://www.linkedin.com/pulse/end-telecoms-history-william-webb-1xzqe/.

[35] *See, e.g.*, Comments of Spectrum for the Future to NTIA, "Advancement of 6G Telecommunications Technology," Docket 2024-001, at 2 (August 21, 2024) (OpenSignal data for 2022 shows between 78% and 80% of Verizon, AT&T and T-Mobile mobile subscriber data traffic is carried by Wi-Fi networks); Dynamic Spectrum Alliance, "How Do Europeans Connect To The Internet?" at 4 (2022), (reporting that Wi-Fi represents about 90% of fixed broadband traffic in Europe), available at https://tinyurl.com/DSA-EU-WiFiOffload; Claus Hetting, "Report: US cable MVNOs extract big value from Wi-Fi offload," *Wi-Fi NOW* (Oct. 17, 2019), https://wifinowglobal.com/news-and-blog/report-us-cable-mvnos-benefitting-greatly-from-wi-fi-offload/.

nearly 90% of mobile device data use.[36] In short, mobile operators do not have the sort of short-term need for substantial new mid-band spectrum that they appeared to have five years ago.

Finally, while the 2020 C-Band auction framework ensured that the mandatory acceleration payments did not directly reduce the auction proceeds deposited in the U.S. Treasury, there is little doubt that it reduced the aggregate amount of the auction proceeds by billions of dollars. To be sure, our groups do not oppose auction conditions that serve important public interests (e.g., buildout requirements). Indeed, Section 309(j) explicitly states that considerations of the amount of revenue raised in an auction must not supersede other public interest considerations.[37] Nonetheless, the Commission should be reluctant to impose "acceleration" or other premium payments on winning bidders or other band entrants that exceed actual and reasonable relocation costs.

B. The Upper Portion of C-Band that Remains Allocated to FSS Can be Efficiently Shared for Mobile Satellite Services and/or Fixed Wireless Broadband Services

In 2020 the Commission declined to "complicate the repacking and relocation of FSS operations and earth station registrants" by authorizing any coordinated and shared use of the remaining 200 megahertz of the C-Band that would remain in use by FSS incumbent space and earth stations. OTI and PK urge the Commission to strive to authorize more efficient and intensive use of all of the remaining 220 megahertz in the Upper C-Band. In particular, any

[36] Kohposh Guda, "Comcast Lights Up Wi-Fi Boost Delivering Gig Speeds to Xfinity Mobile Customers on Millions of Wi-Fi Hotspots," Comcast Blog (Apr. 23, 2024), https://tinyurl.com/2thfe979 ("90% of the mobile data traffic on Xfinity Mobile travels over Wi-Fi"). Charter reported 87% offload rates two years ago. Linda Hardesty, "Charter, Comcast Share Their Wi-Fi Networks for MVNO Services," *Fierce Wireless* (May 10, 2023), https://www.fierce-network.com/wireless/charter-talks-spectrum-connectx.

[37] 47 U.S.C. § 309(j)(7)(A).

portion of the band that remains allocated for FSS use should be considered for an additional authorization for coordinated shared use by the Mobile Satellite Service (MSS) operators, by point-to-multipoint fixed wireless providers (e.g., WISPs), or by both.

1. Consider Adding a Mobile Satellite Service Allocation

Regardless of how many megahertz of the Upper C-Band can be repurposed for flexible use after the merger of SES and Intelsat, any remaining FSS portion of the band will be lightly used no matter how vital it is to its video programming and other customers. One timely opportunity would be to add an allocation to the Mobile Satellite Service (MSS). In that respect we generally agree with MSSA that the Commission should consider adding new MSS allocations rather than waiting years to see if rulemakings on sharing can shoehorn some additional operators into the existing narrow MSS bands.[38] With reference to the Upper C-Band, we also agree with the recent suggestion of SpaceX that "to maximize the utility of the spectrum for consumers, the Commission should expeditiously develop modern, efficient sharing rules for the upper C-band that permit flexible use of satellite spectrum among fixed and mobile satellites."[39]

LEO satellite constellations providing mobile and D2D connectivity clearly have enormous potential for innovation, competition and consumer welfare. Recent innovations by

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[38] Reply Comments of The Mobile Satellite Services Association, *Petition for Rulemaking by Space Exploration Holdings, LLC, Regarding Revision of the Commission's 1.6/2.4 GHz MSS Sharing Plan*, RM-11975, and *Petition for Rulemaking by Space Exploration Holdings, LLC, Regarding Revision of the Commission's 2 GHz MSS Sharing Plan*, RM-11976 (May 10, 2024). "The Commission should also pursue opportunities to make additional, dedicated MSS spectrum available, including through ongoing efforts to develop additional MSS allocations at the ITU" [citation omitted]. *Id*. at 7.

[39] Letter from David Goldman, Space Exploration Technologies Corp., to Marlene H. Dortch, FCC, *Expanding Flexible Use of the 3.7 GHz to 4.2 GHz Band*, GN Docket No. 18-122, at 1 (Jan. 30, 2025) (*SpaceX Letter)*.

Globalstar, Apple, T-Mobile, AST, SpaceX and others have demonstrated an enormous potential for direct-to-device (D2D) connectivity, yet there are relatively few and narrow bands of low-frequency MSS spectrum available to expand on opportunities for convergent connectivity. Satellite operators should not be hamstrung by effectively limiting new entrants to partnerships with mobile carriers, on exclusive-use mobile carrier bands, where the satellite D2D service is at best ancillary. With respect to D2D connectivity to consumer handsets, LEO satellite operators are currently providing supplemental coverage, primarily in rural, remote, or other areas where the terrestrial mobile signal is absent or weak. This supplemental and very narrowband coverage could improve over time as LEO satellite constellations grow and their technological capabilities increase. At a minimum, mobile enterprise use cases – including vehicle fleets, ships, workers, drones and robots – are likely to benefit from more robust MSS connectivity that can be relied upon at virtually any location.

A challenge, however, is that there are only a handful of relatively small MSS allocations. As two leading satellite spectrum experts opined in a recent white paper: "Finding large amounts of spectrum in bands suitable for direct-to-device services, which in practice means bands below 4 GHz, will be very difficult, particularly if D2D providers want to provide nationwide or global coverage."[40] Moreover, today's relatively narrow MSS assignments (e.g., in the Big LEO and L Band spectrum between 1.6 and 2.5 GHz) are occupied by incumbents that assert co-frequency sharing among MSS operators is infeasible.[41] Contentious debates are

[40] Timothy M. Farrar and J. Armand Musey, "Spectrum for Emerging Direct-to-Device Satellite Operators," at 11 (Jan. 2025), available https://summitridgegroup.com/wp-content/uploads/D2D-White-Paper-SRG-TMF-Final.pdf. "To date, the amount of terrestrial spectrum made available for D2D is limited and, in many cases, only covers a paired 5 MHz channel, and, in the case of AST's testing agreement with Verizon, even less." *Id*.

[41] See, eg, Echostar Corporation's Opposition to Petition for Rulemaking, *Revision of the Commission's Sharing Plan to Encourage Productive Satellite Use of the 2 GHz Frequencies*,

already pending over whether a rulemaking is needed to resolve if even these small allocations can be shared by entrants.[42]

Clearly more spectrum is needed for MSS and D2D connectivity. Both SpaceX and Kepler have recently argued that advances in satellite technology has made co-frequency sharing by two or more MSS operators feasible. For its part, Kepler's request for access to spectrum for its MSS service in 2021 was accompanied by the assertion that it "reasonably expects that its system can operate in these bands without causing harmful interference to or requiring additional protection from any other higher priority service duly licensed in these bands,"[43] at least under a sharing regime that allowed for an "equitable allocation of interference noise."[44] It cited strategies such as using "a polarization orthogonal to that of [the incumbent]" in the band,

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RM-11976 (filed March 12, 2024) (Echostar Opposition). "Nor is co-frequency sharing between two different MSS systems technically feasible today. In 2000, as described above, the Commission made the decision to segment the band, dividing it evenly between the licensees due to a host of technical and other issues that made assigning the spectrum by any other method impractical…Nothing has changed to suggest these issues can be resolved today either." *Id*. at 5-6.

[42] *See, e.g.*, Space Exploration Technologies Corp. Petition for Rulemaking, *Revision of the Big LEO Spectrum Sharing Plan to Encourage Productive MSS Use of 1.6/2.4 GHz Frequencies*, RM-11975 (Feb. 21, 2024); Space Exploration Technologies Corp. Petition for Rulemaking, *Revision of The Commission's Sharing Plan to Encourage Productive Satellite Use of 2 GHz Frequencies*, RM-11976 (Feb. 22, 2024); EchoStar Opposition; *Request for Comment on Petition for Rulemaking by Space Exploration Holdings, LLC, Regarding Revision of the Commission's 2 GHz MSS Sharing Plan*, RM-11976 (rel. March 26, 2024); *Request for Comment on Petition for Rulemaking by Space Exploration Holdings, LLC, Regarding Revision of the Commission's 1.6/2.4 GHz "Big LEO" NGSO MSS Sharing Plan*, RM-11975 (rel. March 26, 2024); Globalstar Application for Modification, ICFS File No. SAT-MOD-20230804-00192 (Aug. 4, 2023); Reply Comments of Space Exploration Holdings, LLC, *Request for Comment on Petition for Rulemaking by Space Exploration Holdings, LLC, Regarding Revision of the Commission's 1.6/2.4 GHz "Big LEO" NGSO MSS Sharing Plan*, RM-11975 (May 10, 2024).

[43] Kepler Communications Inc., *Petition for Declaratory Ruling for U.S. Market Access for the Kepler MSS System*, IBFS File No. SAT-PDR20211224-00204, at 10 (Dec. 23, 2021) (Kepler Petition).

[44] *Id*. at 11, citing Final Report of the Majority of IWG1, at 2-2.

operating its "MSS System consistent with the ITU PFD coordination triggers" to ensure it caused no more interference than the incumbent, and using Long Range ("LoRa") for its MSS service with the assumption that that waveform would be better able to coexist with the incumbent.[45]

With respect to sharing MSS allocations in the 2 GHz band, Kepler argued that its satellites had built-in "software-defined radios [that would allow] for the dynamic adjustment of communication parameters," and that self-imposed effective isotropic radiated power and out-of-band emission limits would help protect services in the adjacent bands.[46] More recently in the debate precipitated by SpaceX's petition, Kepler advocated for more sharing in existing MSS bands with the suggestion that the Commission establish standards for sharing and coexistence, build a record on necessary protection criteria, and put the onus on newcomers to prove their ability to provide services without causing harmful interference to incumbents.[47]

With respect to C-Band, SpaceX recently proposed that the Commission enable more intensive and innovative use of the upper C-band "by sharing the band across multiple operators in addition to the merged entity that already controls more than 90% of the band" and "permitting satellite licensees to use the band for either fixed or mobile use cases—just as terrestrial operators may do in the lower C-band."[48] Of course, for decades the C-Band has been shared successfully among multiple FSS satellite providers.[49] A question for this proceeding

[45] Kepler Petition at 12.

[46] *Id*. at 15.

[47] Comments of Kepler Communications Inc., *Request for Comment on Petition for Rulemaking by Space Exploration Holdings, LLC, Regarding Revision of the Commission's 1.6/2.4 GHz MSS Sharing Plan*, RM-11975, at 4-5 (Apr. 25th, 2024).

[48] *SpaceX Letter* at 1-2.

[49] *See, e.g., FWCC Request for Declaratory Ruling on Partial-Band Licensing of Earth Stations in the Fixed-Satellite Service That Share Terrestrial Spectrum et al.*, First Report and Order, 16

should be whether and under what framework can a portion or all of the Upper C-Band accommodate coordinated sharing among FSS and MSS operators and services. While our groups do not have the technical expertise or resources to answer that question at this time, SpaceX has asserted a basis for this belief, and will hopefully provide more specifics going forward. For example, in its January letter, SpaceX notes that the SES/Intelsat merger filing states that the merger will "put the companies in a better position to bring to market technologies, including high-throughput and very high-throughput satellites to better meet customer demand,"[50] updated technology that "should be better able to share" C-Band spectrum.[51]

2. Authorize Coordinated Sharing for Fixed Wireless Access Services

The initial C-Band NPRM in 2018 sought comment on a proposal from WISPA, OTI, PK and other rural broadband advocates to authorize coordinated sharing on a secondary basis with FSS earth stations.[52] Although the proposal garnered substantial support, the Commission ultimately declined to authorize it even for the upper portion of the band that remained exclusively FSS in the continental U.S. The Commission's brief explanation in the *2020 C-Band R&O* stated that "[o]ther bands are available for point-to-multipoint use" and that "authorizing

FCC Rcd 11511, ¶ 17 (rel. May 25, 2001) (noting the "policy of authorizing the entire 1000 MHz of C-band spectrum" for FSS space stations and earth stations).

[50] Description of Transaction and Public Interest Statement, ICFS File No. SAT-T/C-20240530-00117, at 13 (filed May 30, 2024).

[51] *SpaceX Letter* at 2.

[52] *See Expanding Flexible Use of the 3.7 to 4.2 GHz Band*, Order and Notice of Proposed Rulemaking, GN Docket No. 18-122, 33 FCC Rcd 6915, 6951-52, ¶ 116 (2018) (*C-Band NPRM)*; Broadband Access Coalition, Petition for Rulemaking to Amend & Modernize Parts 25 & 101 of the Commission's Rules, RM-11791 (filed June 21, 2017).

more intensive point-to-multipoint Fixed Service use of the 4.0-4.2 GHz band before the transition is over could dramatically complicate the repacking and relocation of FSS operations and earth station registrants."[53]

Our groups continue to agree with the Commission's proposal in the original *C-Band NPRM* stating it is entirely feasible to authorize P2MP fixed wireless to "operate on a secondary basis vis-à vis FSS in any part of the band in which FSS continues to operate during a transition period to accommodate repacking and, thereafter, on a frequency-coordinated basis to protect actual FSS operations."[54] The Commission should authorize fixed point-to-multipoint (P2MP) providers to coordinate shared use across the whatever portion if the band remains in use for FSS on a first-in licensed basis. With the benefit of an automated frequency coordination system, this approach can maximize the public interest benefits of the band, promoting enhanced rural connectivity while ensuring protection for both incumbent FSS and future mobile users from harmful interference.

Throughout the C-Band proceeding, a diverse range of parties that included the Broadband Access Coalition, WISPA, Microsoft, and the Dynamic Spectrum Alliance demonstrated in numerous filings and a technical study that fixed point-to-multipoint (P2MP) services can coordinate into the band on a localized basis by relying on sectorization and highly directional antennas. In July 2019 a coalition of rural ISPs and technology companies released a Virginia Tech engineering study, led by Dr. Jeffrey Reed, that validated the feasibility of extensive co-channel sharing by P2MP operations with earth stations as proximate as seven

[53] *2020 C-Band R&O* at ¶ 331.

[54] *C-Band 2018 NPRM* at ¶ 116.

kilometers.[55] The study showed that more than 80 million Americans, most of them in rural and low-density areas, live within these 'sharing zones' where P2MP can be coordinated on a *co-channel* basis (and more extensively on an adjacent-channel basis) without any significant risk of harmful interference to FSS incumbents.[56]

The Commission does not need auction authority to authorize terrestrial use of the entire Upper C-band, which will boost both the coverage and capacity of fixed wireless service providers nationwide – and especially in rural and underserved areas. While another clearing or consolidation of Upper C-Band spectrum will take years, the Commission can immediately adopt technical and sharing rules that protect incumbent MSS users in-band as well as in the adjacent bands above and below 4.2-4.4 GHz. Likewise, the 3.98-4.0 GHz guard band, which currently lays completely fallow, can be allocated for fixed terrestrial use on an unlicensed basis with power and out-of-band emission limits tailored to protect authorized primary licensees in the adjacent bands from harmful interference. One or more existing Commission-certified automated frequency coordination systems could be readily adapted for this purpose. In sum, we urge the Commission to not let a megahertz of unused capacity in the Upper C-Band go to waste.

III. CONCLUSION

Our groups urge the Commission to adopt changes that make all of the 3.98-4.2 GHz band available for more intensive licensed and shared use. The Commission can achieve this through a combination of consolidating Fixed Satellite Service (FSS) incumbents – enabling a

[55] Monica Alleven, "Google, WISPA tout results of study on sharing in C-band," *Fierce Network* (Jul. 2, 2019), https://www.fierce-network.com/wireless/google-wispa-tout-results-study-sharing-c-band.

[56] *Id*.

new flexible use allocation in the lower portion of the band – and by authorizing shared use by mobile satellite and/or fixed wireless services in the upper portion of the band.

/s/ Michael Calabrese
/s/ Jessica Dine
Open Technology Institute at New America
740 15th Street, NW Suite 900
Washington, DC 20005

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