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

In the Matter of	
Use of Spectrum Bands Above 24 GHz for Mobile Radio Services	GN Docket No. 14-177
Establishing a More Flexible Framework to Facilitate Satellite Operations in the 27.5-28.35 GHz and 37.5-40 GHz Bands	IB Docket No. 15-256
Petition for Rulemaking of the Fixed Wireless Communications Coalition to Create Service Rules for the 42-43.5 GHz Band	RM-11664
Amendment of Parts 1, 22, 24, 27, 74, 80, 90, 95, and 101 to Establish Uniform License Renewal, Discontinuance of Operation, and Geographic Partitioning and Spectrum Disaggregation Rules and Policies for Certain Wireless Radio Services	WT Docket No. 10-112
Allocation and Designation of Spectrum for Fixed-Satellite Services in the 37.5-38.5 GHz, 40.5-41.5 GHz and 48.2-50.2 GHz Frequency Bands; Allocation of Spectrum to Upgrade Fixed and Mobile Allocations in the 40.5-42.5 GHz Frequency Band; Allocation of Spectrum in the 46.9-47.0 GHz Frequency Band for Wireless Services; and Allocation of Spectrum in the 37.0-38.0 GHz and 40.0-40.5 GHz for Government Operations	IB Docket No. 97-95

REPLY COMMENTS OF IRIDIUM COMMUNICATIONS, INC.

INTRODUCTION

As the Commission clears the path toward deployment of next-generation terrestrial wireless services, Iridium Communications, Inc. ("Iridium") prepares for the launch of its next-generation satellite constellation, Iridium NEXT.[1] Iridium NEXT will dramatically enhance Iridium's ability to meet demand for secure, reliable, and truly global communications with

[1] *See Iridium Constellation LLC Application for Modification of License to Authorize a Second-Generation NGSO MSS Constellation*, Order and Authorization, DA 16-875 (rel. Aug. 1, 2016).

mobile satellite services that, in many cases, will complement the innovative services that the Commission seeks to unleash in this proceeding. With these reply comments, Iridium reiterates its support for the Commission's 5G agenda, and the synergies with Iridium NEXT that it stands to create. Iridium wishes only to address a discrete issue on which the *Further Notice*[2] did not even seek comment. Two joint interest holders in certain Local Multipoint Distribution Service ("LMDS") licenses have asked the Commission to authorize flexible use services ("FUS") in the 29.1-29.25 GHz band, also known as the LMDS A2 band.[3]

The Commission has already concluded—*twice*—that the 29.1-29.25 GHz band remains poorly suited to FUS operations,[4] and no developments support a shift in policy at this time. To the contrary, with interest in the band waning among potential 5G operators and throughout the international community, the record supporting the Commission's determination is stronger now than ever before. The evidence is clear: in light of the unique sharing challenges in the 29.1-29.25 GHz band and its diminished utility to 5G services, any proposal seeking to authorize FUS in the band would merely distract the Commission from the critical next steps required to make our 5G future a reality for U.S. consumers. Accordingly, the Commission should reject calls to open the 29.1-29.25 GHz band to new terrestrial services.

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[2] *Use of Spectrum Bands Above 24 GHz for Mobile Radio Services*, GN Docket No. 14-177, et al., Report and Order and Further Notice of Proposed Rulemaking, FCC 15-138 (rel. July 14, 2016) ("*Report and Order*" or "*Further Notice*").

[3] *See* Comments of Nextlink Wireless, LLC, GN Docket No. 14-177 (filed Sept. 30, 2016) ("XO/Nextlink Comments"); Comments of Verizon, GN Docket No. 14-177 (filed Sept. 30, 2016) ("Verizon Comments"). As the Commission is aware, Verizon Wireless and Nextlink Wireless, LLC, an affiliate of XO Communications, LLC, seek to enter a *de facto* transfer long-term lease of Nextlink's LMDS license portfolio, and Verizon Wireless holds an option to purchase XO Holdings, Nextlink's parent company, under separate agreement. *See Cellco Partnership d/b/a Verizon Wireless and Nextlink Wireless, LLC, a Subsidiary of XO Holdings, Seek FCC Consent to a Long-Term De Facto Transfer Spectrum Leasing Arrangement Involving Local Multipoint Distribution Service and 39 GHz Spectrum*, Public Notice, DA 16-394 (rel. April 12, 2016).

[4] *Use of Spectrum Bands Above 24 GHz for Mobile Radio Services*, GN Docket No. 14-177, et al., Notice of Proposed Rulemaking, FCC 15-138 ¶ 70 (rel. Oct. 23, 2015) ("*Notice of Proposed Rulemaking*") (declining to propose authorization of FUS in the 29.1-29.25 GHz band); *Further Notice* ¶ 373 (same).

I. The Commission Properly Declined to Propose FUS Operations in the 29.1-29.25 GHz Band

Iridium uses the 29.1-29.25 GHz band on a co-primary basis for feeder uplink and telemetry, track and control operations that support mission-critical commercial, defense, and public safety communications on ships, planes, and in remote earth locations.[5] As Iridium has explained[6] and other proceeding participants have recognized,[7] the unique architecture of Iridium's low-earth, non-geostationary orbit satellite network poses unique challenges to sharing the 29.1-29.25 GHz band with ubiquitously deployed terrestrial services. These challenges are magnified by the exceptional risks of harmful interference to Iridium's users. In addition to serving as the last (and often *only*) line of communications for many commercial users, the Iridium network supports the core operations of our defense and intelligence communities, including delivery of secure battlefield communications. As a result, successful coordination with FUS in the 29.1-29.25 GHz band would prove costly and difficult in the best of worlds—if not altogether impossible. Critically, even if the Commission could develop a workable spectrum sharing regime, negotiating co-existence would hardly be worth the effort given the large contiguous blocks of spectrum required to support 5G operations. Not only does the A2 band contain only 150 MHz of spectrum, it provides no opportunity to create larger contiguous blocks for terrestrial 5G services given the lack of adjacent LMDS spectrum.

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[5] *See, e.g.*, Comments of Iridium Satellite, LLC, GN Docket No. 14-177 (filed Jan. 15, 2015) ("Iridium NOI Comments"); Comments of Iridium Satellite, LLC, GN Docket No. 14-177 (filed Jan. 27, 2016) ("Iridium NPRM Comments").

[6] *See* Iridium NOI Comments at 2-6; Iridium NPRM Comments at 2-6; Letter from Scott B. Harris, Counsel, Iridium, to Marlene H. Dortch, Secretary, FCC, GN Docket No. 14-177 (filed May 18, 2016); Letter from Scott B. Harris, Counsel, Iridium, to Marlene H. Dortch, Secretary, FCC, GN Docket No. 14-177 (filed July 8, 2016).

[7] *See* Letter from Dave Horne, Intel Corporation, to Marlene H. Dortch, Secretary, FCC, GN Docket No. 14-177 (Aug. 10, 2015) (noting the "particularly challenging interference scenarios" in the 29.1-29.25 GHz band) ("*Intel August 2015 Ex Parte*"); Comments of Straight Path Communications, Inc., GN Docket 14-177 (filed Sept. 30, 2016) (declining to recommend the 29.1-29.25 GHz band for FUS operations because "there continues to be significant interest in using this spectrum for satellite operations") ("Straight Path Comments").

In light of this evidence, the Commission correctly concluded in its *Notice of Proposed Rulemaking* that its "efforts are better directed towards bands that offer more contiguous spectrum" than the 150 MHz available in 29.1-29.25 GHz.[8] In response, most commenters—including Verizon—agreed that the Commission should focus on bands, band plans, and auction rules that would provide operators with access to far more than 150 MHz of contiguous spectrum.[9] While a few proceeding participants expressed general, unreasoned support for allowing FUS operations in the 29.1-29.25 GHz band,[10] only one—XO Communications ("XO")—endeavored to explain why the Commission should revisit its sound conclusion that the band contains too little spectrum to merit consideration.[11] As Iridium explained in its reply comments, XO's analysis attempted to shortchange the true bandwidth needs of 5G innovators with an unrealistic, back-of-the-napkin engineering calculation, ignored the challenges of carrier aggregation in the millimeter wave bands, and failed to address co-existence with Iridium's

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8 *Notice of Proposed Rulemaking* ¶ 70.

9 *See, e.g.*, Comments of Verizon, GN Docket No. 14-177, at 6, 13-15 (filed Jan. 28, 2016) (advocating against spectrum screens or caps in light of the need for 5G operators to "assemble substantial amounts of contiguous mmW spectrum," and supporting a single contiguous 37-39 GHz band plan with "highly attractive licenses with bandwidths of 200 MHz or more"); Letter from Charla M. Rath, Vice President, Wireless Policy Development, Verizon, to Marlene H. Dortch, Secretary, FCC (filed July 6, 2016) (strongly opposing spectrum screens or caps because of contiguous bandwidth requirements); Comments of Huawei Technologies, Inc., GN Docket No. 14-177, at 5-6 (filed Jan. 28, 2016) (noting that "significant bandwidths of contiguous spectrum" is "the principal reason for expanding 5G systems to include the mmW bands," and the "global consensus forming" that "a minimum of 500 MHz to 1 GHz bandwidth" is needed "to support 5G mobile services"); Comments of AT&T, GN Docket No. 14-177, at 10 (filed Jan. 28, 2016) ("large contiguous channel bandwidths will be essential to 5G's advancement"); Comments of Qualcomm Incorporated, GN Docket No. 14-177, at i (filed Jan. 27, 2016) ("The millimeter wave bands offer large contiguous blocks of spectrum to help meet today's surging mobile broadband data demands, particularly in major metropolitan areas and event venues where large numbers of users are often densely concentrated"); *see also* Comments of Nokia, GN Docket No. 14-177, at 9 (filed Jan. 27, 2016).

10 *See* Comments of Mobile Future, GN Docket No. 14-177, at 9 (filed Jan. 27, 2016) (stating, without elaboration, that bands including 29.1-29.25 GHz should be considered for FUS use); Comments of the Telecommunications Industry Association, GN Docket No. 14-177, at 6 n.14 (filed Jan. 27, 2016) ("TIA NPRM Comments") (requesting, in a footnote, that the Commission "continue pursuing the other spectrum bands above 24 GHz that were identified as candidate bands in the NOI").

11 Comments of XO Communications, LLC, GN Docket No. 14-177, at 16 (filed Jan. 28, 2016).

operations.[12] In addition, Iridium noted that the 29.1-29.25 GHz band was unlikely to become available for globally harmonized use in light of the World Radiocommunication Conference's decision not to identify it as even a candidate band for IMT-2020.[13]

Unsurprisingly, in the *Further Notice*, the Commission once again declined to propose the 29.1-29.25 GHz band for FUS operations. Recognizing the benefits of international harmonization, the Commission instead sought comment on FUS operations "in the following bands: 24.25-24.45 GHz and 24.75-25.25 GHz, 31.8-33.4 GHz, 42-42.5 GHz, 47.2-50.2 GHz, 50.4-52.6 GHz, 71-76 GHz, and 81-86 GHz," noting that each of these bands "was identified as a candidate band for IMT-2020."[14]

II. The Record Does Not Support Revisiting the Commission's Sound Decisions

Notwithstanding the Commission's repeated rejection of proposals to explore FUS operations in the 29.1-29.25 GHz band, XO (through wireless affiliate Nextlink)—and in an about-face, Verizon, which now holds an interest in Nextlink's LMDS portfolio—essentially ask the Commission to reconsider.[15] As explained below, record developments only further confirm the wisdom of the Commission's decisions, and XO's and Verizon's own arguments merely expose the diminished utility of the 29.1-29.25 GHz band for 5G services.

First, the record shows that Verizon and XO/Nextlink now stand alone in their request for the Commission to open the 29.1-29.25 GHz band to FUS services. In fact, commenters that previously—and halfheartedly—asked the Commission to authorize new services in the band

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[12] Comments of Iridium Communications, Inc., GN Docket No. 14-177, at 6-7 (filed Feb. 26, 2016).

[13] *Id.* at 3; *see* World Radiocommunication Conference, Final Acts, Resolution 238 (WRC-15) (declining to study the 29.1-29.25 GHz band for IMT-2020), *available at* https://www.itu.int/dms_pub/itu-r/oth/0c/0a/R0C0A00000C0014PDFE.pdf.

[14] *Further Notice* ¶ 373.

[15] *See* XO/Nextlink Comments at 3-6, 11-12; Verizon Comments at 5.

have shifted their attention to the more useful spectrum that the Commission identified in the *Further Notice*.[16] Notably, even Straight Path Communications, an LMDS licensee, recommends against discussing the "LMDS A2 band at this time," given that the "A2 band is not contiguous with other LMDS spectrum" and the "significant interest in using this spectrum for satellite operations."[17] This assessment echoes Intel's early recognition of the "particularly challenging interference scenarios" in the A2 band, which Intel expressed in response to the Commission's *Notice of Inquiry* in this proceeding.[18]

Second, despite XO/Nextlink's claim to the contrary, recent actions by the international regulatory community only further support the Commission's decision to explore other spectrum for terrestrial 5G services. In its comments, XO/Nextlink claims that "[t]elecommunications regulatory authorities in other countries—including Australia, Finland, and Sweden—have also expressed interest in using the LMDS band for deploying 5G services," and suggest that the "Commission should follow suit and adopt flexible use rules" for the entire LMDS band.[19] This is simply incorrect. To demonstrate the purported international consensus over use of the A2 band for FUS, XO/Nextlink relies on outdated, country-level recommendations on the WRC-15 agenda.[20] As an initial matter, several of these countries—including Australia and Finland—did not recommend FUS operations in the A2 band at all, and confined their interest in LMDS

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16 *See* Comments of Mobile Future, GN Docket No. 14-177, at 4 & n.9 (filed Sept. 30, 2016) (supporting the Commission's identification of bands in the FNPRM); Comments of the Telecommunications Industry Association, GN Docket No. 14-177, at 8-13 (filed Sept. 30, 2016) (same) ("TIA Comments").

17 Straight Path Comments at 6-7.

18 *Intel August 2015 Ex Parte* at 2.

19 XO/Nextlink Comments at 5.

20 *Id*.

spectrum to A3 band and B block frequencies.[21] More importantly, however, XO/Nextlink's obsolete citations ignore the actual *outcome* of WRC-15 held last November. As explained above, although WRC-15 identified *other* LMDS bands as potential candidates for terrestrial 5G services, it declined to do so with respect to the A2 band.[22] As a result, the A2 band will not be considered for IMT-2020, and the prospect of harmonized use of the A2 band in the next decade for 5G operations has evaporated.

Third, commenters continue to emphasize that 5G network operators will need large, contiguous blocks of spectrum in order to deliver the "data speeds . . . expected of wireless 5G uses," optimize "traffic management," improve "system performance," and facilitate the "higher throughput" necessary for a large number of "users to simultaneously utilize" 5G spectrum.[23] As a result, the record continues to undermine XO/Nextlink's claim that the 150 MHz of discontiguous bandwidth in the A2 band merits the Commission's attention. For example, TIA urges the Commission to use block sizes of at least 200 MHz "throughout the UMFUS bands," criticizes the Commission's proposal for federal priority in the lower 37 GHz band on grounds that it would leave commercial licensees with "only 400 MHz," and proposes blocks larger than 500 MHz in the 47 GHz band.[24] Qualcomm explains the importance of ensuring that "the dynamic variations in link quality that results from mobile operations in the millimeter wave bands . . . can be compensated for by using higher burst rates to drive a high quality user experience," and notes that "[t]his type of operation is best supported by wide contiguous blocks

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[21] *See* 4G Americas, 5G Spectrum Recommendations, at 9 (Aug. 2015), http://www.4gamericas.org/files/6514/3930/9262/4G_Americas_5G_Spectrum_Recommendations_White_Paper.pdf

[22] *See supra* note 13 & accompanying text.

[23] Comments of AT&T, GN Docket No. 14-177, at 7 (filed Sept. 30, 2016) ("AT&T Comments").

[24] TIA Comments at 5, 10-12.

of spectrum that are at least 200 MHz wide."[25] Similarly, AT&T explains that "[a]llocations of large, contiguous channels will be necessary to support 5G's expected level of performance," and urges the Commission to make available "200 MHz at a minimum, with even larger blocks where possible."[26] Critically, AT&T also makes clear that carrier aggregation is no solution,[27] echoing the position of numerous commenters in response to the *Notice of Proposed Rulemaking*.[28] As AT&T explains, "[e]xtensive carrier aggregation to meet demand would come at a cost in terms of power consumption, equipment complexity, and system performance," and will prove especially burdensome to emerging services given that "efficient power consumption will be critical to sustaining the new 5G environment."[29]

Finally, XO/Nextlink's attempt to find a 5G use of the A2 band serves only to prove that this spectrum has virtually no value for next-generation wireless networks. XO/Nextlink tries to compare the LMDS A2 band to the 700 MHz band,[30] and claims that 5G operators will be able to use the A2 band for supplemental downlink operations. Of course, this underscores the restriction in the A2 band limiting it to downlink transmission only.[31] More importantly, it concedes that A2 band spectrum cannot be used for competitive entry by new 5G operators. Because of the limited spectrum available in the A2 band, as well as the downlink-only restriction, the Commission cannot divide the A2 band into the paired channels that a facilities-based competitor would need to acquire in order to begin providing service in a given wireless

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[25] Comments of Qualcomm Incorporated, GN Docket No. 14-177, at 7 (filed Sept. 30, 2016).

[26] AT&T Comments at 7.

[27] *Id*. at 10.

[28] *See, e.g.*, Comments of CTIA, GN Docket No. 14-177, at 21-22 (filed Jan. 22, 2016); *see also* TIA NPRM Comments at 29–30.

[29] AT&T Comments at 10.

[30] XO/Nextlink Comments at 11-12.

[31] *See* 47 C.F.R. § 101.1005 (permitting downlink hub-to-subscriber transmissions only).

market. Finally, XO/Nextlink's proposed use of the A2 band would be grossly inefficient since supplemental downlink operations depend on carrier aggregation. As the record makes clear, the lost "power consumption," increased "equipment complexity," and lower "system performance" associated with carrier aggregation at millimeter wave frequencies undermines any value smaller spectrum blocks might have for 5G network operators.[32]

Thus, in effect, XO/Nextlink concedes that the A2 band would have no meaningful impact on 5G competition, and would function, *at best*, as a highly inefficient source of unidirectional bandwidth in the event that existing 5G networks, once (and if) deployed in the 28 GHz band, eventually develop to the point that such additional downlink capacity becomes useful. That is hardly a reason to accept XO and Verizon's request to re-litigate now a matter that the Commission already has correctly decided twice in this proceeding.

CONCLUSION

The record is clear that the costs of authorizing FUS operations in the 29.1-29.25 GHz band remain substantial, and that the gains for 5G network operators would be minimal at best. Accordingly, the Commission should decline to upend its plans outlined in the *Report and Order* and *Further Notice*, and continue to focus on bands that hold the greatest promise for 5G.

Respectfully submitted,

Scott Blake Harris
V. Shiva Goel
HARRIS, WILTSHIRE & GRANNIS LLP
1919 M Street, NW, Eighth Floor
Washington, DC 20036
(202) 730-1300
Counsel to Iridium Communications, Inc.

Maureen C. McLaughlin
Vice President Public Policy
IRIDIUM COMMUNICATIONS, INC.
1750 Tysons Boulevard, Suite 1400
McLean, VA 22102
(703) 287-7518

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[32] AT&T Comments at 10-11 (cautioning the Commission against "squandering the opportunity to create large blocks in these bands by thinking a 'small building blocks' model will allow for necessary assemblage").