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

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| In the Matter of | ) | |
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| 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 a provider of mobile satellite services that largely complement terrestrial communications, Iridium Communications, Inc. ("Iridium") remains a firm supporter of the

Commission's efforts to promote 5G services in the millimeter wave ("mmW") bands.[1] To ensure that these new services are timely and efficiently deployed, the Commission should focus this proceeding on the bands that show the greatest promise for 5G services. Because those bands simply do not include the 29.1-29.25 GHz band, Iridium urges the Commission to stand firm in its decision not to authorize new terrestrial services in this spectrum.

As described below, Iridium uses the 29.1-29.25 GHz band on a co-primary basis to deliver essential communications to the U.S. government and consumers. Coordinating terrestrial mobile services with Iridium's operations could prove challenging, and unduly risky to users who depend on the absolute reliability of Iridium's network. Even if it were possible for both services to share the band, the difficult process of negotiating co-existence would hardly be worth the effort. As the record conclusively establishes, large blocks of contiguous spectrum are critical to the efficient delivery of 5G services, and there is just not enough of it in the 29.1-29.25 GHz band to warrant distracting the Commission from its end goal in this proceeding.

## I. The Commission's Criteria Supports the Commission's Decision not to Consider the 29.1-29.25 GHz Band for Terrestrial Mobile Use at This Time.

The Commission set forth "four main criteria"[2] for identifying bands suitable for expanded mobile use: the presence of "at least 500 megahertz of contiguous spectrum,"[3] whether the band is "being considered internationally for mmW mobile service,"[4] the compatibility of

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1 *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, 30 FCC Rcd. 11,878 (rel. Oct. 23, 2015) ("NPRM").

2 *Id.* at 11,887 ¶ 20.

3 *Id.*

4 *Id.* ¶ 21.

identifying the band "with existing incumbent license assignments and uses,"[5] and the prospect of using the band to accommodate "as wide a variety of services as possible" above 24 GHz.[6]

As Iridium explained in its comments,[7] the 29.1-29.25 GHz band does not satisfy any of these criteria. The 150 MHz of spectrum available in the band would be of limited value to new terrestrial systems, which will benefit substantially from contiguous blocks of high frequency spectrum even as spectrum aggregation technologies continue to develop. Further diminishing the already limited potential of the band is the small chance of globally harmonized use—indeed, the recent World Radiocommunication Conference declined to even study the 29.1-29.25 GHz band for terrestrial mobile services.[8] Finally, even if new services managed to overcome these challenges, they would have to coordinate successfully with Iridium's co-primary feeder link and telemetry, track and control ("TT&C") operations. Notwithstanding the Commission's speculative finding that "it could be possible to develop a sharing regime between [Iridium's] feeder links and mobile operations,"[9] successful coordination would prove challenging, if not impossible, given the unique design of Iridium's earth stations, user-driven pressures to construct more earth stations, and the mission critical communications carried over the Iridium network.[10] In short, the value of the band to new services would be negligible, while the cost to critical existing services could be substantial.

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5 *Id.* at 11,887-88 ¶ 22.

6 *Id.* at 11,888 ¶ 23.

7 Comments of Iridium Satellite LLC, GN Docket No. 14-177, at 2-4 (filed Jan. 27, 2016) ("Iridium Comments").

8 *See* World Radiocommunication Conference, Provisional Final Acts, Resolution COM6/20 (WRC-15) at 426 (declining to study the 29.1-29.25 GHz band for future development of international mobile telecommunications), *available at* https://www.itu.int/dms_pub/itu-r/opb/act/R-ACT-WRC.11-2015-PDF-E.pdf.

9 NPRM at 11,901 ¶ 70.

10 *See* Iridium Comments at 5-6.

## II. The Current Record Further Supports the Commission's Decision.

The additional analysis the Commission has compiled in this proceeding further supports the Commission's decision not to explore terrestrial mobile use in the 29.1-29.25 GHz band. Indeed, it demonstrates that authorizing new services in the band could actually inhibit the deployment of 5G services. Several commenters—including staunch supporters of 5G services—caution the Commission against addressing low-value bands in this proceeding, particularly where coordination challenges could prove difficult or insurmountable. As AT&T explains, "5G deployment will be challenging enough without the added difficulties inherent in implementing . . . novel sharing mechanism[s]," and "handling these added coordination challenges would only divert resources from investment in new services and technologies."[11] Similarly, Straight Path Communications, which "generally favors making the LMDS band available for mobile use,"[12] reiterates its "concern[] . . . that progress will be unnecessarily delayed if the scope of this initial effort becomes too broad."[13]

Participants confirm that the 29.1-29.25 GHz band simply does not contain enough bandwidth to outweigh the coordination challenges inherent in using the spectrum. Huawei observes that access to "significant bandwidths of contiguous spectrum" is "*the principal reason* for expanding 5G systems to include the mmW bands"[14]—a point that Verizon also acknowledges.[15] As Huawei explains, there is a "global consensus forming" that "a minimum of

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11 Comments of AT&T, GN Docket No. 14-177, at 14 (filed Jan. 28, 2016) ("AT&T Comments").

12 NPRM at 11,901-02 ¶ 68.

13 Comments of Straight Path Communications Inc., GN Docket No. 14-177, at 6-7 (filed Jan. 27, 2016) ("Straight Path Comments").

14 Comments of Huawei Technologies, Inc., GN Docket No. 14-177, at 5-6 (filed Jan. 28, 2016) ("Huawei Comments").

15 Comments of Verizon, GN Docket No. 14-177, at 14 (filed Jan. 28, 2016) ("Verizon Comments") ("[T]he attractiveness of the mmW bands stems from the substantial amounts of spectrum that will available at these frequencies.").

500 MHz to 1 GHz bandwidth" is needed "to support 5G mobile services," and that "access to large blocks of spectrum" will be critical to the "adoption of new ultra-high [bandwidth] broadband wireless services."[16] AT&T confirms "that large contiguous channel bandwidths will be essential to 5G's advancement,"[17] as does Nokia, which agrees with the Commission's requirement that new bands for terrestrial mobile services have at least 500 MHz of contiguous spectrum, and seeks exceptions to that requirement for lower band spectrum only.[18]

The debate over the Commission's existing band plans, pre-auction swap mechanisms, and the proposed hybrid licensing regime for the 37 GHz band, reinforces the critical importance of contiguous spectrum to the deployment of terrestrial 5G systems. Due to the limitations of carrier aggregation technology in the mmW bands, these commenters uniformly favor "large unpaired spectrum blocks for 5G mmWave operations."[19] Similarly, commenters support pre-auction swaps with incumbent licensees "to enable large contiguous spectrum blocks to be auctioned."[20] Finally, many commenters ask the Commission to abandon its hybrid licensing

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16 *Id.* at 5.

17 AT&T Comments at 10.

18 Comments of Nokia, GN Docket No. 14-177, at 9 (filed Jan. 27, 2016) ("Nokia Comments"); *see* Comments of Qualcomm Incorporated, GN Docket No. 14-177, at i (filed Jan. 27, 2016) ("Qualcomm Comments") ("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").

19 Straight Path Comments at 23; *see also* Qualcomm Comments at 15 (noting that time division duplexing "will likely predominate for mobile use of the millimeter wave bands for technical reasons," because "it is extremely challenging to build a duplexer that can support [frequency division duplex ("FDD")] operations in the millimeter wave bands"); Comments of Samsung Electronics America, Inc. and Samsung Research America, GN Docket No. 14-177, at 17 (filed Jan. 27, 2016) (asking the Commission to license spectrum "on an unpaired basis," as "TDD works best for mobile broadband applications in higher frequency bands"); Huawei Comments at 25-27 (discussing why the "use of TDD for the mmW bands is . .. indicated" in mmW spectrum); Comments of Skyriver Communications, Inc., GN Docket No. 14-177, at 16-17 (filed Jan. 27, 2016) ("Skyriver Comments") (asking for contiguous blocks rather than non-contiguous channel pairs, because "the majority of users will opt for TDD technology").

20 Nokia Comments at 24; *see* Skyriver Comments at 17 (swaps will "provide incumbents with the contiguous spectrum blocks that will allow them to better service the market").

regime in the 37 GHz band, and instead combine the 37 GHz and 39 GHz bands to increase access to large contiguous channels.[21]

With 5G operators and equipment manufacturers seeking to maximize the availability of large, contiguous blocks of spectrum at every turn, there is simply no room to conclude on this record that the Commission should devote scarce agency and industry resources to exploring terrestrial mobile use of the 150 MHz of spectrum available in the 29.1-29.25 GHz band. Nevertheless, a small number of commenters ask the Commission to revisit its decision and authorize new terrestrial services in the 29.1-29.25 GHz band. The Commission should reject these proposals out of hand, as the support provided crumbles upon examination—to the extent any support is provided at all. For example, XO Communications relies on an industry consultant's assertion that an FDD "system with a 100 MHz downlink channel and 100 MHz uplink channel" could, in theory, support high speed terrestrial broadband applications in the band with a sufficient number of antenna elements.[22] This "analysis" does not respond to the challenges, described in detail by many commenters,[23] of using carrier aggregation technology in the mmW bands at this time—challenges that *XO itself* recognizes in the very same pleading when it asks the Commission for flexibility to use TDD.[24] More importantly, XO makes no effort to address compatibility with Iridium's feeder link and TT&C operations, as it fails to

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[21] Qualcomm Comments at 8; *see also* Comments of 4G Americas, GN Docket No. 14-177, at 15 (filed Jan. 27, 2016); Nokia Comments at 4; AT&T Comments at 15; Comments of Ericsson, GN Docket No. 14-177, at 7-8 (filed Jan. 27, 2016); Comments of T-Mobile USA, Inc., GN Docket No. 14-177, at 29 (filed Jan. 27, 2016) ("the hybrid licensing scheme would unnecessarily divide what could otherwise be 3 GHz of contiguous spectrum between 37 GHz and 40 GHz," and "carrier aggregation technologies . . . do not yet provide the same level of spectrum efficiency as is achieved when wide blocks of contiguous spectrum are used").

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

[23] *See supra* at n.19.

[24] XO Comments at 24-25.

provide even generic technical information for any 5G system currently under development, let alone an analysis explaining how coordination would be possible with such a system. In fact, XO curiously invokes a filing from Samsung in support of its position, but ignores that Samsung explicitly asks the Commission to defer consideration of the band precisely because of these coordination challenges.[25]

Like XO, Mobile Future also suggests that the Commission explore the 29.1-29.25 GHz band, but rests its case on even a flimsier basis. Mobile Future merely states, without elaboration, that bands which do not meet the Commission's criteria should nevertheless be "aggressively" considered.[26] The Commission should reject these bald attempts to grab spectrum that most participants agree would be of very little value to the future of 5G, and focus this proceeding on rules and action that stand to benefit U.S. consumers.

## CONCLUSION

As this proceeding continues to unfold, Iridium urges the Commission to resist the impulsive calls to identify additional bands for new terrestrial services. Even as the likely technical characteristics of 5G systems continue to evolve, the Commission can and should require participants to substantiate their claims that 5G technologies can deploy successfully in identified spectrum, and coordinate successfully with incumbent services. With respect to the 29.1-29.25 GHz band, that showing simply has not been (and there is no reason to think it can

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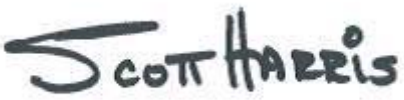
[25] *Id.* at 16 (citing Letter from Robert Kubik, Samsung Electronics America, Inc., to Marlene H. Dortch, FCC Secretary, GN Docket No. 14-177 (Aug. 28, 2015) ("Samsung recommends that in the NPRM the Commission consider [the 29.1-29.25 GHz band] in a further rulemaking beyond the initial NPRM")); *see also* Letter from Dave Horne, Intel Corporation, to Marlene H. Dortch, Secretary, FCC, GN Docket No. 14-177 (Aug. 10, 2015) (recommending that the Commission defer consideration of the 29.1-29.25 GHz band because of "particularly challenging interference scenarios").

[26] Comments of Mobile Future, GN Docket No. 14-177, at 9 (filed Jan. 27, 2016) ("Mobile Future Comments"); *see also* Comments of the Telecommunications Industry Association, GN Docket No. 14-177, at 6 n.14 (filed Jan. 27, 2016) (asking the Commission to "continue pursuing the other spectrum bands above 24 GHz that were identified as candidate bands in the *NOI*").

be) made. Accordingly, the Commission should stand firm in its decision not to authorize new services in the 29.1-29.25 GHz band.

Respectfully submitted,



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