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May 31, 2016

VIA ELECTRONIC FILING

Marlene H. Dortch
Secretary
Federal Communications Commission
445 12th Street, SW
Washington, D.C. 20554

**Re: O3b Limited, Notice of *Ex Parte* Presentation
Use of Spectrum Bands Above 24 GHz For Mobile Radio Services, et al., GN
Docket No. 14-177, IB Docket Nos. 15-256 & 97-95; RM-11664; WT Docket
No. 10-112**

Dear Ms. Dortch:

This *ex parte* letter addresses multiple submissions in this proceeding that discuss compatibility of new Upper Microwave Flexible Use (“UMFU”) services with satellite services in the 27.5-28.35 GHz band (the “28 GHz band”).

O3b understands that the FCC continues to work towards completing an order in this proceeding in July. In recent weeks, interested parties have submitted various technical proposals, studies, and illustrations, and the non-technical (policy) proposals advanced by interested parties have been revised, developed and changed. At the same time, interested parties have been discussing possible consensus.¹ However, it is not apparent at this time that satellite and terrestrial interests will reach a negotiated consensus.

Given the FCC’s timeframe and the mixed progress towards an industry consensus, O3b here presents its view of what is required to achieve the FCC’s goals and schedule in this proceeding consistent with sound policy, requisite process, and international obligations.

¹ Letter from Stacey Black, Assistant Vice President, AT&T Services, Inc., and Jennifer Manner, Sr. Vice President, EchoStar Corp. to Marlene H. Dortch, GN Docket No. 14-177, *et al.* (filed April 6, 2016) (“April 6 AT&T/EchoStar Letter”); Letter from Stacey Black, Assistant Vice President, AT&T Services, Inc., and Jennifer Manner, Sr. Vice President, EchoStar Corp. to Marlene H. Dortch, GN Docket No. 14-177, *et al.* (filed May 19, 2016) (“May 19 AT&T/EchoStar Letter”); Letter from Jennifer Manner, Sr. Vice President, EchoStar Corp., to Marlene H. Dortch, GN Docket No. 14-177, *et al.* at 4 (filed May 12, 2016) (“May 12 Satellite Operators Letter”); Letter from Donna Bethea-Murphy, Sr. Vice President, Inmarsat, and Petra Vorwig, Sr. Legal & Regulatory Counsel, SES Americom, Inc. to Marlene H. Dortch, GN Docket No. 14-177, *et al.* at 1 (filed Apr. 26, 2016) (“SES/Inmarsat Letter”) (expressing support “in principle” for the AT&T/EchoStar proposal).

This submission addresses the following points:

- ***Timing and Process.*** Industry consensus is the *only practical* way to meet the FCC’s timeline without adopting arbitrary rules. The FCC can and should provide incentives for all stakeholders to work towards a negotiated consensus. Absent consensus, the FCC should condition all UMFU licenses on rules that maintain and permit co-primary site-licensed FSS earth stations, and should protect FSS from aggregate interference from UMFU operations.
- ***Primary or Co-Primary Status of FSS.*** The FCC’s band plan treats FSS as having priority over all services except LMDS in the 28 GHz band, and 28 GHz satellite authorizations uniformly reflect secondary status only to LMDS. The FCC cannot now treat FSS as secondary to UMFU and put billions of dollars in investment at risk.
- ***Aggregate Uplink Interference to Satellites.*** The Commission *must* protect existing and future FSS satellites in the 28 GHz band from interference. As O3b and others have explained in earlier ex parte filings and meetings with FCC staff, a straightforward limit on skyward emissions from UMFU base stations in the 28 GHz band would afford the broadest possible flexibility for future deployment “flexible use” mobile services.
- ***Co-primary FSS Earth Station Deployment – No Restriction to Existing Sites.*** If mobile service is authorized in the 28 GHz band, the Commission must (at minimum): (1) grant co-primary status to all existing FSS earth stations; (2) treat as co-primary those applied for up to the date of the first auction; and (3) provide a clear, reliable path for future co-primary site-licensed earth stations. FSS earth stations should not be limited to one site per designated area (such as a county) for all FSS operators.

Timing and Process

Introducing mobile service into the 28 GHz band in a way that does not imperil the substantial service already provided by broadband satellites is a difficult task entailing dozens of complex technical tradeoffs. Much is at stake, both for potential future 5G deployment and for existing and future satellite services. The Commission’s priority should be to make the best tradeoffs possible for the benefit of all direct stakeholders and the public interest.

Recent submissions by 5G advocates incorrectly assume that because FSS is secondary to LMDS, it will also be secondary to the new mobile UMFU services.² They argue that the

² The NPRM also states, incorrectly, that FSS is secondary to all terrestrial service. *See, e.g., NPRM* ¶ 31. The NPRM statements to that effect, though, are contrary to the order adopting the band plan that maintains the co-primary allocations for LMDS and FSS, but treats FSS as secondary to LMDS and only to LMDS. *See 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, CC Docket No. 92-297, First Report and Order* ¶ 44 (1996) (“*First Report and Order*”). Elsewhere the NPRM acknowledges that FSS is treated as secondary to LMDS specifically: “For the 28 GHz band, the U.S. Table of Frequency Allocations includes a co-primary Fixed Satellite Service (FSS) Earth-to-space allocation, but section 25.202 of the Commission’s rules provides that FSS is secondary to LMDS in that

Commission should reject studies submitted by FSS operators (which have actual operating systems and known values) and instead make optimistic assumptions (about UMFU systems that have not been planned and have no known values) that FSS will not be materially harmed. And if FSS ultimately is harmed, they assert that harm is consistent with secondary status. These submissions are not constructive and do not provide a basis for the Commission to make the complex tradeoffs required to authorize mobile service in the 28 GHz band.

The only path to appropriate tradeoffs on the Commission's timeframe for this order is industry consensus. The satellite industry heard Chairman Wheeler when he said that satellite operators should engage with the wireless industry to find consensus.³ But the only practical way to achieve consensus is for all stakeholders to be equally concerned that the regulator's decision will be less favorable overall than a negotiated solution. Stakeholders that believe the Commission will treat satellite as secondary in the 28 GHz band have no incentive to seek constructive solutions that allow both satellite and terrestrial services to thrive in the 28 GHz band. The Commission should mediate a true industry consensus. Absent consensus, the FCC should condition all UMFU licenses on rules that maintain and permit co-primary site-licensed FSS earth stations, and protect FSS from aggregate interference from UMFU operations. Uses of the 28 GHz band for 5G service are not yet defined in any event, and will not be made available for several years at the earliest.

Primary or Co-Primary Status for FSS

Several 5G proponents argue that FSS should have no expectations for ongoing access to the 28 GHz band or protection from UMFU operations because FSS is secondary "to terrestrial" in the 28 GHz band, by which they mean to say, secondary to all terrestrial services. That is categorically false. Both domestically and internationally, FSS is co-primary with other allocated services. Twenty years ago, based on an extensive record, the Commission chose to give FSS priority over all services in the 28 GHz band, with a single exception. The Commission decided that FSS systems would be treated as *secondary to LMDS* in the United States, but would have *priority over any other service allocated domestically or internationally*.⁴

The decision to treat FSS as secondary to LMDS at the time was highly contested – particularly given that the promise of LMDS then was as expansive as is the promise of 5G in the 28 GHz band today. The Commission thus correctly chose to expressly establish satellite's

band." NPRM ¶ 27; *see also Id.* ¶ 31 ("Under our current rules, FSS use of this band is secondary to LMDS. Furthermore, this band has a co-primary mobile allocation throughout the world.").

³ *See* Remarks of Chairman Wheeler, Spectrum Frontiers Workshop, FCC, Washington, DC, (Mar. 10, 2016) *video recording available at* <https://www.fcc.gov/news-events/events/2016/03/spectrum-frontiers-workshop> (stating that sharing is "a two-way street" and hoping "that the satellite industry and the mobile industry would get together and work on how they can coexist because the future of spectrum in the 21st century is a future of sharing" and that there are "expectations on the mobile industry to meet the satellite interests in a fair and open and equal manner.").

⁴ *See* First Report and Order ¶ 44 (Services then-treated by rule as secondary (specifically including FSS) would have "licensing priority vis-à-vis any third service allocated domestically or internationally in the band."). This is a sweeping priority established by the FCC for FSS over any other service. Section 25.202(a)(1) of the Commission's rules also plainly states that the 28 GHz band is "available for use by the Fixed-Satellite Service." 47 C.F.R. § 25.202(a)(1). The only qualification (other than qualifications in the Table of Frequency Allocations not relevant here) is the notation (at note 2) that "FSS is secondary to LMDS in this band." 47 C.F.R. § 25.202(a)(1) n.2.

priority over other future services. Authorizations for FSS use of the 28 GHz band state that operations are secondary to LMDS.⁵ The Commission knows well that satellites, once built and deployed, cannot be changed. Regulatory certainty is important for all licensees, but it is essential for satellite operations.

Relying on 1) the Commission's decision to give FSS priority over all services except LMDS and 2) the ITU and U.S. co-primary allocations of the 28 GHz band to FSS, O3b and others have designed, developed, financed, built, launched and now operate large, sophisticated, cutting-edge satellite communications networks that rely on 28 GHz frequencies.⁶ And many more 28 GHz satellite systems are being planned and built today.

Twenty years and many billions of dollars of investment later, 5G proponents suggest that the Commission simply elevate another service – mobile – over FSS, despite the Commission having said categorically that FSS would have priority over *any other service domestically or internationally*. Doing so would be arbitrary and capricious, when over that time both the Commission and the satellite industry have proceeded consistent with the Commission's express statements that FSS would have priority over any other services. The Commission cannot now treat FSS as secondary to UMFU and put billions of dollars in investment at risk. At a minimum, FSS and mobile UMFU must be treated as co-primary in any Commission technical and licensing rules for the introduction of mobile UMFU services.

Aggregate Interference at Satellite

Primary or co-primary status for 28 GHz FSS services must be assured both on the ground and in space. In space, this means that the Commission must adopt a limit on aggregate skyward emissions from UMFU deployments. The record clearly shows that skyward emissions from terrestrial deployments in 28 GHz can disrupt satellite communications.⁷ The NPRM also acknowledged this as a particular concern for NGSO satellites.⁸ To date, there is no consensus on the point at which such emissions would begin to degrade satellite operations.⁹ But in the

⁵ See, e.g., O3b FSS Authorization No. SAT-LOI-20141029-00118 ¶ 8 (“Accordingly, [O3b] operations must be on an unprotected, non-harmful interference basis relative to LMDS in accordance with 47 C.F.R. § 2.105(c)(2)”).

⁶ In addition to O3b, ViaSat and Hughes Network Systems rely on the 28 GHz band the United States. Internationally, O3b, SES, Eutelsat and Avanti rely on the 28 GHz band.

⁷ See, e.g. May 12 Satellite Operators Letter at 4 (“UMFU skyward aggregate interference in 27.5-28.35 GHz (‘28 GHz band’) can result in severe degradation of broadband satellite service to US customers”); see also Comments of SpaceX, GN Docket No. 14-177, *et al.* at 6 (filed Feb. 18, 2015) (“aggregate interference from terrestrial operations could adversely impact satellite receive operations”); Comments of Robert W. Heath Jr., PhD, GN Docket No. 14-177, *et al.* at ¶ 4 (filed Feb. 18, 2015).

⁸ NPRM ¶ 299 (“Perhaps the most likely increased source of interference to satellites (particularly NGSO satellites) would be the large number of backhaul links that will likely be necessary to connect the many small-cell base stations that will be required to support mobile service in the 28 GHz band.”).

⁹ See Letter from representatives of AT&T Services Inc., Nokia, Samsung Electronics America, T-Mobile USA, Inc., and Verizon to Marlene H. Dortch, GN Docket No. 14-177, *et al.* at 1 (filed May 6, 2016) (“*Joint Terrestrial Letter*”) (“limitations on Upper Microwave Flexible Use (‘UMFU’) licensees are not required to manage aggregate interference from 5G networks into existing FSS receivers that are part of current FSS geostationary (‘GEO’) or non-geostationary (‘NGSO’) operations”); May 12 Satellite Operators Letter at 3-21 (discussing a study by satellite operators on the risk of aggregate interference to FSS receivers from UMFU networks).

face of acknowledged risk of disruption of satellite operations, the Commission *must* establish a limit on skyward emissions from UMFU services in the 28 GHz band.

O3b and other satellite operators have proposed an aggregate skyward emissions limit of 16.5 dBm/MHz per one thousand square kilometers.¹⁰ We believe this limit will adequately protect FSS satellite receivers and allow flexibility of deployment for terrestrial services.¹¹

International obligations also compel the Commission to limit harmful interference from terrestrial transmissions into satellites. FSS is allocated as a co-primary service in both the domestic and international allocation tables, and in the U.S. FSS is treated as secondary *only* to LMDS. Aggregate emissions from terrestrial systems operating within U.S. borders can disrupt FSS satellites providing service to FSS earth stations beyond U.S. borders pursuant to the ITU co-primary allocation for FSS. This is true regardless of whether those satellites provide service in the U.S.: satellites operating pursuant to the 28 GHz band FSS primary ITU frequency allocation do (and will continue to) “see” U.S. terrestrial emissions within beams covering existing FSS facilities in the 28 GHz band. Many satellites (including O3b’s) will not be able to avoid doing so. The Commission must ensure that terrestrial emissions avoid disrupting the services of foreign licensed space stations that are operating pursuant to ITU and other national authorizations.

Limiting skyward emissions will not materially constrain 5G service, which is still in the early planning stages. UMFU operations can and should adapt to the existing environment, which includes broad domestic and global use of the 28 GHz band for broadband satellite services. A single metric for minimizing skyward emissions towards all satellites (rather than different metrics for different satellite systems) will allow the greatest flexibility for designing UMFU deployments.

The Commission should also expressly state that UMFU aeronautical mobile service will not be permitted in the 28 GHz band. UMFU aeronautical mobile would require “terrestrial” beams to point upwards towards space and, presumably, require substantial power. The record does not include any cognizable support for such authorization, and no public submissions indicate that such operations would be compatible with extensive existing FSS satellite operations in the band.¹²

The Commission must adopt clear, enforceable rules that ensure that aggregate emissions from UMFU services remain at all times below the limits for interference to satellite receive

¹⁰ See letter from representatives of O3b Limited, EchoStar Corp., Inmarsat, WorldVu Satellites Ltd./OneWeb, ViaSat Inc., and SES Americom, Inc. to Marlene H. Dortch, GN Docket No. 14-177, *et al.* at 1 (filed May 26, 2016) (“*May 26 Satellite Operators Letter*”).

¹¹ May 12 Satellite Operators Letter at 12.

¹² Aeronet Global Communications Inc. (“Aeronet”) has made two submissions in this proceeding. Aeronet appears to advocate that the Commission permit aeronautical mobile service. However, essentially all substance has been redacted from the first filing. See Comments of Aeronet, GN Docket 14-177, *et al.* (filed Jan. 27, 2016). The second filing was submitted as confidential so is not viewable at all. See Errata of Aeronet, GN Docket 14-177, *et al.* (filed Mar. 18, 2016). It is impossible to determine from the submissions which, if any, of the bands under review in this docket Aeronet seeks to access for mobile aeronautical service. This information is not in the public record, so O3b cannot comment on whatever assertions Aeronet has made, and the FCC cannot rely on this nonpublic information to establish critically important spectrum policy.

beams. All UMFU licensees, individually and collectively, must be required to remain below the limits at all times.

Co-primary FSS Earth Station Deployment – No Restriction to Existing Sites

If mobile service is authorized in the 28 GHz band the Commission must (at minimum): (1) grant co-primary status to all existing FSS earth stations; (2) treat as co-primary those FSS earth stations applied for up to the date of the first auction; and (3) provide a clear, reliable path for future site-licensing of FSS earth stations on a co-primary basis.

This can best be accomplished by defining safe harbors by rule, and imposing on UMFU licensees an obligation to coordinate in good faith, at arm's length, with FSS operators seeking to deploy in areas that are outside of the safe harbors. O3b has supported one rule-based safe harbor within low population density census tracts, along with a presumption in favor of an FSS earth station when no existing UMFU deployment and no planned UMFU deployment would be impaired.¹³

Co-existence between FSS earth stations and UMFU deployments could be facilitated by the use of a PFD threshold. A PFD threshold can establish a “bright line” to indicate when coordination is required for new earth stations. Earth stations that would not exceed the PFD threshold for any existing or planned¹⁴ UMFU sites could be built without coordination.¹⁵ In other cases, UMFU licensees must bear an obligation to coordinate in good faith with FSS operators seeking to deploy in areas that are outside of the safe harbors.

PFD thresholds would: (1) provide an objective technical measure by which FSS earth stations and UMFU licensees could reliably assess coordination issues and ensure that FSS earth stations do not interfere with UMFU terrestrial networks; (2) facilitate sharing based on site-specific parameters and antenna performance; and (3) enable more efficient use of the 28 GHz band than would coordination zones based on pre-determined distances. A PFD-based coordination threshold supplements the safe harbor based on population density, which is important, given that populations change over time. As the Joint Terrestrial Filers note,¹⁶ a PFD approach also provides known mitigation options in the event that the proximity between FSS earth station deployment and UMFU deployment is unavoidable.

O3b has reservations about part of the April 6, 2016¹⁷ joint proposal offered by AT&T and EchoStar, and as further elaborated on May 19, 2016¹⁸ to include use of a maximum EIRP

¹³ See May 26 Satellite Operators Letter at 5.

¹⁴ SES/Inmarsat Letter at 3 (“The ultimate rules must also define what stage of development a terrestrial system must have achieved to be considered in the coordination process.”).

¹⁵ A version of the safe harbor framework proposed by EchoStar and AT&T might be used. Prospective builders of FSS earth stations would be required to give notice to all potentially affected UMFU licensees. UMFU licensees with existing or planned facilities would be required to respond. At that point it could be determined whether the PFD threshold had been reached. If it had not, no coordination would be required. If the threshold had been reached, the parties would be required to coordinate in good faith, with no financial consideration.

¹⁶ Joint Terrestrial Letter at 1. To be clear, O3b does not agree with the particular PFD limits or general approach proposed by the Joint Terrestrial Filers. But we agree that PFD thresholds may be one useful tool in creating a workable regime for co-primary access of FSS and UMFU services.

¹⁷ April 6 AT&T/EchoStar Letter.

density toward the horizon of 12.2 dBm/MHz for operations of individually-licensed earth stations in the 28 GHz band. The value of 12.2 dBm/MHz is specific to GSO FSS earth stations only. This value is too constraining on O3b's operations by approximately 30 dB. In other words, if a fixed EIRP density toward the horizon were to be adopted, it would have to be 30 dB higher in order to sustain O3b's NGSO operations. In contrast, a regime using a PFD threshold would provide improved flexibility for efficient spectrum use by FSS and UMFU operations with greater certainty and possibly closer proximity than assumed by a single EIRP toward the horizon. The PFD proposal would take into account terrain or possibly shielding that could further decrease emissions from FSS earth stations toward UMFU operations as well as allow parties to agree to different PFD values in different circumstances.

The Commission should reject proposals that do not provide for flexible site-licensing for new individually-licensed FSS earth stations to address customer requirements and support system growth. The record shows that continued site-licensing of FSS earth stations can proceed via coordination with minimal constraints on future UMFU deployment. Submissions by 5G advocates affirm that 5G services are expected to be a localized adjunct to traditional terrestrial networks.¹⁹ Since 5G will only "use" a small percentage of any given geographic area, there is no reason to exclude or limit deployment of new satellite earth stations in other areas.

Given the demonstrated and continuing requirements for the services supported by FSS deployments, the Commission should reject proposals to limit FSS growth to areas where population density is extraordinarily low, e.g., less than 100 people per square mile as suggested by Verizon.²⁰ FSS services cannot be sustainably provided or keep pace with demand if FSS earth stations must be located only in only rural or low-density regions of the country. FSS operators must have the flexibility to place their customer terminals wherever the customer needs them. This keeps last mile connectivity costs low, speed and quality of service high, and ensures maximum competition.

Similarly, proposals that would constrain all FSS earth station deployments to a single site (e.g., one satellite campus per county) are unworkable for reasons both competitive and technical. First, even when it is spatially feasible for some FSS earth stations to share the same property, it is no coincidence that existing instances of shared facilities involve operators

¹⁸ May 19 AT&T/EchoStar Letter.

¹⁹ See, e.g., Letter from Scott Bergmann, Vice President, CTIA, to Marlene H. Dortch, GN Docket No. 14-177, *et al.* at 2 (filed May 20, 2016) ("CTIA Letter") ("As CTIA and its member companies have noted in this proceeding, the primary opportunity for mmW deployment is in areas with the greatest population density. This is due to the fact that mmW spectrum is unlikely to deliver extensive coverage in a market but instead will be best suited to providing capacity via small cells and backhaul, particularly in densely populated areas."); see also CTIA Letter at 3 (in advocating for the top 150 CMAs to be reserved and sufficient for UMFU licensing, CTIA indicates that "[t]he top-150 MSAs/CMAs as defined by the Commission encompasses roughly two-thirds of the population and approximately 11% of the geographic area of the country."). Nothing in the record suggests that even a material portion of these CMAs would actually be covered by 5G service.

²⁰ Letter from Gregory Romano, Verizon, to Marlene H. Dortch, GN Docket No. 14-177, *et al.* at 1 (filed April 26, 2016) ("to the extent the Commission is considering distinguishing between urban and rural areas in its analysis of satellite interference issues, it should analyze past Commission definitions of urban and rural areas rather than adopt an arbitrary list of urban core areas. For example, in its December 2015 Wireless Competition Report, the Commission considered an area to be rural if it had a 'population density of less than 100 people per square mile.'").

affiliated either by corporate or commercial relationships.²¹ Different satellite operators' ability to share facilities is limited because activities performed at such facilities, such as primary or back-up spacecraft control and customer traffic management, involve competitively sensitive or proprietary developments with respect to both an operator and its customers. In addition, satellite operators and their ground equipment partners are constantly innovating, often through new technology at earth station sites. Forcing FSS operators to share a property, even if the issues of property ownership and management could be overcome, would substantially reduce the ability of FSS companies to compete against each other, and would create an undue risk of exposure of proprietary commercial information. From a technical perspective, different FSS companies have different requirements for how they must site their individually licensed earth stations (for example, on an Internet node), and a single site selected by the Commission or terrestrial operators would not likely correspond to the different GSO and NGSO FSS network needs. Lastly, it is not technically feasible to co-locate earth stations when the primary purpose of some earth stations is to provide network redundancy through geographic diversity (very specific locations are required for this function). It is clear that forcing FSS operators to locate their earth stations in places not demanded by network or customer requirements suffers from the same disadvantages as mentioned above: it would reduce service quality, service speed, benefits of competition, efficient network operations, and is often technically infeasible. Thus, the Commission should reject proposals for single site co-location of all FSS earth stations such as on a county basis, and should instead pursue the more flexible co-primary approaches with coordination or safe harbors as proposed in this *ex parte*.

In sum, constraining satellite deployment to specific locations in UMFU license areas (whether by population density or by decree) would impose unnecessary and substantial expenses, eliminate the innovative value of lower latency services like O3b and reduce the potential for FSS competition with high-performance terrestrial services. O3b must be able to access 28 GHz frequencies on an individually site-licensed co-primary basis in order to sustain the global operations of its constellation, and to provide O3b's state-of-the-art low latency and connectivity to O3b's U.S. customers. Such deployment will include additional earth stations at existing facilities, as well as additional site-licensed earth stations in other U.S. locations for O3b's enterprise and government customers.

mmW bands and Warehousing

Exclusive geographic area UMFU licenses are wholly inappropriate for the mmW bands generally, and in particular, for the 28 GHz band.²² The anticipated future uses of any new UMFU licenses are expected to be limited in scope and in geographic coverage, and would be awarded by auction only in those license areas without an LMDS incumbent today. The NPRM

²¹ Although O3b's Global Network Operations Center initially shared space in an SES facility, O3b has since moved its personnel to O3b's own separate facility, and expects to move all O3b antennas to its the new location as well.

²² Comments of O3b Comments Limited, GN Docket No. 14-177, *et al.* at 17-18 (filed Jan. 28, 2016) ("*O3b Comments*") ("Pre-defined geographic areas of any size are unworkable for FSS, particularly if the only assured path to access is to acquire those licenses via auction. If the geographic licenses are too small, an FSS operator may need to acquire several licenses (or, in the secondary market, negotiate with several incumbents), and failure to acquire all (or coordinate with all) would preclude the deployment. If the license areas are too large, the FSS operator would be required to bid for vastly more spectrum rights than it actually needs.").

proposes, however, that existing LMDS authorizations that cover substantial portions of U.S. population and geography simply be upgraded to include mobile service, even where these incumbents may be delivering at best limited service to limited geography. In short, the NPRM proposes to award licenses – mostly upgrades to incumbents – for arguably limited uses but that exclude FSS – the service that has actually shown itself willing and able to bring highly productive use of the 28 GHz band to market. This proposal affords a very limited role to the market mechanisms that underlie exclusive geographic area licensing, and by upending regulatory certainty discourages the investment and innovation that market mechanism are intended to encourage.

However, if the Commission does award exclusive geographic licenses to UMFU operators, it must impose meaningful performance requirements to ensure that spectrum is not warehoused in *any* portion of the license area, and those licenses should be required to accommodate new FSS earth stations as described in this filing. This is the only way to ensure that spectrum is not warehoused, and that growth of other services is not unduly handicapped. Given the short-range propagation characteristics of the mmW bands and the pressing need of FSS operators to meet fast-growing demand, performance requirements should be based on “keep what you use” rather than “all or nothing”.²³

Conclusion

As O3b originally proposed, O3b continues to support co-primary site licensing for all 28 GHz facilities and services, FSS and UMFU alike, as the most practical and spectrum efficient approach to shared FSS/UMFU use in the 28 GHz band.²⁴ Site licensing is a true market-based mechanism that also prevents inefficient warehousing.

If the Commission decides not to proceed down this true co-primary co-existence path in 28 GHz, the Commission must, at a minimum, establish a flexible site-licensing mechanism for FSS access to 28 GHz spectrum. That mechanism must be independent of the UMFU licensing process, and must limit the cases in which UMFU has any opportunity to constrain new FSS sites to very narrow cases. Specifically:

- Existing FSS earth stations should be grandfathered as co-primary. FSS earth station licensing should be permitted to continue until the UMFU auction, and all FSS earth stations applied for by the time of the auction should have co-primary status.
- FSS should not be required to bid for large geographic licenses in order to secure future co-primary earth stations, and FSS licensing should not be subject to buying secondary access from terrestrial licensees.

²³ No performance requirements can fully compensate for the application of exclusive geographic area licenses in a band in which large terrestrial geographic licenses are not needed and are (by clear evidence) counterproductive. See O3b Comments at ¶¶ 20-26 (site license/cutoff rules for future 28 GHz facilities represents a time-tested, statutorily sanctioned process for assigning spectrum rights).

²⁴ O3b Comments at 24-32; see Comments of SES Americom, Inc., GN Docket No. 14-177, *et al.* at 7-11 (filed Jan. 28, 2016) (“The Licensing Framework Must be Truly Technology Neutral”); see also Comments of ViaSat, GN Docket No. 14-177, *et al.* at 10-16 (filed Jan. 28, 2016).

- After auction, co-primary FSS individually licensed antennas may be located within a population-based safe harbor and/or wherever the PFD threshold is not reached with respect to UMFU facilities existing or planned at the time the FSS earth station license is issued. When the population threshold is reached, new FSS earth stations should be permitted (and treated as co-primary) where successfully coordinated with existing or planned UMFU facilities. In areas not licensed to any UMFU licensee, FSS should be able to deploy co-primary earth stations subject only to Part 25 licensing rules. FSS earth stations should not be limited to one site per designated area (such as a county) for all FSS operators.
- FSS individually licensed antennas should be licensed after completing good faith coordination under clearly defined technical parameters. Coordination rules must define what stage of development a terrestrial system must have achieved to be considered in the coordination process.
- In all coordination situations, there must be an equal provision of technical information from both terrestrial and satellite parties, and an obligation on both to respond in a timely manner.
- Critically, mobile UMFU licensees shall not be allowed to deploy unless they conform to clear rules that ensure they will not cause harmful interference to in-orbit FSS satellite receivers. To this end, the Commission should adopt an aggregate skyward EIRP density limit for all UMFU operations in the 28 GHz band of 16.5 dBm/MHz per 1000 km².
- UMFU license areas should be small (even counties are too large), and UMFU license terms should be short (initial build out should commence no later than 2020 as terrestrial proponents have asserted, and thereafter subject to 5-year renewal expectancy if performance requirements are met). Areas not used at the end of the license term should be opened to FSS based on PFD thresholds.

Respectfully submitted,

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