

July 4, 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:

In this letter, O3b urges the Commission to consider rules regarding deployment of non-geostationary orbit (“NGSO”) FSS earth stations in the 27.5-28.35 GHz (“28 GHz”) band that would ensure intensive and efficient use of spectrum, robust Upper Microwave Flexible Use (“UMFU”) services, and continued growth of satellite broadband services. O3b also responds to Verizon’s proposal of June 14, 2016.¹

Specifically, O3b recommends the following:

- Rather than adopt the proposed power flux density (“pfd”) limit of -77.6 dBm/m²/MHz at 200 meters from the FSS earth station antenna, as proposed by Verizon,² the Commission should:
 - Allow an FSS operator to site an earth station anywhere the earth station pfd is less than or equal to -77.6 dBm/m²/MHz as measured from a height of 10 meters over areas where the population-weighted density is greater than or equal to 1,500 people per square mile.
 - With respect to NGSO FSS, adopt a metric by which an NGSO FSS operator would also be permitted to site an earth station in any location in which the area within the -77.6 dBm/m²/MHz pfd “contour” does not include more than 10 percent of the population of the census tract(s) at the time of the application.
- Reject any additional tiers of restrictions for FSS earth station deployment, such as U.S. Military Bases, National and State Parks, and facilities that cover more than one acre of real property.

¹ Notice of *Ex Parte* of Verizon, filed in GN Doc. No. 14-177 (filed June 14, 2016).

² *Id.*

O3b reiterates its recommendations for ensuring flexibility and future growth of both UMFU and FSS services:

- Performance requirements should be attuned to the propagation characteristics of the millimeter wave (“mmW”) bands and should create incentives and opportunities for full and efficient use of the 28 GHz band.
- Auctions are not a workable method for FSS access to spectrum.
- Grandfathering is essential for existing FSS earth stations, those applied for by the date of the UMFU auction or relicensing, and new individually-licensed FSS earth stations for communication with space stations that are already authorized or applied for by the pending Report & Order date.
- All FSS earth stations deployed pursuant to the new standard should have co-primary status and should not be subject to displacement at the behest of an UFMU licensee.

Proposals for FSS Earth Station Siting Must Be No More Restrictive than Necessary, and Must Account for NGSO System Characteristics.

O3b reiterates that at least one site for FSS earth stations per county is essential, although several sites would be more reasonable and likely to facilitate deployment of broadband to unserved and underserved areas of the U.S.³ If the Commission adopts any siting preconditions, no further FSS/UMFU coordination should be required. Siting criteria must ensure that an FSS earth station may be sited when the criteria are met, and that the earth station, once built, can operate without the risk of later being forced to modify or cease operations.

O3b previously joined the Satellite Industry Association (“SIA”) in advocating an approach to future earth station siting in the 28 GHz band that would allow flexibility to FSS operators without limiting UMFU deployment.⁴ The SIA comments noted that the -77.6 dBm/m²/MHz threshold may be appropriate at larger distances than proposed by Verizon, but would be too constraining at Verizon’s proposed 200 meter distance.⁵

O3b supports the SIA comments, which used the -77.6 dBm/m²/MHz threshold – the same threshold proposed by Verizon – as a key metric in its proposal for determining FSS earth station siting. Adopting a pfd limit in relation to a reasonable population metric is consistent with facilitating widespread UMFU deployment while allowing the spectrum in some less populated areas to be used to provide broadband services across the United States.⁶ SIA also noted, however, that in certain instances different standards will be appropriate for siting FSS

³ Notice of *Ex Parte* of O3b, filed in GN Doc. No. 14-177 (filed May 31, 2016). “[P]roposals 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.”

⁴ Notice of *Ex Parte* of Satellite Industry Association, filed in GN Doc. No. 14-177, 4-5 (filed Jun. 22, 2016).

⁵ *Id.* at 4.

⁶ *Id.* at 5. Notably, an FSS earth station, whether GSO or NGSO, impacts only a relatively small area. The total area impacted by all FSS earth stations collectively will represent a miniscule percentage of even the less densely populated geography of the United States, even in the most ambitious FSS projections.

earth stations outside an initial one-per-county location for geostationary (“GSO”) and NGSO systems in the 28 GHz band.⁷

While the factors at any given NGSO site are relatively constant, NGSO antennas must scan the sky to track passing satellites. An O3b earth station will exceed a -77.6 dBm/m²/MHz pfd at 200 meters in some azimuths periodically as the earth station acquires and tracks each new passing satellite. Although the area within an NGSO earth station’s -77.6 dBm/m²/MHz pfd “contour” is generally relatively small, the size is not uniform (and varies from minute to minute at each site), and will vary based on terrain and other local factors.⁸ The size of census tracts also varies considerably, so that in some cases an NGSO pfd contour may include a meaningful portion of the census tract in which it is located, as well as one or more adjacent census tracts. Annex 1 contains one example of the contour of an NGSO earth station to illustrate this situation.

O3b recommends that the Commission adopt the approach proposed by SIA, which would provide a level of certainty with respect to both GSO and NGSO earth station siting. That is, an FSS operator may site an earth station anywhere the earth station pfd is less than or equal to -77.6 dBm/m²/MHz as measured from a height of 10 meters over areas where the population-weighted density is greater than or equal to 1,500 people per square mile.⁹ Establishing clear values for FSS earth station operations, including appropriate values for NGSO systems, will allow UMFU systems to deploy widely and in areas of the country needing additional capacity, while still facilitating a minimum acceptable opportunity for access by FSS operators.

A Threshold of 0.1% Population Density of a Census Tract is Unworkable for Any FSS Operator.

If the Commission absolutely must adopt a sharing framework that limits FSS deployment, a reasonable metric is population-weighted density as proposed by SIA and O3b. However, with respect to NGSO operators, the Commission should base deployment on a percentage of the population of census tracts within the station’s -77.6 dBm/m²/MHz contour. A

⁷ SIA proposed the metric of 1,500 people per square mile as a safe harbor for additional FSS earth station locations beyond one site designated per county for FSS earth station deployment; however, O3b proposes this metric for deployment of any FSS earth station.

⁸ At 200 meters, the level and duration of a pfd in excess of -77.6 dBm/m²/MHz should correspond to the typical off-axis antenna gain performance and average dwell time at low elevation angles. For example, at 200 meters an NGSO earth station operator should be allowed to exceed this pfd by 15 dB at elevation angles between 5 and 10° for short periods of time depending on the earth station coordinates and available satellites in the NGSO satellite constellation. Allowing NGSO transmitting earth stations to take advantage of their temporal architecture will increase the efficient use of the spectrum.

⁹ SIA recommended, and O3b agrees, that the Census Bureau’s formula for calculating population-weighted density for metropolitan and micropolitan areas be adapted to calculate population-weighted density of the impact area within the earth station’s -77.6 dBm/m²/MHz contour. *See Id.* at fn. 4 and p. 5. SIA provided a specific proposal in the interest of developing a concrete solution to sharing with UMFU operators; however, SIA stated that FSS operators should presumptively be entitled to deploy individually licensed earth stations in areas outside densely populated areas as long as there is no existing UMFU deployment and where doing so is not likely to materially impair UMFU deployment already planned. O3b shares this view.

cut-off of one-tenth of one percent (0.1%) of the population, as proposed by Verizon, is not a viable option.

Census tracts generally run from about 1200 to 8000 people,¹⁰ so 0.1% ranges from one person to eight people. While O3b has accepted in principle for purposes of this proceeding (and for the U.S. only) the concept of a population-based metric for FSS earth station siting, Verizon's metric is entirely antithetical to the sharing principles that Chairman Wheeler and the Notice of Proposed Rulemaking have encouraged. This metric, particularly when further constrained by Verizon's additional proposed restrictions, would all but eliminate the possibility of siting any new O3b earth stations.

However, it appears that an impact threshold of 10% of the population of the affected census tracts, while extremely constraining, would permit a limited number of new O3b sites. This threshold would ensure that NGSO sites permitted under this standard are sited in relatively unpopulated areas. O3b proposes that the FCC permit siting based on this standard in addition to, and not in lieu of, the proposed SIA approach.¹¹

The Commission's Rules for UMFU Should Support Co-existence with FSS.

As an enabler of 3G and 4G roll-out globally, O3b looks forward to supporting its customers as they introduce 5G services. However, an environment in which NGSO FSS services like O3b can co-exist with 5G service in the 28 GHz band must take into account certain basic principles, as follows.

Performance Requirements Should Maximize Use of 28 GHz Spectrum. As O3b has previously noted, the Commission must reject proposals for wide scale spectrum warehousing.¹² Performance requirements should be attuned to the propagation characteristics of the millimeter wave ("mmW") bands and should create incentives and opportunities for full and efficient use of the 28 GHz band. This can be accomplished by means of performance milestones, build-out credits related to FSS earth station deployment, and by allowing access to FSS earth stations on a co-primary basis in areas that remain unserved at the end of a license term.

Verizon's proposal to limit FSS earth station deployment to areas that do not cover more than one-tenth of one percent (0.1%) of the population of a census tract – in addition to being

¹⁰ United States Census Bureau, *Geographic Terms and Concepts – Census Tract* (Dec. 06, 2012), https://www.census.gov/geo/reference/gtc/gtc_ct.html.

¹¹ Verizon's stated goal in limiting FSS earth station deployment to a 200-meter area that does not cover more than one-tenth of one percent (0.1%) of the population of the census tract in which it is located is "to minimize the impact on the public." Notice of *Ex Parte* of Verizon, filed in GN Doc. 14-177 (filed June 14, 2016). If Verizon's exclusion zone is enacted, the impact on the public will indeed be minimized, but not in a good way. Such an anti-competitive measure will negatively impact the ability of certain populations to access broadband satellite services in the 28 GHz band that are most practical for their needs. As an example, restricting NGSO FSS earth stations to those whose -77.6 dBm/m²/MHz pfd "contour" encompasses only 0.5 percent of a census tract's population would exclude NGSO FSS earth stations from all but the very largest and least densely populated census tracts – those with large areas and small populations.

¹² Notice of *Ex Parte* of O3b, filed in GN Doc. No. 14-177 (filed June 24, 2016).

blatantly anti-competitive – highlights why performance requirements are essential to ensuring full use of the 28 GHz band. One implication of Verizon’s proposal is that UMFU services will cover the other 99.9% of the population. If the Commission adopts Verizon’s directive, UMFU licensees should be held to this standard. If UMFU licensees fail to meet a 99.9% buildout requirement, they should be required to permit expansion of FSS earth stations where UMFU providers have not built out. Otherwise, this proposal ensures that in the medium to long term, 28 GHz spectrum is not being put to efficient use and portions of the population will go unserved by other innovative mmW band services.

The Commission Should Not Support Anti-Competitive Siting Limits. Certain of the Verizon proposals for limits on FSS earth station siting are blatantly anti-competitive. Verizon proposes to preclude the “coordination zone”¹³ of any FSS earth station from covering any portion of a myriad of facilities that have long relied on satellite communications: military bases, mining facilities, interstates or highways, and National and State Parks. At the extremes, Verizon proposes that FSS earth stations simply not exist in or near:

- Military bases: Verizon’s proposed ‘coexistence criteria’ would preclude earth station operations in the 28 GHz band at military installations, even though the Department of Defense is a heavy user of all telecommunications technologies, including NGSO FSS systems like O3b, and has broad experience in interference avoidance.
- Federal or commercial facilities employing more than 100 full time employees or covering more than one acre of real property: ‘Coexistence’ under this metric would exclude large swaths of U.S. real estate from FSS operations in the 28 GHz band, whether or not people live there.

These constraints are unnecessary and overly limiting. Such prohibitions would prevent industry, educational institutions and government facilities from determining what best suits their needs for 28 GHz based broadband services. The O3b satellite system currently connects to earth stations on multiple U.S. government bases in the United States. The U.S. government relies on satellite services abroad, and will be unable to test or operate satellite services in 28 GHz to train and prepare its troops for theater-like communications scenarios under such constraints.

The Commission should instead focus on the proposals made herein by O3b as a more balanced approach that would enable FSS operators to build out in areas with low population density. Adoption of Verizon’s proposed metrics¹⁴ as a pre-condition to “coexistence” would set

¹³ An NGSO FSS earth station’s “coordination zone” under this proposal would be the area within its -77.6 dBm/m²/MHz pfd “contour.” This NGSO FSS zone will vary in size and precise shape from site to site and between systems, but often will extend two, three, or more kilometers in certain directions, and significantly further in some cases.

¹⁴ Verizon offers no rationale for the proposed location limits, and as of July 1, O3b finds no support in the record for Verizon’s proposed prohibitions.

a bad precedent for any subsequent sharing scenarios, and would pave the way for any number of anti-competitive market carve-outs.

Auctions Are Not an Appropriate Method for FSS Access to Spectrum. UMFU proponents encourage rules that permit satellite operators to obtain access to spectrum through negotiation or purchase at auction – as O3b, SIA, and others have stated before, this is not workable.¹⁵ Licenses covering 75% of the U.S. population are already held by LMDS operators. Even if satellite operators could afford to participate in an auction, they would have no opportunity to purchase most valuable license areas. Subjecting FSS to negotiations with UMFU licensees simply makes UMFU licensees gatekeepers to satellite services, especially if FSS is not given co-primary status. This proposal neither maximizes use of the spectrum to serve the public good nor allows satellite companies to respond to market demand.

Grandfathering for Existing FSS Earth Stations and Co-Primary Status for Future FSS Earth Stations is Essential. As previously noted by O3b, existing and future FSS earth stations and UMFU services must be treated as co-primary.¹⁶ FSS operators have already undertaken billions of dollars in investment in reliance on the existing regime, for satellites that are planned and launched years before earth station applications are filed. Although earth station locations are programmed into the satellites and network designs, the Commission’s rules effectively require that FSS operators delay submission of earth station applications until an FSS operator knows it can begin operation of the facilities within a year of licensing.

O3b reiterates that FSS is secondary only to LMDS, not to UMFU, by longstanding Commission policy, rule, and licensing decisions.¹⁷ All FSS earth stations deployed pursuant to rules adopted in this proceeding should have co-primary status and should not be subject to displacement at the behest of an UFMU licensee.

Conclusion

O3b understands that the Commission is seeking to develop a fair, efficient sharing regime that protects thriving incumbent services¹⁸ and allows introduction of new services. The Verizon proposal is not that regime, and is in fact a dangerous, misguided series of recommendations. Tailoring the spectrum sharing framework to facilitate practical, logical and reasonable sharing between FSS operators and UMFU services, and to accommodate the operational features of NGSO satellite systems, will maximize spectrum efficiency without restricting future UMFU licensees.

¹⁵ See Comments of O3b Limited, GN Doc. No. 14-177 *et al.*, 20-28 (filed Jan. 28, 2016).

¹⁶ Notice of *Ex Parte* of O3b, filed in GN Doc. No. 14-177 (filed May 31, 2016). “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.”

¹⁷ Notice of *Ex Parte* of O3b, filed in GN Doc. No. 14-177 (filed June 24, 2016).

¹⁸ O3b Networks, *O3b Networks the Fastest Growing Satellite Operator in History*, (Oct. 6, 2015), <http://www.o3bnetworks.com/o3b-networks-the-fastest-growing-satellite-operator-in-history/>.

Respectfully submitted,
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Annex 1

Example NGSO earth station $-77.6 \text{ dBm/m}^2/\text{MHz}$ contour projected onto the Earth's surface

The following graphic is illustrative of type of “contour” that would result from meeting the $-77.6 \text{ dBm/m}^2/\text{MHz}$ that a NGSO earth station can have at different azimuth and elevation angles, corresponding to the location of the active satellite that is being tracked by the NGSO earth station during a pass. In this example, the edge of the red shaded area represents the distance at which the pfd is met. Outside of this area, the pfd is less than $-77.6 \text{ dBm/m}^2/\text{MHz}$ while inside this area, the pfd may be higher depending on terrain and clutter around the NGSO earth station. As shown, at elevations of 5° , the distance at which this pfd is met could be 14 km away from the earth station. This illustrates a worst case example of 5° handoff in both directions. A typical case may acquire the satellite at 5° but could drop the setting satellite at 15° .

