

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

In the Matter of)	
)	
International Bureau Seeks Comment on)	IB Docket No. 17-172
Implementing Earth Station Siting)	
Methodologies)	

REPLY COMMENTS OF VIASAT, INC.

Daryl H. Hunter
Senior Director, Regulatory Affairs
VIASAT, INC.
6155 El Camino Real
Carlsbad, CA 92009

John P. Janka
Elizabeth R. Park
Lilit Sheymajash K. Edwards
LATHAM & WATKINS LLP
555 Eleventh Street, N.W.
Suite 1000
Washington, DC 20004

Counsel for ViaSat, Inc.

August 7, 2017

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ViaSat, Inc. (“ViaSat”) replies to the comments filed¹ in response to the above-referenced Public Notice, regarding appropriate methodologies for calculating the 0.1 Percent Zone for earth stations in the 27.5-28.35 GHz and 37.5-40 GHz band segments within a UMFU license area, in accordance with in Section 25.136 of the Commission’s rules.

Consistent with ViaSat’s position that sharing between satellite and UMFUS is feasible at 27.5-28.35 GHz and 37.5-40 GHz, ViaSat supports the adoption of methodologies in this proceeding to implement earth station licensing in these band segments in a manner that promotes greater opportunities for future earth station deployment and facilitates efficient use of spectrum by all services in these bands. ViaSat has advocated for the use of actual operation and site conditions to the extent feasible in order to achieve these goals.

Commenters generally reiterate ViaSat’s recommendation that the most accurate data should be used as inputs into calculating the size of the relevant terrestrial compatibility zone

¹ See Comments of AT&T Services, Inc., GN Docket No. 14-177, IB Docket No. 17-172 (July 21, 2017) (“AT&T Comments”); Comments of EchoStar Satellite Operating Corporation and Hughes Network Systems, LLC, IB Docket No. 17-172 (July 21, 2017) (“EchoStar Comments”); Comments of SES Americom, Inc., O3b Limited, Inmarsat, Inc., and Telesat (“Joint Commenters”), IB Docket No. 17-172 (July 21, 2017) (“Joint Comments”); Comments of The Boeing Company, IB Docket No. 17-172 (July 21, 2017) (“Boeing Comments”); and Comments of WorldVu Satellites Limited d/b/a OneWeb, IB Docket No. 17-172 (July 21, 2017) (“OneWeb Comments”).

around any given earth station, which ViaSat refers to as the “0.1 Percent Zone calculation.”²

Broad agreement exists that shielding should be permitted to be taken into account in the 0.1 Percent Zone calculation. Moreover, there is consensus that population calculations should reflect the most granular census data available, and that applicants should be allowed to use information from mapping databases and other available tools for greater accuracy.

ViaSat agrees with all of these positions and that population in areas overlapping multiple 0.1 Percent Zones should not be double counted. ViaSat does not agree that it would be appropriate to calculate 0.1 Percent Zones based on wide ranges of operating parameters (as some commenters propose), such as pointing angles or possible antenna characteristics that do not reflect the facilities proposed in the application. Nor does ViaSat agree with the suggestion of WorldVu Satellites Limited d/b/a OneWeb (“OneWeb”) to substitute new, specific interference protection thresholds for the framework provided in the *Spectrum Frontiers Order* for establishing satellite earth station protection criteria at 37.5-40 GHz.

Finally, ViaSat recommends that the Commission consider more thoroughly the NGSO-specific issues raised by The Boeing Company (“Boeing”) and OneWeb regarding the assessment of near-field effects and methodologies for assessing antenna gain toward the horizon of NGSO earth stations.

² ViaSat’s references to the “0.1 Percent Zone” here and in its opening comments are to (i) for the 27.5-28.35 GHz band, the “area in which the earth station generates a power flux density (PFD), at 10 meters above ground level, of greater than or equal to -77.6 dBm/m²/MHz[,]” covers more than 0.1 percent of the population of the relevant UMFU license area (considered along with certain previously-licensed earth stations), and “contain[s] any major event venue, arterial street, interstate or U.S. highway, urban mass transit route, passenger railroad, or cruise ship port;” and (ii) for the 37.5-40 GHz band, the “zone within which the earth station will require protection from transmissions” of UMFU licensees. 47 C.F.R. §§ 25.136(a)(4), (b); *see also Use of Spectrum Bands Above 24 GHz for Mobile Radio Services*, Report and Order, 31 FCC Rcd 8014 at ¶¶ 54, 93 (2016) (“*Spectrum Frontiers Order*” or “*Order*”).

I. CONSENSUS EXISTS THAT ACTUAL INFORMATION AND REALISTIC ESTIMATES SHOULD BE USED IN CALCULATING THE 0.1 PERCENT ZONES

There is strong consensus among commenters that actual earth station operating parameters and realistic assumptions must be used to the greatest extent feasible in calculating the 0.1 Percent Zone. As noted in the various comments, actual data sources and reliable estimates are readily available for each of the relevant parameters identified in the Public Notice.

A. Antenna Pointing

EchoStar Satellite Operating Corporation and Hughes Network Systems, LLC (“EchoStar”) and AT&T Services, Inc. (“AT&T”) agree with ViaSat that the 0.1 Percent Zone should be calculated based on the actual antenna pointing angles of the earth station toward the satellite point(s) of communication requested in the earth station application,³ and not by drawing a large circle around the earth station that bears no relationship to intended operations. Using actual antenna pointing angles would establish a 0.1 Percent Zone that is sufficient for the proposed earth station operations but that would not consume unused geographic areas in a manner that could preclude the deployment of earth stations by others.

On the other hand, Boeing and the Joint Commenters propose that applicants be allowed to draw a large 0.1 Percent Zone around a proposed earth station in order to (i) allow for the possibility of communicating with a number of different GSO satellites in the future, or (ii) allow NGSO earth stations increased operational flexibility to track satellites that are in motion across the sky.⁴ More specifically, Boeing suggests allowing applicants to “simplif[y]” their 0.1 Percent Zone showing by utilizing a single radius (for an NGSO earth station) or the entire

³ See AT&T Comments at 4; EchoStar Comments at 4.

⁴ See Boeing Comments at 2-3; Joint Comments at 3.

azimuth field of view (for a GSO earth station)⁵ rather than using an actual antenna gain contour. Similarly, the Joint Commenters suggest allowing operators to take into account a range of possible antenna pointing angles.⁶

At bottom, these proposals might provide the proponents with more operational flexibility, but by creating large 0.1 Percent Zones, they also threaten to preclude the deployment of earth stations by other satellite operators. Essentially, these proposals are unfounded and collateral attacks on the *Spectrum Frontiers Order*,⁷ which recognized that (i) it is possible to design, site, and operate an earth station that satisfies the 0.1 Percent Zone calculation, (ii) it is possible to deploy such an earth station in urban areas, (iii) it may not be possible for every conceivable desired earth station configuration to fit within the 0.1 Percent Zone framework, such as NGSO systems that are designed so their earth stations sweep wide and low across the neighboring areas,⁸ and (iv) in circumstances where that may not be the case, the Commission has provided a number of other ways to authorize earth stations. Moreover, as ViaSat has previously explained, careful siting of earth stations can help establish a suitable 0.1 Percent Zone.⁹

⁵ Boeing Comments at 3.

⁶ See Joint Comments at 3.

⁷ See *Spectrum Frontiers Order*, 31 FCC Rcd 8014 at ¶ 60.

⁸ See *id.* at ¶ 46.

⁹ See, e.g., Opposition of ViaSat, Inc., Petitions for Reconsideration, GN Docket No. 14-177, *et al.*, at 11-12 (Jan. 31, 2017) (“ViaSat Opposition”).

B. Antenna Patterns

Commenters unanimously support the use of actual antenna patterns where possible when calculating 0.1 Percent Zones.¹⁰ Where such patterns are not available, Boeing agrees with ViaSat that simulated antenna patterns can be developed through software programs with a high degree of accuracy,¹¹ and that simulated patterns should be used if measured antenna patterns are unavailable.¹²

Other commenters suggest allowing the use of the Commission's Section 25.209 mask in cases in which actual antenna pattern data is unavailable.¹³ As ViaSat has detailed previously, using the Section 25.209 mask to make a 0.1 Percent Zone calculation creates highly inaccurate results by overstating the potentially affected population and geographic area.¹⁴ The Joint Commenters also propose that when an applicant uses the Section 25.209 mask (instead of measured or simulated antenna patterns) to calculate the 0.1 Percent Zone, "a subsequent applicant seeking to deploy an earth station in the same UMFUS license area should be permitted to work collaboratively with the earlier-filed earth station applicant to provide a more detailed analysis on the impact for both the existing and proposed earth stations."¹⁵ It is unclear how that concept would work as a practical matter, and it also seems to unnecessarily introduce regulatory complexity and burdens that would be avoided by requiring use of accurate earth station data.

¹⁰ See AT&T Comments at 4; Boeing Comments at 6-7; EchoStar Comments at 5-6; Joint Comments at 4; OneWeb Comments at 6.

¹¹ See Boeing Comments at 6-7; Comments of ViaSat, Inc., IB Docket No. 17-172 at 6 (July 21, 2017) ("ViaSat Comments"), Technical Exhibit at 7-8, Annex 1.

¹² See Boeing Comments at 6-7; ViaSat Comments at 6, Technical Exhibit at 7-8, Annex 1.

¹³ See EchoStar Comments at 5; Joint Comments at 4.

¹⁴ See ViaSat Comments at 6-7; *see also* ViaSat Opposition at 16-19 & Technical Annex.

¹⁵ Joint Comments at 5-6.

Moreover, this approach would provide an opportunity for regulatory arbitrage by earlier-filed applicants who could create unnecessarily large 0.1 Percent Zones and then use them as leverage in negotiations with their competitors.

C. Propagation Models and Terrain/Clutter

Commenters broadly agree that using propagation models to calculate 0.1 Percent Zones would result in more accurate calculations than assuming free-space loss,¹⁶ and that it is reasonable to require the use of terrain and clutter data in that calculation.¹⁷ Indeed, doing so is important for purposes of making realistic 0.1 Percent Zones that do not unnecessarily preclude the deployment of additional earth stations in the same license areas.

D. Shielding

Commenters resoundingly agree the Commission should allow applicants to factor in the effect of RF shielding in making a 0.1 Percent Zone calculation.¹⁸ While AT&T and EchoStar suggest that earth station licensees should be required to certify that any such shielding has actually been installed,¹⁹ it is not clear why complying with this particular license condition warrants an additional layer of regulatory paperwork. The obligation to operate in accordance with applied-for parameters already exists as a general matter. Moreover, the certification requirement in Section 25.133 already requires, upon completion of construction, that “the licensee must file with the Commission . . . [a] certification that the facility as authorized has

¹⁶ See AT&T Comments at 3-4; Boeing Comments at 5; EchoStar Comments at 4-5; Joint Comments at 4; OneWeb Comments at 5-6.

¹⁷ See AT&T Comments at 5; Boeing Comments at 8-9; EchoStar Comments at 6; Joint Comments at 5; OneWeb Comments at 8.

¹⁸ See Boeing Comments at 9; EchoStar Comments at 6; Joint Comments at 5; OneWeb Comments at 8.

¹⁹ See AT&T Comments at 5; EchoStar Comments at 6.

been completed . . .”²⁰ Certainly, the earth station grant could include a specific condition that the applicant install the shielding that it has relied on in making a 0.1 Percent Zone calculation.

E. Population Calculation

There is broad recognition by commenters that more granular population data yields more accurate 0.1 Percent Zone population coverage calculations. Therefore, almost all commenters propose to use census block level data, as ViaSat also endorsed.²¹ The Joint Commenters ask the Commission to work with the U.S. Census Bureau to develop a new population calculation tool for the 0.1 Percent Zone that would result in more accurate population calculations.²² ViaSat has two concerns with such an approach: (i) the potential for delay and uncertainty in earth station licensing processing while a new population calculation tool is being developed, and (ii) it is not clear why developing a new specific census tool for this purpose is necessary when other tools already exist to enable applicants to estimate population more granularly, such as Google Maps, as OneWeb has suggested.²³

There does not seem to be any valid basis for AT&T’s proposal to limit any given earth station applicant to making a 0.1 Percent Zone calculation based on only 0.033 of the population in a given license area.²⁴ Nothing in the *Spectrum Frontiers Order* so much as suggests that the Commission intended to divide the 0.1 percent allotment in this manner and thereby constrain

²⁰ 47 C.F.R. § 25.133(b)(1)(v).

²¹ See AT&T Comments at 6; Boeing Comments at 12; EchoStar Comments at 6-7; Joint Comments at 7.

²² See Joint Comments at 7.

²³ See OneWeb Comments at 9.

²⁴ See AT&T Comments at 7.

the deployment of an earth station that otherwise satisfied the 0.1 Percent Zone criteria. To the contrary, doing so would needlessly restrict earth station deployment.

F. Earth Station Collocation

In its comments and throughout the Spectrum Frontiers proceeding, ViaSat has expressed concern about any regulatory efforts that require or are designed to encourage collocation of earth stations,²⁵ because earth station sites are selected based on a number of technical and business considerations, and earth station collocation often is not feasible the way it is for terrestrial wireless base stations. Against this backdrop, the Joint Commenters claim that *the Commission should encourage earth station collocation* because “collocation reduces costs and enables greater siting flexibility.”²⁶ To the extent that statement may be true in any given circumstance, and absent any one party extracting an unreasonable rent from its competitor, market forces should yield an ideal result—an *ex ante* regulatory solution today is not warranted. Moreover, as EchoStar, Hughes, Lockheed, O3b, SES, and OneWeb previously acknowledged, “[m]andating that earth stations be co-located and placed in pre-designated areas that bear no relation to technical or customer needs will severely undermine the satellite industry’s ability to serve the Commission’s broadband connectivity objectives.”²⁷

²⁵ ViaSat Comments at 5.

²⁶ Joint Comments at 8-9.

²⁷ See Satellite Broadband Companies, Joint *Ex Parte* Filing by EchoStar Satellite Operating Corporation, Hughes Network Systems, LLC, Inmarsat, Inc., Lockheed Martin Corporation, O3b Limited, SES Americom, Inc., ViaSat, Inc., and WorldVu Satellites Ltd./OneWeb, GN Docket No. 14-177, *et al.*, at 2 (filed June 13, 2016).

G. Avoiding Double Counting

The observations that various commenters make about avoiding double-counting population for purposes of 0.1 Percent Zone calculations²⁸ are self-evident and apply well beyond the colocation context. It goes without saying that population should not be double counted when a proposed 0.1 Percent Zone overlaps with that of an earlier-licensed (or applied for) earth station. Common sense dictates that if a proposed 0.1 Percent Zone overlaps with that of a previously licensed (or applied for) earth station, any population in the overlapping area should not be counted a second time in determining whether the 0.1 Percent Zones of all authorized earth stations would cover more than 0.1 percent of the relevant population of the UMFU license area.²⁹

II. ESTABLISHING NEW PROTECTION CRITERIA FOR EARTH STATIONS AT 37.5-40 GHZ IS INCONSISTENT WITH THE *SPECTRUM FRONTIERS ORDER*

The earth station licensing rules adopted in the *Spectrum Frontiers Order* specify that the 0.1 Percent Zone for the 37.5-40 GHz band be calculated based on the use of demonstrated and reasonable engineering methods to define a level of protection from UMFUS operations that “is no larger than necessary.”³⁰

In its comments, OneWeb proposes to instead replace the framework adopted by the full Commission with a new one based on pre-defined numerical criteria. Without any explanation or technical support, OneWeb requests that all earth station applicants in the 37.5-40 GHz band base their 0.1 Percent Zone calculations on (i) an I/N value of -10 dB, not to be exceeded more than 20 percent of the time; and (ii) an I/N value of 0 dB, not to be exceeded more than 0.1

²⁸ See AT&T Comments at 6-7; EchoStar Comments at 8; Joint Comments at 9-10.

²⁹ See, e.g., AT&T Comments at 6-7; EchoStar Comments at 8; Joint Comments at 9.

³⁰ *Spectrum Frontiers Order*, 31 FCC Rcd 8014 at ¶ 93; see also 47 C.F.R. § 25.136(b).

percent of the time.³¹ OneWeb also does not explain how these criteria would be used in calculating the 0.1 Percent Zone.

As a threshold matter, OneWeb's proposal effectively is an untimely petition for reconsideration of the *Spectrum Frontiers Order* and also is outside the scope of this proceeding. Establishing fixed technical parameters to define the 0.1 Percent Zone as OneWeb suggests is fundamentally at odds with the intent of the rule, which is to establish a zone defined by what an applicant demonstrates as necessary in its particular circumstances, and for its network design. In other words, the *Spectrum Frontiers Order* specifically accommodated differences in satellite network designs.

Notably, OneWeb fails to provide any studies or even explain its reasoning for selecting I/N values of -10 dB and 0 dB, or its proposal to include time-variant exceedance allowances. Sharing criteria for earth station receivers and UMFUS have not been established at the Commission or the ITU. And while studies at the ITU are underway, it bears emphasis that OneWeb's proposed I/N of 0 dB is well below any limit being studied in that forum, and that any evaluation of a time-variant component also would have to be considered alongside the studies of appropriate I/N criteria.

III. NGSO SYSTEMS PRESENT UNIQUE ISSUES

Boeing and OneWeb, both applicants for NGSO systems, identify issues unique to NGSO systems for which different methodologies may be needed in calculating the 0.1 Percent Zone for NGSO earth stations. ViaSat agrees that further study may be warranted to evaluate these considerations.

³¹ See OneWeb Comments at 10.

The Public Notice asks whether near-field effects should be considered for purposes of determining the 0.1 Percent Zone. In response, ViaSat explained that near-field antenna patterns differ from far-field patterns only at angles less than 10 degrees from boresight. Accordingly, very low earth station elevation angles (*e.g.*, angles of less than 10 degrees), which in the United States typically would only be the case for some NGSO earth stations,³² or for some GSO earth stations in Alaska.³³ In the case of NGSO earth stations, ViaSat explained that near-field patterns could be relevant at distances from the earth station in the range of 100 meters.³⁴ In contrast, Boeing asserts that relevant far-field distances are in the range of 500 to 1,680 meters, but it provides no support or analysis for this assertion.³⁵ Based on ViaSat's analysis, the far-field and near-field patterns converge at distances well below this range. ViaSat agrees that "correct modeling and measurements"³⁶ are necessary for calculating the 0.1 Percent Zone in ranges in the near-field, where appropriate, but the appropriate ranges where the near-field is relevant must first be identified.

In response to the Public Notice inquiry regarding the antenna pointing angles assumed in the 0.1 Percent Zone calculation, OneWeb states that calculating the gain toward the horizon for an NGSO earth station, which tracks a satellite across the sky, requires a more complex analysis

³² Most applicants for the pending NGSO systems have committed to elevation angles greater than 10 degrees.

³³ See ViaSat Comments at 6-7. The near- and far-field patterns converge at angles from boresight in the range of 10 degrees or less, therefore at higher elevation angles than 10 degrees, the near-field is not an issue. See *id.*, Technical Exhibit at 8-9, Annex 2. Because there is no difference between the two patterns in these cases, there is no need to account for near-field patterns in making a 0.1 Percent Zone calculation.

³⁴ See *id.*, Technical Exhibit at 9.

³⁵ See Boeing Comments at 8.

³⁶ *Id.*

than for a GSO earth station pointed toward a fixed point of communication on the GSO arc.³⁷

OneWeb thus proposes that NGSO earth station applicants be allowed to use one of two methods provided in ITU regulations to calculate NGSO earth station antenna gain toward the horizon.³⁸

The Time-Invariant Gain method is a simplified calculation that significantly overestimates the gain, while the Time Variant Gain method is based on a statistical distribution of antenna gain toward the horizon. While ViaSat has no issues with using more complex methodologies to calculate the 0.1 Percent Zone for NGSO earth stations, ViaSat favors methodologies that yield the most accurate calculations possible. OneWeb's proposal should be studied further and assessed more thoroughly.

IV. CONCLUSION

For the reasons provided above and in ViaSat's opening comments, ViaSat urges the Commission to require that applicants use the most accurate information and data in computing the 0.1 Percent Zone for any given earth station. In particular, applicants should not be allowed to rely on the Section 25.209 mask, because measured or simulated antenna patterns are readily available, and reliance on the Section 25.209 mask would not yield accurate results. Population calculations should reflect the most granular census data available, and applicants should be permitted to supplement their census data analysis with additional information for greater accuracy. ViaSat also supports further consideration of the calculation methodologies and issues

³⁷ See OneWeb Comments at 4.

³⁸ See *id.*

identified by Boeing and OneWeb relating specifically to NGSO earth station operations.

Respectfully submitted,

/s/

Daryl H. Hunter
Senior Director, Regulatory Affairs
VIASAT, INC.
6155 El Camino Real
Carlsbad, CA 92009

John P. Janka
Elizabeth R. Park
Lilit Sheymajash K. Edwards
LATHAM & WATKINS LLP
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Washington, DC 20004

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