Approved by OMB
3060-0678

Date & Time Filed: Nov 25 2024 9:54:42:703AM
File Number: SES-LIC-INTR2024-07620
Callsign/Satellite ID:

APPLICATION FOR EARTH STATION AUTHORIZATIONS FCC 312 MAIN FORM FOR OFFICIAL USE ONLY	FCC Use Only

APPLICANT INFORMATION

Enter a description of this application to identify it on the main menu:
Syracuse, NY 2.4 m SAN Ka band

1-8. Legal Name of Applicant

Name:	Viasat, Inc.	Phone Number:	760-476-2583
DBA Name:		Fax Number:	760-929-3941
Street:	6155 El Camino Real	E-Mail:	daryl.hunter@viasat.com
City:	Carlsbad	State:	CA
Country:	USA	Zipcode:	92009 -
Attention:	Mr Daryl T Hunter P.E.		

9-16. Name of Contact Representative

Name:	Viasat, Inc.	Phone Number:	760-476-2583
Company:		Fax Number:	760-929-3941
Street:	6155 El Camino Real	E-Mail:	daryl.hunter@viasat.com
City:	Carlsbad	State:	CA
Country:	USA	Zipcode:	92009-
Attention:	Daryl T. Hunter, P.E.	Relationship:	Engineer

CLASSIFICATION OF FILING

17. Choose the button next to the classification that applies to this filing for both questions a. and b. Choose only one for 17a and only one for 17b. a. a1. Earth Station (N/A) a2. Space Station	b. b1. Application for License of New Station b2. Application for Registration of New Domestic Receive-Only Station (N/A) b3. Amendment to a Pending Application (N/A) b4. Modification of License or Registration (N/A) b5. Assignment of License or Registration (N/A) b6. Transfer of Control of License or Registration (N/A) b7. Notification of Minor Modification (N/A) b8. Application for License of New Receive-Only Station Using Non-U.S. Licensed Satellite (N/A) b9. Letter of Intent to Use Non-U.S. Licensed Satellite to Provide Service in the United States b10. Other (Please specify) b11. Application for Earth Station to Access a Non-U.S.satellite Not Currently Authorized to Provide the Proposed Service in the Proposed Frequencies in the United States.

17c. Is a fee submitted with this application?
If Yes, complete and attach FCC Form 159.

If No, indicate reason for fee exemption (see 47 C.F.R.Section 1.1114).

- ○ Governmental Entity ○ Noncommercial educational licensee
- ○ Other(please explain):

17d.

Fee Classification BAX - Fixed Satellite Transmit/Receive Earth Station

18. If this filing is in reference to an existing station, enter:	19. If this filing is an amendment to a pending application enter:	
(a) Call sign of station:	(a) Date pending application was filed:	(b) File number of pending application:
Not Applicable	Not Applicable	Not Applicable

TYPE OF SERVICE

20. NATURE OF SERVICE: This filing is for an authorization to provide or use the following type(s) of service(s): Select all that apply:

- ☑ a. Fixed Satellite
- ☐ b. Mobile Satellite
- ☐ c. Radiodetermination Satellite
- ☐ d. Earth Exploration Satellite
- ☐ e. Direct to Home Fixed Satellite
- ☐ f. Digital Audio Radio Service
- ☐ g. Other (please specify)

21. STATUS: Choose the button next to the applicable status. Choose only one.

○ Common Carrier ◉ Non-Common Carrier

22. If earth station applicant, check all that apply.

- ☐ Using U.S. licensed satellites
- ☑ Using Non-U.S. licensed satellites

23. If applicant is providng INTERNATIONAL COMMON CARRIER service, see instructions regarding Sec. 214 filings. Choose one. Are these facilities:

○ Connected to a Public Switched Network ○ Not connected to a Public Switched Network ◉ N/A

24. FREQUENCY BAND(S): Place an "X" in the box(es) next to all applicable frequency band(s).

☐ a. C-Band (4/6 GHz) ☐ b. Ku-Band (12/14 GHz)

☑ c.Other (Please specify upper and lower frequencies in MHz.)

Frequency Lower: 17700 Frequency Upper: 28350

TYPE OF STATION

25. CLASS OF STATION: Choose the button next to the class of station that applies. Choose only one.

- ◉ a. Fixed Earth Station
- ○ b. Temporary-Fixed Earth Station
- ○ c. 12/14 GHz VSAT Network
- ○ d. Mobile Earth Station
- (N/A) e. Geostationary Space Station
- (N/A) f. Non-Geostationary Space Station
- ○ g. Other (please specify)

26. TYPE OF EARTH STATION FACILITY: Choose only one.

◉ Transmit/Receive ○ Transmit-Only ○ Receive-Only ○ N/A

PURPOSE OF MODIFICATION

27. The purpose of this proposed modification is to: (Place an 'X' in the box(es) next to all that apply.)

Not Applicable

ENVIRONMENTAL POLICY

28. Would a Commission grant of any proposal in this application or amendment have a significant environmental impact as defined by 47 CFR 1.1307? If YES, submit the statement as required by Sections 1.1308 and 1.1311 of the Commission's rules, 47 C.F.R. §§ 1.1308 and 1.1311, as an exhibit to this application.A Radiation Hazard Study must accompany all applications for new transmitting facilities, major modifications, or major amendments.

○ **Yes** ◉ **No**

ALIEN OWNERSHIP Earth station applicants not proposing to provide broadcast, common carrier, aeronautical en route or aeronautical fixed radio station services are not required to respond to Items 30-34.

29. Is the applicant a foreign government or the representative of any foreign government?	Yes ◉ No
30. Is the applicant an alien or the representative of an alien?	Yes No ◉ N/A
31. Is the applicant a corporation organized under the laws of any foreign government?	Yes No ◉ N/A
32. Is the applicant a corporation of which more than one-fifth of the capital stock is owned of record or voted by aliens or their representatives or by a foreign government or representative thereof or by any corporation organized under the laws of a foreign country?	Yes No ◉ N/A
33. Is the applicant a corporation directly or indirectly controlled by any other corporation of which more than one-fourth of the capital stock is owned of record or voted by aliens, their representatives, or by a foreign government or representative thereof or by any corporation organized under the laws of a foreign country?	Yes No ◉ N/A
34. If any answer to questions 29, 30, 31, 32 and/or 33 is Yes, attach as an exhibit an identification of the aliens or foreign entities, their nationality, their relationship to the applicant, and the percentage of stock they own or vote.	

BASIC QUALIFICATIONS

35. Does the Applicant request any waivers or exemptions from any of the Commission's Rules? If Yes, attach as an exhibit, copies of the requests for waivers or exceptions with supporting documents.	Yes ◉ No
36. Has the applicant or any party to this application or amendment had any FCC station authorization or license revoked or had any application for an initial, modification or renewal of FCC station authorization, license, or construction permit denied by the Commission? If Yes, attach as an exhibit, an explination of circumstances.	Yes ◉ No
37. Has the applicant, or any party to this application or amendment, or any party directly or indirectly controlling the applicant ever been convicted of a felony by any state or federal court? If Yes, attach as an exhibit, an explination of circumstances.	Yes ◉ No
38. Has any court finally adjudged the applicant, or any person directly or indirectly controlling the applicant, guilty of unlawfully monopolizing or attemptiing unlawfully to monopolize radio communication, directly or indirectly, through control of manufacture or sale of radio apparatus, exclusive traffic arrangement or any other means or unfair methods of competition?If Yes, attach as an exhibit, an explanation of circumstances	Yes ◉ No
39. Is the applicant, or any person directly or indirectly controlling the applicant, currently a party in any pending matter referred to in the preceding two items? If yes, attach as an exhinit, an explanation of the circumstances.	Yes ◉ No
40. If the applicant is a corporation and is applying for a space station license, attach as an exhibit the names, address, and citizenship of those stockholders owning a record and/or voting 10 percent or more of the Filer's voting stock and the percentages so held. In the case of fiduciary control, indicate the beneficiary(ies) or class of beneficiaries. Also list the names and addresses of the officers and directors of the Filer.	
41. By checking Yes, the undersigned certifies, that neither applicant nor any other party to the application is subject to a denial of Federal benefits that includes FCC benefits pursuant to Section 5301 of the Anti-Drug Act of 1988, 21 U.S.C. Section 862, because of a conviction for possession or distribution of a controlled substance. *See 47 CFR 1.2002(b) for the meaning of "party to the application" for these purposes*.	◉ Yes No
42a. Does the applicant intend to use a non-U.S. licensed satellite to provide service in the United States? If Yes, answer 42b and attach an exhibit providing the information specified in *47 C.F.R. 25.137, as appropriate*. If No, proceed to question 43.	◉ Yes No
42b. What administration has licensed or is in the process of licensing the space station? If no license will be issued, what administration has coordinated or is in the process of coordinating the space station?UK	

43. Description. (Summarize the nature of the application and the services to be provided). See narrative.Narrative

43a. Geographic Service Rule Certification

By selecting A, the undersigned certifies that the applicant is not subject to the geographic service or geographic coverage requirements specified in 47 C.F.R. Part 25. (selected) **A**

By selecting B, the undersigned certifies that the applicant is subject to the geographic service or geographic coverage requirements specified in 47 C.F.R. Part 25 and will comply with such requirements. **B**

By selecting C, the undersigned certifies that the applicant is subject to the geographic service or geographic coverage requirements specified in 47 C.F.R. Part 25 and will not comply with such requirements because it is not feasible as a technical matter to do so, or that, while technically feasible, such services would require so many compromises in satellite design and operation as to make it economically unreasonable. A narrative description and technical analysis demonstrating this claim are attached. **C**

Contour

CERTIFICATION

The Applicant waives any claim to the use of any particular frequency or of the electromagnetic spectrum as against the regulatory power of the United States because of the previous use of the same, whether by license or otherwise, and requests an authorization in accordance with this application. The applicant certifies that grant of this application would not cause the applicant to be in violation of the spectrum aggregation limit in 47 CFR Part 20. All statements made in exhibits are a material part hereof and are incorporated herein as if set out in full in this application. The undersigned, individually and for the applicant, hereby certifies that all statements made in this application and in all attached exhibits are true, complete and correct to the best of his or her knowledge and belief, and are made in good faith.

44. Applicant is a (an): (Choose the button next to applicable response.)

- Individual
- Unincorporated Association
- Partnership
- Corporation (selected)
- Governmental Entity
- Other (please specify)

45. Name of Person Signing	46. Title of Person Signing
Daryl T. Hunter, P.E.	CTO, Regulatory Affairs

47. Please supply any need attachments.

Attachment 1:	Attachment 2:	Attachment 3:

WILLFUL FALSE STATEMENTS MADE ON THIS FORM ARE PUNISHABLE BY FINE AND / OR IMPRISONMENT (U.S. Code, Title 18, Section 1001), AND/OR REVOCATION OF ANY STATION AUTHORIZATION (U.S. Code, Title 47, Section 312(a)(1)), AND/OR FORFEITURE (U.S. Code, Title 47, Section 503).

SATELLITE EARTH STATION AUTHORIZATIONS
FCC Form 312 - Schedule B:(Technical and Operational Description)

FOR OFFICIAL USE ONLY

Location of Earth Station Site

E1: Site Identifier:	SAN 2.4 m	E5. Call Sign:	
E2: Contact Name	Daryl Hunter	E6. Phone Number:	760-476-2583
E3. Street:	3182 Vickery Rd	E7. City:	Syracuse
		E8. County:	Onondaga
E4. State	NY	E9. Zip Code	13212
E10. Area of Operation:		Fixed	

E11. Latitude:	43 ° 6 ' 26.5 " N			
E12. Longitude:	76 ° 9 ' 17.1 " W			
E13. Lat/Lon Coordinates are:		○ NAD-27	● NAD-83	○ N/A
E14. Site Elevation (AMSL):		121.21 meters		

E15. If the proposed antenna(s) operate in the Fixed Satellite Service (FSS) with geostationary satellites, do(es) the proposed antenna(s) comply with the antenna gain patterns specified in Section 25.209(a) and (b) as demonstrated by the manufacturer's qualification measurement? If NO, provide asa technical analysis showing compliance with two-degree spacing policy.	● Yes ○ No ○ N/A
E16. If the proposed antenna(s) do not operate in the Fixed Satellite Service (FSS), or if they operate in the Fixed Satellite Service (FSS) with non-geostationary satellites, do(es) the proposed antenna(s) comply with the antenna gain patterns specified in Section 25.209(a2) and (b) as demonstrated by the manufacturer's qualification measurements?	○ Yes ○ No ● N/A
E17. Is the facility operated by remote control? If YES, provide the location and telephone number of the control point.	● Yes ○ No
E18. Is frequency coordination required? If YES, attach a frequency coordination report as	● Yes ○ No
E19. Is coordination with another country required? If YES, attach the name of the country(ies) and plot of coordination contours as	○ Yes ● No
E20. FAA Notification - (See 47 CFR Part 17 and 47 CFR part 25.113(c)) Where FAA notification is required, have you attached a copy of a completed FCC Form 854 and or the FAA's study regarding the potential hazard of the structure to aviation? FAILURE TO COMPLY WITH 47 CFR PARTS 17 AND 25 WILL RESULT IN THE RETURN OF THIS APPLICATION.	○ Yes ● No

POINTS OF COMMUNICATION

Satellite Name:ViaSat-3(S2917/3050 | | 88.9 W.L. If you selected OTHER, please enter the following:	
E21. Common Name:	E22. ITU Name:
E23. Orbit Location:	E24. Country:

POINTS OF COMMUNICATION (Destination Points)

E25. Site Identifier:	
E26. Common Name:	E27. Country:

ANTENNA

Site ID	E28. Antenna Id	E29. Quantity	E30. Manufacturer	E31. Model	E32. Antenna Size	E41/42. Antenna GainTransmint and/or Recieve(____dBi at _____GHz)
SAN 2.4 m	SAN 1	1	Viasat	13001xx	2.5	48.8 dBi at 17.7
						49.3 dBi at 18.2
						49.6 dBi at 18.7
						52.3 dBi at 27.5
						52.4 dBi at 28.0
						52.6 dBi at 28.5

E28. Antenna Id	E33/34. Diameter Minor/Major(meters)	E35. Above Ground Level (meters)	E36. Above Sea Level (meters)	E37. Building Height Above Ground Level (meters)	E38. Total Input Power at antenna flange (Watts)	E39. Maximum Antenna Height Above Rooftop (meters)	E40. Total EIRP for al carriers (dBW)

SAN 1	2.4/2.6	2.4	123.6	0.0	84.14	0.0	72.3

FREQUENCY

E28. Antenna Id	E43/44. Frequency Bands(MHz)	E45. T/R Mode	E46. Antenna Polarization(H,V,L,R)	E47. Emission Designator	E48. Maximum EIRP per Carrier(dBW)	E49. Maximum ERIP Density per Carrier(dBW/4kHz)
SAN 1	17700 18300	R	Right Hand Circular	5M00G7D	0.0	0.0
E50. Modulation and Services 5 MBd digital data carrier						
SAN 1	17700 18300	R	Right Hand Circular	80M0G7D	0.0	0.0
E50. Modulation and Services 80 MBd digital data carrer						
SAN 1	17700 18300	R	Right Hand Circular	10M0G7D	0.0	0.0
E50. Modulation and Services 10 MBd digital data carrier						
SAN 1	17700 18300	R	Right Hand Circular	20M0G7D	0.0	0.0
E50. Modulation and Services 20 MBd digital data carrier						
SAN 1	17700 18300	R	Right Hand Circular	40M0G7D	0.0	0.0
E50. Modulation and Services 40 MBd digital data carrier						
SAN 1	17700 18300	R	Right Hand Circular	160MG7D	0.0	0.0
E50. Modulation and Services 160 MBd digital data carrier						
SAN 1	17700 18300	R	Right Hand Circular	320MG7D	0.0	0.0
E50. Modulation and Services 320 MBd digital data carrier						
SAN 1	17700 18300	R	Right Hand Circular	464MG7D	0.0	0.0
E50. Modulation and Services 464 MBd digital data carrier						
SAN 1	27500 28350	T	Left Hand Circular	325MG7D	67.7	18.6
E50. Modulation and Services 325 MBd digital data carrier						
SAN 1	27500 28350	T	Left Hand Circular	464MG7D	69.3	18.6
E50. Modulation and Services 464 MBd digital data carrier						

FREQUENCY COORDINATION

E28. Antenna Id	E51. Satellite Orbit Type	E52/53. Frequency Limits(MHz)	E54/55. Range of Satellite Arc E/W Limit	E56. Earth Station Azimuth Angle Eastern Limit	E57. Antenna Elevation Angle Eastern Limit	E58. Earth Station Azimuth Angle Western Limit	E59. Antenna Elevation Angle Western Limit	E60. Maximum EIRP Density toward the Horizon(dBW/4kHz)
SAN 1	Geostationary	17700 18300	88.9/ 88.9	198.3	38.6	198.3	38.6	0.0
	Geostationary	27500 28350	88.9/ 88.9	198.3	38.6	198.3	38.6	-56.2

REMOTE CONTROL POINT LOCATION
REMOTE CONTROL POINT LOCATION

E61. Call Sign NOTE: Please enter the callsign of the controlling station, not the callsign for which this application is being filed.	E65. Phone Number 720-493-7400
E62. Street Address 349 Inverness Drive South	

E63. City Englewood	E67. County Arapahoe	E64/68. State/Country CO/ USA	E66. Zip Code 80112

FCC NOTICE REQUIRED BY THE PAPERWORK REDUCTION ACT

The public reporting for this collection of information is estimated to average 0.25 - 24 hours per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the required data, and completing and reviewing the collection of information. If you have any comments on this burden estimate, or how we can improve the collection and reduce the burden it causes you, please write to the Federal Communications Commission, AMD-PERM, Paperwork Reduction Project (3060-0678), Washington, DC 20554. We will also accept your comments regarding the Paperwork Reduction Act aspects of this collection via the Internet if you send them to PRA@fcc.gov. PLEASE DO NOT SEND COMPLETED FORMS TO THIS ADDRESS.

Remember - You are not required to respond to a collection of information sponsored by the Federal government, and the government may not conduct or sponsor this collection, unless it displays a currently valid OMB control number or if we fail to provide you with this notice. This collection has been assigned an OMB control number of 3060-0678.

THE FOREGOING NOTICE IS REQUIRED BY THE PAPERWORK REDUCTION ACT OF 1995, PUBLIC LAW 104-13, OCTOBER 1, 1995, 44 U.S.C. SECTION 3507.

Attachment 1
NARRATIVE EXHIBIT
(Response to Question 43)
Ka Band SAN Earth Station (Site-Based Authority)

In this application, Viasat, Inc. ("Viasat") seeks authority to operate a 2.4 meter individually licensed earth station located in Syracuse, NY. This earth station would operate in the fixed-satellite service ("FSS") in the 17.7-18.3 GHz and 27.5-28.35 GHz band segments,[1] and would communicate with the ViaSat-3 satellite at 88.9º W.L. Grant of this application is in the public interest because it would allow the deployment of an earth station that would serve as an interconnection point for the ViaSat-3 network (which the Commission has already authorized to serve the United States and thus found to be in the public interest).[2]

I. COMPATIBILITY WITH CO-FREQUENCY OPERATIONS

The proposed operations are compatible with co-frequency operations—including adjacent geostationary orbit ("GSO") systems, Upper Microwave Flexible Use Service ("UMFUS") operations, fixed service operations, and broadcasting-satellite service ("BSS") feeder link Earth-to-space transmissions.[3]

A. GSO Operations

In seeking authority for the ViaSat-3 satellite, Viasat demonstrated two-degree compatibility in the 17.7-18.3 GHz and 27.5-28.35 GHz band segments.[4]

The antenna gain patterns with the Section 25.209 limits superimposed are included as Exhibit B. The proposed 2.4 meter earth station complies with the antenna performance standards in Sections 25.209(a) and (b) for all off-axis angles.

---

[1] Viasat has separately requested authority to operate this earth station terminal type in the 18.3-19.3 GHz, 19.7-20.2 GHz, 28.35-29.1 GHz, and 29.5-30.0 GHz band segments on a blanket basis. *See* Viasat, Inc., Call Sign E202143, ICFS File No. SES-LIC-20200811-00852. The earth station proposed in this application would also operate under that blanket license once it is granted.

[2] *See* Viasat, Inc., Call Sign S2917, ICFS File Nos. SAT-LOI-20140204-00013 *et al.*; Call Sign S3050, ICFS File No. SAT-LOA-20190617-00048 (granted May 27, 2020). VIASAT-3 (Call Sign S2917) and VIASAT-89US (Call Sign S3050), are collectively referred to as "ViaSat-3."

[3] NGSO systems in the 27.5-28.35 GHz band segment operate on an unprotected, non-interference basis with respect to GSO FSS. *See Update to Parts 2 and 25 Concerning Non-Geostationary, Fixed-Satellite Service Systems and Related Matters*, 32 FCC Rcd 7809, at ¶ 23 (2017). In the 17.7-18.3 GHz band segments, NGSO systems may not claim interference protection from the GSO FSS. *See* 47 C.F.R. § 25.289.

[4] Viasat, Inc., Call Sign S2917, ICFS File No. SAT-MOD-20190617-00047, Attachment A, at 7-8 (granted May 28, 2020) ("ViaSat-3 Technical Attachment").

B. UMFUS

The 27.5-28.35 GHz band segment is designated for FSS use on a secondary basis and to the UMFUS on a primary basis. Notwithstanding that secondary status, an applicant for a license for a transmitting earth station in the 27.5-28.35 GHz band segment that meets the criteria of Section 25.136 of the Commission's rules may be authorized to operate without providing interference protection to stations in the UMFUS.[5] Viasat would operate the earth station in the 27.5-28.35 GHz band segment consistent with the provisions of Section 25.136 regarding compatibility with UMFUS operations. Specifically, the proposed earth station meets the criteria for protection under Section 25.136(a)(4). The attached Technical Analysis in Exhibit A details the earth station's compliance with these criteria. Therefore, the earth station qualifies to operate without providing interference protection to any UMFUS stations.

C. Fixed Service and BSS

The 17.7-18.3 GHz band segment is allocated on a primary basis for fixed services. The 17.8-18.3 GHz portion of this band segment is allocated for FSS on a secondary basis with respect to fixed services. The 17.7-17.8 GHz portion of the band segment is allocated to FSS on a co-primary basis in the space-to-Earth direction with the BSS subject to the condition that receiving earth stations shall not claim protection from transmissions of non-Federal stations in the fixed service that operate in that band.[6] The 17.7-17.8 GHz portion of the band segment is also allocated to the broadcasting-satellite service ("BSS") on a co-primary basis.

In seeking market access for ViaSat-3, Viasat demonstrated that its FSS downlinks in the 17.7-18.3 GHz band segment are compatible with primary fixed service operations and neighboring BSS operations.[7] More specifically, Viasat demonstrated that downlink transmissions from ViaSat-3 will be within the power-flux density limits at the earth's surface set forth in Article 21 of the ITU Radio Regulations and would not cause harmful interference into primary fixed service operations throughout the 17.7-18.3 GHz band segment.[8] In addition, the half-power beam width of the subject earth station in the 17.8-18.3 GHz band is 0.57 degrees.[9] In the 17.7-17.8 GHz band segment, Viasat seeks to operate on an unprotected, non-interference basis consistent with the Commission's authorization of the ViaSat-3 satellite.[10]

II. RADIATION HAZARD ANALYSIS

A radiation hazard analysis for the proposed antenna is attached hereto as Exhibit D. As demonstrated in Exhibit D, the general population will not be exposed to RF levels in excess of

---

[5] *See* 47 C.F.R. § 25.136.

[6] *See* 47 C.F.R. § 2.106 n.NG58(d). *See also* 47 C.F.R. § 25.115(e)(2).

[7] *See* ViaSat-3 Technical Attachment at 13-16.

[8] *See id.* at 6-7.

[9] *See* 47 C.F.R. § 25.115(a)(9).

[10] *See Viasat, Inc.*, Order and Declaratory Ruling, 35 FCC Rcd 5416, ¶ 32 (2020).

the Commission's standard, and the antenna does not present a risk to trained personnel in the controlled area in the immediate vicinity of the antenna.

III. FAA NOTIFICATION

The proposed 2.4 meter antenna is exempt from notification to the FAA under Section 17.7(e)(3) of the Commission's rules because the height of the antenna is less than 6.1 meters above ground level.

Exhibit A

Technical Analysis

Viasat submits the following showing to demonstrate that the proposed gateway-type earth station, or satellite access node (“SAN”), located in Onondaga County, NY, is compatible with Upper Microwave Flexible Use Service (“UMFUS”) operations in accordance with Section 25.136(a)(4) and therefore should be authorized with the rights and protections afforded by Section 25.136(a).

The Viasat SAN antenna is configured to operate with the ViaSat-3 satellite at 88.9° W.L., and this configuration provides the relevant operational azimuth and elevation angles. In normal operation, the input power density is constant for all atmospheric conditions and is not increased during rain fade events and thus, the operations during clear sky conditions will be the same as worst-case operating scenarios.

The antenna parameters used in the analysis are identified in the FCC Form 312 application and supporting exhibits, and reflect measured gain patterns for the proposed earth station antenna. The methodology used to compute the contours in this analysis using the NTIA ITS Irregular Terrain Model is the same methodology that Viasat has used for numerous other SAN antenna applications, and that the Space Bureau has found is appropriate for computing contours to establish compliance with Section 25.136.[1]

Description	Value	Unit
Antenna Diameter	2.4	m
Antenna Gain	52.6	dB(i)
Antenna Input Density	-10.0	dB(W/MHz)
EIRP Density	42.6	dB(W/MHz)
Average Antenna Disc toward Horizon	83.6	dB
Density toward Horizon	-41.0	dB(W/MHz)
Polarization Discrimination	1.5	dB
Gain of m^2 area (28.35 GHz)	50.5	dB(m^2)
Boundary Limit in flux density	-107.6	dB(W/(m^2*MHz))
Average free space distance to limit	506.1	m

Table 1 – Antenna Parameters

The above calculation provides a simple baseline estimate of the average required separation distance for all azimuths around the 2.4 meter antenna to meet the -77.6 dB(mW/(m^2 * MHz)) power flux density (“pfd”) limit based only on free space loss and 1.5 dB of

[1] *See generally Viasat, Inc.*, Order and Authorization, ICFS File No. SES-LIC-20210323-00559 (Sep. 5, 2023).

polarization discrimination.[2] The minimum and maximum required free space distances for this antenna to meet the -77.6 dB(mW/(m^2 * MHz)) pfd limit range from 112 meters to 1284 meters but are typically much lower once terrain and clutter are considered, as described further below.

A. Computation of pfd Contour

While the above table provides an estimate of the average distance around the earth station where the pfd at a height of 10 meters above ground level would be equal to or greater than -77.6 dB(mW/(m^2 * MHz)) for a flat field with no obstructions nearby, in most cases, terrain and objects on the Earth's surface provide for some additional reduction of the region around the SAN antenna where the pfd value above is exceeded.

To determine whether terrain or surface obstructions around the SAN antenna would provide any further reduction of the pfd at a 10 meter reference height, an analysis was performed using the NTIA ITS Irregular Terrain Model.[3] In the computation of the contour, surface data with 1 meter resolution from Intermap was used to provide both clutter height and terrain information.

The computation of the contour around the antenna used the nominal input power density to the SAN antenna along with measured antenna gain information to determine the e.i.r.p. density along a particular azimuth. Next, path and clutter/terrain losses were taken into consideration for all the locations around a SAN site along with polarization discrimination to determine which blocks around the SAN site exceed the -77.6 dB(mW/(m^2 * MHz)) limit at the 10 meter reference height.

For this SAN antenna, shielding was used for additional reduction in the pfd over and above that from terrain and clutter in the area around a SAN antenna. The attenuation from shielding was computed using the TICRA Tools antenna analysis program which is the latest version of the industry standard GRASP analysis software. The attenuation is computed for each degree of azimuth around the earth station antenna and ranges from 7 dB to 34 dB around the antenna with an average attenuation of 22 dB.

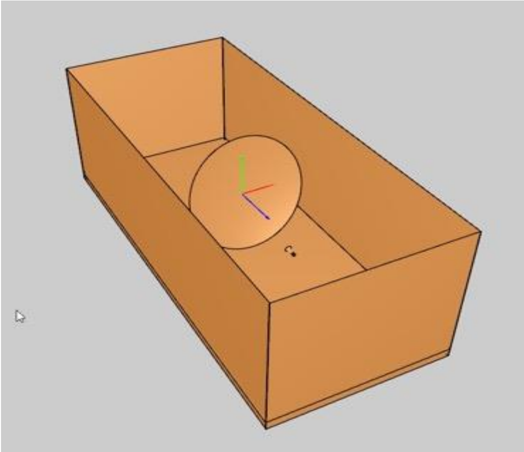
The approach uses a Geometrical Theory of Diffraction (GTD) analysis whereby the total RF energy in the direction of the interference source (or victim) antenna was computed for various wall dimensions and compared to the total RF energy when no shield wall was present. The shield wall was modeled as a perfect conductor and diffraction was allowed to occur on the top and sides of the wall. The bottom edge was assumed to be below grade so no bottom edge diffraction was included. The wall dimensions and position were adjusted until the required

---

[2] Use of 1.5 dB for polarization discrimination is a conservative value consistent with Appendix 8 Section 2.2.3 of the ITU-R Radio Regulations.

[3] *See* NTIA Report 82-100 (Apr. 1, 1982), available at: https://www.ntia.doc.gov/report/1982/guide-use-its-irregular-terrain-model-area-prediction-mode. A link to the particular implementation used can be found here: https://www.its.bldrdoc.gov/media/50674/itm.pdf. Additional information on Viasat's use of the Irregular Terrain Model is included in Attachments 1 and 2 below.

shielding level was reached. The wall height used with the 2.4 m antenna is 10 feet. The nominal shielding design uses solid corrugated steel walls in a rectangular configuration around the antenna. The standard enclosure is 25 feet long and 12 feet wide as depicted below. The dimensions provide sufficient room for the antenna beam to clear the wall at the operating elevation angle and also provide room for ancillary equipment to be located behind the antenna.



Finally, once the analysis is completed, a GIS shape file of the resulting contour is created for import into Viasat's ArcGIS tool and can be examined with respect to population and other elements of Section 25.136. An illustration of the contour is included below as Figure 1, and is also included in a .kmz file attached separately in ICFS.

B. Satisfaction of Section 25.136 Criteria

a. Section 25.136(a)(4)(i)

The earth station location is in Onondaga County, NY. A search of the ICFS database indicates that there is no other earth station licensed in the 27.5-28.35 GHz band segment in that county.

Therefore, the earth station satisfies the requirement in Section 25.136(a)(4)(i) that there be no more than two other earth stations operating or authorized to operate in the 27.5-28.35 GHz band within the county on a protected basis under Section 25.136.

b. Section 25.136(a)(4)(ii)

The total population covered by the -77.6 dB(mW/(m^2 * MHz)) contour is below the applicable threshold specified in Section 25.136(a)(4)(ii).

Overlaying the -77.6 dB(mW/(m^2 * MHz)) contour on a map depicting census blocks, Viasat has calculated an estimate of the population covered by the contour using 2020 census data and assuming that the population coverage within a partially covered census block is equal to the percentage of the geographic area of the census block covered by the contour.[4] Figure 1 below contains a diagram depicting the contour overlaid on a census block map.

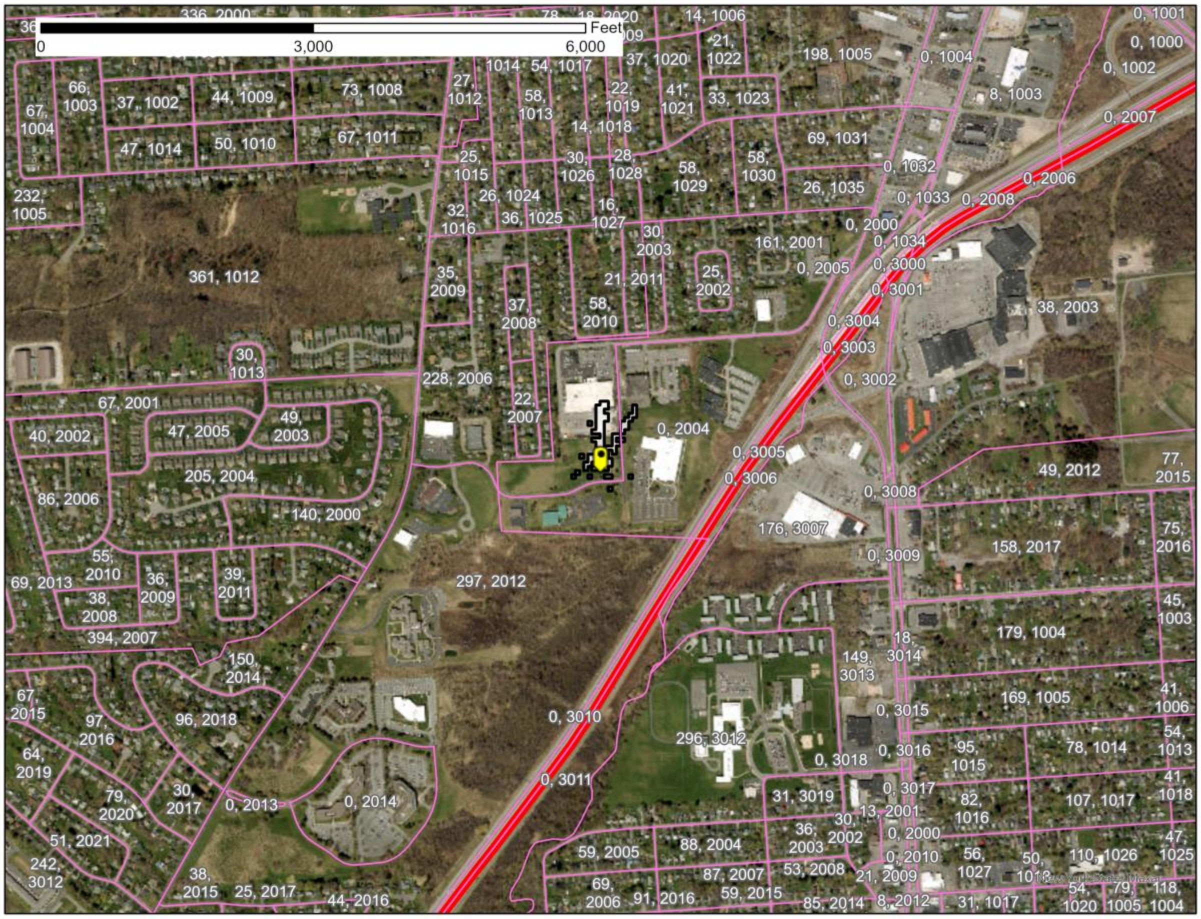


Figure 1 – Syracuse, NY SAN -77.6 dB(mW/(m^2 * MHz)) pfd contour

The population of Onondaga County is 476,516, and thus the applicable population limit under Section 25.136(a)(4)(ii) is 477.

---

[4] This approach to estimating population coverage using the most recently available decennial census block data and the actual area method is consistent with the recommended approach in the Commission's guidance regarding earth station siting. *See International Bureau Issues Guidance on Siting Methodologies for Earth Stations Seeking to Operate in the 24.75-25.25 GHz, 27.5-28.35 GHz, 37.5-40 GHz, 47.2-48.2 GHz, and 50.4-51.4 GHz Frequency Bands to Demonstrate Compliance with Section 25.136*, 35 FCC Rcd 6347 (2020). Viasat notes that the Satellite Industry Association, of which Viasat is a member, has petitioned for reconsideration of this guidance. *See* Petition for Reconsideration of SIA, IB Docket. No. 17-172 (filed July 16, 2020). Nothing herein should be construed to prejudice that pending petition, or otherwise suggest that Viasat agrees with the Bureau's guidance.

The following identifies the census block, population and the population coverage estimate as determined by the actual area method.

Census Block Number	Total Population of Census Block	Population Coverage Estimate	Percent of Block Covered by Pattern
360670138002001	161	6	3.62%
360670138002004	0	0	0.67%
Total Estimated Population Coverage:			6

Table 2 – Population Coverage Overview

The total estimated population covered by the contour thus is below the applicable population limit.

c. Section 25.136(a)(4)(iii)

The -77.6 dB(mW/(m^2 * MHz)) contour does not contain any major event venue, urban mass transit route, passenger railroad, or cruise ship port, or any road identified as an Interstate, Other Freeway and Expressway, or Other Principal Arterial road in the Federal Highway Administration Office of Planning, Environment, and Realty Executive Geographic Information System map.[5] Viasat notes that roads that intersect the contour (if any) have not been designated by the relevant state agency as Other Freeways and Expressways, or Other Principal Arterials.

d. Section 25.136(a)(4)(iv)

Viasat has completed frequency coordination with the UMFUS licensees within the area covered by the -77.6 dB(mW/(m^2 * MHz)) contour with respect to existing facilities constructed and in operation by the UMFUS licensees. The Prior Coordination Notice (PCN) was sent by Comsearch on 07/24/2024 and no objections were received within the 30 day notice period. The Comsearch coordination report is attached as Exhibit C.

---

5 *See* Federal Highway Administration, Office of Planning, Environment, and Realty Executive Geographic Information System Map, *available at* https://hepgis.fhwa.dot.gov/fhwagis/#; *see also Use of Spectrum Bands Above 24 GHz for Mobile Radio Services*, Second Report and Order, 32 FCC Rcd 10988, App'x B (2017) ("[T]he roads listed in the revision to Section 25.136 . . . can readily be identified by consulting the Federal Highway Administration (FHWA) Office of Planning, Environment, and Realty Executive Geographic Information System (HEPGIS) map . . . . HEPGIS allows the user to enter any street address in the U.S. and display an interactive map with a legend that identifies road classifications as they are defined by the Department of Transportation at 23 C.F.R. Section 470.105 pursuant to 23 U.S.C. Sections 101 and 103."); 47 C.F.R. § 25.136(a)(4)(iii).

ATTACHMENT 1

USE OF IRREGULAR TERRAIN MODEL (ITM) FOR COORDINATING EARTH STATIONS WITHIN 1 KM

Viasat has engaged RKF Engineering Solutions, LLC (RKF) to determine the model to calculate contours around each Satellite Access Node (SAN) earth station which exceeds a power flux density (PFD) of -77.6 dBW/m^2/MHz.

RKF relied upon the National Telecommunications and Information Administration (NTIA)'s Irregular Terrain Model (ITM)[1] to compute the power densities from these transmitting earth stations / SANs for distances greater than 100 m. The ITM model was selected in large part because it is an accepted Federal Communications Commission (FCC) model and was assessed to produce conservative results (low path loss) for propagation paths for the site-specific geometries analyzed, thereby building confidence in the ability to achieve successful spectrum sharing. For elevation and terrain data RKF relied upon the 5-meter NEXTMap[2] Elevation data suite.

In choosing ITM, there were several considerations. First, the Defense Information System's Agency (DISA) Spectrum Sharing Test and Demonstration (SSTD) working group, made up of many Government stakeholders, uses 2D terrain path loss models for predicting clutter in the band 1.755 to 1.780 GHz, for rural and suburban areas. These predictions were shown to be accurate when compared to measurements in the band. In the paper, *"What are the underlying calculations, parameters, and assumptions for the Longley-Rice (ITM) propagation model?*[3], the nominal frequency range for the ITM model is listed as 20 MHz to 40 GHz. While the upper limit was modified to 20 GHz in some later documentation, 28 GHz frequencies, within these topologies, conform to the model.

While the ITM doesn't explicitly account for loss within the first kilometer, the model's formulas were used in association with the NEXTMap data. Specifically, to improve the fidelity of the estimates, NEXTMap terrain and clutter data were calculated from 100 m from the SAN sites. In his doctoral thesis, Kasampalis Stylianos[4] reviews many diffraction models including ITM and observed that the ITM model can be used for distances as low as 200 meters.

The probability of reflections in rural and suburban areas is low at higher frequencies and reflections tend to attenuate quickly at these frequencies if they aren't close to the direct path.

---

[1] Model available at https://github.com/NTIA/itm

[2] https://www.intermap.com/nextmap

[3] "What are the underlying calculations, parameters, and assumptions for the Longley-Rice (ITM) propagation model?" September 24, 2013, in RF Engineering Article, (https://www.softwright.com/knowledgebase/faq/underlying-calculations-parameters-assumptions-longley-rice-itm-propagation-model/)

[4] "Modelling and Coverage Improvement of DVB-T Networks," A thesis submitted for the degree of Doctor of Philosophy by Kasampalis Stylianos, March 2018

Furthermore, an accepted 3D model that accurately predicts loss is not available and the 5-meter NEXTMap data does not have enough resolution to predict reflections accurately. Consequently, a 3D model was not employed.

To demonstrate the conservative nature of the ITM model used, simulations were performed with a series of single knife edge terrain path, where the knife edge height was assumed to be 2 m. The table below compares the knife edge diffraction loss to the ITM predicted loss (ITM path loss minus free space loss) for paths equal to or less than 1 km. In all but one case shown, the ITM model significantly underestimates the loss compared to the knife edge prediction.

Frequency	Total Path Distance	Distance to Knife Edge	Knife Edge Loss	ITM Predicted Loss
GHz	meters	meters	dB	dB
28	1000	250	19.02	16.2
18	1000	250	17.28	10
28	800	200	19.94	14
18	800	200	18.15	8.4
28	500	100	22.57	23.6
18	500	100	20.71	15.1
28	200	60	25.33	7.3
18	200	60	23.43	3.5

In summary, the ITM propagation model is well-accepted by regulators and has been used in many instances up to the frequencies associated with the SANs under consideration and down to distances below 1 km, where results were shown to be conservative for pathloss thereby helping to build confidence in successful sharing with these earth station nodes.

ATTACHMENT 2

RESPONSES TO MAY 13, 2022 FCC QUESTIONS ON VIASAT'S USE OF THE IRREGULAR TERRAIN MODEL (ITM)

(1) Which mode (area or point to point) of the ITM model did ViaSat implement?

In preparing analysis for its SAN earth station applications, the point-to-point mode of the ITM was used.

(2) What inputs did Viasat use in the ITM model for the following: a) Surface Refractivity; b) Radio Climate; c) Dielectric Constant of Ground d) Conductivity of Ground

Viasat's analysis utilized inputs that were based on conservative and widely accepted values for Earth characteristics and radio climate. For the short distances analyzed, the dominant path loss consideration is diffraction. Additionally, the vast majority of the sites are located in the eastern United States in regions with similar climates. As such, a standard atmosphere was assumed, and only median path loss components were considered across Viasat's SAN earth stations. RKF Engineering Solutions, LLC ("RKF"), the engineering firm engaged by Viasat to calculate contours using the ITM, verified that for the short distances modeled the results were not sensitive to changes in refractivity, radio climate, or ground constants.

The following specific inputs were used:

a) Surface Refractivity: 301 (minimum globally-worst-case, it gives 4/3 Earth radius)

b) Radio Climate: 6 - Maritime Temperate, Over Land (most of the U.S. population is located on the East and West coasts)

c) Dielectric Constant of Ground: 15 (average ground)

d) Conductivity of Ground: 0.005 (average ground)

(3) If Point-to-point Mode implemented: a) Percentage of confidence; b) Percentage of reliability

The point-to-point mode was implemented with median propagation conditions, specifically:

a) Percentage of confidence: 50%

b) Percentage of reliability: 50%

(4) If Area mode implemented: a) Mode of Variability; b) Delta h; c) Percentage of Confidence for time, situation, and location

N/A

(5) Do the elevation heights from the high resolution NEXTmap data include building and clutter heights? If so, were those heights input directly into the

ITM model as terrain heights? If not, could you explain the components/inputs from the NEXTmap data and how they were used in the ITM model?

The NEXTMap Five digital elevation model is Intermap's next-generation global 3D terrain dataset.[1] It provides seamless data at five-meter resolution enabling precise spatial analysis. NEXTMap Five is a comprehensive worldwide offering that is available as a digital surface model ("DSM") and digital terrain model ("DTM"). The NEXTMap DSM contains elevations of natural terrain features including vegetation and cultural features such as buildings and roads. The NEXTMap DTM provides elevations of the bare earth where surface features such as buildings, vegetation, and other infrastructure have been removed.

Both DSM and DTM files were used in Viasat's analysis. The DTM bare earth file was used to site terminal heights relative to bare earth. Clutter in close proximity to terminals was then removed from the DSM file. For receive terminals clutter within 5 meters of the terminal location was removed and for transmit terminals clutter within 10 meters was removed. This process ensured that the ITM returned valid numerical results for all receiver locations tested. A larger clutter removal distance was considered for transmit terminals because they are more carefully sited and installed. The DSM terrain database with the removed clutter in close proximity to terminals, along with terminal locations and heights, were then used in the ITM.

(6) Is Viasat using NTIA source code for the ITM model, or its own code based on the formulas/algorithms described in https://www.its.bldrdoc.gov/media/50674/itm.pdf, If the former did the NTIA software produce any error codes, and could those be provided?

Viasat used the NTIA C++ source code base available on the NTIA's website.[2] The C++ implementation (the archived v1.2.2 version) is functionally identical to the version of the ITM currently available on Github, but does not generate the same warning or error messages as the Github version in certain cases. The C++ code downloaded from NTIA's website and implemented by Viasat for its demonstrations compiles and runs without error for the distances and frequency ranges analyzed by Viasat.

The Github code generates the following messages for the distances and frequencies considered in Viasat's analysis:

---

1 *See* https://www.intermap.com/nextmap.

2 *See* https://its.ntia.gov/research-topics/radio-propagation-software/itm/itm.aspx. The C++ code was downloaded and used for Viasat's analysis prior to the Github version becoming available. RKF has implemented, for different projects, both the Github version and the older C++ code utilized in Viasat's analysis. It was inadvertently stated in the Explanatory Addendum that RKF used the Github version for Viasat's analysis. However, as both versions are functionally identical this discrepancy has no material effect on the analysis.

- WARN_PATH_DISTANCE_TOO_SMALL_2: Path distance is small - care must be taken with result
- ERROR_FREQUENCY: Frequency is out of range

Neither of these messages in any way impacts the validity of Viasat's analysis using the ITM; notwithstanding the fact that the Github version may generate an error message for frequencies above 20 GHz, the original source for the ITM makes clear that it is valid up to 40 GHz.[3] Moreover, the code in the current Github version is easily modified to bypass the error message.

Furthermore, and as noted above, at distances less than one km the dominant factor affecting path loss is diffraction. The ITM results are insensitive to changes in refractivity, radio climate, or ground constants. The diffraction model itself is geometric and as such, there is no reason why it should not be valid in the frequency range studied.

(7) What were the factors or rationale that led Viasat to use the ITM model vs other models?

The ITM was selected based on several considerations. The ITM is the Commission's physics model of choice and has regularly been applied in a variety of Commission proceedings.[4] The ITM also includes a widely used and sophisticated diffraction model, which was the dominant propagation mechanism explored for Viasat's analysis. The model uses a combination of double knife edge and irregular terrain diffraction. As discussed in the Explanatory Addendum (see Attachment 1 above), the ITM is known for accuracy in modeling and can be applied in frequency bands ranging from 20 MHz to 40 GHz.[5]

RKF has explained to Viasat that RKF has extensive experience applying the ITM to perform analyses for its other clients, including application of the ITM with terrain, building, and clutter data (*e.g.*, DISA and the Wireless Coalition).

- For the past five years, RKF has supported the Spectrum Sharing Test & Demonstration ("SSTD") program under DISA in its effort to develop more accurate clutter models. This modeling included analyzing path loss using physics-based models (including the ITM) with terrain plus clutter data as

---

3 *See infra* n.5.

4 *See, e.g.*, *The Commission Begins the Process for Authorizing 6 GHZ Band Automated Frequency Coordination Systems*, FCC 21-100, ¶ 5 (Sept. 28, 2021).

5 A.G. Longley & P. Rice, *Prediction of Tropospheric Radio Transmission Loss Over Irregular Terrain. A Computer Method*, ESSA Tech. Rep. ERL 79-ITS 67, U.S. Government Printing Office, at 2 (1968), https://its.ntia.gov/umbraco/surface/download/publication?reportNumber=erl%2079-its%2067.pdf (noting that the model is intended for use in frequencies from "20 to 40,000 MHz," *i.e.*, 20 MHz to 40 GHz); *see also* Explanatory Addendum, n.3.

inputs. Currently, RKF is also supporting DISA in developing path-loss prediction approaches for the CBRS band with the ITM as a baseline.

- For several years working for the Wireless Coalition, RKF developed models for predicting interference between a national deployment of Wi-Fi and FS Microwave stations in the 6 GHz band. This included a wide variety of morphologies and site-specific situations that incorporated both terrain and clutter.

- RKF is also currently the technical developer of the Open Automated Frequency Coordination ("OpenAFC") tool for coordinating operations in the 6 GHz band. This code base has been adopted by the WInnForum, the Wi-Fi Alliance, and hundreds of companies. In addition to incorporating agreed-to standard approaches, this is a testbed where sensitivity and site-specific effects can be explored.

- In its effort to model clutter accurately, RKF has extensively studied and implemented a variety of advanced approaches and concepts. RKF has not found any better approach than using a 2D physics-based model with terrain plus clutter for estimating path loss and identifying critical line-of-sight paths for site-specific cases like Viasat's.

Viasat's use of the ITM was also driven by discussions with Commission and NTIA staff. On June 30, 2021, Viasat met with staff from the Commission's International Bureau and Wireless Telecommunications Bureau and staff from NTIA to discuss Viasat's use of the ITM for modeling attenuation of emissions in the immediate vicinity of Viasat's SAN earth stations. The attendees of the June 30 meeting discussed the contents of the Explanatory Addendum, "Use of Irregular Terrain Model (ITM) for Coordinating Earth Stations within 1 km." The focus of the discussion was on the use of the ITM at 28 GHz and explaining some studies indicating that use of the model was appropriate up to 40 GHz. The discussion also covered use of the model below one km and explained how Viasat approached modeling of knife-edge losses in the area immediately next to the earth station.

After Viasat explained its proposed use of the ITM, NTIA agreed that use of the model was appropriate at the 28 GHz frequencies being studied by Viasat for its SAN applications. Likewise, NTIA agreed that the augmentation of the model with the knife edge path loss predictions was appropriate as well. Based on the feedback from NTIA and Commission staff, Viasat proceeded to use the ITM to model its PFD contours and provided an Explanatory Addendum with each SAN application.

(8) Were any field tests/measurements performed to verify model accuracy? If so what were they?

There is a large body of third-party measurements validating the ITM. Additionally, the NTIA version of the model is well-tested and stable. As such, no additional on-site verification testing was performed to validate the ITM results produced in connection with the specific SAN earth stations at issue here.

That said, Viasat notes that it has previously validated the accuracy of the ITM in other contexts. More specifically, as part of the Commission's *Spectrum Frontiers* proceeding, Viasat contracted with Comsearch to perform on-site measurements of radio frequency levels around its Carlsbad, CA facility from a 1.8 m roof-mounted antenna operating in the Ka band.[6] This testing was performed by Comsearch using calibrated test equipment to measure emissions from a 1.8 m antenna facility similar to the SAN earth station antennas currently pending before the Commission for use with the ViaSat-3 satellite network. The tests were conducted at 28212.5 MHz and measurements were taken at both 2 m and 10 m heights above ground level ("AGL") at a number of locations around the earth station location.

The test results demonstrated that at each test location the measured signal levels were significantly less than those predicted by free space path loss values. Thus, the actual path loss was larger than free space path loss. The lowest additional loss value measured was 7.98 dB, but in many cases the signal was below the spectrum analyzer noise floor resulting in over 40 dB of additional attenuation in some cases. On average the additional attenuation was 24 dB at the 10 m AGL height and 32.6 dB at the 2 m AGL height, noting that at many of the test locations the test signal was below the instrument noise floor so actual attenuation was higher than reported. These measurements are comparable to the typical attenuation predicted using the ITM in Viasat's analysis for the SAN earth stations.

---

[6] *See* Letter from Viasat to FCC, GN Docket No. 14-177 *et al.* (filed Apr. 20, 2017).

Exhibit B – 2.4 m Antenna Gain Patterns

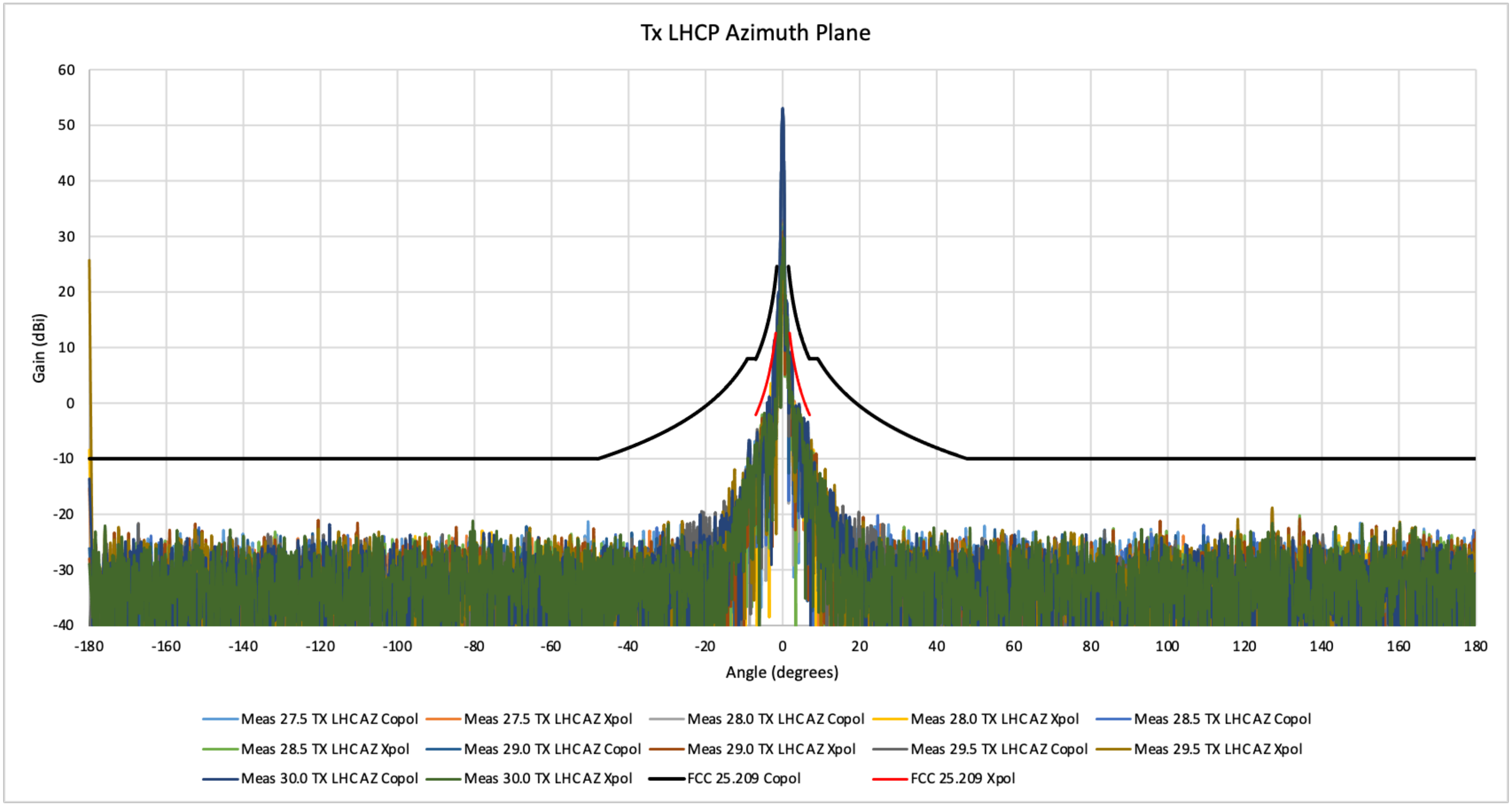


Figure 1 Tx LHCP Azimuth Plane Wide Cut

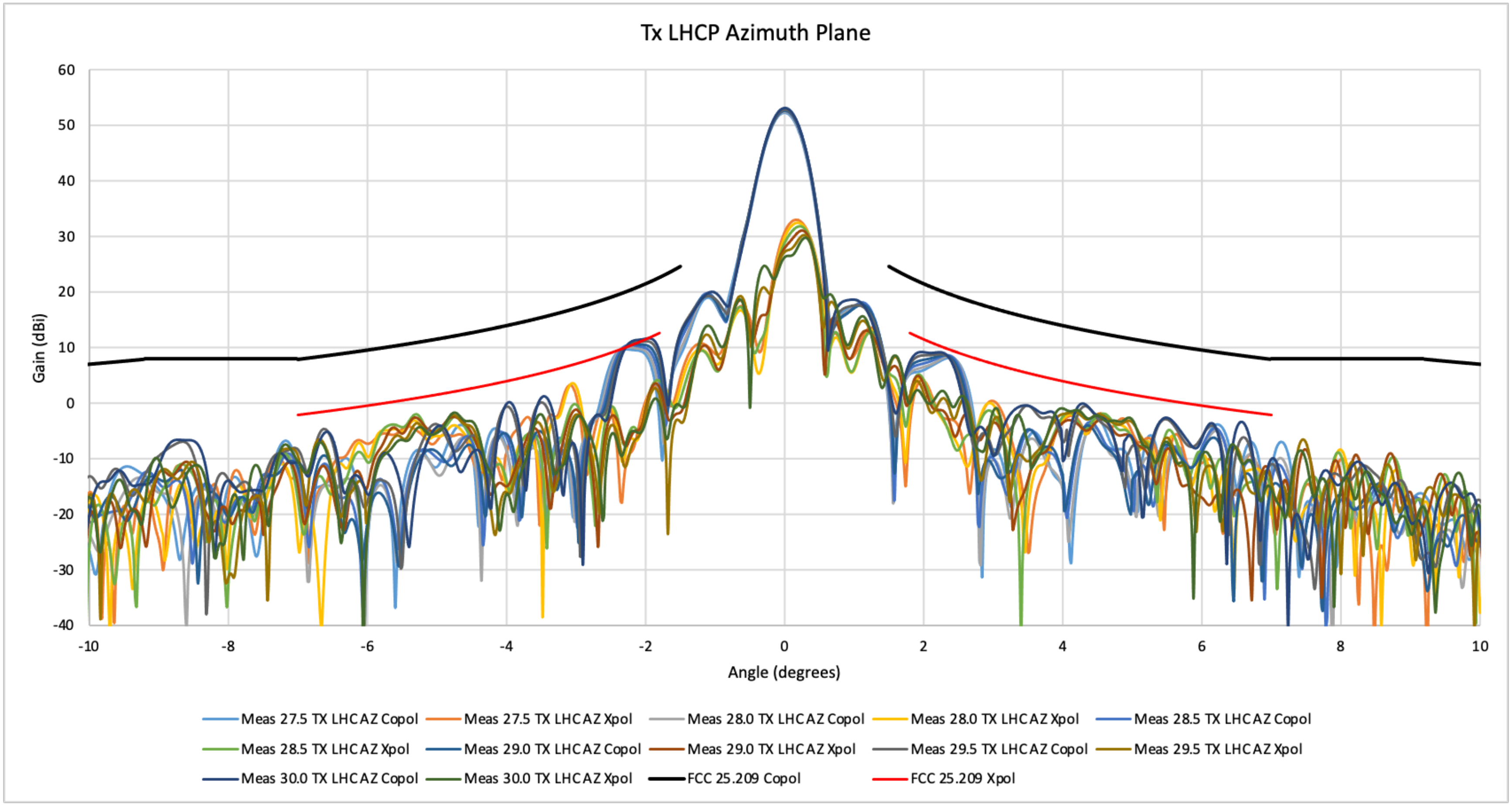


Figure 2 Tx LHCP Azimuth Plane Narrow Cut

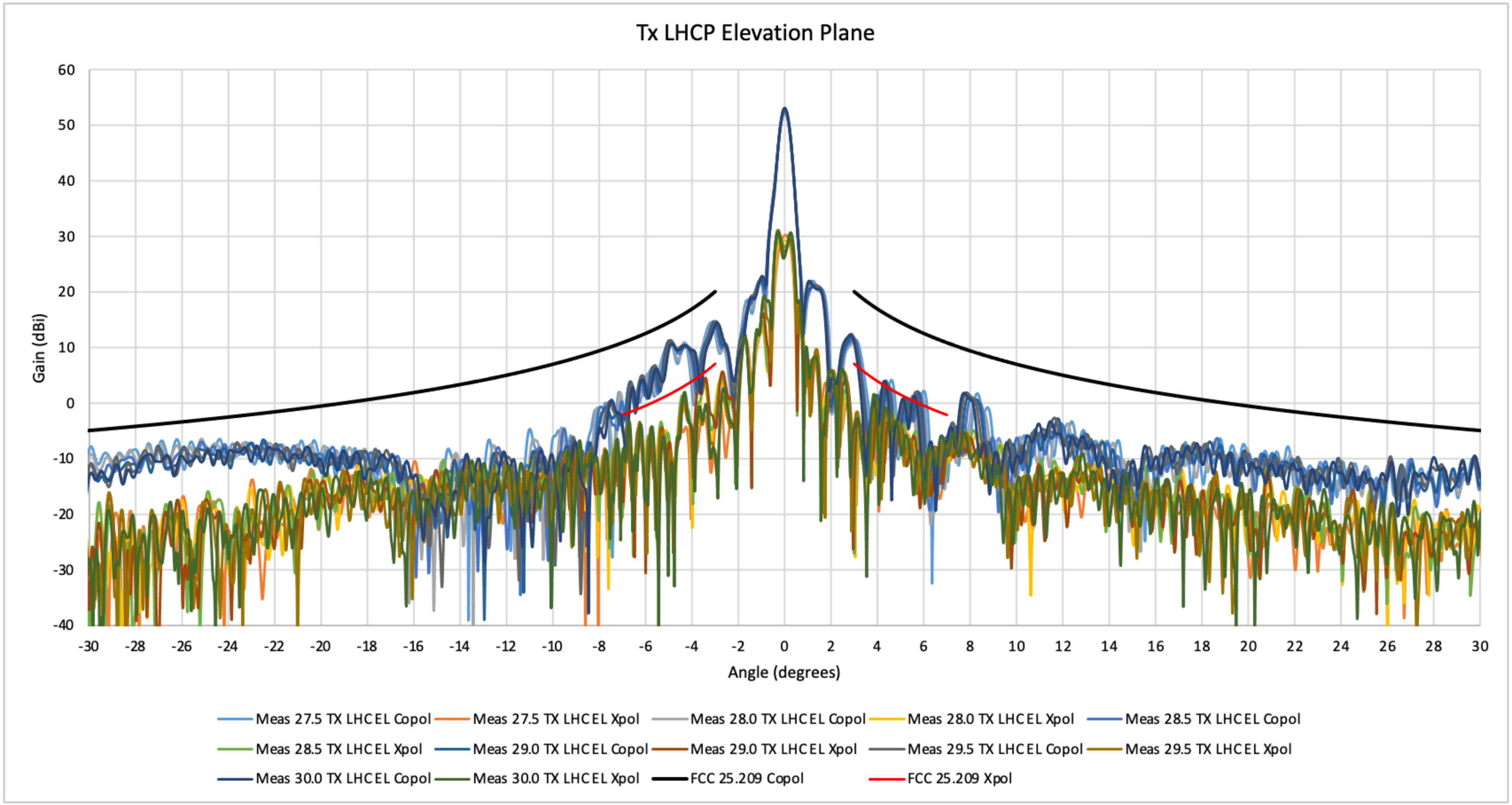


Figure 3 Tx LHCP Elevation Plane Wide Cut

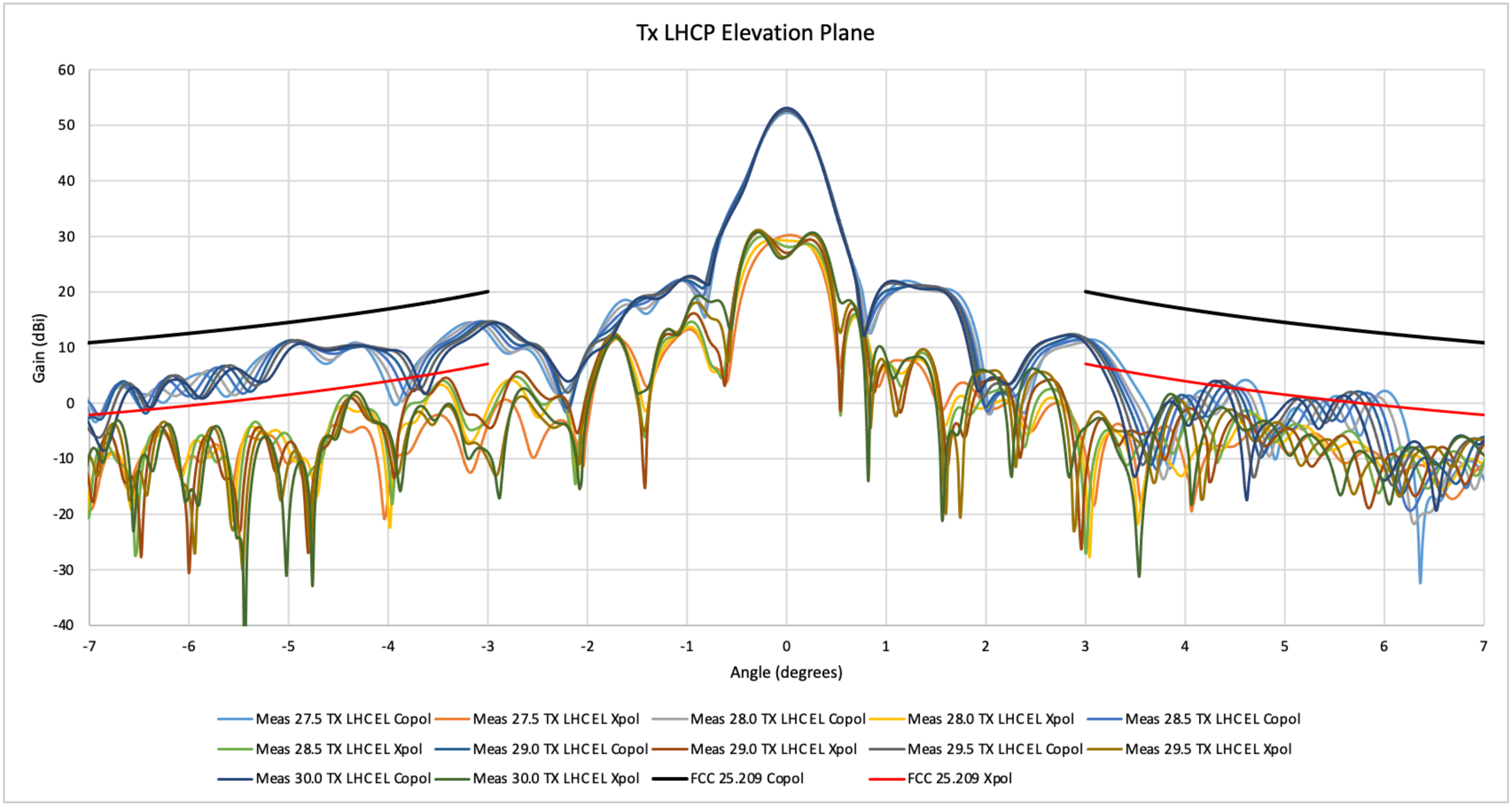


Figure 4 Tx LHCP Elevation Plane Narrow Cut

Exhibit C

Coordination Report

Ka-Band Earth Station – Syracuse, NY

Frequency Coordination Report

28 GHz

Prepared on Behalf of
ViaSat, Inc.

August 27, 2024

COMSEARCH
A CommScope Company

Table of Contents

1. Summary of Results

On behalf of ViaSat. Inc., Comsearch issued coordination notice under Section 25.203(c) and Section 25.136(a)(4) of the FCC's rules for all existing and proposed terrestrial licenses within the coordination contours of their proposed Ka-Band earth station in Syracuse-NY, which will transmit at 28 GHz[1]. Prior-notification emails were sent to the licensees and a copy of the notification data is provided in section four of this report. The earth station coordination was finalized on August 24, 2024.

No objections were received from any of the incumbent 28 GHz licensees.

2. 28 GHz UMFUS Coordination

All 28 GHz UMFUS licensees within the coordination distance of the proposed earth station were identified. The proposed earth station will operate on frequencies that overlap Channel L1 & L2 of the UMFUS service. The total frequency allocation for Channels L1 & L2 of the UMFUS spectrum appears below.

Channel:	**L1**	27.500 - 27.925 GHz
	L2	27.925 - 28.350 GHz

Licensee	Authorized Geographic Area
Verizon	Market Based

No objections were received from the UMFUS incumbents within coordination distance.

[1] The proposed earth station will operate in the 27.5 – 29.1 GHz & 29.5 – 30.0 GHz portion of the Ka-Band.

3. Earth Station Coordination Data

This section presents the data pertinent to the proposed Ka-Band earth station in Syracuse, NY. This data was circulated to all incumbent licensees in the shared 28 GHz frequency ranges.

Date:		07/24/2024	
Job Number:		240724COMSNR13	
Administrative Information			
Status		ENGINEER PROPOSAL	
Call Sign			
Licensee Code		VIASAT	
Licensee Name		ViaSat, Inc	
Site Information		**SYRACUSE, NY**	
Venue Name			
Latitude (NAD 83)		43° 06' 26.54" N	
Longitude (NAD 83)		76° 09' 17.08" W	
Climate Zone		A	
Rain Zone		2	
Ground Elevation (AMSL)		120.61 m / 395.7 ft	
Link Information			
Satellite Type		Geostationary	
Mode		TO - Transmit-Only	
Modulation		Digital	
Satellite Arc		78° W to 91° West Longitude	
Azimuth Range		182.7° to 201.2°	
Corresponding Elevation Angles		40.2° / 38.0°	
Antenna Centerline (AGL)		1.5 m / 4.9 ft	
Antenna Information		**Transmit - VES001**	
Manufacturer		VIASAT INC.	
Model		13001XX	
Gain / Diameter		52.6 dBi / 2.4 m	
3-dB / 15-dB Beamwidth		0.40° / 0.80°	
Max Available RF Power	(dBW/4 kHz)	-34.0	
	(dBW/MHz)	-10.0	
Maximum EIRP	(dBW/4 kHz)	18.6	
	(dBW/MHz)	42.6	
Interference Objectives:	Long Term	-141.0 dBW/4 kHz	20%
	Short Term	-118.0 dBW/4 kHz	0.0025%
Frequency Information		**Transmit 28.0 GHz**	
Emission / Frequency Range (MHz)		464MG7D / 27500.0 - 29500.0	
Coordination Distance		4 km / 2.48 mi	

4. Contact Information

For questions or information regarding the 28 GHz Frequency Coordination Report, please contact:

Contact person:	Naveen Raghavan
Title:	Engineering Program Manager
Company:	Comsearch
Address:	19700 Janelia Farm Blvd., Ashburn, VA 20147
Telephone:	703-726-5648
Email:	nraghavan@Comsearch.com
Web site:	www.comsearch.com

Exhibit D

Analysis of Non-Ionizing Radiation for a Viasat 2.4 m Ka-band Earth Station Antenna System

This report analyzes the non-ionizing radiation levels for a 2.4 m earth station antenna system. The analysis method uses principally the formulae in FCC Office of Engineering Technology Bulletin No. 65 but replaces formula (13) of OET-65 with the updated near field power density formula from Table D.5 of the IEEE C95.3-2021 Standard as requested by FCC/OET staff.

The FCC's Office of Engineering Technology's Bulletin No. 65 specifies that there are two separate tiers of exposure limits that are dependent upon the situation in which the exposure takes place and/or the status of the individuals who are subject to the exposure. The two tiers are General Population / Uncontrolled environment, and an Occupational / Controlled environment.

The applicable exposure limit for the General Population / Uncontrolled environment, *i.e.*, areas that people may enter freely, at this frequency of operation is 1 mW/cm^2 average power density over a 30-minute period.

The applicable exposure limit for the Occupational / Controlled environment, *i.e.*, areas that only authorized / trained personnel have access to, at this frequency of operation is 5 mW/cm^2 average power density over a 6-minute period.

Summary of expected radiation levels for a 2.4 m Ka-band antenna in an Uncontrolled Environment when operating at 30 GHz with a 100 W PA

Region	Maximum Power Density	Hazard Assessment
Far field (R_{ff}) = 405.881 m	0.81 mW/cm^2	Satisfies FCC MPE
Near field (R_{nf}) = 169.117 m	21.71 mW/cm^2	Potential Hazard
Transition region (R_t) (R_t) = $R_{nf} < R_t < R_{ff}$	21.71 mW/cm^2	Potential Hazard
Main Reflector Surface ($S_{surface}$)	6.94 mW/cm^2	Potential Hazard

Although the power density level is greater than 1 mW/cm^2 at the reflector surface, near field, and transition region of the projected RF cylinder, these areas are not accessible by the General Population. The earth station enclosure limits access by the General Population in the area immediately around the antenna and the RF cylinder is well above head height outside the earth station enclosure where the General Population / Uncontrolled Environment is present.

Summary of expected radiation levels for a 2.4 m Ka-band Antenna in a Controlled Environment when operating at 30 GHz with a 100 W PA

Region	Maximum Power Density	Hazard Assessment
Far field (R_{ff}) = 405.881 m	0.81 mW/cm^2	Satisfies FCC MPE
Near field (R_{nf}) = 169.117 m	21.71 mW/cm^2	Potential Hazard
Transition region (R_t) (R_t) = $R_{nf} < R_t < R_{ff}$	21.71 mW/cm^2	Potential Hazard
Main Reflector Surface ($S_{surface}$)	6.94 mW/cm^2	Satisfies FCC MPE

Although the power density level is greater than 5 mW/cm^2 at the near field and transition region of the projected RF cylinder, access to the earth station enclosure will be limited to trained personnel and only when the transmitted is not turned on. Additionally, the transition region begins outside the earth station enclosure and is well above head height for Controlled Environments.

The power density level in the area between the feed and the reflector surface is greater than the reflector surface and is assumed to be a potential hazard.

Conclusions

The proposed earth station system will be located in an enclosure that provides for an environment with controlled access and will be serviced by trained personnel. The enclosure has RF Exposure caution signage posted at the entry gate and each side. Only trained personnel will operate the transmitting system during normal operation or testing. No access to the reflector/feed or near field areas will be permitted when the transmitter is turned on and the transition region begins well above head height even when the transmitter is turned on. Based on the above analysis it is concluded that no hazard exists for Occupational staff or the General Population when the system is being operated.

Additionally, Viasat may submit an updated radiation hazard analysis based on measured data in the near future, as the near field power density formula that FCC/OET staff requested appears to produce overly conservative results with respect to measured data and the methodology in formula 13 of the most current version (August 1977) of OET-65.

Analysis of 2.4 m antenna for operation at 30 GHz

The analysis and calculations that follow in this report are performed in compliance with the methods described in the OET Bulletin No. 65 except where noted and as directed by FCC staff.

Definition of terms

The terms are used in the formulas here are defined as follows:

$S_{surface}$ = maximum power density at the antenna surface
S_{nf} = maximum near-field power density
S_t = power density in the transition region
S_{ff} = power density (on axis)
R_{nf} = extent of near-field
R_{ff} = distance to the beginning of the far-field
R = distance to point of interest

P_a = 100 W	maximum power amplifier output
L_{fs} = 0.7 dB	loss between power amplifier and antenna feed
OBO = 0 dB	operating PA output back off
P = 85.1 W	power fed to the antenna in Watts
A = 4.9 m^2	physical area of the aperture antenna
G = 197349.2	power gain relative to an isotropic radiator
D_{maj}, D_{min} = 2.6 m x 2.4 m	major, minor axis diameter of reflector
D_{eff} = 2.5	effective diameter of elliptical antenna in meters
F = 30000	frequency in MHz
λ = 0.01 m	wavelength in meters (~300/F_{MHz})
η = 0.32	aperture efficiency

Antenna Surface. The maximum power density directly in front of an antenna (e.g., at the antenna surface) can be approximated by the following equation:

$$S_{surface} = (4 * P) / A \quad (1.1)$$

$$= (4 * 85.1 \text{ W}) / 4.9 \text{ m}^2$$

$$= 6.95 \text{ mW/cm}^2$$

Near Field Region. In the near-field or Fresnel region, of the main beam, the power density can reach a maximum before it begins to decrease with distance. The extent of the near field can be described by the following equation **(D** and λ in same units):

$$R_{nf} = D_{eff}^2 / (4 * \lambda) \quad (1.2)$$
$$= (2.5 \text{ m})^2 / (4 * 0.01 \text{ m})$$
$$= 169.1 \text{ m}$$

The magnitude of the on-axis (main beam) power density varies according to location in the near field. The following equation is used at the request of FCC/OET staff in lieu of OET-65 equation 13[1]:

$$S_{nf} = (16 * P) / (\pi * \eta * D_{eff}^2) \qquad (1.3)$$

$$= (16 * 85.1\ W) / (\pi * 0.32 * (2.5\ m)^2)$$

$$= 21.71\ mW/cm^2$$

Transition Region. Power density in the transition region decreases inversely with distance from the antenna, while power density in the far field (Fraunhofer region) of the antenna decreases inversely with the ***square*** of the distance. The transition region will then be the region extending from R_{nf} to R_{ff}. If the location of interest falls within this transition region, the on-axis power density can be determined from the following equation:

$$S_t = (S_{nf} * R_{nf}) / R \qquad (1.4)$$

$$= (21.71\ mW/cm^2 * 169.1\ m) / R$$

$$= (3.67 \times 10^3\ m * mW/cm^2) / R$$ where R is the location of interest in meters

Far-Field Region. The power density in the far-field or Fraunhofer region of the antenna pattern decreases inversely as the square of the distance. The distance to the start of the far field can be calculated by the following equation:

$$R_{ff} = (0.6 * D_{eff}^2) / \lambda \qquad (1.5)$$

$$= (0.6 * (2.5\ m)^2) / 0.01\ m$$

$$= 405.9\ m$$

The power density at the start of the far-field region of the radiation pattern can be estimated by the equation:

$$S_{ff} = (P * G) / (4 * \pi * R_{ff}^2) \qquad (1.6)$$

$$= (85.1\ W * 197349.2) / (4 * \pi * (405.9\ m)^2)$$

$$= 0.81\ mW/cm^2$$

---

1 Derived from Table D.5 of IEEE Std C95.3-2021