Exhibit C

Analysis of Non-Ionizing Radiation for a Viasat Antenna System

Introduction

This report analyzes the non-ionizing radiation levels for the Viasat antenna system described in the narrative and other exhibits attached to this application.

The FCC's Office of Engineering and Technology's Bulletin No. 65 specifies that there are two separate tiers of Maximum Permissible Exposure ("MPE") 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.

As described in the definitional section of this document, this report considers the maximum power density levels in the vicinity of an earth station antenna in several regions: (1) the far field, (2) the near field, (3) the transition region between near field and far field, and (4) the surface of the radiating aperture. These radiation regions were analyzed using the definitions and formulas in Bulletin No. 65 for aperture antennas but replaces formula (13) of Bulletin No. 65 with the near field power density formula from Table D.5 of the IEEE C95.3-2021 Standard as indicated by FCC/OET staff in the context of other Viasat applications. The results of this analysis are summarized at the end of this document.

This earth station antenna is mounted on the fuselage or vertical stabilizer on aircraft, well above head height of people working in the area and is covered by a radome which prevents access to the area between the feed and reflector surface, and which is clearly marked with RF warnings. Due to its location on top of the aircraft, the antenna is inaccessible to ground crew during normal gate operations when the antenna is active. The antenna will be turned off during maintenance windows where personnel may have access to areas near the antenna. Additionally, as discussed below, when maintenance occurs inside a hanger, the system will not transmit because receive communications (a precursor to transmit operations) with the satellite will be blocked.

Terminal Description

The earth station terminals described in the Application employ Multi-Frequency Time Division Multiple Access ("MF-TDMA") where any given Earth-to-space (uplink) return link channel used by user terminals to transmit data to the satellite is shared among the population of users in that beam. There are many users potentially needing to transmit data to the satellite within a given beam. Each transmitting user is scheduled a time slot to transmit a portion of their traffic to the satellite and then in the next time slot another user transmits their data. Depending on the utilization of return channels, users may be directed to transmit in an available time slot on a different frequency channel from burst to burst.

Earth stations operating in the network transmit a certain percentage of time ("duty cycle") dependent on user traffic requirements. When idle, the terminal transmits only timing and system information to the network with an average duty cycle of 0.06%. During normal traffic usage the earth station terminal could burst with a nominal duty cycle of up to 50% during an averaging period of six minutes. In special circumstances, the terminal may transmit 100% of the time, occupying the given channel completely and thus operating as a single channel per carrier ("SCPC").

When the receive signal is lost by the earth station terminal due to signal blockage, the transmitter is shut down until the receive downlink is restored. Since the areas of high field strength near the reflector and the feed are very sensitive to blockage of the downlink, this "fail safe" feature minimizes the potential for human exposure in the area between the feed and reflector. If the blockage due to human exposure occurs in these areas, the downlink will be interrupted causing the transmitter to turn off almost immediately and it will remain off until the blockage is removed. After the blockage is removed, the earth station terminal will have to reacquire the receive downlink and wait to be invited back into the network before the transmitter will be enabled.

Analysis of 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.

The calculated values in the analysis show the exposure rates calculated using the formulae from the Office of Engineering and Technology Bulletin Number 65 (Edition 97-01) for the peak RF power output during transmission. While the nominal duty cycle is 50% or less and reduces the power density, this analysis considers the worst-case scenario of 100%.

The tables below summarize the expected radiation level in the main beam of the antenna for a controlled environment at the frequencies of operation.

<u>Summary of expected radiation levels at boresight at 29.5 GHz for a Controlled Environment</u>

Region	Maximum Power Density	Hazard Assessment
Far field (R_{ff}) = 5.31 m	27.48 mW/cm^2	Does not satisfy FCC MPE
Near field (R_{nf}) = 2.21 m	199.67 mW/cm^2	Does not satisfy FCC MPE
Transition region (R_t) (Rt) = $R_{nf} < R_t < R_{ff}$	442.07 /R_t mW/cm^2	Does not satisfy FCC MPE
Main Reflector Surface ($S_{surface}$)	113.18 mW/cm^2	Does not satisfy FCC MPE

The analysis and calculations that follow in this report are performed in compliance with the methods described in the OET Bulletin No. 65, but replaces formula (13) of Bulletin No. 65 with the near field power density formula from Table D.5 of the IEEE C95.3-2021 Standard as indicated by FCC/OET staff in the context of other Viasat applications. As stated in OET Bulletin No. 65, in the near field and transition regions, power density is 100 times (20 dB) less than on axis power density once the point of interest is one antenna diameter away from the center of main beam. In the far field, off-axis power density is determined by the antenna's radiation pattern. Figure 1 below shows the off-axis power density as a function of distance from the earth station terminal at 29.5 GHz, calculated in accordance with OET Bulletin No. 65 instructions.

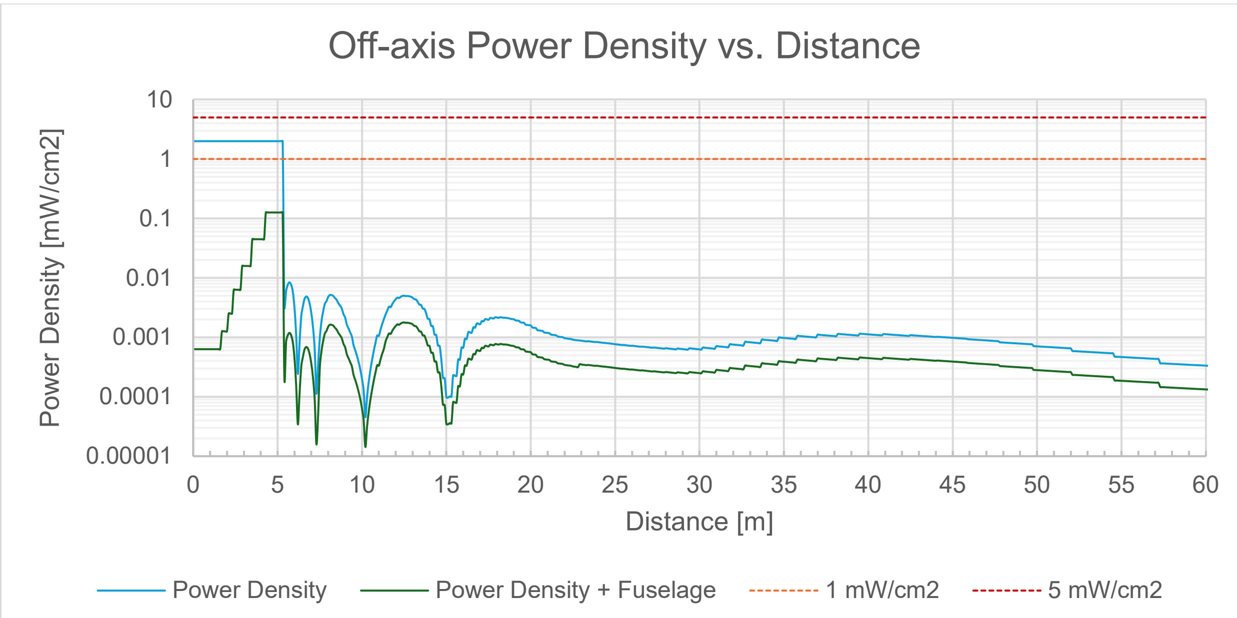

Figure 1: Off-axis power density as a function of distance

The power density in the figure assumes the antenna is mounted 4 m above the ground with elevation angle of 5° and the calculated power density is measured 2 m above ground to approximate the height of a person. Appropriately, the figure shows both power density calculations without and with fuselage attenuation according to Reports ITU-R M.2221 and ITU-R S.2565-0. Importantly, the closer a person is to the aircraft the more fuselage attenuation is a significant contributor to the measured power density. As the figure illustrates, the occupational MPE is not exceeded and the General Population MPE is not exceeded when taking into account the aircraft fuselage.

Conclusion

Calculations below show that the proposed system exceeds FCC MPE limits for persons in the main beam however, personnel will not have access to the boresight region of the antenna due to operational elevation angles, mounting location and limited access to the antenna while transmitting. The maximum power density, taking into account the off-axis gain and fuselage attenuation, towards any ground personnel is 0.13 mW/cm² which occurs at the beginning of far field region, 5.3 m. Additionally, personnel will not be permitted in the near field region in line of sight to the antenna while operational. Finally, the General Population has no access to anywhere near the antenna and given the operating elevation, any area of uncontrolled access where General Population may travel are well removed from the cylinder of RF power projected by the antenna.

The proposed earth station system will be located in an environment with controlled access and will be serviced by trained personnel. Only trained personnel will operate the transmitting system during testing. Procedures will be established that will ensure that all transmitters are turned off before access by maintenance personnel to this area is possible. Based on the above analysis, it is concluded that no hazard exists for the public.

In the following section, the power density in the above regions, as well as other critically important areas will be calculated and evaluated using the parameters for the 0.3 m antenna at 29.5 GHz.

Definition of terms

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

S_{surf}	=		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_t	=		distance to point of interest
P	=	20 W	power fed to the antenna in Watts
A	=	706.86 cm^2	physical area of the aperture antenna
G	=	4875.28	antenna gain relative to an isotropic radiator
D	=	30 cm	diameter of antenna in meters
F	=	29.5 GHz	frequency in GHz
λ	=	0.0102 m	wavelength in meters
η	=	0.57	aperture efficiency
D_C	=	100%	duty cycle

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:

$$S_{surface} = (D_C * 4 * P) / A$$

$$= (1 * 4 * 20W) / 706.86 \text{ cm}^2$$

$$= 113.18 \text{ mW/cm}^2$$

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):

$$R_{nf} = D^2 / (4 * \lambda)$$

$$= (30 \text{ cm})^2 / (4 * 0.0102 \text{ m})$$

$$= 2.21 \text{ m}$$

The magnitude of the on-axis (main beam) power density varies according to location in the near field. However, the maximum value of the near-field, on-axis, power density can be expressed by the following equation:

$$S_{nf} = (D_C * 16 * P) / (\eta * p * D^2)$$

$$= (100\% * 16 * 20 \text{ W}) / (0.57 * \pi * (30 \text{ cm})^2)$$

$$= (199.67 \text{ mW/cm}^2)$$

Transition Region. Power density in the transition region decreased inversely with distance from the antenna, while power density in the far field (Fraunhofer region) of the antenna decreased 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 = $(D_C * S_{nf} * R_{nf}) / R_t$

= (100% * 199.67 mW/cm^2 * 2.21 m) / R (m)

= (442.07 mW/cm) / R_t (m) where R_t is the location of interest in meters

Far-Field Region. The power density in the far-field or Fraunhofer region of the antenna pattern decreased 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} = $(0.6 * D^2) / \lambda$

= (0.6 * (30 cm)^2) / 0.0102 m

= 5.31 m

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

S_{ff} = $(D_C * P * G) / (4 * p * R_{ff}^2)$

= (100% * 20 W * 4875.28) / (4 * p * (531 cm)^2)

= 27.48 mW/cm^2