Exhibit A
Technical Annex

Viasat, Inc. seeks blanket authority to operate Honeywell JetWaveX earth station terminals (the "Terminals") as Earth Station Aboard Aircraft ("ESAA") Earth Stations in Motion ("ESIMs") in the fixed-satellite service ("FSS"). The Terminals are 30 cm antennas with circular apertures and would operate over Viasat's Ka-band satellite network to deliver high-throughput broadband communications to the aviation community.

Network Architecture and Operations

Viasat is requesting Commission authority to operate the Terminals with Ka-band GSO networks authorized by the Commission. The design of each network allows the aircraft to fly across the service area and seamlessly switch from spot beam to spot beam within the current operational satellite and to switch between satellites as coverage dictates. The networks employ adaptive coding and modulation; accordingly, terminals may transmit using a range of modulation and coding schemes with symbol rates from 600 kBd to 320 MBd. In Schedule B of this application, all of the possible symbol rates for the Afterburner waveform are included, however, for operation on iDirect's Velocity waveform, the symbol rates are from 600 kBd up to 8.4 MBd in 50 kBd increments. As a result, only a sampling of typical symbol rates are listed. Additionally, direct sequence spread spectrum ("DSSS") may be employed at lower symbol rates to reduce effective power density. DSSS is used solely for power density reduction and not as a multiple access method.

The architectures are designed to operate at the lowest power density modulation and coding that allows the link to close. The network employs adaptive power control and reduces power when conditions permit, typically keeping the Es/No margin at 1 dB or less above the intended operating point. When the modem has sufficient excess transmit capability, it would automatically switch to the next higher modulation and coding ("MODCOD") point or symbol rate and increase data rate, keeping the EIRP density at the minimum. This further reduces the likelihood that the system would impact traffic on other satellites.

The Terminals continuously monitor their transmissions and are capable of automatically reducing or ceasing emissions within 100 milliseconds if off-axis EIRP density limits are exceeded.

Antenna Patterns

The transmit emissions of the Terminals comply with the off-axis EIRP density mask of 47 CFR § 25.218 as demonstrated in Exhibit B of this application. To the extent that the antenna patterns do not comply with 47 C.F.R. § 25.209, Viasat understands that protection from interference in the receive bands is limited only to that provided by the § 25.209 gain mask.

Out-of-Band Emissions

The Terminals would comply with 47 CFR § 25.202(f) out-of-band emission limits.

GSO Sharing

As noted above, the Terminals would transmit at off-axis EIRP density levels which are compliant with 47 C.F.R. § 25.218 and therefore is compatible with the Commission's 2-degree spacing policy. Any operations in excess of routine levels would be subject to the coordination requirements Section 25.220.

UMFUS Sharing Analysis

The Terminals are capable of operation across the 27.5-28.35 GHz band. As noted in the narrative to this application, Viasat seeks a waiver of the Commission's rules to operate the Terminals in this spectrum on an unprotected, non-interference basis and only when the Terminals are on aircraft flying at 10,000 feet or more above ground level. To assess compatibility of these operations with terrestrial Upper Microwave Flexible Use Service ("UMFUS") operations in the 27.5-28.35 GHz band, an analysis was performed using Visualyse to determine compliance with the power flux density ("PFD") limit of -77.6 dBmW/(m^2 * MHz) at a 10 m reference height above ground level from an aircraft flying at a minimum 10,000 ft above ground level, as prescribed in 47 C.F.R. § 25.136. This is consistent with prior authorizations for similar antennas.[1]

The Visualyse analysis uses the measured JetWaveX antenna pattern and assumes the maximum antenna input power of 20 W is being applied in the 40 MBd symbol rate setting which in clear sky conditions complies with the FCC off-axis EIRP density mask. The aircraft in the simulation is set to fly at 10,000 ft above ground level directly over a reference antenna located at 10 m above ground level. The flight starts approximately 230 km away from the airport and flies at 250 knots until it passes over the airport and continues until it is approximately 230 km away in the other direction. The operating elevation angle from the aircraft to the satellite is 43.6 degrees. As the aircraft is flying at 10,000 ft, the UMFUS PFD reference antenna is always below the aircraft and accordingly the angle downward from the aircraft toward the UMFUS PFD reference is always negative and ranges from -1.8 degrees relative to the horizon to -89 degrees as the aircraft passes over the top of the reference antenna on the ground and back up to -1.8 degrees at the end of the simulation run. The total off-axis angle is the difference of the elevation angle towards the satellite (43.6 degrees) minus the angle downward toward the UMFUS reference antenna (-1.8 to -89 degrees), or 45.4 to 132.6 degrees.

The simulation takes into consideration fuselage attenuation (airframe blockage) according to Figure 1 and normal path and atmospheric losses but does not assume any clutter losses between the aircraft and the antenna on the ground. At long distances, fuselage

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1 *See* Viasat, Inc., Call Sign E190201, ICFS File No. SES-LIC-20190411-00503, Attachment 1 (granted Nov. 15, 2019); Viasat, Inc., Call Sign E180006, ICFS File No. SES-LIC-20180123-00055, Attachment 1 (granted Apr. 17, 2018); Viasat, Inc., Call Sign E120075, ICFS File No. SES-MOD-20160108-00029, Technical Analysis (granted Jun. 29, 2016). Also consistent with prior authorizations, the analysis did not consider operations on aircraft below 10,000 feet because Viasat is not seeking operate below 10,000 feet. All communications below 10,000 feet, including any communications while the aircraft is on the ground, would be conducted in other portions of the Ka band.

attenuation is minimal, but path loss is higher. At closer distances, the downward angle toward the UMFUS PFD reference angle on the ground increases, as does the related fuselage attenuation. As the airplane banks in flight the amount of fuselage attenuation varies but at no point during the simulation run does the PFD exceed the -77.6 dBmW/(m^2 * MHz) limit at the reference antenna location on the ground.

Figure 1

Fuselage Attenuation (Aircraft Shielding) from Reports ITU-R M.2221 and ITU-R S.2565-0

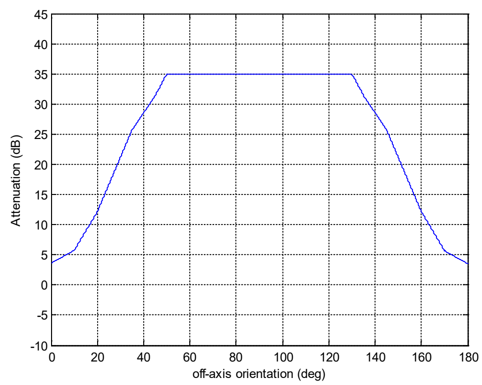

Table 1 shows the values taken from the Visualyse simulation at a snapshot of the point when the worst-case PFD value at the 5G reference measurement location occurred in the simulation. The maximum observed PFD value was -100.5 dBmW/(m^2 * MHz), which is 22.9 dB below the -77.6 dBmW/(m^2 * MHz) limit in Section 25.136.

Table 1: Visualyse Simulation Snapshot Results

Parameter	Value	Unit
Antenna Input Power	20	W
Modulated Bandwidth	40	MHz
Input Power Density	-3.01	dBW/MHz
Antenna On-Axis Gain	36.6	dBi
Antenna Relative Gain toward UMFUS Reference	-51.5	dB
Antenna Off-Axis Gain toward UMFUS Reference	-14.9	dBi
EIRP Density toward UMFUS Reference	-17.9	dBW/MHz
Spreading Loss toward UMFUS Reference	80.7	dB-m^2
Fuselage Attenuation (ITU-R S.2565)	32	dB

Power Flux Density at UMFUS Reference Location	-100.5	dBmW/(m^2*MHz)
PFD Limit (§ 25.136)	-77.6	dBmW/(m^2·MHz)
Margin Below PFD Limit	22.9	dB

The analysis shows that the PFD limit for protection of UMFUS stations would be met, with significant margin, even at the highest potential clear-sky operational EIRP density for the Terminals.