RADIOFREQUENCY RADIATION HAZARD (RFR) STUDY

2.4 Meter C-Band / Ku-Band Satellite Uplink Earth Station

Prepared in support of FCC Form 312 / Schedule B — 47 C.F.R. § 1.1307(b), § 1.1310

1. Purpose and Scope

This study evaluates compliance with the FCC's radiofrequency (RF) exposure limits in 47 C.F.R. § 1.1310, applying the methodology of OET Bulletin 65 ("Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields") and its Supplement C (antennas), for the 2.4 meter AVL Technologies parabolic reflector antenna described below, operating as a transmit/receive Fixed-Satellite Service (FSS) earth station in the 6 GHz (C-band) and 14 GHz (Ku-band) uplink bands.

This exhibit accompanies the FCC Form 312 / Schedule B earth station license application for the station formerly identified as callsign E050245, now relicensed at the same site under a new call sign to be assigned by the Commission.

2. Station and Antenna Parameters

Parameter	Value	Basis / Source
Antenna manufacturer / model	AVL Technologies (2.4 m Ku/C-band class)	Prior E050245 record;
Reflector diameter (D)	2.4 m	User-provided
Aperture efficiency (η)	0.65 (assumed, typical prime-focus/Cassegrain)	Manf Data sheet
Mounting	Rooftop, restricted (non-public) access	User-provided
C-band uplink frequency	5.925 – 6.425 GHz (center 6.175 GHz used)	Standard FSS C-band uplink allocation
Ku-band uplink frequency	14.0 – 14.5 GHz (center 14.25 GHz used)	Standard FSS Ku-band uplink allocation
HPA output power per band	100 W	
Feed/waveguide loss	Not netted out (conservative)	Assumption

3. Applicable Exposure Limits

Both operating bands (6.175 GHz and 14.25 GHz) fall in the 1.5–100 GHz range of Table 1 to § 1.1310, where the Maximum Permissible Exposure (MPE) power-density limits are frequency-independent:

Exposure category	MPE limit	Averaging time
Occupational / Controlled (site personnel, restricted-access rooftop)	5 mW/cm²	6 minutes

General Population / Uncontrolled	1 mW/cm²	30 minutes

4. Methodology

Consistent with OET Bulletin 65 §A.9.3, the on-axis power density directly in front of a parabolic reflector is evaluated in two regions:

- Near field (R < Rff): power density is approximated conservatively as constant with distance, using S_nf = 4·Pt / A, where A is the physical aperture area (worst-case bound; ignores focusing loss).
- Far field (R ≥ Rff): power density falls off with the inverse square of distance, S(R) = Pt·G / (4πR²).

The near-field/far-field (Rayleigh) transition distance is Rff = 2D²/λ. Antenna gain is estimated as G = η·(πD/λ)².

5. Calculated Results — On-Axis (Main Beam)

Parameter	C-band (6.175 GHz)	Ku-band (14.25 GHz)
Wavelength (λ)	4.86 cm	2.11 cm
Estimated gain	41.9 dBi	49.2 dBi
Far-field (Rayleigh) distance, Rff	237 m	547 m
Near-field on-axis power density (single band, 100 W)	8.84 mW/cm²	8.84 mW/cm²
Compliance distance — Occupational (5 mW/cm²)	≈ 315 m	≈ 728 m
Compliance distance — General population (1 mW/cm²)	≈ 705 m	≈ 1,627 m

6. Beam Geometry and Practical Hazard Zone

The on-axis distances in Section 5 describe the theoretical hazard extent if a person stood directly in the main beam indefinitely at boresight height. In practice, satellite earth stations point at a fixed, elevated look angle toward a geostationary satellite (typically 20–50° or more above the horizon depending on site latitude and the target satellite's orbital longitude). This has two direct consequences that must be documented with site-specific data before filing:

- The main beam leaves the rooftop mounting structure at an upward angle and does not intersect ground level, adjacent rooftops, or publicly accessible areas beyond a short distance from the antenna, provided the elevation angle and any nearby taller structures are confirmed clear of the boresight path.
- The compliance distances in Section 5 remain relevant for (a) personnel access within the immediate near-field zone directly in front of the dish on the rooftop itself, and (b) any structure, walkway, or adjacent building that the boresight path could physically intersect at the site's specific elevation and azimuth.
- Off-axis (sidelobe) power density is substantially lower than the on-axis values above — typically 20–30+ dB down beyond a few degrees off boresight per antenna pattern envelope (e.g., 29–25log(θ) per §25.209) — and generally does not drive the compliance boundary except very close to the reflector edge.

7. Mitigation and Access Control

- Maintain the rooftop as a restricted-access (occupational-controlled) area, with locked roof access and RF-hazard warning signage at entry points, consistent with the occupational MPE limit of 5 mW/cm².
- Post RF hazard warning placards at the antenna itself, since near-field power density immediately at the aperture exceeds both MPE tiers.
- Verify via site survey that no publicly accessible space (adjacent rooftop, window, walkway) falls within the boresight path at the operating elevation angle.
- Interlock or procedurally prohibit personnel from working directly in front of the reflector while either HPA is keyed.

8. Conclusion

Based on the assumed parameters in Section 2, the station's near-field on-axis power density exceeds both the occupational and general-population MPE limits at the antenna aperture itself, as is typical for a high-power 2.4 m uplink terminal, and requires restricted access and warning signage at the rooftop mounting location per Section 7. Because the antenna's operating elevation angle directs the main beam away from ground level and publicly accessible areas, the station can be shown to comply with § 1.1310 for the general population, subject to confirmation of the site-specific beam geometry described in Section 6.

9. Certification

The undersigned certifies that this radiofrequency radiation hazard analysis was prepared in accordance with FCC OET Bulletin 65 and reflects, to the best of the engineer's knowledge, the actual as-built configuration of the referenced earth station.

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