Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, DC 20554

In the Matter of	)	
	)	
Application of Heighliner Corp. for a	)	Call Sign: _____
Ka-Band Fixed Earth Station License to	)	File No.: _____
Operate with GSO Space Stations	)	

Earth Station Application Narrative

Heighliner Corp. ("Heighliner"), a wholly owned subsidiary of Astranis Space Technologies Corp. ("Astranis"), pursuant to Section 25.115 of the Federal Communications Commission's ("FCC" or "Commission") rules, 47 C.F.R. § 25.115, respectfully seeks authority to install and operate three 2.4-meter Ka-band fixed earth stations on the roof of Astranis's headquarters building in San Francisco, California. The three 2.4m earth stations will communicate with the Arcturus satellite[1] and other Ka-band geostationary orbit ("GSO") satellites on the FCC's Approved Space Station List[2] using Permitted List frequencies.[3]

I. DISCUSSION

A. Satellite Points of Communication

The proposed 2.4m earth stations will communicate with the Arcturus satellite (which will operate at the 163° W.L. orbit location)[4] as well as other satellites on the Approved Space Station List in the 28.35-28.6 GHz and 29.3-30.0 GHz (Earth-to-space) and 18.3-18.8 GHz and 19.7-20.2 GHz (space-to-Earth) bands, which are included in the Arcturus License and available for Permitted List operations.

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[1] *See* Astranis Projects USA LLC, File No.: SAT-LOA-20221019-00145, Call Sign S3092 (granted-in-part/deferred-in-part Dec. 6, 2022) (the "Arcturus License").

[2] Available at: https://www.fcc.gov/approved-space-station-list.

[3] *See id.* (identifying Permitted List frequencies).

[4] The Arcturus satellite is expected to launch on April 26, 2023, and Heighliner seeks authority to operate these earth stations on or about May 10, 2023. Accordingly, in addition to this application, Heighliner is filing a concurrent request for special temporary authorization ("STA") to communicate with the Arcturus satellite prior to grant of the instant earth station application.

B. Description of Earth Station Operations

Heighliner seeks to operate three 2.4-meter earth stations (CPI Series 3244, formerly GD Satcom Model 3244). CPI acquired the earth station business of General Dynamics[5] and the technical characteristics of the GD 2.4m Series 3244 antenna have been previously reviewed and approved by the Commission.[6] The antenna gain and power level of the three 2.4m earth stations conform to the Commission's rules.

Protection of GSO Networks. Measured transmit and receive antenna patterns for the 2.4m terminal meet the limits articulated by Section 25.209(a) and (b) of the Commission's rules. The technical certification made pursuant to Section 25.132(a)(1) of the Commission's rules confirms the conformance of this antenna with Sections 25.209(a) and (b). The input power spectral density into the antenna will not exceed 3.5 dBW/MHz, consistent with Section 25.212(e) of the Commission's rules. Therefore, this earth station model is compliant with the Commission's two-degree spacing requirements.

Coordination with Non-geostationary Orbit ("NGSO") Mobile-Satellite Service Feeder Link ("MSS FL") Operators in the 29.35-29.5 GHz Band. There are no NGSO MSS FL earth stations in the vicinity of the proposed earth station site. As a result, Heighliner's operations will comply with Section 25.258 of the Commission's rules. Heighliner is committed to engaging with good faith coordination efforts for its earth station deployments where necessary.

RF Safety Considerations. A comprehensive radiofrequency ("RF") radiation hazard analysis is attached as Exhibit A. As demonstrated therein, because the subject earth stations will be installed on the rooftop of the Astranis headquarters building, and because signage and

[5] *See* https://www.defensedaily.com/cpi-completes-purchase-gd-satcom-technologies/business-financial/.

[6] *See* Viasat, Inc. File No. SES-LIC-20120927-00854, Call Sign E120196 (granted March 20, 2013) (which includes submission of antenna gain patterns).

operational procedures will ensure that no individuals will be in any RF hazard area while the earth stations are transmitting, the Commission's RF safety requirements are satisfied.

C. Public Interest Considerations

Grant of this application is in the public interest because it will enhance operations of Ka-band GSO satellites authorized by the Commission and facilitate the provision of Ka-band GSO satellite connectivity in the United States, including increased satellite bandwidth in Alaska. Authorization of the three 2.4m earth stations will also enable new satellite solutions for U.S. government users.

In addition, the 2.4m earth station antenna model to be operated by Heighliner has been previously authorized by the Commission and is fully compliant with applicable technical requirements. Thus, the Commission can be assured that operation of the terminals will raise no potential interference concerns.

II. CONCLUSION

For all the forgoing reasons, Heighliner respectfully requests grant of an earth station license consistent with the technical parameters described in this application (including the accompanying FCC Form 312, Schedule B) at the earliest practicable time.

EXHIBIT A

Radiation Hazard Analysis

1. Introduction

This analysis assesses the non-ionizing radiation levels for the Communications and Power Industries ("CPI") 2.4-meter Ka-band earth station Model 3244. The calculations performed in this analysis are consistent with the recommendations articulated in the Commission's Office of Engineering and Technology Bulletin, Number 65 ("Bulletin 65"). This analysis demonstrates that the 2.4m earth station complies with the applicable radiation exposure limits.[7]

This report analyzes the maximum power density levels in the vicinity of an earth station antenna in five regions: (1) the far field, (2) the near field, (3) the transition region between near field and far field, (4) near the main reflector surface, and (5) between the main reflector and the feed. These radiation regions were analyzed using the definitions and formulas in Bulletin 65 for aperture antennas. The results of this analysis are summarized below and identify the potential exposure under nominal operating conditions and worst-case conditions, respectively.

2. Input Parameters

The input parameters below are those used to determine the radiation levels for the proposed 2.4m earth station.

2.4m Earth Station Parameter Chart

Antenna Diameter	D_{maj} := 2.4 m
Antenna Surface Area	A_{ref} := 4.52 m^2
Antenna Feed Mouth Area	A_{feed} := 13.3 cm^2
Antenna Isotropic Gain	G := 55.68 dBi
Nominal Antenna Efficiency	η := 65%

[7] Bulletin 65 and Section 1.310 of the Commission's rules specify two separate exposure limits: one for Occupational/Controlled Exposures and one for General Population/Uncontrolled Exposures. The maximum level of non-ionizing radiation to which employees may be exposed under the occupational threshold is limited to a power density level of 5 milliwatts per square centimeter (5 mW/cm^2) averaged over any 6-minute period in a controlled environment. The maximum level of non-ionizing radiation to which the General Population may be exposed is limited to a power density level of 1 milliwatt per square centimeter (1 mW/cm^2) averaged over any 30-minute period in an uncontrolled environment.

Nominal Frequency	f := 30.00 GHz
Nominal Wavelength	λ := 1.00 cm
Maximum Transmit Power / Carrier	P_{car} := 100 W
Number of Carriers	N_{car} := 2
Total Transmit Power	P_{total} := 200 W
W/G Loss from Transmitter to Feed	N/A, transmitter with integrated feed
Total Feed Input Power	P_{feed} := 200 W

3. Analysis

At the Antenna Surface. The maximum power density directly in front of an antenna (e.g., at the antenna surface).

Power Density $S_{ref} := \frac{4P_{total}}{A_{ref}}$ 17.68 mW/cm^2

Near Field Region. The near field region is an elliptical volume co-incident with the boresight of the main beam extending outward from the main reflector.

Near Field Region $R_{nf} := \frac{D_{maj}^2}{4\lambda}$ 144 m

Power Density $S_{nf} := \frac{16P_{total}}{4\pi\eta R_{nf}^2}$ 27.21 mW/cm^2

Transition Region. The transition region is located between the near field region and the far field region. This region has a power density that decreases inversely with increasing distance. Therefore the power density in the transition region will be less than the power density in the near field for the purpose of evaluating potential exposure.

Transition Region $R_{nf}\ to\ R_{ff}$ 144.0 m to 346 m

Far Field Region. That region of the field of an antenna where the angular field distribution is essentially independent of the distance from the antenna.

Far Field Region	$R_{ff} := 0.6\frac{D_{maj}^2}{\lambda}$	346 m
Power Density	$S_{ff} := \frac{P_{total} G}{4\pi R_{ff}^2}$	4.92 mW/cm^2

Region between the Main Reflector and the Feed. The region where radiation is emitted is where power is fed to the antenna from a transmitter feed mounted on a mast at the focal point of the antenna. Radiation from this source is then incident on to the main reflector resulting in the transmission of a collimated beam.

4. Conclusion and Site Access Restrictions

The analysis above demonstrates that the 2.4m earth station will exceed the general population exposure threshold in the near field. It will not result in exposure limits exceeding the applicable radiation limits in any other regions. In order to ensure the 2.4m earth station will not pose a risk of harmful radiation hazard to the general population, Heighliner Corp. and Astranis Space Technologies Corp. (collectively, "Astranis") will restrict access to the area around the 2.4m earth stations pursuant to the guidance in Bulletin 65 to prevent any potential exposure of the earth station's near-field region to the general population.

All three subject earth stations will be located on a 32 ft-high, access-controlled roof. The three earth stations will only be pointed toward the sky when operating, so the general population will not be exposed at above acceptable levels.

Astranis personnel entering the site or working near/in front of the antennas have the appropriate RF safety training, extensive professional experience, and engineering qualifications. In order to limit potential exposure to the occupational population, the antennas will be turned off prior to and for the duration of any maintenance or other work that must be conducted near the 2.4m earth station. In this connection, the antenna transceivers are equipped with LED indicators which convey the current transmitting status. There will be advisory signs around this antenna area on the roof, in addition to red stripes marking the three-dimensional perimeter of the occupational exposure limit zone.

Astranis has redundant physical and electronic security measures in place to safeguard the Astranis facilities. There are security personnel on-site 24/7 that conduct roving patrols as

well as static observations of all areas. These areas of responsibility are also controlled and monitored via electronic camera surveillance systems and access-controlled badge readers.

No members of the public have access to the roof. No third-party personnel will be performing maintenance in areas of potential concern. The closest publicly accessible road is approximately 160 feet away to the West. The closest publicly accessible building is approximately 320 feet away to the Northwest. In addition, these roadways are 32 feet below the rooftop level and, given the upward elevation angles towards the GSO arc, any potential exposures would be at substantial distances and well into the sidelobes/backlobes of the antenna. Accordingly, the Commission's exposure levels will be satisfied.