Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, DC 20554

In the Matter of	)	Call Sign: E210125
	)	
Amendment to Application of Speedcast Communications Inc. for a Fixed Earth Station License	)	File No. SES-AMD-_____________

AMENDMENT TO APPLICATION
FOR A FIXED EARTH STATION LICENSE

Pursuant to Section 25.116 of the rules of the Federal Communications Commission (the "FCC" or "Commission"),[1] Speedcast Communications Inc. ("Speedcast") respectfully files an amendment to its application to operate a 2.4m earth station in the 5925 – 6425 MHz (Earth-to-space) and 3700 – 4200 MHz (space-to-Earth) bands in San Juan, Puerto Rico (the "Application").[2] Speedcast hereby amends the Application to (i) update certain technical parameters in the Form 312, Schedule B ("Form 312"); (ii) clarify its compliance with respect to 25.218(d) of the Commission's rules; and (iii) update the transmit frequency in the associated radiation hazard report. All other aspects of the Application remain unchanged.

I. Discussion

A. Technical Parameters

The amended Form 312 appropriately aligns the technical parameters of the proposed earth station with the coordination data sheets submitted with the Application.[3] Specifically, the input power at the antenna flange is 208.35 W for the 35 MHz emission, which results in a maximum EIRP per carrier of 64.79 dBW; and the input power at the antenna flange for the 18 MHz emission is 55.6 W, which results in a maximum EIRP per carrier of 59.05 dBW. Because

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[1] 47 C.F.R. § 25.116.

[2] *See* Speedcast Communications Inc., *Application for a Fixed Earth Station License*, File No. SES-LIC-20210628-00992, Call Sign E210125 (filed June 28, 2021).

[3] *See id.*, Technical Appendix at §A.1.

each input power is associated with only a single emission and only one emission is used at any point in time, the total EIRP for all carriers is equal to the EIRP per carrier (*i.e.*, the total EIRP for all carriers for the 35 MHz emission is 64.79 dBW). The transmit antenna gain in Form 312 is updated to 41.6 dBi to eliminate rounding and align with the data sheets.

The foregoing changes result in a transmit EIRP density per carrier of 22.52 dBW/4kHz and 25.37 dBW/4kHz for the 18 MHz and 35 MHz emissions, respectively. In addition, the maximum EIRP density towards the horizon is updated to -44.99 dBW/4kHz for the 18 MHz emission and -24.69 dBW/4kHz for the 35 MHz emission.

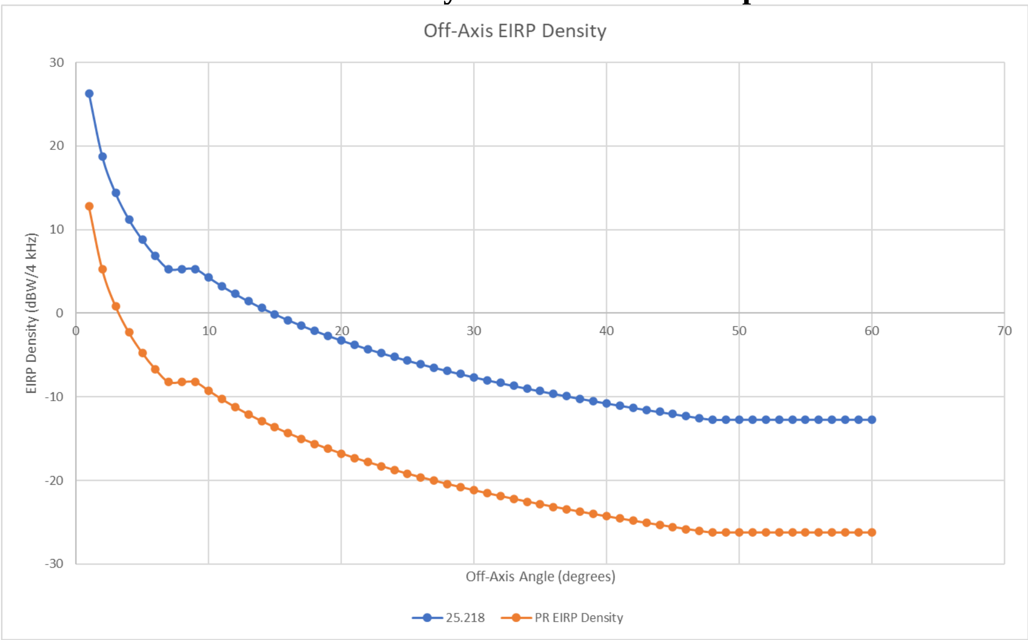
B. Technical Certifications

As discussed in the Application narrative and in accordance with Section 25.212(d) of the Commission's rules, Speedcast certifies compliance with §25.209(a) and (b), and that the power density into the antenna will not exceed −2.7 dBW/4 kHz.[4] Out of an abundance of caution, Speedcast also certifies that it will operate the 2.4m earth station at off-axis EIRP spectral density ("ESD") levels in compliance with the mask in Section 25.218(d) of the Commission's rules to ensure no harmful interference into other authorized operators in the bands.

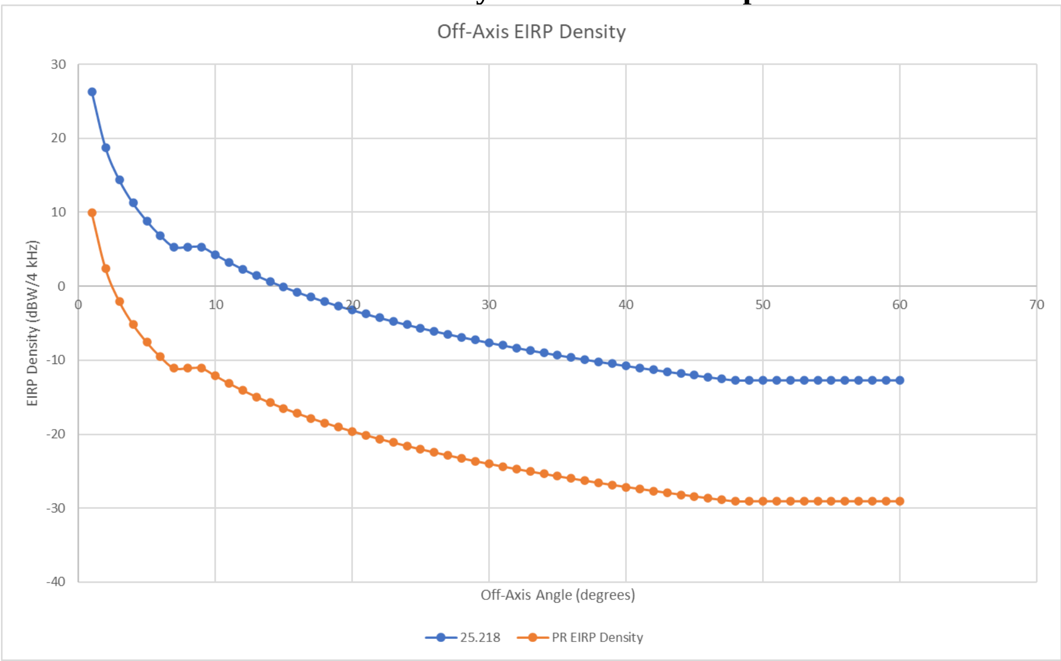
The following figures demonstrate the antennas compliance with the off-axis EIRP density envelopes provided in Section 25.218(d).

[4] *See* 47 C.F.R. §§ 25.212(d), 25.209.

Off-Axis EIRP Density Mask – 208.35 W Input Power



Off-Axis EIRP Density Mask – 55.6 W Input Power



The above analyses confirm that proposed operations comply with the Section 25.218(d) digital modulation EIRP density mask, considering both the 208.35 W and 55.6 W input powers into the antenna with their corresponding bandwidth carriers.

C. Radiation Hazard Study

The attached radiation hazard study is updated to reflect a transmit frequency of 5925 MHz.[5] This amendment has a *de minimis* impact on the values in the radiation hazard study and no impact on its underlying conclusions.

II. PUBLIC INTEREST CONSIDERATIONS

The 2.4m earth station will provide critical emergency communications restoration services in Puerto Rico if severe weather events adversely affect existing communications infrastructure. Expeditious grant of the Application, as amended herein, will enable Speedcast to deliver critical emergency restoration services following a weather event or other natural disaster, which is particularly important given the risk of communications outages during hurricane season and the increased reliance on communications connectivity as Puerto Rico continues to address the impacts of the COVID-19 pandemic and is therefore consistent with the public interest.

III. CONCLUSION

The updates in this amendment appropriately align the technical information in this proceeding with the parameters being coordinated with terrestrial licensees. Speedcast respectfully requests that the Commission process and ultimately grant the Application, as amended, at the earliest practicable time.

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[5] *See* Exhibit I, Radiation Hazard Study, 2.4m C-band Earth Station (attached).

Exhibit I
Radiation Hazard Study

2.4m C-band Earth Station

This study analyzes the non-ionizing radiation levels for a 2.4m C-band earth station. This report is developed in accordance with the prediction methods contained in OET Bulletin No. 65, Evaluating Compliance with FCC Guidelines for Human Exposure to Radio Frequency Electromagnetic Fields, Edition 97-01.

Bulletin No. 65 specifies that there are two separate tiers of exposure limits that are depending on the area of exposure and/or the status of the individuals who are subject to the exposure -- the General Population/Uncontrolled Environment and the Controlled Environment, where the general population cannot access.

The maximum level of non-ionizing radiation to which individuals may be exposed 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, and the maximum level of non-ionizing radiation to which the general public is 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 a uncontrolled environment.

In the normal range of transmit powers for satellite antennas, the power densities at or around the antenna surface are expected to exceed safe levels. The purpose of this study is to determine the power flux density levels for the earth station under study as compared with the MPE limits. This comparison is done in each of the following regions:

1. Far-field region
2. Near-field region
3. Transition region
4. The region between the feed and the antenna surface
5. The main reflector region
6. The region between the antenna edge and the ground

Input Parameters

The following input parameters were used in the calculations:

Parameters:	Value	Unit	Symbol
Antenna Diameter	2.4	m	*D*
Antenna Transmit Gain	41.6	dBi	*G*
Transmit Frequency	5925	MHz	*f*
Antenna Feed Flange diameter	~22.5	cm	*d*
Power Input to the Antenna	208.35	W	*P*

Calculated Parameters:

The following values were calculated using the above input parameters and the corresponding formulas:

Parameter	Value	Unit	Symbol	Formula
Antenna Surface Area	4.524	m^2	A	$\pi D^2/4$
Area of Antenna Flange	~397	cm^2	a	$\pi d^2/4$
Antenna Efficiency	0.65		η	$G\lambda^2/(\pi^2 D^2)$
Gain Factor	14,454		g	$10^{G/10}$
Wavelength	0.051	m	λ	$300/f$

Behavior of EM Fields as a Function of Distance

The behavior of the characteristics of EM fields varies depending on the distance from the radiating antenna. These characteristics are analyzed in three primary regions: the near-field region, the far-field region and the transition region. Of interest also are the region between the antenna main reflector and the subreflector, the region of the main reflector area and the region between the main reflector and ground.

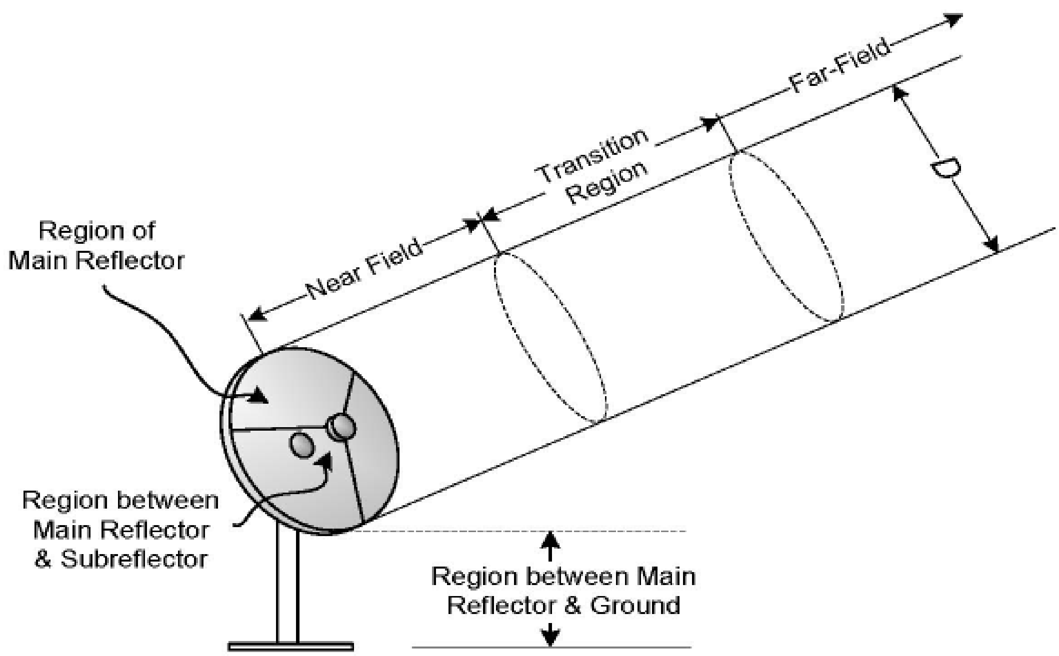

Figure 1. EM Fields as a Function of Distance

For parabolic aperture antennas with circular cross sections, such as the antenna under study, the near-field, far-field and transition region distances are calculated as follows:

Parameter	Value	Unit	Formula
Near-Field Distance	28.4	m	$R_{nf} = D^2/(4\lambda)$
Distance to Far-Field	68.3	m	$R_{ff} = 0.60D^2/(\lambda)$
Distance of Transition Region	28.4	m	$R_t = R_{nf}$

The distance in the transition region is between the near and far fields. Thus, $R_{nf} \leq R_t \leq R_{ff}$. However, the power density in the transition region will not exceed the power density in the near-field. Therefore, for purposes of the present analysis, the distance of the transition region can equate the distance to the near-field.

Power Flux Density Calculations

The power flux density is considered to be at a maximum through the entire length of the near-field. This region is contained within a cylindrical volume with a diameter, D, equal to the diameter of the antenna. In the transition region and the far-field, the power density decreases inversely with the square of the distance. The following equations are used to calculate power density in these regions.

Parameter	Value	Unit	Symbol	Formula
Power Density in the Near-Field	12.0	mW/cm^2	S_{nf}	$16.0\ \eta\ P/(\pi D^2)$
Power Density in the Far-Field	5.1	mW/cm^2	S_{ff}	$GP/(4\pi\ Rff^2)$
Power Density in the Transition Region	12.0	mW/cm^2	S_t	$S_{nf}\ R_{nf}/(R_t)$

The region between the main reflector and the subreflector is confined within a conical shape defined by the feed assembly. The most common feed assemblies are waveguide flanges. This energy is determined as follows:

Parameter	Value	Unit	Symbol	Formula
Power Density at the Feed Flange	2097	mW/cm^2	S_{fa}	$4P / a$

The power density in the main reflector is determined similarly to the power density at the feed flange; except that the area of the reflector is used.

Parameter	Value	Unit	Symbol	Formula
Power Density at Main Reflector	18.4	mW/cm^2	$S_{surface}$	$4P / A$

The power density between the reflector and ground, assuming uniform illumination of the reflector surface, is calculated as follows:

Parameter	Value	Unit	Symbol	Formula
Power Density b/w Reflector and Ground	4.6	mW/cm^2	S_g	P / A

The below table summarizes the calculated power flux density values for each region. In a controlled environment, the only regions that exceed FCC limitations are shown below. These regions are only accessible by trained technicians who, as a matter of procedure, turn off transmit power before performing any work in these areas.

Power Density	Value	Unit	Controlled Environment
Far Field Calculation	5.14	mW/cm^2	Exceeds Limits
Near Field Calculation	11.97	mW/cm^2	Exceeds Limits
Transition Region	11.97	mW/cm^2	Exceeds Limits
Region b/w feed iris and reflector	2096	mW/cm^2	Exceeds Limits
Main Reflector Region	18.4	mW/cm^2	Exceeds Limits
Region b/w Main Reflector & Ground	4.6	mW/cm^2	Satisfies FCC MPE

The antenna will be installed on the roof of a commercial building that is not accessible by the general public. The antenna will be sited at an elevation angle of greater than 30-degrees. The earth station will be marked with the standard radiation hazard warnings, as well as the area in the vicinity of the earth station to inform the general public and building maintenance personnel not responsible for earth station maintenance or operations, who might be working or otherwise present in or near the path of the main beam.

The applicant will ensure that the main beam of the antenna will be pointed at least one diameter away from any building, or other obstacles in those areas that exceed the MPE limits. Since one diameter removed from the center of the main beam the levels are down at least 20 dB, or by a factor of 100, public safety will be ensured.

Finally, the earth station's operational personnel will not have access to areas that exceed the MPE limits while the earth station is in operation. The transmitter will be turned off during periods of maintenance so that the MPE standard of 5.0 mW/cm^2 will be complied with for those regions in close proximity to the main reflector, which could be occupied by operating personnel.

In conclusion, the results show that the antenna, in a controlled environment, may exist in the regions noted above and applicant will take the proper mitigation procedures to ensure it meets the guidelines specified in 47 C.F.R. § 1.1310.