SATELLITE EARTH STATION AUTHORIZATIONS
FCC Form 312 - Schedule B (Technical and Operational Description)

E1. Site Identifier:	1
E2. Contact Name:	Jio Castro (Intellian Technologies USA, Inc.)
E3. Street Address or Area of Operation:	3172 N. Andrews Avenue Extension
E4. State:	Florida
E5. Call Sign:	NEW
E6. Phone Number:	213-465-5829
E7. City:	Pompano Beach
E8. County:	Broward
E9. Zip Code:	33064
E11. Latitude:	26° 16' 9.8" N
E12. Longitude:	80° 08' 8.9" W
E13. Lat/Long Coordinates are:	NAD 83
E14. Site Elevation (AMSL):	4 m

E15. If the proposed antenna(s) operate in the Fixed Satellite Service (FSS) with geostationary satellites, do(es) the proposed antenna(s) comply with the antenna gain patterns specified in Section 25.209(a) and (b) as demonstrated by the manufacturer's qualification measurement? If NO, provide as a technical analysis showing compliance with two-degree spacing policy.	N/A
E16. If the proposed antenna(s) do not operate in the Fixed Satellite Service (FSS), or if they operate in the Fixed Satellite Service (FSS) with non-geostationary satellites, do(es) the proposed antenna(s) comply with the antenna gain patterns specified in Section 25.209(a2) and (b) as demonstrated by the manufacturer's qualification measurements?	N/A
E17. Is the facility operated by remote control? If YES, provide the location and telephone number of the control point.	No
E18. Is frequency coordination required? If YES, attach a frequency coordination report.	No (See Narrative Attachment)
E19. Is coordination with another country required? If YES, attach the name of the country(ies) and plot of coordination contours	No
E20. FAA Notification - (See 47 CFR Part 17 and 47 CFR part 25.113(c)) Where FAA notification is required, have you attached a copy of a completed FCC Form 854 and/or the FAA's study regarding the potential hazard of the structure to aviation? FAILURE TO COMPLY WITH 47 CFR PARTS 17 AND 25 WILL RESULT IN THE RETURN OF THIS APPLICATION.	N/A (i.e. FAA Notification not required)

POINTS OF COMMUNICATION

Satellite Name	
E21. Common Name:	Telesat Leo-1
E22. ITU Name:	COMMSTELLATION
E23. Orbit Location:	Non-GEO
E24. Country:	Canada

POINTS OF COMMUNICATION (Destination Points)

E25. Site Identifier	N/A: loop-back tests to Site 1 only
E26. Common Name	
E27. Country	

ANTENNA

Site ID	E.28. Antenna ID	E29. Quantity	E30. Manufacturer	E31. Model	E32 Antenna Size (m)	E41/42. Antenna Gain Transmit or Receive (__dBi at __GHz)
1	1	1	Intellian	V150Ka	1.50	46.5 at 19.05
1	1	1	Intellian	V150Ka	1.50	50.0 at 28.85

E.28. Antenna ID	E33/34. Diameter Minor/Major (m)	E35. Above Ground Level (m)	E36. Above Sea Level (m)	E37. Building Height Above Ground Level (m)	E38. Max Total Input Power at Antenna Flange (W)	E39. Maximum Antenna Height Above Rooftop (m)	E40. Total EIRP for all Carriers (dBW)
1	1.50 / 1.50	1.95	5.95	N/A	29.6	N/A	64.7

FREQUENCY

E28. Antenna ID	E 43/44. Frequency Band (MHz)	E45. T/R Mode	E46. Antenna Pol (H, V, L, R)	E47. Emission Designator	E48. Max EIRP per Carrier (dBW)	E49. Max EIRP Density per Carrier (dBW/4KHz)	E50. Modulation and Services
1	28600 - 29100	T	L	30M0D1D	61.7	22.9	DATA (256 APSK)
1	28600 - 29100	T	L	47M6D1D	61.7	21.0	DATA (128 APSK)
1	28600 - 29100	T	L	208MD1D	61.7	14.5	DATA (64 APSK)
1	18800 - 19300	R	R	30M0D1D			DATA (256 APSK)
1	18800 - 19300	R	R	47M6D1D			DATA (128 APSK)
1	18800 - 19300	R	R	208MD1D			DATA (64 APSK)

FREQUENCY COORDINATION

E28. Antenna ID	E 51. Satellite Orbit Type	E52/53. Frequency Limits (MHz)	E454/55 Range of Satellite Arc Eastern/Western Limit	E56. Earth Station Az. Angle Eastern Limit	E57. Earth Station Elevation Angle Lower Limit	E58. Earth Station Az. Angle Western Limit	E59. Earth Station Elevation Angle Upper Limit	E60. Max EIRP Density toward the Horizon (dBW/4KHz)
1	NGSO	28600 - 29100	NON-GEO	0	15	360	115	-27.5
1	NGSO	18800 - 19300	NON-GEO	0	15	360	115	

INTRODUCTION

The FCC adopted new guidelines and procedures in 1996 for evaluating environmental effects of radio frequency (RF) emissions. In order to provide assistance in determining whether proposed or existing transmitting facilities comply with the new guidelines, the FCC Office of Engineering and Technology revised OET Bulletin 65. The revised version updates limits for Maximum Permissible Exposure (MPE) in terms of electric and magnetic field strength and power density for transmitters operating at frequencies between 300 kHz and 100 GHz. This bulletin was adopted by the FCC in their General Docket No. 97-303 on August 25, 1997. In order to comply with the requirements of the Report and Order, calculations to determine the power flux densities in the far field, near field, and reflector regions of the earth station antenna have been made and are contained in this study.

The FCC guidelines incorporate two separate tiers of exposure limits that are dependent on the situation in which the exposure takes place and the status of the individuals who are subject to exposure. The earth station transmitting equipment and antenna are located within a controlled area and not accessible to the general public. Entry is restricted to employees who have been made fully aware of the potential for human exposure and can exercise control over their exposure. Therefore occupational / controlled exposure maximum power density limits are used in this study.

The FCC Office of Engineering and Technology suggests a method for calculating the maximum values of the power densities emanating from an aperture antenna in OET bulletin 65. This method is used to determine the power densities associated with the satellite antenna.

The Intellian Ka-Band satellite earth station will be equipped with an amplifier supplying a maximum output power, *P*, at the antenna flange of *P*= 29.6 watts. The transmitter will feed the antenna with diameter *D* = 1.5 meters. Its efficiency is η=0.49. The highest frequency of the transmitted signal is 29,100 MHz, corresponding to a wavelength of $\lambda = 0.01$ m. Its peak gain is $G = 50.0$ dBi, and the radius of the feed subreflector is $R_{feed} = 3.2$ cm

Antenna Surface: The maximum power density at the antenna surface, $S_{surface}$ may be expressed as:

$$S_{surface} = \frac{4P}{A}$$

Using the parameters for the antenna:

$$A = (\pi (D / 2)^2)$$
$$= (\pi (1.5 \text{ m} / 2)^2)$$
$$= 1.7 \text{ m}^2$$

$S_{surface}$ = 4 (29.6 W) / 1.7 m^2
= 118.4 W / 1.7 m^2
= 67.0 W / m^2
= 6.7 mW / cm^2

Near- Field Region: In the near field of the main beam the power density can reach a maximum before it begins to decrease with distance. The extent of the near field, R_{nf} , can be described by the following equation:

$$R_{nf} = \frac{D^2}{4\lambda}$$

Using the parameters for this antenna:

R_{nf} = (1.5 m) ^{2} / 4(0.01 m)
= 2.3 / .04 m
= 54.6 m

The magnitude of the on axis power density varies according to location in the near field. However, the maximum value of the near field, on axis, power density, S_{nf} , can be expressed by the following equation:

$$S_{nf} = \frac{16\eta P}{\pi D^2}$$

Using the parameters for this antenna:

S_{nf} = 16 (.49) (29.6 W) / π (1.5 m) ^{2}
= 231.0 W / 7.1 m^2
= 32.7 W / m^2
= 3.3 mW / cm^2

Far Field Region: For purposes of evaluating RF exposure, the distance to the beginning of the far field region, R_{ff}, can be approximated by the following equation:

$$R_{ff} = \frac{0.6D^2}{\lambda}$$

Using the parameters for this antenna:

R_{ff} = 0.6 (1.5 m) ^{2} / .01 m
= 131.0 m

The power density in the far field region of the antenna pattern decreases inversely as the square of the distance. The on-axis power density, S_{ff}, in the far field region of the radiation pattern can be estimated by the equation:

$$S_{ff} = PG / 4\pi R^2$$

where *R* = distance to the point of interest

Using the parameters for this antenna, the maximum power in the far field, at *R* = 131 m is:

S_{ff} = 29.6 W ($10^{(50.0\ dBi/10)}$) / 4 (π) (131) ^{2}
= 2960000 /215785.4
= 13.7 W / m ^{2}
= 1.4 mW / cm ^{2}

Region between Feed and Reflector: The RF energy radiated from the feed system is confined to a conical shape whose vertex is located at the feed subreflector and extends reflector surface. The power density at any point in this region, S_{feed}, is expressed by the equation:

$$S_{feed} = P/A_{feed}$$

where A_{feed} is the area of the feed subreflector:

$$A_{feed} = \pi R^2_{feed}$$

Using the parameters for this antenna, the power density is:

$$S_{feed} = 29.6 / (\pi (0.032)^2)$$
$$= 9201 \text{ W/m}^2$$
$$= 920.1 \text{ mW / cm}^2$$

CONCLUSION

The results of the above calculations are summarized in the following table.

Region	Power Density	Remarks
Antenna Surface	6.7 mW/cm²	**Hazardous**
Main Reflector Sub-reflector Region	920.1 mW/cm²	**Hazardous**
Near Field < 54.6 meters	3.3 mW/cm²	Safe Level
Far Field > 131.0 meters	1.4 mW/cm²	Safe Level

Results of this hazard study indicate that the antenna does not exceed the 5 mW/cm² MPE limit for Occupational/Controlled Exposure in the 1500 – 100,000 MHz range in areas directly in front of the antenna in the near field and the far field. The areas where the antenna exceeds the limit are at the antenna surface and in the region between the reflector and the feed horn. To ensure there is no harmful exposure to personnel, they will not be in contact with these areas while the antenna is operating. Whenever they are required to work on the radiating or reflecting parts of the antenna structure, the transmitter will be turned off.

Based on this study of predicted radio frequency levels, the conclusion is that the operation of this satellite earth station meets OET Bulletin 65 maximum permissible exposure limits and that no harmful effects will occur to station personnel or anyone within proximity of the station.

Therefore, in accordance with 47 CFR § 1.1307 (b) of the Commission's Rules, preparation and submission of an Environmental Assessment (EA) is not required.

SATELLITE EARTH STATION AUTHORIZATIONS
FCC Form 312 - Schedule B (Technical and Operational Description)

E1. Site Identifier:	2
E2. Contact Name:	William Mudge (Speedcast)
E3. Street Address or Area of Operation:	1335 Gateway Drive, Suite 2013
E4. State:	Florida
E5. Call Sign:	NEW
E6. Phone Number:	321-733-9015
E7. City:	Melbourne
E8. County:	Brevard
E9. Zip Code:	32919
E11. Latitude:	28°05'15.4"N
E12. Longitude:	80°38'51.9"W
E13. Lat/Long Coordinates are:	NAD 83
E14. Site Elevation (AMSL):	8 m

E15. If the proposed antenna(s) operate in the Fixed Satellite Service (FSS) with geostationary satellites, do(es) the proposed antenna(s) comply with the antenna gain patterns specified in Section 25.209(a) and (b) as demonstrated by the manufacturer's qualification measurement? If NO, provide as a technical analysis showing compliance with two-degree spacing policy.	N/A
E16. If the proposed antenna(s) do not operate in the Fixed Satellite Service (FSS), or if they operate in the Fixed Satellite Service (FSS) with non-geostationary satellites, do(es) the proposed antenna(s) comply with the antenna gain patterns specified in Section 25.209(a2) and (b) as demonstrated by the manufacturer's qualification measurements?	N/A
E17. Is the facility operated by remote control? If YES, provide the location and telephone number of the control point.	No
E18. Is frequency coordination required? If YES, attach a frequency coordination report.	No, See Attachment
E19. Is coordination with another country required? If YES, attach the name of the country(ies) and plot of coordination contours	No
E20. FAA Notification - (See 47 CFR Part 17 and 47 CFR part 25.113(c)) Where FAA notification is required, have you attached a copy of a completed FCC Form 854 and/or the FAA's study regarding the potential hazard of the structure to aviation? FAILURE TO COMPLY WITH 47 CFR PARTS 17 AND 25 WILL RESULT IN THE RETURN OF THIS APPLICATION.	N/A (i.e. FAA Notification not required)

POINTS OF COMMUNICATION

Satellite Name	
E21. Common Name:	Telesat Leo-1
E22. ITU Name:	COMMSTELLATION
E23. Orbit Location:	Non-GEO
E24. Country:	Canada

POINTS OF COMMUNICATION (Destination Points)

E25. Site Identifier	N/A: loop-back tests to Site 2 only
E26. Common Name	
E27. Country	

ANTENNA

Site ID	E.28. Antenna ID	E29. Quantity	E30. Manufacturer	E31. Model	E32 Antenna Size (m)	E41/42. Antenna Gain Transmit or Receive (__dBi at __GHz)
2	2	1	Seatel	4412	1.10	44.9 at 19.25
2	2	1	Seatel	4412	1.10	48.1 at 29.05

E.28. Antenna ID	E33/34. Diameter Minor/Major (m)	E35. Above Ground Level (m)	E36. Above Sea Level (m)	E37. Building Height Above Ground Level (m)	E38. Max Total Input Power at Antenna Flange (W)	E39. Maximum Antenna Height Above Rooftop (m)	E40. Total EIRP for all Carriers (dBW)
2	1.1/ 1.1	2.05	10.05	N/A	20.5	N/A	61.2

FREQUENCY

E28. Antenna ID	E 43/44. Frequency Band (MHz)	E45. T/R Mode	E46. Antenna Pol (H, V, L, R)	E47. Emission Designator	E48. Max EIRP per Carrier (dBW)	E49. Max EIRP Density per Carrier (dBW/4KHz)	E50. Modulation and Services
2	29000 - 29100	T	L	47M6D1D	58.2	17.4	DATA (64 APSK)
2	19200 - 19300	R	R	47M6D1D			DATA (64 APSK)

FREQUENCY COORDINATION

E28. Antenna ID	E 51. Satellite Orbit Type	E52/53. Frequency Limits (MHz)	E454/55 Range of Satellite Arc Eastern/Western Limit	E56. Earth Station Az. Angle Eastern Limit	E57. Earth Station Elevation Angle Lower Limit	E58. Earth Station Az. Angle Western Limit	E59. Earth Station Elevation Angle Upper Limit	E60. Max EIRP Density toward the Horizon (dBW/4KHz)
2	NGSO	29000 - 29100	NON-GEO	0	15	360	90	-31.1
2	NGSO	19200 - 19300	NON-GEO	0	15	360	90	

INTRODUCTION

The FCC adopted new guidelines and procedures in 1996 for evaluating environmental effects of radio frequency (RF) emissions. In order to provide assistance in determining whether proposed or existing transmitting facilities comply with the new guidelines, the FCC Office of Engineering and Technology revised OET Bulletin 65. The revised version updates limits for Maximum Permissible Exposure (MPE) in terms of electric and magnetic field strength and power density for transmitters operating at frequencies between 300 kHz and 100 GHz. This bulletin was adopted by the FCC in their General Docket No. 97-303 on August 25, 1997. In order to comply with the requirements of the Report and Order, calculations to determine the power flux densities in the far field, near field, and reflector regions of the earth station antenna have been made and are contained in this study.

The FCC guidelines incorporate two separate tiers of exposure limits that are dependent on the situation in which the exposure takes place and the status of the individuals who are subject to exposure. The earth station transmitting equipment and antenna are located within a controlled area and not accessible to the general public. Entry is restricted to employees who have been made fully aware of the potential for human exposure and can exercise control over their exposure. Therefore occupational / controlled exposure maximum power density limits are used in this study.

The FCC Office of Engineering and Technology suggests a method for calculating the maximum values of the power densities emanating from an aperture antenna in OET bulletin 65. This method is used to determine the power densities associated with the satellite antenna.

The Seatel 4412 Ka-Band satellite antenna will be equipped with an amplifier supplying a maximum output power, *P*, at the antenna flange of *P*= 20.5 Watts. The transmitter will feed the antenna with diameter *D* = 1.1 meters. Its efficiency is η=0.57. The highest frequency of the transmitted signal is 29,100 MHz, corresponding to a wavelength of $\lambda = 0.01$ m. Its peak gain is $G = 48.1$ dBi, and the radius of the feed horn is $R_{feed} = 0.53$ cm

Antenna Surface: The maximum power density at the antenna surface, $S_{surface}$ may be expressed as:

$$S_{surface} = \frac{4P}{A}$$

Using the parameters for the antenna:

$$A = (\pi (D / 2)^2)$$
$$= (\pi (1.1 \text{ m} / 2)^2)$$
$$= 1.0 \text{ m}^2$$

$S_{surface}$ = 4 (20.5 W) / 1.0 m^2
= 81.8 W / 1.0 m^2
= 86.1 W / m^2
= 8.6 mW / cm^2

Near- Field Region: In the near field of the main beam the power density can reach a maximum before it begins to decrease with distance. The extent of the near field, R_{nf} , can be described by the following equation:

$$R_{nf} = \frac{D^2}{4\lambda}$$

Using the parameters for this antenna:

R_{nf} = (1.1 m) ^{2} / 4(0.01 m)
= 1.2 / .04 m
= 29.4 m

The magnitude of the on axis power density varies according to location in the near field. However, the maximum value of the near field, on axis, power density, S_{nf} , can be expressed by the following equation:

$$S_{nf} = \frac{16\eta P}{\pi D^2}$$

Using the parameters for this antenna:

S_{nf} = 16 (.57) (20.5 W) / π (1.1 m) ^{2}
= 186.6 W / 3.8 m^2
= 49.1 W / m^2
= 4.9 mW / cm^2

Far Field Region: For purposes of evaluating RF exposure, the distance to the beginning of the far field region, R_{ff}, can be approximated by the following equation:

$$R_{ff} = \frac{0.6D^2}{\lambda}$$

Using the parameters for this antenna:

R_{ff} = 0.6 (1.1 m) ^{2} / .01 m
= 70.5 m

The power density in the far field region of the antenna pattern decreases inversely as the square of the distance. The on-axis power density, S_{ff}, in the far field region of the radiation pattern can be estimated by the equation:

$$S_{ff} = PG / 4\pi R^2$$

where *R* = distance to the point of interest

Using the parameters for this antenna, the maximum power in the far field, at *R* = 131 m is:

S_{ff} = 20.5 W ($10^{(48.1\ dBi/10)}$) / 4 (π) (70.5) ^{2}
= 1321387 /62406.2
= 21.2 W / m ^{2}
= 2.1 mW / cm ^{2}

Region between Feed and Reflector: The RF energy radiated from the feed system is confined to a conical shape whose vertex is located at the feed subreflector and extends reflector surface. The power density at any point in this region, S_{feed}, is expressed by the equation:

$$S_{feed} = P/A_{feed}$$

where A_{feed} is the area of the feed subreflector:

$$A_{feed} = \pi R^2_{feed}$$

Using the parameters for this antenna, the power density is:

$$S_{feed} = 20.4 / (\pi (0.005)^2)$$
$$= 228967 \text{ W/m}^2$$
$$= 22897 \text{ mW / cm}^2$$

CONCLUSION

The results of the above calculations are summarized in the following table.

Region	Power Density	Remarks
Antenna Surface	8.6 mW/cm²	**Hazardous**
Reflector and Feed Region	22897 mW/cm²	**Hazardous**
Near Field **<** 29.4 meters	4.9 mW/cm²	Safe Level
Far Field > 70.5 meters	2.1 mW/cm²	Safe Level

Results of this hazard study indicate that the antenna does not exceed the 5 mW/cm² MPE limit for Occupational/Controlled Exposure in the 1500 – 100,000 MHz range in areas directly in front of the antenna in the near field and the far field. The areas where the antenna exceeds the limit are at the antenna surface and in the region between the reflector and the feed horn. To ensure there is no harmful exposure to personnel, they will not be in contact with these areas while the antenna is operating. Whenever they are required to work on the radiating or reflecting parts of the antenna structure, the transmitter will be turned off.

Based on this study of predicted radio frequency levels, the conclusion is that the operation of this satellite earth station meets OET Bulletin 65 maximum permissible exposure limits and that no harmful effects will occur to station personnel or anyone within proximity of the station.

Therefore, in accordance with 47 CFR § 1.1307 (b) of the Commission's Rules, preparation and submission of an Environmental Assessment (EA) is not required.