<u>Engineering Statement</u>

RADIOFREQUENCY EXPOSURE CALCULATIONS

300 New LLC

New C-Band Uplink - Hauppauge, NY

300 New LLC (“ViacomCBS”) is the applicant for a new satellite uplink facility at Hauppauge, New York that will consist of seven C-Band and two Ku-Band fixed uplink antennas. The following study evaluates the proposed facility with respect to the potential for human exposure to radiofrequency (“RF”) electromagnetic field. Specifically, the study determined that exposure to RF electromagnetic field would not exceed the FCC’s maximum permissible exposure limits to the general public, employees, or occupational personnel based on the proposed operating parameters, procedures, and antenna manufacturer specifications.

Human Exposure to Radiofrequency Electromagnetic Field

The proposed operation was evaluated using the procedures outlined in FCC OET Bulletin No. 65 (“OET 65"), which describes procedures for determining whether a proposed facility meets the RF exposure guidelines specified in §1.1310 of the Rules. Under present Commission policy, a facility may be presumed to comply with the limits in §1.1310 if it satisfies the exposure criteria set forth in OET 65.

Worst-case C-Band and Ku-Band operating parameters were evaluated using OET 65 methodology to determine percentages of FCC’s general public (uncontrolled) and occupational (controlled) exposure limits at various locations and separation distances. Exposure from multiple emitters throughout the facility was predicted by adding worst-case exposure limit percentages. As demonstrated in the following, the proposed transmitting system complies with the FCC guidelines when certain procedures are followed.

The following worst-case parameters were used in this study:

Description	**C-Band**	**Ku-Band**
Antenna Manufacturer	Scientific Atlanta, Inc.	Vertex Communications
Antenna Model	8007	9 KPK
Center Transmit Frequency	6,175 MHz	14,250 MHz

Description	C-Band	Ku-Band
Wavelength at Center Frequency	0.049 meters	0.021 meters
Max Antenna Input Power	986.2 Watts	59.7 Watts
Antenna-Diameter	11.0 meters	9.0 meters
Antenna Transmit Gain	54.4 dBi	60.4 dBi
Antenna Gain Ratio	275,422.87	1,096,478.20
Antenna Aperture Efficiency	0.543	0.607

Near Field Calculations

The region within several hundred meters of the antenna surface (see “Minimum Near Field Distance” below) is known as the near field. As antenna directional characteristics have not fully formed in this region, off-axis antenna pattern discrimination cannot be used to accurately predict potential RF exposure. Instead, OET 65 provides a methodology (Equation 13) for calculating exposure within the cylindrical volume along the main beam within a one antenna-diameter radius from the center of the main beam. The results are provided below.

Table 2 - Near-Field Calculations - Within One Dish-Diameter from Main Beam		
Description	**C-Band**	**Ku-Band**
Minimum Near Field Distance	623.1 meters	962.6 meters
One Antenna-Diameter	11.0 meters	9.0 meters
Predicted Near Field Exposure Beyond Outer Antenna Edge Within One Antenna-Diameter	2.26 mW/cm²	0.23 mW/cm²
Predicted Controlled Access Near Field Exposure Beyond One Antenna-Diameter	45.1%	4.6%

OET 65 also specifies that power density is reduced 20 dB at near-field locations beyond one antenna-diameter from the center of the main beam. Table 3 provides predicted near field radiofrequency exposure values and percentages for the FCC’s general population (uncontrolled) and occupational (controlled) limits.

Table 3 - Near Field Calculations – Beyond One Dish-Diameter from Main Beam		
Description	**C-Band**	**Ku-Band**
Minimum Near Field Distance	623.1 meters	962.6 meters
One Antenna-Diameter	11.0 meters	9.0 meters
Predicted Near Field Exposure Beyond One Antenna-Diameter	0.0226 mW/cm²	0.002 mW/cm²
Predicted General Population Near Field Exposure Beyond One Antenna-Diameter	2.26%	0.23%
Predicted Controlled Access Near Field Exposure Beyond One Antenna-Diameter	0.45%	0.05%

Far Field Calculations

In the far field region, since antenna directional characteristics have formed, off-axis power densities can be calculated using antenna off-axis discrimination specifications. At locations greater than five degrees off-axis, manufacturers of both antennas specify attenuations of at least 40 dB (see below). Again using the methodology detailed in OET 65 (Equation 18), this off-axis attenuation results in predicted power densities well below the FCC's general public (uncontrolled) limit. As the far field region begins well beyond the perimeter fencing, only uncontrolled limits are shown in Table 4 below.

Table 4 - Far Field Calculations		
Description	**C-Band**	**Ku-Band**
Minimum Far Field Distance	1,495.4 meters	2,310.1 meters
Pattern Discrimination 5-Degrees Off-Axis	-42.9 dB	-48.9 dB
Predicted Far Field Exposure 5-Degrees Off-Axis	0.05 µW/cm²	0.0013 µW/cm²
Predicted General Population Far Field Exposure 5-Degrees Off-Axis[1]	0.01%	0.00%

[1] The percentage figures were rounded to the nearest hundredth of a percent.

General Public (Uncontrolled) Exposure - Multiple Emitters

Whenever transmitting, uplink antennas will be oriented at least one antenna-diameter and five-degrees away from publicly accessible locations. Predicted RF exposure values in these publicly accessible locations are shown in Table 3 (near field exposure beyond one antenna-diameter from the main lobe) and Table 4 (far field exposure more than 5-degrees off-axis) expressed in percent of the FCC's public limit. Considering seven C-Band and two Ku-Band antennas, the total worst-case exposure value is 16.28% of the FCC's general public (uncontrolled) limit. In actual practice, publicly accessible radiofrequency exposure will be significantly less due to greater distance separations from the main beam.

Occupational (Controlled) Access Exposure - Multiple Emitters

The antenna compound will be secured by perimeter fencing and conspicuously posted RF exposure warning signs. Since only trained personnel will be allowed within the perimeter when any uplink is operational, the FCC's occupational (controlled) limit applies within the antenna compound. Procedures will prohibit personnel in the immediate vicinity of any uplink antenna surface, feed apparatus, or within the cylindrical volume extending from the antenna's outer perimeter outward toward the satellites.

Near field RF exposure calculations are provided in Tables 2 and 3. As shown, all C-Band predictions are greater than Ku-Band calculations. For the sake of simplicity, the following discussion assumes worst-case C-Band exposure predictions for all nine antennas.

Most uplink antennas will be separated from one another by at least 11 meters. In such cases, it will be possible for occupational workers to be at locations separated from only one antenna by less than one antenna-diameter. Table 2 shows that exposure to a single antenna reaches 45.1% of the occupational (controlled) limit. Referring to Table 3, additional fields from the other eight antennas will contribute no more than another 3.6% of the same limit, for a total of 48.7% of the occupational (controlled) limit.

In cases where uplink antennas cannot be separated by more than 11 meters, areas between antennas may be within one antenna-diameter of two antennas at the same time. Again referring to Tables 2 and 3, it can be seen that exposure from two antennas reaches 90.2% of the occupational (controlled) limit and exposure to seven other antennas beyond one antenna-diameter contributes another 3.2% of the same limit, for a total of 93.4% of the FCC's occupational (controlled) limit. No locations will exist less than a one antenna-diameter distance to more than two antennas.

Conclusion

As demonstrated herein, excessive levels of RF energy will not be caused at publicly accessible areas by following the policies detailed herein. Consequently, neither members of the general public nor non-occupational staff in uncontrolled areas will be exposed to RF levels in excess of the Commission's guidelines.

With respect to occupational workers, the preceding analysis demonstrates that excessive exposure would not occur provided that adequate physical separation is maintained. This separation will be achieved by controlling access with fences, locked doors, conspicuous RFR warning signs, and by following strict procedures as part of an overall RF safety program.

As mentioned previously, policies will be employed protecting workers from excessive exposure when work must be performed. Such protective measures may include, but will not be limited to, restriction of access to areas with excessive predicted exposure levels or shutdown of facilities when work or inspections must be performed in areas where the exposure guidelines would otherwise be exceeded. On-site RF exposure measurements may also be undertaken to more accurately establish the bounds of working areas within appropriate FCC exposure limits.