

Radiofrequency Exposure Study
RADIOFREQUENCY EXPOSURE CALCULATIONS
CBS Communications Services Inc.
New Ku-Band SNG Vehicles

CBS Communications Services Inc. ("Paramount") is the applicant for two new Ku-Band satellite news gathering (SNG) licenses. This study evaluates the proposed facilities with respect to the potential for human exposure to radiofrequency ("RF") electromagnetic field. As shown, strict adherence to the procedures outlined below will prevent human exposure to excessive levels of RF energy. This study was based on the proposed operating parameters and equipment specifications.

Human Exposure to Radiofrequency Electromagnetic Field

The proposed operation was evaluated using FCC OET Bulletin No. 65 ("OET 65") for determining whether a proposed facility meets the RF exposure guidelines specified in §1.1310 of the Rules. Under present Commission policy, a facility complies with §1.1310 if it satisfies the exposure criteria set forth in OET 65.

Worst-case operating parameters were evaluated to determine percentages of FCC's general public (uncontrolled) and occupational (controlled) exposure limits at various locations and separation distances. As demonstrated below, the proposed facility complies with the FCC guidelines when certain procedures are followed.

The following parameters were used in this study:

Antenna Manufacturer	AvL Technologies
Antenna Model	1258K
Center Transmit Frequency	14,250 MHz
Wavelength at Center Frequency	0.021 meters
Max Antenna Input Power	30.0 Watts
Antenna-Diameter	1.2 meters
Antenna Transmit Gain	43.2 dBi
Antenna Gain Ratio	20892.96
Antenna Aperture Efficiency	0.6506

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Near Field Calculations

The region immediately beyond the antenna surface 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 exposures both at the dish surface and within the cylindrical volume along the main beam within a one antenna-diameter from the main beam. As the following calculated fields exceed the FCC's occupational limit, operating procedures will prohibit human access to these areas when the proposed facility is operating.

Maximum Near Field Distance	17.1 meters
One Antenna-Diameter	1.2 meters
Predicted Field Exposure at Antenna Surface	10.61 mW/cm ²
Predicted Field Exposure at Antenna Surface	212.2%
Predicted Near Field Exposure Beyond Outer Antenna Edge Within One Antenna-Diameter	6.90 mW/cm ²
Predicted Controlled Access Near Field Exposure Within One Antenna-Diameter	138.0%

OET 65 also specifies that power density is reduced 20 dB at locations beyond one antenna-diameter from the center of the main beam. Predicted near field radiofrequency exposure values in the near field region meet the FCC's general population (uncontrolled) limit. Predicted exposure values beyond one antenna-diameter in the transition region (beyond the near field) are even less.

Maximum Near Field Distance	17.1 meters
One Antenna-Diameter	1.2 meters
Predicted Near Field Exposure Beyond One Antenna-Diameter	0.069 mW/cm ²
Predicted General Population Near Field Exposure Beyond One Antenna-Diameter	6.9%

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Far Field Calculations

The far field region begins 41 meters from the antenna surface. In this area, antenna directional characteristics have formed so off-axis power densities can be calculated using the antenna off-axis discrimination specifications. At locations greater than ten degrees off-axis, the antenna has a minimum attenuation of at least 36 dB. Using the methodology detailed in OET 65 (Equation 18), this off-axis attenuation results in predicted power density well below the FCC's general public (uncontrolled) limit.

Minimum Far Field Distance	41.07 meters
Pattern Discrimination 10-Degrees Off-Axis	-36.1 dB
Predicted Far Field Exposure 10-Degrees Off-Axis	0.0007 $\mu\text{W}/\text{cm}^2$
Predicted General Population Far Field Exposure 10-Degrees Off-Axis	0.07%

General Public (Uncontrolled) Exposure

Whenever transmitting, the uplink antenna will be oriented with the main beam at least one antenna-diameter and ten-degrees away from publicly accessible location. Access to the vicinity of the uplink antenna will be controlled by physical barriers such as rope stanchions and appropriate RF exposure warning signs. When this policy is strictly followed, predicted RF exposure values in publicly accessible locations will be within the FCC's public limit.

Occupational (Controlled) Access Exposure

Only trained personnel will be allowed in the vicinity of the uplink antenna where the FCC's occupational (controlled) limit applies. Procedures will prohibit personnel in the immediate vicinity of any uplink antenna surface, feed apparatus, or within the cylindrical volume one antenna-diameter from the main beam extending from the antenna surface toward the satellite.

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Conclusion

Strict adherence to the procedures outlined above will prevent human exposure to excessive levels of RF energy. This separation will be achieved by controlling access with physical barriers, conspicuous RFR warning signs, and by following strict procedures as part of an overall RF safety program. Consequently, neither members of the general public nor occupational staff will be exposed to RF levels in excess of the Commission's guidelines.

Policies will also 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 exposure guidelines would otherwise be exceeded. On-site RF exposure measurements may also be undertaken to establish the bounds of working areas more accurately within appropriate FCC exposure limits.