Engineering Statement

RADIOFREQUENCY EXPOSURE CALCULATIONS

prepared for

Valley Broadcasting Company

Valley Broadcasting Company ("KVBC") seeks authorization to operate a transportable Ku-Band satellite uplink truck. The uplink transmit antenna will be located on a vehicle roof and operated at various locations throughout the United States. The instant study was completed to evaluate the potential for human exposure to radiofrequency electromagnetic field in accordance with the guidelines established by the Federal Communications Commission ("FCC").

This study demonstrates that exposure to radiofrequency ("RF") electromagnetic field from the proposed facility will not exceed FCC maximum permissible exposure limits to the general public or to occupational workers. This conclusion was based on data provided by representatives of the applicant and equipment manufacturers.

Human Exposure to Radiofrequency Electromagnetic Field

The proposed *KVBC* operation was evaluated using the procedures outlined in FCC OET Bulletin No. 65 ("OET 65"). OET 65 describes a means of determining whether a proposed facility exceeds 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. Based upon that methodology, and as demonstrated in the following, the transmitting system under study will comply with the cited adopted guidelines at publicly accessible locations when procedures described herein are followed.

The instant study is based on the following data provided by the applicant and equipment manufacturers:

Antenna Manufacturer, Model	Andrew, 203197
Center Frequency	14.250 GHz
Wavelength at Center Frequency	0.02103807 meters
Max Average Antenna Input Power	269.2 Watts
Antenna Diameter, Gain	2.3 meter, 49.1 dBi
Antenna Gain Ratio, Efficiency	81238.1, 0.69
Waveguide Type, Length	WR75, 22 feet
Antenna Center Above Ground	4.9 meters

Public Exposure

According to *KVBC*, the uplink antenna will be installed on a truck rooftop with it's center of radiation approximately 4.9 meters above the ground. The mechanical design of the mounting equipment is optimized to orient the antenna toward satellites which operate well above the horizon. Considering the antenna height and range of elevation angles, the nearest location to the antenna at two meters above ground is greater than one dish-diameter from the center of the main beam.

Prevention of public exposure to predicted RF electromagnetic field in excess of the general population/uncontrolled limit[1] depends on adherence to the following operational guidelines by the *KVBC* employees. To assure that no publicly accessible area is within the main-beam of the satellite antenna, sites and satellites will be selected such that the elevation angle of the antenna will always exceed five degrees and one antenna-diameter above the horizon, nearby buildings, and publicly accessible areas.

Because the proposed antenna is of a transportable design, permanently installed fences and gates are impractical. Therefore, crowd control stanchions, cones, and conspicuous RF exposure warning signs will be utilized to prevent public access in areas near the satellite antenna that are known to exceed the FCC's general population / uncontrolled MPE limit. These areas will be defined either by measurements made by qualified, on-site, personnel or by the calculations described herein.

The area in the vicinity of the antenna is known as the near-field region. Because the antenna directional characteristics have not yet formed in this region[2], antenna manufacturer off-axis discrimination specifications cannot be utilized for the determination of RF exposure. Instead, OET 65 provides a methodology (Equation 13) for calculating a "worst case" exposure figure within the near-field region. Further, OET 65 specifies that the worst-case power density would be reduced by 20 dB at locations at least one antenna-diameter (2.3 meters) off-axis from the antenna main-beam.

1 The general population/uncontrolled maximum permissible exposure ("MPE") limit of 1 mW/cm² for 14,250 MHz is specified in §1.1310 of the Rules.

2 For this facility, the near-field region is the within 62.9 meters of the antenna but not at the antenna surface.

Using this procedure, an off-axis, near-field of 0.26 mW/cm², or 26 percent of the general population/uncontrolled limit was calculated. Off-axis predicted fields reduce commensurately at greater distances from the antenna.

In the far-field region, located 150.9 or more meters from the antenna[3], the directional characteristics have formed. Therefore, the off-axis "far field" power density can be readily calculated using published antenna specifications. At locations greater than six degrees off-axis from the "main beam," the manufacturer of the proposed antenna specifies a minimum side-lobe attenuation of 40 dB. Again using the methodology detailed in OET 65, this off-axis attenuation is predicted to result in a power density of 0.0008 mW/cm², or 0.08 percent of the general population/uncontrolled limit.

As shown above, the "compliant area" is defined by any location more than six degrees and 2.3 meters away from the satellite antenna "main beam." Appropriate crowd control devices will be deployed 2-3 meters from the uplink truck at sufficient distances in the direction of the antenna "main beam" to prevent unauthorized access and to assure that publicly accessible locations do not result in head heights approaching the six-degree and 2.3 meter non-compliant areas.

Controlled Access Area Exposure

Access to the vicinity of the antenna will be limited and restricted to authorized, trained personnel. Using data provided by the applicant, the potential for RF exposure to occupational workers was evaluated. As described previously, the maximum predicted off-axis, near-field power density is 0.26 mW/cm², which is 5.2% of the FCC's occupational, controlled limit. Because the operator will generally be posted at locations either behind the parabolic reflector or in the truck itself, it is anticipated that actual exposure will be substantially less than the above, worst-case calculation.

With respect to worker safety, it is believed that based on the preceding analysis, excessive exposure would not occur provided adequate physical separation is maintained. A

3 The transition region between the near field and far field would lie between 62.9 and 150.9 meters.

detailed operator policy will be employed protecting workers from excessive exposure when work must be performed where high RF levels may be present. Such protective measures may include, but will not be limited to, restriction of access to areas where levels in excess of the guidelines may be expected, or the complete 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 establish the bounds of safe working areas. The applicant will coordinate exposure procedures with all pertinent facilities.

Conclusion

As demonstrated herein, excessive levels of RF energy will not be caused at publicly accessible areas by strictly following the policy detailed herein. Consequently, neither members of the general public nor occupational staff will be exposed to RF levels in excess of the Commission's guidelines. Access to the vicinity of the uplink antenna will be restricted and controlled through the use of crowd control stanchions, cones, and conspicuous RF exposure warning signs as part of an overall RF safety program. The above study presumes that the subject antenna is the sole source of RF energy at the uplink site. In the case of multiple emitters, further analysis or measurement is necessary to assure compliance.

Certification

The undersigned hereby certifies that the foregoing statement was prepared by him or under his direction, and that it is true and correct to the best of his knowledge and belief. Mr. Ryson is a senior engineer in the firm of Cavell, Mertz & Associates, Inc.

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