Statement of Hammett & Edison, Inc., Consulting Engineers

The firm of Hammett & Edison, Inc., Consulting Engineers, has been retained by Louisiana Educational Television Authority, licensee of Station KLTL-TV, D20 (V18), Lake Charles, LA, to prepare the technical portions of an application for a new temporary-fixed Ku-band satellite uplink station.

Justification for Requested EIRP Levels

Although the KLTL-TV satellite news gathering (SNG) truck will be used primarily in Louisiana, the requested continental United States (CONUS) operational area means that the truck could be operated in areas of heavy rain or snow; thus, a 360-watt high-power amplifier has been installed, which can provide up to 83.6 watts of Ku band RF at the input flange to the 2.3-meter uplink antenna. This results in the requested main beam EIRP of up to 68.32 dBW. Only the power necessary to establish reliable communications with the satellite transponder will be used; during good-weather conditions, it is anticipated that this power level will be between 10 and 20 dB less power than the maximum possible power.

Prevailing Exposure Standards

The U.S. Congress requires that the Federal Communications Commission ("FCC") evaluate its actions for possible significant impact on the environment. In Docket 93-62, effective October 15, 1997, the FCC adopted the human exposure limits for field strength and power density recommended in Report No. 86, "Biological Effects and Exposure Criteria for Radiofrequency Electromagnetic Fields," published in 1986 by the Congressionally chartered National Council on Radiation Protection and Measurements ("NCRP"). Separate limits apply for occupational and public exposure conditions, with the latter limits generally five times more restrictive. The more recent standard, developed by the Institute of Electrical and Electronics Engineers and approved as American National Standard ANSI/IEEE C95.1-2006, "Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz," includes similar exposure limits. These limits apply for continuous exposures and are intended to provide a prudent margin of safety for all persons, regardless of age, gender, size, or health.

For 14.0–14.5 GHz Ku-Band satellite transmitting antennas, the prevailing standard for occupational exposures of unlimited duration is 5 mW/cm^2, and 1 mW/cm^2 for public exposures of unlimited duration.

Proposed Uplink Facilities

It is proposed to use an Andrew Model ESA23VM-124 2.3-meter diameter satellite earth station Ku-Band transmitting antenna. The antenna would be mounted on the roof a vehicle, placing the base of the antenna 3.0 meters AGL. For the minimum operational elevation angle of 5°, this would place the centerline of the uplink's main beam 3.7 m AGL.

NIST Nomograph

The maximum power density was determined using a method developed by the staff of the National Bureau of Standards (NBS, now the National Institute for Standards and Technology, "NIST"), "An Efficient and Accurate Method for Calculating and Representing Power Density in the Near-Field Zone of Microwave Antennas."* Figure 2 from Page 6 of that report is applicable to the proposed installation, and it is reproduced here in Figure 1. According to the NIST paper, this nomograph is applicable to all aperture antennas with diameter-to-wavelength ratios of 30 or greater. Since a 2.3-meter diameter antenna at 14.2 GHz (the mean frequency of the Ku uplink band) has a diameter-to-wavelength ratio of approximately 110 to 1, the nomograph is applicable.

Figure 1 characterizes the power density variation in the near-field. The extent of the near-field covered by this nomograph extends to a D^2/λ ratio of unity, where D is the antenna diameter and λ is the wavelength, expressed in compatible units (*i.e.*, either both in meters or both in centimeters). For Ku-Band uplinks the mid-band wavelength is 0.021 m (2.1 cm), so for the proposed 2.3-m antenna, D^2/λ equals approximately 252 meters (826 feet).

At Page 3 of the NIST paper, the formula $S = 38.6 - 20\log_{10}D$ is given for calculating the maximum power density for 1 watt of antenna input power, where S is the power density in dBm/cm^2 and D is the antenna diameter in centimeters. For higher input powers a $10\log_{10}(P)$ factor must be applied, where P is the antenna input power in watts. Thus for the maximum antenna input power of 83.6 watts the main beam power density would be $38.6 - 20\log_{10}(230) + 10\log_{10}(83.6)$, or 11.6 dBm/cm^2. This is 11.6 dB higher than the 1.0 mW/cm^2 (0 dBm/cm^2) NCRP guideline for uncontrolled (public) exposures. Thus, the closest applicable and conservative contour line in Figure 1 defining the NCRP public limit is the -12.5 dB contour, and the closest and conservative applicable contour line defining the five-times (7.0 dB) higher occupational limit is the -5 dB contour.

For the NCRP public limit of 0 dBm/cm^2, Figure 1 shows that the maximum distance in the main beam to the -12.5 dB contour is a Z-axis distance (by extrapolation) of about $1.05D^2/\lambda$, or 265 m. Given the worst case antenna elevation angle of 5°, this point would occur at a height of 26.6 meters

* Publication number NBSIR-85/8036, December 1985. This paper was written by Richard L. Lewis and Allen C. Newell, and was sponsored by the U.S. Environmental Protection Agency (EPA).

(87 feet) above ground, after allowing for the vehicle height and assuming a flat site. The applicant will ensure that in the event of operation from a non-flat site, or a site with nearby structures, or nearby SNG trucks, the beam centerline will be at least 4.1 meters (*i.e.*, one dish diameter plus the height on a 1.8-meter tall person) above those obstructions. The nomograph shows that perpendicular to the main beam distance 0.67D or greater, the off-axis suppression range from 75 dB close-in to the antenna, to 12.5 dB at a main beam distance of 1.0 D^2/λ. Since 12.5 dB below 11.6 dBm/cm^2 gives -0.9 dBm/cm^2 (0.81 mW/cm^2), compliance with the public limit is assured so long as no human access exists in an imaginary cylinder of 3.1 m diameter, centered on the antenna's main beam.

Occupational Exposures

The nomograph shows that on the back side of the uplink antenna, and outside the periphery of the of 0.67D (1.5 meters) perpendicular to the main beam, no exposures in excess of the 7 dBm/cm^2 occupational limit could occur. Exposures in excess of the occupational limit could occur on the feed horn side of the antenna. However, access to this volume would require climbing onto the roof of the SNG truck. Therefore, no worker access will be allowed to the feedhorn side of the dish unless the uplink transmitter has been turned off.

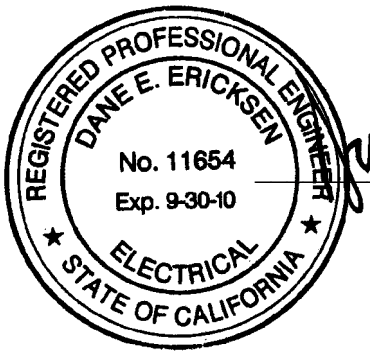
Summary

Operation of the proposed temporary-fixed uplink subject to the above-described operation restraints will result in the temporary fixed uplink station complying with the Commission's guidelines for human exposure to radio frequency energy, even at the highest possible HPA power.

List of Figures

In carrying out these engineering studies, the following attached figure was prepared under my direct supervision:

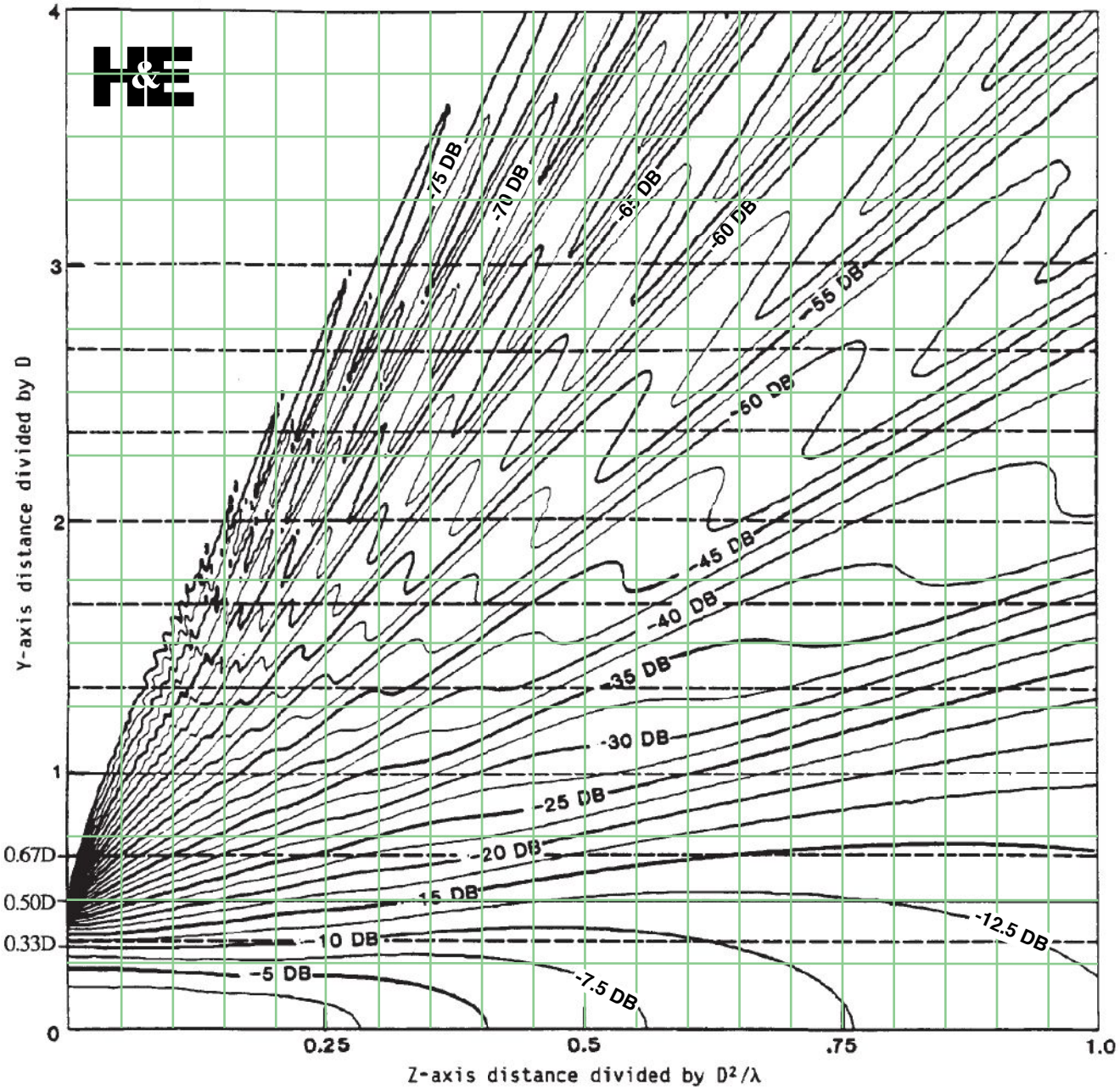
1. NIST nomograph.



July 30, 2012

Dane E. Ericksen, P.E.

Relative Power Density Contours in the Y-Z Plane for D >30λ



Nomograph from NTIS #NBSIR85-3036, page 6.
Additional notations by Hammett & Edison, Inc., Consulting Engineers, San Francisco.