ANALYSIS OF NON-IONIZING RADIATION FOR PRODELIN 2.4 MTR ANTENNA

The following report will provide information on the non-ionizing radiation levels for the proposed earth station using the Prodelin Series 1251 2.4 meter antenna. The equations used in these calculations are found in the Office of Science and Technology Bulletin OET-65. The purpose of this analysis is to determine the power densities in the near field, transition region, and far field regions of the antenna. Per the FCC, the maximum amount of non-ionizing radiation at these frequencies is 5 mwatts/sq. cm and 1 mwatt/sq. cm for the controlled and occupational environment and the general population exposure environment respectively. The following calculations demonstrate these levels are met.

NEAR FIELD

Near-field distance = $(D^2)/(4*\lambda) = (2.4)^2/ (4*300/14250) = 68.4$ meters

Power density at the horizon is a maximum of 18 degrees off axis. This results in a gain of 29-25 log θ dBi or -2.4 dBi.

Radiated Power at this angle = 22 watts (13.4 dBw) – reduction due to off-axis radiation
= 13.4 –(gain at 18 degrees compared to gain at peak)
= 13.4 – (49.2- (-2.4)) = -38.2 dBw = -8.2 dBm = 0.16 mwatts

Power Density = $(16*(\text{radiated power})*\eta)/(\Pi*D^2)$, $\eta = 0.6$ for this antenna
$= (16*0.16*0.6)/(\Pi*(2.4)^2)$
= .085 mwatts/m^2
= 0.0085uwatts/cm^2

FAR FIELD

Far field distance = $R = D^2/(4*\lambda)$ λ=300/14250 meters
= $2.4^2(4*300/14250)$
= 164 meters

Power Density = $(P*G)/(4*\Pi*R^2)$

P= 22 watts input to the flange
G=0.578 =-2.38 dBi

Power Density = $(22*.578)/(4*\Pi*164^2)$
= 37.6 uwatts/m^2
= 0.00376uwatts/cm^2

TRANSITION REGION

The RF exposure in the transition region can be no worse than the far field region and thus all RF exposure levels at the various regions are less than the required levels.