RF Exposure Requirements

RF Exposure Requirements: **§90.1217, §1.1307(b)(1) and §1.1307(b)(2):** Systems operating under the provisions of this section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy levels in excess of the Commission's guidelines.

RF Radiation Exposure Limit: **§1.1310:** As specified in this section, the Maximum Permissible Exposure (MPE) Limit shall be used to evaluate the environmental impact of human exposure to radiofrequency (RF) radiation as specified in Sec. 1.1307(b), except in the case of portable devices which shall be evaluated according to the provisions of Sec. 2.1093 of this chapter.

MPE Limit Calculation: EUT's operating frequencies @ 4945-4985 MHz; highest conducted power = 26.578 dBm (peak) therefore, **Limit for Uncontrolled exposure: 1 mW/cm^2 or 10 W/m^2**

Equation from page 18 of OET 65, Edition 97-01

EUT with 9 dBi Omni Antenna

$S = PG / 4\pi R^2$ or $R = \sqrt{PG / 4\pi S}$

where, S = Power Density (1 mW/cm^2)
P = Power Input to antenna (454.78 mW)
G = Antenna Gain (7.94 numeric)
R = Minimum Distance between User and Antenna (20 cm)

$S = (454.78 * 7.94)/(4 * 3.14 * 20^2) = 3610.95/5024 = 0.719\ mW/cm^2$

Since $S < 1\ mW/cm^2$, the minimum distance (R) is 20cm

EUT with 15 dBi Sector Antenna

$S = PG / 4\pi R^2$ or $R = \sqrt{PG / 4\pi S}$

where, S = Power Density (1 mW/cm^2)
P = Power Input to antenna (454.78 mW)
G = Antenna Gain (31.62 numeric)
R = Minimum Distance between User and Antenna (20 cm)

$S = (454.78 * 31.62)/(4 * 3.14 * 20^2) = 14380.14/5024 = 2.862\ mW/cm^2$

Since $S > 1\ mW/cm^2$, the minimum distance (R) should be

$R = (454.78 * 31.62/4 * 3.14)^{1/2} = (14380.14/12.56)^{1/2} = 33.84cm$ in order to comply with $1\ mW/cm^2$

EUT with 16 dBi Panel Antenna

$S = G / 4\pi R^2$ or $R = \sqrt{PG / 4\pi S}$

where, S = Power Density (1 mW/cm^2)
P = Power Input to antenna (454.78 mW)
G = Antenna Gain (39.81 numeric)
R = Minimum Distance between User and Antenna (20 cm)

$S = (454.78 * 39.81)/(4*3.14*20^2) = 18104.79/5024 = 3.604\ mW/cm^2$

Since $S > 1\ mW/cm^2$, the minimum distance (R) should be

$R = (454.78 * 39.81/4*3.14)^{1/2} = (18104.79/12.56)^{1/2} = 37.97cm$ in order to comply with $1\ mW/cm^2$