§ 15.407(f) RF Exposure

RF Exposure Requirements: **§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 @ 5180-5240 MHz; highest conducted power = *9.79dBm* (avg) therefore, **Limit for Uncontrolled exposure: 1 mW/cm^2 or 10 W/m^2**

Omni Antenna
Gain of Antenna Elements @ 5GHz= 10 dBi
# of Summing Antenna Elements = 3
EUT maximum antenna gain = 10dBi + 10*log(3)dBi = *14.77 dBi.*

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

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

where, S = Power Density (mW/cm^2)
P = Power Input to antenna (5.728 mW)
G = Antenna Gain (29.99)
R = Separation Distance between antenna and user (20 cm)

$S = (5.728 * 29.99)/(4\pi(20)^2) = 0.0342$ mW/cm^2

Panel Antenna
Gain of Antenna Elements @ 5GHz= 10.7 dBi
# of Summing Antenna Elements = 2
EUT maximum antenna gain = 10.7dBi + 10*log(2)dBi = *13.71 dBi.*

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

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

where, S = Power Density (mW/cm^2)
P = Power Input to antenna (8.072 mW)
G = Antenna Gain (23.496)
R = Separation Distance between antenna and user (20 cm)

$S = (8.072 * 23.496)/(4\pi(20)^2) = 0.0378$ mW/cm^2

Lower-Gain Omni Antenna
Gain of Antenna Elements @ 5GHz= 8.25 dBi
# of Summing Antenna Elements = 3
EUT maximum antenna gain = 8.25dBi + 10*log(3)dBi = *13.02 dBi.*

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

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

where, S = Power Density (mW/cm^2)
P = Power Input to antenna (9.528 mW)
G = Antenna Gain (20.045)
R = Separation Distance between antenna and user (20 cm)

$S = (9.528 * 20.045)/(4\pi(20)^2) = 0.0380\ mW/cm^2$

Patch Antenna
Gain of Antenna Elements @ 5GHz= 10.1 dBi
# of Summing Antenna Elements = 3
EUT maximum antenna gain = 10.1dBi + 10*log(3)dBi = *14.87 dBi.*

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

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

where, S = Power Density (mW/cm^2)
P = Power Input to antenna (6.138 mW)
G = Antenna Gain (30.690)
R = Separation Distance between antenna and user (20 cm)

$S = (6.138 * 30.690)/(4\pi(20)^2) = 0.0375\ mW/cm^2$

Since $S<1mW/cm^2$ at a separation distance of 20 cm with each antenna, the EUT complies with the limits of RF exposure