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FCC Standard: Part 15.247
FCC ID: QLN-DP2310P0001
Model Name: Wireless Packet Switch

APPENDIX A: RF EXPOSURE CALCULATIONS FOR HIGH GAIN ANTENNAS

From FCC 1.1310 Table 1A, the maximum permissible RF exposure for an uncontrolled environment is $1mW/cm^2$. The Electric field generated for a $1mW/cm^2$ exposure (S) is calculated as follows:

$S = E^2/Z$

WHERE:

S = Power density
E = Electric field
Z = Impedance

$E = \sqrt{S \times Z}$

$1mW/cm^2 = 10 \ W/m^2$

The impedance of free space is 337 ohms, where E and H fields are perpendicular.
Thus:

$E = \sqrt{10 \times 377} = 61.4$ V/m which is equivalent to $1mW/cm^2$

Using the relationship between Electric field E, Power in watts P, and distance in meters d, the corresponding Antenna numeric gain G and the transmitter output power and solving for d,

$$D = \frac{\sqrt{P_{EAK} \times 30 \times G}}{E}$$

EXAMPLE USING THE STUB OMNI-DIRECTIONAL ANTENNA

1. The Numeric gain G of antenna with a gain specified in dB is determined by:

$G = LOG^{-1} (dB \ gain/10)$

$G = LOG^{-1} \ 0.215 = 1.64$

The following table represents the RF exposure separation distance. The value shown was calculated from the defacto EIRP (antenna gain + total combined power output). The worst-case maximum combined power output of 12.4 dBm listed in the report, was used for the calculation of the defacto EIRP (worst case combined 0 degree steering mode). The manufacturer numerically calculated antenna gain to be 29.2 dBi as detailed in the product description of the antenna. Furthermore, the manufacturer measured the antenna gain to be 28.2 dBi.

The table represents the typical RF distance and the worst-case configuration based on the antenna specification provided by the manufacturer for the bore sight gain.

TABLE 11-1:   RF EXPOSURE SEPARATION DISTANCE FROM DEFACTO EIRP

ANTENNA PART #	TOTAL COMBINED POWER dBM	ANTENNA GAIN (dBI)	TOTAL EIRP (dBM)	DEFACTO FCC ANTENNA GAIN dBI	CALCULATED RF EXPOSURE SEPARATION DISTANCE (CM)	MINIMUM RF EXPOSURE SEPARATION DISTANCE (CM)
WI-FI SWITCH ANTENNA	12.4	29.2 (THEORETICAL GAIN)	41.6	(29.2-6)/3 = 7.73	34.0	200 CM
WI-FI SWITCH ANTENNA	12.4	28.2 (MEASURED GAIN)	40.6	(28.2 –6)/3 = 7.4	30.2	200 CM