Exposure of humans to RF fields

As per FCC KDB 447498 D01 and Section 2.1091 radio frequency transmitters are required to be operated in a manner that ensures the public is not exposed to RF energy levels.

Calculations have been made using the General Public/Uncontrolled Exposure limits that are defined in Section 1.1310.

Minimum safe distances have been calculated below.

The formula for Power Density is given by: $E^2/3770 = mW/cm^2$

Between 300 – 1500 MHz the General Population / Uncontrolled exposure limit is f/1500 mW/cm^2 .

As this radio can operate over the range of 421.0 to 480.0 MHz the lowest frequency of operation in the USA, which will give the worst case result, would be 421.0 MHz.

The power density at 421.0 MHz will be 0.281 mW/cm^2.

For an Uncontrolled Environment

Power Density = 0.281 $mW/cm^2 = E^2/3770$

$E = \sqrt{0.281*3770}$

E = 32.5 V/m

The rated maximum transmitter power = 100 mW (+20 dBm).

A worst case scenario duty cycle of 100% has been used for the calculations.

The client has declared that this transmitter would typically be operated using quarter wave whip or a dipole antennas which typically have a gain of 2.15 dBi or a numeric gain of 1.64.

The minimum distance from the antenna at which the MPE is met is calculated from the following

Field strength in V/m (FS),

Transmit power in watts (P)

Transmit antenna gain (G)

Transmitter duty cycle (DC)

Separation distance in metres (D)

The calculation is as follows:

FS = (√ (30 * P * G * DC)) / D

Therefore

D = (√ (30 * P * G * DC)) / FS

D = (√ (30 * 0.1 * 1.64 * 1)) / 32.5

d= 0.068 m or 6.8 cm

Result: Complies if a safe distance of at least 20 cm is applied to this device when it is used in an uncontrolled environment.