FCC RF Exposure Requirements

General information:

FCCID:
Device category: Fixed and mobile per Part 2.1091
Environment: uncontrolled Exposure

Mobile devices that operate under Part 15 of this chapter are subject to routine environmental evaluation for RF exposure prior to equipment authorization or use if they operate at frequencies of 1.5 GHz or below and their effective radiated power (ERP) is 1.5 watts or more. However, compliance with the power density limits of 1.1310 is not required.

Antenna:

The manufacturer specifies the following antennas to be used with this device:

0 dBi monopole antenna
10 dBd Yagi antenna Thermo Electron #7-0132-235 with 200 ft of RG 400 coax cable
9 dBd colinear antenna Bluewave BMO902J with 100 ft of RG 400 coaxial cable

Operating configuration and exposure conditions:

The conducted output power is 1 watt.
The manufacturer markets this device as professionally installed.

Part 2.1091 states that devices are excluded from routine evaluation if the EIRP is less than 2.46Watt (or 1.5WERP).

MPE Calculation:

The minimum separation distance is calculated as follows:

$$E(V/m) = \frac{\sqrt{30 \times P \times G}}{d} \qquad \text{Power density: } P_d(mW/cm^2) = \frac{E^2}{3770}$$

The limit for uncontrolled exposure environment above 1500 MHz 1 mW/cm^2 .

Mobile Case
Channel frequency: 2400 to 2483.5 MHz
The conducted power output is 1 watt.
The coax loss was taken as 1 dB.
Antenna gain was taken as 0 dBi

Power output

$Po := 1000$ mWatts

$CL := 1$ coax loss

$G := dBd + 2.15 - CL$

$G = -1$ net-gain in dBi

$Gn := 10^{\frac{G}{10}}$ gain numeric

$Gn = 0.794$

antenna gain

$dBd := -2.15$

$R := \sqrt{\frac{(Po \cdot Gn)}{(4 \cdot \pi \cdot S)}}$

$R = 7.951$ distance in centimeters required for compliance

Calculation of S

$f := 1500$ Frequency in MHz

uncontrolled exposure

$S := \frac{f}{1500}$

$S = 1$ $\frac{mW}{cm^2}$

$Rinches := \frac{R}{2.54}$

$Rinches = 3.13$

Fixed Case #1
Channel frequency: 2400 to 2483.5 MHz
The conducted power output is 1 watt.
The coax loss was taken as 7 dB.
Antenna gain was taken as 9 dBd

Power output

$Po := 1000$ mWatts

$CL := 7$ coax loss

$G := dBd + 2.15 - CL$

$G = 4.15$ net-gain in dBi

gain numeric

$Gn := 10^{\frac{G}{10}}$

$Gn = 2.6$

antenna gain

$dBd := 9$

Calculation of S

$f := 1500$ Frequency in MHz

uncontrolled exposure

$S := \frac{f}{1500}$

$S = 1 \quad \frac{mW}{cm^2}$

$R := \sqrt{\frac{(Po \cdot Gn)}{(4 \cdot \pi \cdot S)}}$

$R = 14.385$ distance in centimeters required for compliance

$Rinches := \frac{R}{2.54}$

$Rinches = 5.663$

Fixed Case #1
Channel frequency: 2400 to 2483.5 MHz
The conducted power output is 1 watt.
The coax loss was taken as 13 dB.
Antenna gain was taken as 10 dBd

Power output

$Po := 1000$ mWatts

antenna gain

$dBd := 10$

Calculation of S

$f := 1500$ Frequency in MHz

$CL := 13$ coax loss

uncontrolled exposure

$G := dBd + 2.15 - CL$

$G = -0.85$ net-gain in dBi

$S := \frac{f}{1500}$

$Gn := 10^{\frac{G}{10}}$ gain numeric

$S = 1$ $\frac{mW}{cm^2}$

$Gn = 0.822$

$R := \sqrt{\frac{(Po \cdot Gn)}{(4 \cdot \pi \cdot S)}}$

$Rinches := \frac{R}{2.54}$

$R = 8.089$ distance in centimeters required for compliance

$Rinches = 3.185$

Conclusion:

The device complies with the MPE requirements by providing a safe separation distance of 15 cm between the antenna, including any radiating structure, and any persons when normally operated .

Proposed RF exposure safety information to include in User's Manual:

"FCC RF Exposure Requirements:

CAUTION:
The antenna(s) used for this transmitter must be installed to provide a separation distance of at least 20 cm from all persons and must not be co-located or operating in conjunction with any other antenna or transmitter.

Failure to observe these restrictions will result in exceeding the FCC RF exposure limits.