| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| MPE Calculator | RF Exposure uses EIRP for calculation. EIRP is based on TX power added to the antenna gain in dBi. | | | | | | | |
| | dBi = dB gain compared to an isotropic radiator. | | | | | | | |
| | S = power density in mW/cm^2 | | | | | | | |
| | | | Transmitter Output power (mW) | 62.2 | | | | |
| | | | Transmitter Output power (W) | 0.062 | | | | |
| | Output Power for % duty Cycle operation (Watts) | 100 | | 0.062 | | Antenna Gain (dBi) | 3 | |
| | Output Power for 100% duty Cycle operation (Watts) | | | 0.062 | | Antenna Gain (Numeric) | 2.00 | |
| Tx Frequency (MHz) | 2437 | | Calcualtion power (Watts) | 0.062 | dBd + 2.17 = dBi | dBi to dBd | 2.2 | |
| | | | | | | Antenna Gain (dBd) | 0.83 | |
| Cable Loss (dB) | 0.0 | | Adjusted Power (dBm) | 17.94 | | Antenna minus cable (dBi) | 3.00 | |
| | | | | | | Antenna Gain (Numeric) | 2.00 | |
| | Calculated ERP (mw) | 75.274 | | | | EIRP = Po(dBM) + Gain (dB) | | |
| | Calculated EIRP (mw) | 124.064 | | | | Radiated (EIRP) dBm | 20.936 | |
| | | | | | | ERP = EIRP - 2.17 dB | | |
| | | | | | | Radiated (ERP) dBm | 18.766 | |

Power density (S) mW/cm² = EIRP / (4 p r^2)

r (cm) EIRP (mW)

| | | FCC radio frequency radiation exposure limits per 1.1310 | | |
|---|---|---|---|---|
| | **Occupational Limit** | | | |
| 5 | mW/cm² | Frequency (MHz) | Occupational Limit (mW/cm²) | Public Limit (mW/cm²) |
| 50 | W/m² | 30-300 | 1 | 0.2 |
| | **General Public Limit** | 300-1,500 | f/300 | f/1500 |
| 1 | mW/cm² | 1,500-10,000 | 5 | 1 |
| 10 | W/m² | | | |

| | | IC radio frequency radiation exposure limits per RSS-102 | | |
|---|---|---|---|---|
| | **Occupational Limit** | | | |
| $0.6455f^{0.5}$ | W/m² | Frequency (MHz) | Occupational Limit (W/m²) | Public Limit (W/m²) |
| 39.7 | W/m² | 100-6,000 | $0.6455f^{0.5}$ | |
| | **General Public Limit** | 6,000-15,000 | 50 | |
| $0.02619f^{0.6834}$ | W/m² | 48-300 | | 1.291 |
| 5.4 | W/m² | 300-6,000 | | $0.02619f^{0.6834}$ |
| | | 6,000-15,000 | 50 | 10 |

| | | | | | |
|---|---|---|---|---|---|
| f = Transmit Frequecny (MHz) | | | f (MHz) = | 2437 | MHz |
| $P_T$ = Power Input to Antenna (mW) | | | $P_T$ (mW) = | 62.1794 | mW |
| Duty cycle (percentage of operation) | | | % = | 100 | % |
| $P_A$ = Adjusted Power due to Duty cycle or Cable Loss (mW) | | | $P_A$ (mW) = | 62.18 | mW |
| $G_N$ = Numeric Gain of the Antenna | | | GN (numeric) = | 2.00 | numeric |
| $S_{20}$ = Power Density of device at 20cm (mW/m²) | | $S_{20}=(P_AG_N)/(4\pi R_{20})^2$ | $S_{20}$ (mW/m²) = | 0.02 | mW/m² |
| $S_{20}$ = Power Density of device at 20cm (W/m²) | | $S_{20}=(P_AG_N)/(4\pi R_{20})^2$ | $S_{20}$ (W/m²) = | 0.25 | W/m² |
| $S_L$ = Power Density Limit (W/m²) | | | $S_L$ (W/m²)= | 5.404 | W/m² |
| $R_C$ = Minimum distance to the Radiating Element for Compliance (cm) | | $R_C=\sqrt{(P_AG_N/4\pi S_L)}$ | $R_C$ (cm) = | 4.3 | cm |
| $S_C$ = Power Density of the device at the Compliance Distance $R_C$ (W/m²) | | $S_C=(P_AG_N)/(4\pi R_C)^2$ | $S_C$ (W/m²) = | 5.40 | W/m² |
| $R_{20}$ = 20cm | | | R20= | 20 | cm |
| | For Complaince with Canada General Population Limits, User Manual must indicate a minimum seperation distance of | | | 4.3 | cm |
| | Or in Meters for Complaince with Canada General Population Limits, a minimum seperation distance of | | | 0.04 | Meters |

| Summary: Standalone MPE Calculations and Summary | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Band (MHZ) | Tx Duty Cycle (%) | Tx Frequeny (MHz) | Power Total (mW) | Antenna Gain (numeric) | $S_L$ (W/m²) | $S_{20}$ (W/m²) | $R_C$ (cm) | $S_C$ (W/m²) |
| 2402-2480 | 100 | 2437 | 62 | 2.00 | 5.404 | 0.25 | 4.3 | 5.40 |
| | | | | | | | | |
| Band (MHZ) | Tx Duty Cycle (%) | Tx Frequeny (MHz) | Power Total (mW) | Antenna Gain (dBi) | SL (W/m2) | S20 (W/m2) | RC (cm) | SC (W/m2) |
| 5150-5825 | 100 | 5745 | 67 | 3.55 | 9.710 | 0.47 | 4.4 | 9.71 |

| Simlutaneous MPE Calculation | | |
|---|---|---|
| | Transmitter 1 | Transmitter 2 |
| Tx Frequeny (MHz) | 2437 | 5745 |
| $S_{20}$ (W/m²) | 0.25 | 0.47 |
| $S_L$ (W/m²) | 5.404 | 9.710 |
| Power Ratio ($S_L$ / $S_{20}$) | 0.046 | 0.049 |
| Sum of Power Ratios at 20cm (Tx1 + Tx2) | | 0.094 |
| Requirement = Σ of MPE Ratio ≤ 1 | | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| MPE Calculator | RF Exposure uses EIRP for calculation. EIRP is based on TX power added to the antenna gain in dBi. | | | | | | | |
| | dBi = dB gain compared to an isotropic radiator. | | | | | | | |
| | S = power density in mW/cm^2 | | | | | | | |
| | | | Transmitter Output power (mW) | 67.0 | | | | |
| | | | Transmitter Output power (W) | 0.067 | | | | |
| | Output Power for % duty Cycle (Watts) | 100 | | 0.067 | | Antenna Gain (dBi) | 5.5 | |
| | Output Power for 100% duty Cycle operation (Watts) | | | 0.067 | | Antenna Gain (Numeric) | 3.55 | |
| Tx Frequency (MHz) | 5745 | | Calcualtion power (Watts) | 0.07 | dBd + 2.17 = dBi | dBi to dBd | 2.2 | |
| | | | | | | Antenna Gain (dBd) | 3.33 | |
| Cable Loss (dB) | 0.0 | | Adjusted Power (dBm) | 18.26 | | Antenna minus cable (dBi) | 5.50 | |
| | | | | | | Antenna Gain (Numeric) | 3.55 | |
| | Calculated ERP (mw) | 144.236 | | | | EIRP = Po(dBM) + Gain (dB) | | |
| | Calculated EIRP (mw) | 237.725 | | | | Radiated (EIRP) dBm | 23.761 | |
| | | | | | | ERP = EIRP - 2.17 dB | | |
| | | | | | | Radiated (ERP) dBm | 21.591 | |

Power density (S) mW/cm² = EIRP / (4 p r^2)

r (cm) EIRP (mW)

| | Occupational Limit | FCC radio frequency radiation exposure limits per 1.1310 | | |
|---|---|---|---|---|
| 5 | mW/cm$^2$ | Frequency (MHz) | Occupational Limit (mW/cm$^2$) | Public Limit (mW/cm$^2$) |
| 50 | W/m$^2$ | 30-300 | 1 | 0.2 |
| | **General Public Limit** | 300-1,500 | f/300 | f/1500 |
| 1 | mW/cm$^2$ | 1,500-10,000 | 5 | 1 |
| 10 | W/m$^2$ | | | |

| | Occupational Limit | IC radio frequency radiation exposure limits per RSS-102 | | |
|---|---|---|---|---|
| $0.6455f^{0.5}$ | W/m$^2$ | | | |
| 48.9 | W/m$^2$ | Frequency (MHz) | Occupational Limit (W/m$^2$) | Public Limit (W/m$^2$) |
| | **General Public Limit** | 100-6,000 | $0.6455f^{0.5}$ | |
| $0.02619f^{0.6834}$ | W/m$^2$ | 6,000-15,000 | 50 | |
| 9.7 | W/m$^2$ | 48-300 | | 1.291 |
| | | 300-6,000 | | $0.02619f^{0.6834}$ |
| | | 6,000-15,000 | 50 | 10 |

| | | | | |
|---|---|---|---|---|
| f = Transmit Frequecny (MHz) | | | f (MHz) = | 5745 MHz |
| $P_T$ = Power Input to Antenna (mW) | | | $P_T$ (mW) = | 67.0000 mW |
| Duty cycle (percentage of operation) | | | % = | 100 % |
| $P_A$ = Adjusted Power due to Duty cycle or Cable Loss (mW) | | | $P_A$ (mW) = | 67.00 mW |
| $G_N$ = Numeric Gain of the Antenna | | | GN (numeric) = | 3.55 numeric |
| $S_{20}$ = Power Density of device at 20cm (mW/m$^2$) | | $S_{20}=(P_AG_N)/(4\pi R_{20})^2$ | $S_{20}$ (mW/m$^2$) = | 0.05 mW/m$^2$ |
| $S_{20}$ = Power Density of device at 20cm (W/m$^2$) | | $S_{20}=(P_AG_N)/(4\pi R_{20})^2$ | $S_{20}$ (W/m$^2$) = | 0.47 W/m$^2$ |
| $S_L$ = Power Density Limit (W/m$^2$) | | | $S_L$ (W/m$^2$)= | 9.710 W/m$^2$ |
| $R_C$ = Minimum distance to the Radiating Element for Compliance (cm) | | $R_C=\sqrt{(P_AG_N/4\pi S_L)}$ | $R_C$ (cm) = | 4.4 cm |
| $S_C$ = Power Density of the device at the Compliance Distance $R_C$ (W/m$^2$) | | $S_C=(P_AG_N)/(4\pi R_C)^2$ | $S_C$ (W/m$^2$) = | 9.71 W/m$^2$ |
| $R_{20}$ = 20cm | | | R20= | 20 cm |

For Complaince with Canada General Population Limits, User Manual must indicate a minimum seperation distance of 4.4 cm

Or in Meters for Complaince with Canada General Population Limits, a minimum seperation distance of 0.04 Meters

| Summary: Standalone MPE Calculations and Summary | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Band (MHZ) | Tx Duty Cycle (%) | Tx Frequeny (MHz) | Power Total (mW) | Antenna Gain (dBi) | $S_L$ (W/m$^2$) | $S_{20}$ (W/m$^2$) | $R_C$ (cm) | $S_C$ (W/m$^2$) |
| 2402-2480 | 100 | 2437 | 62 | 3 | 5.404 | 0.25 | 4.3 | 5.40 |
| | | | | | | | | |
| Band (MHZ) | Tx Duty Cycle (%) | Tx Frequeny (MHz) | Power Total (mW) | Antenna Gain (dBi) | SL (W/m2) | S20 (W/m2) | RC (cm) | SC (W/m2) |
| 5150-5825 | 100 | 5745 | 67 | 5.5 | 9.710 | 0.47 | 4.4 | 9.71 |

| Simlutaneous MPE Calculation | | |
|---|---|---|
| | Transmitter 1 | Transmitter 2 |
| Tx Frequeny (MHz) | 2437 | 5745 |
| $S_{20}$ (W/m$^2$) | 0.25 | 0.47 |
| $S_L$ (W/m$^2$) | 5.404 | 9.710 |
| Power Ratio ($S_L$ / $S_{20}$) | 0.046 | 0.049 |
| Sum of Power Ratios at 20cm (Tx1 + Tx2) | | 0.094 |
| Requirement = Σ of MPE Ratio ≤ 1 | | |