| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | PMN: | aranet PRO Plus base | Test Number: | 230227A | | | | | |
| 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 | | | | | | | | |
| | Peak Transmitter Output power (mW) | | 1 | | | | | | |
| | Peak Transmitter Output power (W) | | 0.001 | | | | | | |
| Output Power for 250mS in 60 second duty Cycle | | 100 | 0.0010 | | Antenna Gain (dBi) | 0 | | | |
| | Output Power for 100% duty Cycle operation (Watts) | | 0.0010 | | Antenna Gain (Numeric) | 1.00 | | | |
| Tx Frequency (MHz) | 923 | Calcualtion power (Watts) | 0.0010 | dBd + 2.17 = dBi | dBi to dBd | 2.2 | | | |
| | | | | | Antenna Gain (dBd) | -2.17 | | | |
| Cable Loss (dB) | 0.0 | Adjusted Power (dBm) | 0.00 | | Antenna minus cable (dBi) | 0.00 | | | |
| | | | | | Antenna Gain (Numeric) | 1.00 | | | |
| | Calculated ERP (mw) | 0.607 | | | EIRP = Po(dBM) + Gain (dB) | | | | |
| | Calculated EIRP (mw) | 1.000 | | | Radiated (EIRP) dBm | 0.000 | | | |
| | | | | | ERP = EIRP - 2.17 dB | | | | |
| | | | | | Radiated (ERP) dBm | -2.170 | | | |

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

r (cm) EIRP (mW)

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|---|---|---|---|---|
| | **Occupational Limit** | FCC radio frequency radiation exposure limits per 1.1310 | | |
| 3.076666667 | $mW/cm^2$ | Frequency (MHz) | Occupational Limit ($mW/cm^2$) | Public Limit ($mW/cm^2$) |
| 31 | $W/m^2$ | 30-300 | 1 | 0.2 |
| | **General Public Limit** | 300-1,500 | f/300 | f/1500 |
| 0.615333333 | $mW/cm^2$ | 1,500-10,000 | 5 | 1 |
| 6 | $W/m^2$ | | | |

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|---|---|---|---|---|
| | **Occupational Limit** | | | |
| $0.6455f^{0.5}$ | $W/m^2$ | IC radio frequency radiation exposure limits per RSS-102 | | |
| 24.4 | $W/m^2$ | 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 | |
| 2.8 | $W/m^2$ | 48-300 | | 1.291 |
| | | 300-6,000 | | $0.02619f^{0.6834}$ |
| | | 6,000-15,000 | 50 | 10 |

| | | | | | |
|---|---|---|---|---|---|
| f = Transmit Frequecny (MHz) | | | f (MHz) = | 923 | MHz |
| $P_T$ = Power Input to Antenna (mW) | | | $P_T$ (mW) = | 1.0000 | mW |
| Duty cycle (percentage of operation) | | | % = | 100 | % |
| $P_A$ = Adjusted Power due to Duty cycle or Cable Loss (mW) | | | $P_A$ (mW) = | 1.00 | mW |
| $G_N$ = Numeric Gain of the Antenna | | | GN (numeric) = | 1.00 | numeric |
| $S_{20}$ = Power Density of device at 20cm ($mW/m^2$) | | $S_{20}=(P_AG_N)/(4\pi R_{20})^2$ | $S_{20}$ ($mW/m^2$) = | 0.00 | $mW/m^2$ |
| $S_{20}$ = Power Density of device at 20cm ($W/m^2$) | | $S_{20}=(P_AG_N)/(4\pi R_{20})^2$ | $S_{20}$ ($W/m^2$) = | 0.00 | $W/m^2$ |
| $S_L$ = Power Density Limit ($W/m^2$) | | | $S_L$ ($W/m^2$)= | 2.783 | $W/m^2$ |
| $R_C$ = Minimum distance to the Radiating Element for Compliance (cm) | | $R_C=\sqrt{(P_AG_N/4\pi S_L)}$ | $R_C$ (cm) = | 0.5 | cm |
| $S_C$ = Power Density of the device at the Compliance Distance $R_C$ ($W/m^2$) | | $S_C=(P_AG_N)/(4\pi R_C)^2$ | $S_C$ ($W/m^2$) = | 2.78 | $W/m^2$ |
| $R_{20}$ = 20cm | | | R20= | 20 | cm |

| | | |
|---|---|---|
| For Complaince with Canada General Population Limits, User Manual must indicate a minimum seperation distance of | 0.5 | cm |
| Or in Meters for Complaince with Canada General Population Limits, a minimum seperation distance of | 0.01 | Meters |

Summary: Standalone MPE Calculations and Summary

| Band (MHZ) | Tx Duty Cycle (%) | Tx Frequeny (MHz) | Power Total (mW) | Antenna Gain (numeric) | $S_L$ ($W/m^2$) | $S_{20}$ ($W/m^2$) | $R_C$ (cm) | $S_C$ ($W/m^2$) |
|---|---|---|---|---|---|---|---|---|
| 902-928 | 100 | 923 | 1 | 1.00 | 2.783 | 0.00 | 0.5 | 2.78 |
| | | | | | | | | |
| 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) |
| 2400-2483.5 | 100 | 2442 | 120.00 | 1.00 | 5.412 | 0.24 | 4.2 | 5.41 |

| Simlutaneous MPE Calculation | | |
|---|---|---|
| | Transmitter 1 | Transmitter 2 |
| Tx Frequeny (MHz) | 923 | 2442 |
| $S_{20}$ ($W/m^2$) | 0.00 | 0.24 |
| $S_L$ ($W/m^2$) | 2.783 | 5.412 |
| Power Ratio ($S_L$ / $S_{20}$) | 0.001 | 0.044 |
| Sum of Power Ratios at 20cm (0.020 + 0.001) | | 0.045 |
| Requirement = Σ of MPE Ratio ≤ 1 | | Therefore the design is Exempt |

| | | | | | | |
|---|---|---|---|---|---|---|
| | PMN: aranet PRO Plus base | | Test Number: 230227A | | | |
| 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 | | | | | |
| | Peak Transmitter Output power (mW) | | 120 | | | |
| | Transmitter maximum Output power operating at 100% (Watts) | | 0.1200 | | | |
| | Percent Duty Cycle operation (%) | | 100.0 | | Antenna Gain (dBi) | 0 |
| | Output Power for 100% duty Cycle operation (Watts) | | 0.1200 | | Antenna Gain (Numeric) | 1.00 |
| Tx Frequency (MHz) | 2442 | Calcualtion power (Watts) | 0.1200 | dBd + 2.17 = dBi | dBi to dBd | 2.2 |
| | | | | | Antenna Gain (dBd) | -2.17 |
| Cable Loss (dB) | 0.0 | Adjusted Power (dBm) | 20.79 | | Antenna minus cable (dBi) | 0.00 |
| | | | | | | |
| | Calculated ERP (mw) | 72.808 | | | EIRP = Po(dBM) + Gain (dB) | |
| | Calculated EIRP (mw) | 120.000 | | | Radiated (EIRP) dBm | 20.792 |
| | | | | | ERP = EIRP - 2.17 dB | |
| | | | | | Radiated (ERP) dBm | 18.622 |

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** | | | |
| $0.6455f^{0.5}$ | W/m$^2$ | IC radio frequency radiation exposure limits per RSS-102 | | |
| 39.7 | 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 | |
| 5.4 | 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) = | 2442 MHz |
| $P_T$ = Power Input to Antenna (mW) | | | $P_T$ (mW) = | 120.0000 mW |
| Duty cycle (percentage of operation) | | | % = | 100.0 % |
| $P_A$ = Adjusted Power due to Duty cycle or Cable Loss (mW) | | | $P_A$ (mW) = | 120.00 mW |
| $G_N$ = Numeric Gain of the Antenna | | | GN (numeric) = | 1.00 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$^2$) = | 0.02 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$^2$) = | 0.24 W/m$^2$ |
| $S_L$ = Power Density Limit (W/m$^2$) | | | $S_L$ (W/m$^2$)= | 5.412 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) = | 4.2 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$^2$) = | 5.41 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 | | | 4.2 cm |
| | Or in Meters for Complaince with Canada General Population Limits, a minimum seperation distance of | | | 0.04 Meters |