

MPE Calculation / RF Exposure

Product: Pathfinder2

Applicant: Dogtra Co., Ltd.

Model: PR20C

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FCC ID: SWN-PR20C

IC: 12166A-PR20C

According to FCC §15.247(i) and §1.1307(b)(1), systems operating under the provisions of this section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy level in excess of the Commission's guidelines.

Limits for General Population/Uncontrolled Exposure

Frequency Range (MHz)	Electric Field Strength (V/m)	Magnetic Field Strength (A/m)	Power Density (mW/cm ²)	Averaging Time (minutes)
Limits for General Population/Uncontrolled Exposure				
0.3-1.34	614	1.63	* (100)	30
1.34-30	824/f	2.19/f	* (180/f ²)	30
30-300	27.5	0.073	0.2	30
300-1500	/	/	f/1500	30
1500-100,000	/	/	1.0	30

f = frequency in MHz

* = Plane-wave equivalent power density

Before equipment certification is granted, the procedure of IC RSS-102 must be followed concerning the exposure of humans to RF fields.

According to IC RSS-102 Issue 2 section 4.1, RF limits used for general public will be applied to the EUT.

Frequency Range (MHz)	Electric Field (V/m rms)	Magnetic Field (A/m rms)	Power Density (W/m ²)	Time Averaging (min)
0.003 - 1	280	2.19	-	6
1 - 10	280 / f	2.19 / f	-	6
10 - 30	28	2.19 / f	-	6
30 - 300	28	0.073	2*	6
300 - 1 500	1.585 f ^{0.5}	0.0042 f ^{0.5}	f / 150	6
1 500 - 15 000	61.4	0.163	10	6
15 000 - 150 000	61.4	0.163	10	616000 / f ^{1.2}
150 000- 300 000	0.158 f ^{0.5}	4.21 x 10 ⁻⁴ f ^{0.5}	6.67 x 10 ⁻⁵ f	616000 / f ^{1.2}

Note: f is frequency in MHz

* Power density limit is applicable at frequencies greater than 100 MHz

MPE Prediction

Predication of MPE limit at a given distance, Equation from OET Bulletin 65, Edition 97-01

$$S = ERP/4 \pi R^2$$

In other words, $R = \sqrt{ERP/4\pi \times S(Pd)}$

For 900 MHz UHF(DSS)

Where S = Power density
ERP = Effective Radiated Power
R = distance to the centre of radiation of the antenna

Calculation S = 0.61 mW/cm² for General population uncontrolled exposure (FCC Part 1.1310 Radiofrequency radiation exposure limits)

P = 30.00 dBm (1000 mW) : maximum output power including tune-up tolerance.*note

G = Antenna gain = 0 dBi (1 in linear terms)

ERP = P x G = 1000 mW

$R = \sqrt{1000/12.56 \times 0.61}$

R = 11 cm

Conclusion This device complies with the FCC/IC MPE limit at 11 cm for uncontrolled exposure environment.

Note: Tune-up tolerance: 29 dBm +/- 1 dB
BLE and 900 MHz UHF do not transmit at the same time.

For BLE(DTS)

$$S = ERP/4 \pi R^2$$

Values S = 1.0 mW/cm² for General population uncontrolled exposure (FCC Part 1.1310 Radiofrequency radiation exposure limits)

$$S = 1.0 \text{ mW/cm}^2$$

PT(BLE) = -5 dBm (0.32 mW) : maximum output power including tune-up tolerance.*note

G = Antenna gain = 3.65 dBi (2.317 in linear terms)

$$EIRP = PT \times G$$

$$R = 11 \text{ cm}$$

Calculation EIRP = 0.32 x 2.317 = 1.20 mW

$$S = 1.20/12.56 \times (11)^2 = 1.20/1520.53$$

$$S = 0.00079 \text{ mW/cm}^2$$

Conclusion This confirms compliance to the required radio frequency radiation exposure limit of 1.0 mW/cm² at 11 cm operation.

Note: Tune-up tolerance : -6 dBm +/- 1 dB
BLE and 900 MHz UHF do not transmit at the same time.