

RF Exposure Requirements

General information:

APPLICANT: NEPTUNE TECHNOLOGY GROUP INC.
FCC ID: P2S-SD250NTG

Device category: Fixed per Part 2.1091/1.1307/1.1310
Environment: Uncontrolled Exposure

Fixed devices that operate under Part 90 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. Compliance with the power density limits of 1.1310 is required.

Antenna:

The manufacturer does not specify an antenna. A typical fix mounted antenna has a gain of anywhere from 3 dBi.

This device has provisions for operation from a fixed location.

Configuration	Antenna p/n	Type	Max. Gain (dBi)
Fixed mounted	Any	omni or directional	3

Operating configuration and exposure conditions:

The conducted output power is 5 Watts. Although the device is fixed mounted control of exposure is an uncontrolled environment but the duty cycle will be approximately 50% or less and is controlled thru the software of the system.

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

- Fixed operation: A typical installation consists of an antenna system with a coaxial cable of the type RG 8U which has a loss of 1dB for a length of 30 feet at UHF frequencies.

MPE Calculation:

The minimum separation distance is calculated as follows:

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

The limit for uncontrolled exposure environment above 300 MHz is $f/1500$ mW/cm² .

Frequency: 450 MHz

The conducted power output is 5 watt.

The coax loss was taken as 1 dB (30 ft RG-8 type).

Antenna gain was taken as 3 dBi

W := 5.0 power in Watts
 (conducted)

D := 1 Duty Factor in decimal % (1=100%)
 1 for FM

E := 15 exposure time in minutes

U := 30 (use 6 for controlled and 30 for uncontrolled)

$$W_{exp} := W \cdot D \cdot \left(\frac{E}{U}\right)$$

W_{exp} = 2.5 Watts

$$PC := \left(\frac{E}{U}\right) \cdot 100$$

PC = 50 % on time

P_o := 2500.0 mWatts

f := 450.0

dBd := .85 antenna gain in dBd

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

G₁ := dBd + 2.15 gain in dBi

See 47 CFR 1.1310

G₁ = 3 dBi

CL := 1. dB coax loss

G := G₁ - CL

S = 0.3 $\frac{mW}{cm^2}$

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

G_n = 1.585

$$R := \sqrt{\frac{(P_o \cdot G_n)}{(4 \cdot \pi \cdot S)}}$$

R = 32.419 distance in centimeters
 required for compliance

$$\text{inches} := \frac{R}{2.54}$$

inches = 12.764

$$\text{ft} := \frac{\text{inches}}{12}$$

ft = 1.064

Conclusion:

The device complies with the MPE requirements when providing a safe separation distance of 33 cm (1.1 ft) between the antenna, including any radiating structure, and any persons when operated as described in the report which is typical of its intended use.

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

"FCC RF Exposure Requirements:

See Users Manual