FCC ID: FC3PTX127T1CG

RF EXPOSURE COMPLIANCE

To meet RF radiation exposure limits for general population as a **mobile** device, the final operating configuration of this transmitter including antenna gain and cable loss must not exceed 7.9dBi of gain. And based on highest conducted output power reading of 29.1dBm, at 20cm distance, the power density meets the 1mW/cm2 limit.

Prediction of MPE limit at a given distance

Equation from page 18 of OET Bulletin 65, Edition 97-01

$$S = \frac{PG}{4\pi R^2}$$

where: S = power density
P = power input to the antenna
G = power gain of the antenna in the direction of interest relative to an isotropic radiator
R = distance to the center of radiation of the antenna

Maximum peak output power at the antenna terminal:	29.10	(dBm)
Maximum peak output power at the antenna terminal:	812.8305162	(mW)
Antenna gain(typical):	7.9	(dBi)
Maximum antenna gain:	6.165950019	(numeric)
Prediction distance:	20	(cm)
Prediction frequency:	13000	(MHz)
MPE limit for uncontrolled exposure at prediction frequency:	1	(mW/cm^2)
Power density at prediction frequency:	0.997080	(mW/cm^2)
Maximum allowable antenna gain:	7.912698554	(dBi)

For **temporary-fixed** rapid deployment applications, the antenna gain can be increased if larger separation distances can be accomplished during the operation. Please see following pages for antenna gain and corresponding separation distance graph and table.

WARNING - RF Power Hazard

High levels of RF power are present in the unit. Exposure to RF or microwave power can cause burns and may be harmful to health.

Remove power from the unit before disconnecting any RF cables and before inspecting damaged cables and/or antennas.

Avoid standing in front of high gain antennas (such as a dish antenna) and never look into the open end of a waveguide or cable where RF power may be present.

RF Exposure - Safe Working Distances

MRC provides this warning for safety purposes with the intent to inform the user of the potential hazard of RF exposure. The following guidelines for safe operation were derived from OET bulletin 65, August 1997, as recommended by the Federal Communications Commission (FCC).

The PTX-PRO 13 GHz Transmitter is a mobile transmitter system designed to provide services to broadcast ENG users under CFR 74 subpart F and 74.601 TV pickup stations. This unit, operated without an antenna, will not create RF energy exceeding 1.0 mW/cm^2, the FCC limit for exposure. Once connected to an antenna, the potential for harmful exposure will be greatly enhanced.

In this situation, a certain distance from the radiator is to be maintained. Calculations need to be performed to understand what that safe margin for exposure is. This is known as the Maximum Permissible Exposure (MPE) limit.

Note	Hazardous RF radiation limits and recommended distances may vary by country. Ensure that all applicable state and federal regulations are observed when using this transmitter.

Calculations provided are for common antennas often utilized in the ENG environment. The following formula used is that suggested by OET 65.

Calculating MPE

EIRP = P * (10 ^ (G / 10)) = (antilog of G/10) * P

P = RF power delivered to the antenna in mW
G = Power gain of the antenna in the direction of interest relative to an isotropic radiator
R = distance to the center of radiation of the antenna in centimeters
S = MPE in mW/cm² (milliwatts per square centimeters)

Conversions
dBi to numeric gain = Antilog (dBi/10)
Feet to centimeters = Feet * 30.48
Centimeters to Feet = cm * .0328
4 π = 12.57

User Input
RF power delivered to the antenna = Watts
Antenna gain (referenced to isotropic antenna) = dBi
Distance from the center of radiation = Feet

Calculation steps:

1. [P] RF power input. Convert watts to milliwatts = Watts * 1000
2. [G] Antenna gain dBi. Convert to numeric gain = Antilog (dBi/10)
3. [EIRP] Multiply P * G
4. [R] Convert centimeters to feet = Centimeters * .0328
5. Square R
6. Multiply R² * 4π
7. [S] Divide (R² * 4π) into EIRP

S = Power Density in milliwatts per square centimeters.
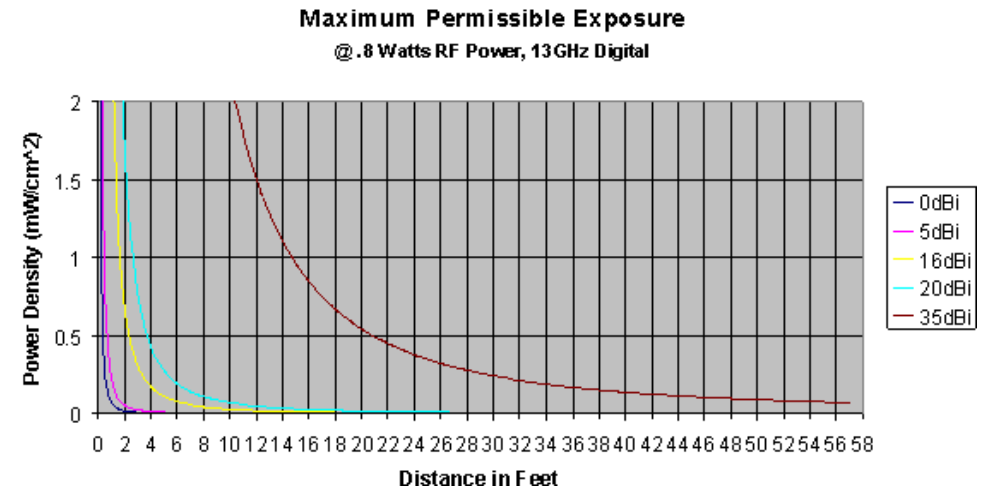Note: At frequencies above 1500 MHz, S must not be greater than 1

Reference
FCC OET Bulletin 65, August 1997 - Evaluating Compliance with FCC Guidelines for Human Exposure to Radio Frequency Electromagnetic Fields

The example shown in Figure 1 is a typical graph for an MRC PTX-PRO 13 GHz Transmitter and shows the permissible exposure distance for various antennas. Graphs and data will vary, based on the actual transmitter, output power, frequency, and antenna utilized.   The plot provides the permissible output of the transmitter for digital modulation

MRC, in accordance with the requirements set forth by the FCC, provides this information as a guide to the user. It is assumed that the users of this equipment are licensed and qualified to operate the equipment per the guidelines and recommendations contained within the product user guides and in accordance with any FCC rules that may apply.

Figure 1: Digital Modulation

The following table reflects the graphic representations above.

Table 1:

Antenna Gain (dBi)	Minimum Distance from Antenna (cm)	Minimum Distance from Antenna (inch)
0	8	3.15
5	45	17.71
16	51	20.07
20	80	31.49
35	449	176.73