

**RADIO FREQUENCY HEALTH LIMITS FOR MPRX READER
USING AN EXTERNAL ANTENNA IN FREQUENCY BAND
OF 902.25 TO 903.75 AND 910.00 TO 921.50 MHZ**

Several agencies (OSHA, FCC, IC) have environmental guidelines regulating maximum permissible exposure (MPE) or “safe” exposure levels that this product falls under. To ensure that proper safety guideline for the end users of this product, i.e. Occupational (Controlled) and General Population/Public (Uncontrolled), the recommended levels for each of the agencies are presented in the next sections with TransCore’s recommendations for safety in the last section.

OSHA (Occupational Safety and Health Administration)

OSHA (an agency of The United States of America) legislates in the Code of Federal Regulations (CFR) Title 29 Part 1910 Subpart G 1910.97 titled “Nonionizing radiation”, a maximum safe exposure limit of 10 milliwatts per square centimeter (mW/cm^2) during any 0.1-hour period (i.e. 6 minutes). Using the frequency (in the middle of the band of operation of this equipment) of 915 MHz and the highest antenna gain that this equipment is certified for use in a final installation, the minimum safe distance was calculated to be 8in (20cm).

FCC (Federal Communication Commission)

FCC (an agency of The United States of America) legislates in the Code of Federal Regulations (CFR) Title 47 Chapter I Subchapter A Part 1 Subpart I Section 1.1310 titled “Radiofrequency radiation exposure limits” that the maximum permissible exposure (MPE) is the following:

Occupational/Controlled Exposure

Power density = frequency (in MHz)/300 mW/cm^2 with an Averaging time of 6 Min

General Population/Uncontrolled Exposure

Power density = frequency (in MHz)/1500 mW/cm^2 with an Averaging time of 30 Min

Using the frequency (in the middle of the band of operation of this equipment) of 915MHz and the highest antenna gain that this equipment is certified for use in a final installation, the minimum safe distance was calculated. The MPE minimum distances are 14in (36cm) for the Occupational/Controlled environment, and 31.5in (80.5cm) for the General Population/Uncontrolled environment.

Industry Canada (Innovation, Science and Economic Development Canada)

Industry Canada (a Department of the Government of Canada) sets out the requirements in Radio Standards Specification RSS-102, Issue 5 guidelines, recommending a maximum safe

power density in W/m^2 . Thus, the maximum permissible exposure for general population/uncontrolled exposure at 915MHz is $2.77 W/m^2$. The average time is 6 minutes. The maximum permissible exposure (MPE) is the following:

Controlled Environment

Power density = $0.6455 * \text{frequency (in MHz)}^{0.5} W/m^2$ with a Reference Period time of 6 Min

General Public/Uncontrolled Environment

Power density = $0.02619 * \text{frequency (in MHz)}^{0.6834} W/m^2$ with a Reference Period time of 6 Min

Using the frequency (in the middle of the band of operation of this equipment) of 915MHz and the highest antenna gain that this equipment is certified for use in a final installation, the minimum safe distance was calculated. The MPE minimum distances are 18in (45cm) for the Controlled environment and 47in (120cm) for the General Public/Uncontrolled environment.

TransCore Recommendation on MPE (Maximum Permissible Exposure)

The calculated power densities and MPE distance for each of the agencies respective to the environment is shown below.

Occupational/Controlled Environment				
Agency	Power Density (mW/cm ²)	MPE minimum distance		Time (min)
		in	cm	
OSHA	10	7	18	6
FCC	3.05	13	32	6
IC	1.95	16	40	6

General Population/Public/Uncontrolled Environment				
Agency	Power Density (mW/cm ²)	MPE minimum distance		Time (min)
		in	cm	
OSHA	10	7	18	6
FCC	0.61	28	72	30
IC	0.28	42	106	6

With the equipment installed and running at the maximum transmit power of 1.6W (32dBm), 0dB transmit attenuation, using the highest gain antenna that the equipment is certified for, the recommendation for each of the operation environments is as follows:

- 1) The antenna should be installed at least 42in (106cm) from the General Population/Public i.e. Uncontrolled Environment.
- 2) Maintenance personnel (i.e. Occupational/Controlled Environment) must remain at least 16in (40cm) from the antenna and limit their time in the environment to 6 minutes when the system is operating.