

RF Maximum Permissible Exposure (MPE)

Exhibit Requirements for Installations in the United States of America

Test item description :	
Trade Mark..... :	TZOA HAVEN
Model/Type reference..... :	HAVEN
Transmission Frequency Range	2.412 to 2.462GHz
Modulation Protocol and Type	802.11g OFDM
Transmitter power at RF Terminal	0.36 Watts (26dBm)
Antenna 1 Type and Gain	Monopole 2dBi
Antenna 2 Type and Gain	Monopole 5dBi
FCC ID..... :	2ANU9HAVEN
IC ID..... :	23327-HAVEN

This Transmitter is designed to be permanently mounted in a fixed location and is to be mounted with a minimum distance of 20cm or more between the antenna and the General Public.

This device was evaluated in accordance with the procedures as outlined in FCC KDB 447498 D01 General RF Exposure Guidance v06.

For United States installations, you must ensure that your installation complies with the Maximum Permissible Exposure (MPE) requirements for general population that are specified under FCC Part 1 Section 1.1310 Table 1.

TABLE 1—LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE)

Frequency range (MHz)	Electric field strength (V/m)	Magnetic field strength (A/m)	Power density (mW/cm ²)	Averaging time (minutes)
(A) Limits for Occupational/Controlled Exposure				
0.3-3.0	614	1.63	*100	6
3.0-30	1842/f	4.89/f	*900/f ²	6
30-300	61.4	0.163	1.0	6
300-1,500			f/300	6
1,500-100,000			5	6
(B) 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
300-1,500			f/1500	30
1,500-100,000			1.0	30

f = frequency in MHz * = Plane-wave equivalent power density

For US Installations, the maximum power density resulting from the composite Effective Isotropic Radiated Power (EIRP) from the antenna connected to this equipment must be limited to the maximum permissible exposure to the General Population as stated below:

- **Power density limit for the band 1,500 to 100,000MHz = 1 mW/cm²**

MPE and Safe Distance Calculations for USA Installations

This Power Density value is determined by the combination of RF output, cable loss, antenna gain, and distance from the antenna when energized.

The MPE calculation for US installations is expressed as follows:

- **Power Density Pd (mW/cm²) =**

$$\left(\frac{EIRP}{4 * \pi * d^2} \right)$$

Where

- **d** = distance from the antenna expressed in cm.
- **EIRP expressed in mW** = $10^{\left(\frac{Tx\ pwr\ (dBm) + Ant\ Gain\ (dBi) - Cable\ Loss\ (dB)}{10} \right)}$
- **Tx Power (dBm)** = $10 * \log[Tx\ Power\ (mW)]$

With the transmitter running at **0.36Watts** output into an antenna with the highest gain of **5dBi** using a short cable with 0dB loss, to verify if **20cm** (0.2meters) is a safe distance from the antenna to ensure exposure compliance of **1mW/cm²**:

1) 0.36Watts Tx Power = 26dBm

2) EIRP (mW) =

$$10^{\left(\frac{Tx\ pwr\ (50dBm) + Ant\ Gain\ (10dBi) - Cable\ Loss\ (0dB)}{10} \right)} = 10^{\left(\frac{31}{10} \right)} = 1,259mW$$

3) Pd (mW/cm²) =

$$\left(\frac{EIRP}{4 * \pi * d^2} \right) = \left(\frac{1259}{4 * \pi * 20^2} \right) = \left(\frac{1259}{5027} \right) = 0.250\ mW/cm^2$$

- 20cm (8 inches) is a safe distance for US installations when using a 5dBi Antenna.

Exhibit Requirements for Installations in Canada

Test item description :	
Trade Mark..... :	TZOA HAVEN
Model/Type reference..... :	HAVEN
Transmission Frequency Range	2.412 to 2.462GHz
Modulation Protocol and Type	802.11g OFDM
Transmitter power at RF Terminal	0.36 Watts (26dBm)
Antenna 1 Type and Gain	Monopole 2dBi
Antenna 2 Type and Gain	Monopole 5dBi
FCC ID..... :	2ANU9HAVEN
IC ID..... :	23327-HAVEN

This Transmitter is designed to be permanently mounted in a fixed location and is to be mounted with a minimum distance of 20cm or more between the antenna and the General Public.

This device was evaluated in accordance with the procedures as outlined in FCC KDB 447498 D01 General RF Exposure Guidance v06.

For Canada installations, you must ensure that your installation complies with the Maximum Permissible Exposure (MPE) requirements for general population that are specified under RSS-102 Section 4 Table 4.

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**Table 4: RF Field Strength Limits for Devices Used by the General Public
(Uncontrolled Environment)**

Frequency Range (MHz)	Electric Field (V/m rms)	Magnetic Field (A/m rms)	Power Density (W/m ²)	Reference Period (minutes)
0.003-10 ²¹	83	90	-	Instantaneous*
0.1-10	-	0.73/ <i>f</i>	-	6**
1.1-10	87/ <i>f</i> ^{0.5}	-	-	6**
10-20	27.46	0.0728	2	6
20-48	58.07/ <i>f</i> ^{0.25}	0.1540/ <i>f</i> ^{0.25}	8.944/ <i>f</i> ^{0.5}	6
48-300	22.06	0.05852	1.291	6
300-6000	3.142 <i>f</i> ^{0.3417}	0.008335 <i>f</i> ^{0.3417}	0.02619 <i>f</i> ^{0.6834}	6
6000-15000	61.4	0.163	10	6
15000-150000	61.4	0.163	10	616000/ <i>f</i> ^{1.2}
150000-300000	0.158 <i>f</i> ^{0.5}	4.21 x 10 ⁻⁴ <i>f</i> ^{0.5}	6.67 x 10 ⁻⁵ <i>f</i>	616000/ <i>f</i> ^{1.2}
Note: <i>f</i> is frequency in MHz. *Based on nerve stimulation (NS). ** Based on specific absorption rate (SAR).				

MPE and Safe Distance Calculations for Canada Installations

For Canada installations, the maximum power density resulting from the composite Effective Isotropic Radiated Power (EIRP) from the antenna connected to this equipment must be limited to the maximum permissible exposure as stated below:

- **Power density limit for the band 300 to 6000MHz = 5.377 W/m²**

The MPE calculation for US is expressed as follows:

- **Power Density Pd (W/m²) = $\left(\frac{EIRP}{4 * \pi * d^2} \right)$**

Where

- **d** = distance from the antenna expressed in meters (m).

- EIRP expressed in Watts (W) = $10^{\frac{[Tx\ pwr\ (dBW) + Ant\ Gain\ (dBi) - Cable\ Loss\ (dB)]}{10}}$
- Tx Power (dBW) = $10 \cdot \log[Tx\ Power\ (W)]$

The transmitter running at **0.36Watts** output into an antenna with a gain of **5dBi**, to verify if **0.2meters** is a safe distance from the antenna to ensure exposure compliance of **5.377W/m²**:

4) 0.36Watts Tx Power = -4.4dBW

5) EIRP (W) = $10^{\frac{[Tx\ pwr\ (20dBW) + Ant\ Gain\ (10dBi) - Cable\ Loss\ (0dB)]}{10}} = 10^{\frac{0.6}{10}} = 1.15W$

6) Pd (W/m2) =

$Pd\ (W/m^2) = \left(\frac{EIRP}{4 \cdot \pi \cdot d^2}\right) = \left(\frac{1.15}{4 \cdot \pi \cdot 0.2^2}\right) = \left(\frac{1.15}{0.5}\right) = 2.3W/m^2$

- 0.2meters is a safe distance for Canada installations when using a 5dBi gain antenna.

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