

## RF EXPOSURE INFORMATION

### 1. MPE Limits

The limit for Maximum Permissible Exposure (MPE), specified in FCC §1.1310, is listed in Table 1

According to FCC §1.1310 : the criteria listed in the following table shall be used to evaluate the environmental impact of human exposure to radio-frequency(RF) radiation as specified in §1.1307(b).

Table 1. Limits for Maximum

Frequency Range (MHz)	Electric Field Strength (V/m)	Magnetic Field Strength (A/m)	Power Density (mW/cm <sup>2</sup> )	Average Time (Minutes)
(A) Limits For Occupational / Control Exposures (f= frequency)				
30-300	61.4	0.163	1.0	6
300-1500	...	...	...	6
1500-100,000	...	...	...	6
(B) Limits For General Population / Uncontrolled Exposure (f=frequency)				
30-300	27.5	0.073	0.2	30
300-1500	...	...	f/1500	30
1500-100,000	...	...	1.0	30

### 2. EUT information

Type of equipment : RFID reader

Model Name : INT-910H

FCC ID : VDF

Frequency Band : RFID (902 ~ 928 MHz)

WLAN 802.11b/g (2400 ~ 2483.5 MHz)

### **Procedure**

The procedure used to determine the RF power density was based upon a calculation for determining compliance with the MPE requirements.

The power generated by each transmitter used in this was initially measured by a power and the powers were recorded . Through use of the Friis transmission formula and knowledge of the maximum antenna gain to be used, the power density level is calculated at a distance of 20 cm.

The antenna gains of each antenna to be used with the WLAN and RFID transmitters were used to calculate the MPE in all relevant bands of operation.

### Friis Transmission Formula

Friis transmission formula :  $P_d = (P_{out} * G) / (4\pi r^2)$

Where,

$P_d$ = Power Density (mW/cm<sup>2</sup>)       $\pi = 3.1416$

$P_{out}$ = out power to antenna(mW)       $r$ =distance between observation point and center of the radiator(cm)

### 3. Calculated MPE

The highest RF power measured in each band was used to determine the maximum theoretical antenna gain in that band. The power density limit for General Population/Uncontrolled Exposure at each frequency is determined based on the information in Table 1.

Table 2. Calculated MPE Data for RFID Reader

<b>Frequency</b>	927.2 MHz
<b>Limit</b>	0.618 mW/cm <sup>2</sup>
<b>Distance (cm), R</b>	20 cm
<b>Power (dBm), P</b>	15.94 dBm (39.26 mW)
<b>Tx Ant Gain(dBi), G</b>	-3
<b>Power Density (mW/cm<sup>2</sup>)</b>	0.004
<b>Minimum Distance</b>	1.6 cm

Table 3. Calculated MPE Data for WLAN 802.11 b

<b>Frequency</b>	2412 MHz
<b>Limit</b>	1 mW/cm <sup>2</sup>
<b>Distance (cm), R</b>	20 cm
<b>Power (dBm), P</b>	4.04 dBm (2.54 mW)
<b>Tx Ant Gain(dBi), G</b>	0
<b>Power Density (mW/cm<sup>2</sup>)</b>	0.0005
<b>Minimum Distance</b>	0.5 cm

Table 4. Calculated MPE Data for WLAN 802.11 c

<b>Frequency</b>	2472 MHz
<b>Limit</b>	1 mW/cm <sup>2</sup>
<b>Distance (cm), R</b>	20 cm
<b>Power (dBm), P</b>	-1.29 dBm (0.74)
<b>Tx Ant Gain(dBi), G</b>	0
<b>Power Density (mW/cm<sup>2</sup>)</b>	0.0002
<b>Minimum Distance</b>	0.24 cm

#### **4. Summary of Results**

Table 5. Maximum Permissible Summary Table

Frequency Band (MHz)	Maximum Antenna Gain (dBi)	MPE at 20 cm (mW/cm <sup>2</sup> )	MPE Limit 20 cm (mW/cm <sup>2</sup> )	Test Result
902 ~ 928	-3	0.004	0.618	<b>PASS</b>
2400 ~ 2483.5 (802.11b)	0	0.0005	1	<b>PASS</b>
2400 ~ 2483.5 (802.11g)	0	0.0002	1	<b>PASS</b>

#### **5. Conclusion**

Calculations show that Radio devices with described antennas complied with Maximum Permissible (MPE) limit for the General Population/Uncontrolled Exposure