# 1. MAXIMUM PERMISSIBLE EXPOSURE (MPE)

## 1.1 General Information

**Client Information**

| | |
|---|---|
| Applicant: | Sierra Monitor Corporation |
| Address of applicant: | 1991 Tarob Court, Milpitas CA 95035, UNITED STATES |
| Manufacturer: | Sierra Monitor Corporation |
| Address of manufacturer: | 1991 Tarob Court, Milpitas CA 95035, UNITED STATES |

**General Description of EUT:**

| | |
|---|---|
| Product Name: | M2M Gateway |
| Trade Name: | / |
| Model No.: | FPA-W44 |
| FCC ID: | 2AIVJ-FPAW44 |
| Rated Voltage: | AC24V/DC12-24V |

**Technical Characteristics of EUT:**

**Wi-Fi**

| | |
|---|---|
| Support Standards: | 802.11b, 802.11g, 802.11n-HT20/40 |
| Frequency Range: | 2412-2462MHz for 802.11b/g/n(HT20)<br>2422-2452MHz for 802.11n(HT40) |
| RF Output Power: | 14.12dBm (Conducted) |
| Type of Modulation: | CCK, OFDM, QPSK, BPSK, 16QAM, 64QAM |
| Data Rate: | 1-11Mbps, 6-54Mbps, up to 150Mbps |
| Quantity of Channels: | 11/7 |
| Channel Separation: | 5MHz |
| Type of Antenna: | External |
| Antenna Gain: | 3.0dBi |

**BT**

| | |
|---|---|
| Bluetooth Version: | V3.0 (BDR/EDR mode) |
| Frequency Range: | 2402-2480MHz |
| RF Output Power: | 6.473dBm (Conducted) |
| Data Rate: | 1Mbps, 2Mbps, 3Mbps |
| Modulation: | GFSK, Pi/4 QDPSK, 8DPSK |
| Quantity of Channels: | 79 |
| Channel Separation: | 1MHz |
| Type of Antenna: | External |
| Antenna Gain: | 3.0dBi |

## 1.2 Standard Applicable

According to § 1.1307(b)(1) and KDB 447498 D01 General RF Exposure Guidance v06, system operating under the provisions of this section shall be operating in a manner that the public is not exposed to radio frequency energy level in excess limit for maximum permissible exposure.

(a) Limits for Occupational / Controlled Exposure

| Frequency range (MHz) | Electric Field Strength (E) (V/m) | Magnetic Field Strength (H) (A/m) | Power Density (S) ($mW/cm^2$) | Averaging Times $\|E\|^2$, $\|H\|^2$ or S (minutes) |
|---|---|---|---|---|
| 0.3-3.0 | 614 | 1.63 | (100)* | 6 |
| 3.0-30 | 1842/f | 4.89/f | (900/f)* | 6 |
| 30-300 | 61.4 | 0.163 | 1.0 | 6 |
| 300-1500 | / | / | F/300 | 6 |
| 1500-100000 | / | / | 5 | 6 |

(b) Limits for General Population / Uncontrolled Exposure

| Frequency range (MHz) | Electric Field Strength (E) (V/m) | Magnetic Field Strength (H) (A/m) | Power Density (S) ($mW/cm^2$) | Averaging Times $\|E\|^2$, $\|H\|^2$ or S (minutes) |
|---|---|---|---|---|
| 0.3-1.34 | 614 | 1.63 | (100)* | 30 |
| 1.34-30 | 824/f | 2.19/f | (180/f)* | 30 |
| 30-300 | 27.5 | 0.073 | 0.2 | 30 |
| 300-1500 | / | / | F/1500 | 30 |
| 1500-100000 | / | / | 1 | 30 |

Note: f = frequency in MHz: * = Plane-wave equivalents power density

## 1.3 MPE Calculation Method

$S = (30*P*G) / (377*R^2)$

S = power density (in appropriate units, e.g., $mw/cm^2$)

P = power input to the antenna (in appropriate units, e.g., mw)

G = power gain of the antenna in the direction of interest relative to an isotropic radiator, the power gain factor is normally numeric gain.

R = distance to the center of radiation of the antenna (in appropriate units, e.g., cm)

## 1.4 MPE Calculation Result

Wi-Fi
Maximum Tune-Up output power: 15.0 (dBm)
Maximum peak output power at antenna input terminal: 31.62 (mW)
Prediction distance: >20(cm)
Prediction frequency: 2437 (MHz)
Antenna gain: 3 (dBi)
Directional gain (numeric gain): 2
The worst case is power density at prediction frequency at 20cm: 0.013(mW/$cm^2$)
MPE limit for general population exposure at prediction frequency: 1 (mW/$cm^2$)

BT
Maximum Tune-Up output power: 7.0 (dBm)
Maximum peak output power at antenna input terminal: 5.01 (mW)
Prediction distance: >20(cm)
Prediction frequency: 2480 (MHz)
Antenna gain: 3 (dBi)
Directional gain (numeric gain): 2
The worst case is power density at prediction frequency at 20cm: 0.002(mW/$cm^2$)
MPE limit for general population exposure at prediction frequency: 1 (mW/$cm^2$)

Wi-Fi and Bluetooth can’t transmit at the same time.

Result: Pass

## 1.5 Test Setup Photos