



---

## **MPE Calculations**

---

**FCC ID:R33D1**  
**IC ID: 7848A-D1**

|            |                            |          |
|------------|----------------------------|----------|
| <b>1.0</b> | <b>SCOPE</b>               | <b>3</b> |
| <b>2.0</b> | <b>REVISION LEVEL</b>      | <b>3</b> |
| <b>3.0</b> | <b>REFERENCE DOCUMENTS</b> | <b>3</b> |
| <b>4.0</b> | <b>CALCULATIONS</b>        | <b>4</b> |
| <b>5.0</b> | <b>CONCLUSION</b>          | <b>4</b> |

## **1.0 SCOPE:**

**This Report Demonstrates Evaluation and Compliance to the following standards:**

- 1. Code of Federal Regulations Title 47, Volume 1, Section 1.1310.**
- 2. Radio Frequency Exposure Compliance of Radiocommunication Apparatus (All Frequency Bands) - RSS-102 Issue 3**

## **2.0 REVISION LEVEL:**

| <b>DATE</b> | <b>COMMENTS</b>          | <b>REVISION</b> |
|-------------|--------------------------|-----------------|
| 10/10/08    | Created.                 | 1.0             |
| 08/16/10    | Added RSS-102 references | 2.0             |
|             |                          |                 |
|             |                          |                 |
|             |                          |                 |
|             |                          |                 |
|             |                          |                 |
|             |                          |                 |

## **3.0 REFERENCE DOCUMENTS:**

- (A) Limits for Maximum Permissible Exposure (MPE). Code of Federal Regulations Title 47, Volume 1, Section 1.1310.**
- (B) Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields. OET Bulletin 67 Edition 97-01.**
- (C) Radio Frequency Exposure Compliance of Radiocommunication Apparatus (All Frequency Bands) - RSS-102 Issue 3**

#### 4.0 CALCULATIONS:

The following worst case emissions can be calculated by two methods

**Method 1: Based on a PPT (Peak Power Total) measurement of the total power into the antenna and the worst case antenna gain.**

Effective/Equivalent Isotropic Radiated Power [EIRP] dBm = Total power into the antenna [dBm] + antenna gain [dBi]

To convert the values from dBm to mW

$$\text{mW} = 10^{\text{dBm}/10}$$

[Or use the link <http://www.aubraux.com/design/dbm-to-milli-watts-calculator.php>]

**Method 2: Based on the radiated field strength measurement at 3 meters [at a calibrated OATS site, maximizing the antenna polarity and height]**

To convert the values from dBμV/m to EIRP [mW] use the link

[http://www.compeng.com.au/emc\\_conversion\\_tables\\_power\\_calculator.aspx](http://www.compeng.com.au/emc_conversion_tables_power_calculator.aspx)

After obtaining the EIRP, the Power density is calculated and compared against the FCC and IC limits.

$S_{\text{FCC}}$  = Power density in **mW/cm<sup>2</sup>** for FCC

$$S_{\text{FCC}} = \text{EIRP}/4\pi \cdot R^2 \quad [4\pi \cdot R^2 = 5028 \text{ for } R=20 \text{ cm}]$$

EIRP = Equivalent isotropically radiated power (**mW**)

R = Distance to the center of radiation of the antenna (**20 cm**)

$S_{\text{IC}}$  = Power density in **W/m<sup>2</sup>** for IC

$$S_{\text{IC}} = \text{EIRP}/4\pi \cdot R^2 \quad [4\pi \cdot R^2 = 0.5028 \text{ for } R=0.2 \text{ m}]$$

EIRP = Equivalent isotropically radiated power in watts (**W**)

$$[1 \text{ mW} = 0.001 \text{ W}]$$

R = Distance to the center of radiation of the antenna (**0.2 m**)

$$[20 \text{ cm} = 0.2 \text{ m}]$$

| Radio    | dBuV@3m | EIRP mW | Sfcc    | Sic    |
|----------|---------|---------|---------|--------|
| 260      | 103     | 5.98    | .0012   | .012   |
| 357      | 102     | 4.75    | .00094  | .0094  |
| WiFi (B) | 89      | 0.24    | .000048 | .00048 |
| WiFi (G) | 93      | 0.60    | .00012  | .0012  |

#### 5.0 CONCLUSION:

1. Based upon the limits for Maximum Permissible Exposure (MPE) given in Table 1 of reference document (A) as 1mW/cm<sup>2</sup>, this device falls under the required limits.
2. Based upon the limits given in section 4.2 of the reference document (C) as 10W/m<sup>2</sup>, this device falls under the required limits.