

## 14 MAXIMUM PERMISSIBLE EXPOSURE (MPE)

### 14.1 Standard Applicable

According to §1.1307(b)(1), systems operating under the provisions of this section shall be operated in a manner that ensure that the public is not exposed to radio frequency energy level in excess of the Commission's guideline.

This is a Mobile device, the MPE is required.

According to §1.1310 and §2.1093 RF exposure is calculated.

Limits for Maximum Permissive Exposure (MPE)

| Frequency Range (MHz)                               | Electric Field Strength (V/m) | Magnetic Field Strength (A/m) | Power Density (mW/cm <sup>2</sup> ) | Averaging Time (minute) |
|---|-------------------------------|-------------------------------|-------------------------------------|-------------------------|
| 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 <sup>2</sup> )              | 30                      |
| 30-300  | 27.5                          | 0.073                         | 0.2                                 | 30                      |
| 300-1500  | /                             | /                             | F/1500                              | 30                      |
| 1500-15000  | /                             | /                             | 1.0                                 | 30                      |

F = frequency in MHz

\* = Plane-wave equipment power density

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## 14.2 Maximum Permissible Exposure (MPE) Evaluation (Worst Case)

| 802.11n_HT40M MIMO |             |           |                         |       |                               |                              |                    |        |
|--------------------|-------------|-----------|-------------------------|-------|-------------------------------|------------------------------|--------------------|--------|
| CH                 | Freq. (MHz) | Data Rate | Peak Output Power (dBm) |       | Total Peak Output Power (dBm) | Total Peak Output Power (mW) | Limit              | RESULT |
|                    |             |           | CH 0                    | CH 1  |                               |                              |                    |        |
| 3                  | 2422        | MCS8      | 18.76                   | 18.89 | 21.84                         | 152.61                       | 1 Watt = 28.48 dBm | PASS   |
| 6                  | 2437        | MCS8      | 18.86                   | 18.87 | 21.88                         | 154.00                       | 1 Watt = 28.48 dBm | PASS   |
| 9                  | 2452        | MCS8      | 18.49                   | 18.96 | 21.74                         | 149.34                       | 1 Watt = 28.48 dBm | PASS   |
| 802.11n_HT40M MIMO |             |           |                         |       |                               |                              |                    |        |
| CH                 | Freq. (MHz) | Data Rate | Avg. Output Power (dBm) |       | Avg. Output Power (dBm)       | Avg. Output Power (mW)       | Limit              | RESULT |
|                    |             |           | CH 0                    | CH 1  |                               |                              |                    |        |
| 3                  | 2422        | MCS8      | 9.57                    | 9.66  | 12.63                         | 18.30                        | 1 Watt = 28.48 dBm | PASS   |
| 6                  | 2437        | MCS8      | 9.78                    | 9.96  | 12.88                         | 19.41                        | 1 Watt = 28.48 dBm | PASS   |
| 9                  | 2452        | MCS8      | 9.43                    | 9.77  | 12.61                         | 18.25                        | 1 Watt = 28.48 dBm | PASS   |

### MPE Prediction (802.11 n\_HT40)

Prediction of MPE limit at a given distance

Equation from page 18 of OET Bulletin 65, Edition 97-01

$$S = PG / 4\pi R^2$$

Where: S = Power density

P = Power input to antenna

G = Power gain of the antenna in the direction of interest relative to an isotropic radiator

R = Distance to the center of radiation of the antenna

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|   |           |           |
|---|-----------|-----------|
| Max. output power including tune-up tolerancel:                       | 12.88     | (dBm)     |
| Max. output power including tune-up tolerancel:                       | 19.408859 | (mW)      |
| Duty cycle:   | 86.51     | (%)       |
| Maximum Pav :   | 16.790604 | (mW)      |
| Peak Antenna gain (Maximum):  | 7.52      | (dBi)     |
| Peak Antenna gain (linear):   | 5.6493697 | (numeric) |
| Prediction distance:  | 20        | (cm)      |
| Prediction frequency:   | 2437      | (MHz)     |
| MPE limit for uncontrolled exposure at prediction                     | 1         | (mW/cm2)  |
| Power density at predication frequency at 20 (cm)                     | 0.019     | (mW/cm2)  |
| <b>Measurement Result</b>   |           |           |
| The predicted power density level at 20 cm is 0.019 mW/cm2.           |           |           |
| This is below the uncontrolled exposure limit of 1 mW/cm2 at 2437MHz. |           |           |

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