

## 13. MAXIMUM PERMISSIBLE EXPOSURE (MPE)

### 13.1 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

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

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

Unless otherwise stated the results shown in this test report refer only to the sample(s) tested and such sample(s) are retained for 90 days only.

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## 13.2 Maximum Permissible Exposure (MPE) Evaluation

BLE mode:

| CH | Frequency (MHz) | Peak Power Output (dBm) | Required Limit  |
|----|-----------------|-------------------------|-----------------|
| 0  | 2402            | -6.03                   | 1 Watt = 30 dBm |
| 20 | 2442            | -6.17                   | 1 Watt = 30 dBm |
| 39 | 2480            | <b>-6.01</b>            | 1 Watt = 30 dBm |

BLE mode:

| CH | Frequency (MHz) | Avg. Output Power (dBm) | Required Limit  |
|----|-----------------|-------------------------|-----------------|
| 0  | 2402            | -6.72                   | 1 Watt = 30 dBm |
| 20 | 2442            | -7.84                   | 1 Watt = 30 dBm |
| 39 | 2480            | -7.69                   | 1 Watt = 30 dBm |

\*Note: Measured by power meter, cable loss as 0.7 dB that offsets on the power meter in Peak

\*Note: Measured by power meter, **as cable loss+ Duty cycle factor** that offsets on the power meter

### MPE Prediction (BLE 2402~2480)

Prediction of MPE limit at a given distance

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

|                                                   |              |                       |
|---------------------------------------------------|--------------|-----------------------|
| Max. output power including tune-up tolerance:    | <b>-6.72</b> | (dBm)                 |
| Max. output power including tune-up tolerance:    | 0.2128139    | (mW)                  |
| Duty cycle:                                       | <b>61.64</b> | (%)                   |
| Maximum Pav :                                     | 0.1311785    | (mW)                  |
| Peak Antenna gain (Maximum):                      | <b>-4.7</b>  | (dBi)                 |
| Peak Antenna gain (linear):                       | 0.3388442    | (numeric)             |
| Prediction distance:                              | 20           | (cm)                  |
| Prediction frequency:                             | <b>2402</b>  | (MHz)                 |
| MPE limit for uncontrolled exposure at prediction | 1            | (mW/cm <sup>2</sup> ) |
| Power density at predication frequency at 20 (cm) | 0.000        | (mW/cm <sup>2</sup> ) |

### Measurement Result

The predicted power density level at 20 cm is 0 mW/cm<sup>2</sup>.

This is below the uncontrolled exposure limit of 1 mW/cm<sup>2</sup> at 2402MHz.

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