

7. RADIO FREQUENCY EXPOSURE

7.1. Limit

According to §1.1310 and §2.1091 RF exposure is calculated.

Table: Limits for General Population/Uncontrolled Exposure

| Frequency Range (MHz) | Power Density (S) (mW/cm²) |
|----------------------------------|--|
| 0.3–1.34 | *(100) |
| 1.34–30 | *(180/f ²) |
| 30–300 | 0.2 |
| 300–1500 | f/1500 |
| 1500–100,000 | 1.0 |

F = frequency in MHz

* = Plane-wave equivalent power density

Maximum Permissible Exposure

The MPE was calculated at 20cm to show compliance with the power density limit.

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

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.

Note:

1. Manufacturer declared that the maximum antenna gain is 3.0dBi(Max.).
2. Manufacturer declared that the nearest distance between human and the EUT is 20cm.
3. Only record worst case data.

| Test Mode | Channel | Frequency (MHz) | Power (dBm, Peak) | Power Tune Up (dBm) |
|-----------------|---------|-----------------|-------------------|---------------------|
| BLE 4.1 | Low | 2402 | -1.583 | -1.0 ± 1.0 |
| | Middle | 2440 | -2.666 | -2.0 ± 1.0 |
| | High | 2480 | -2.276 | -2.0 ± 1.0 |
| 802.11b | Low | 2412 | 15.42 | 15.0 ± 1.0 |
| | Middle | 2437 | 15.26 | 15.0 ± 1.0 |
| | High | 2462 | 15.17 | 15.0 ± 1.0 |
| 802.11g | Low | 2412 | 15.03 | 15.0 ± 1.0 |
| | Middle | 2437 | 14.79 | 14.0 ± 1.0 |
| | High | 2462 | 14.64 | 14.0 ± 1.0 |
| 802.11n HT20 | Low | 2412 | 14.42 | 14.0 ± 1.0 |
| | Middle | 2437 | 14.25 | 14.0 ± 1.0 |
| | High | 2462 | 14.34 | 14.0 ± 1.0 |
| 802.11n HT40 | Low | 2422 | 14.36 | 14.0 ± 1.0 |
| | Middle | 2437 | 14.03 | 14.0 ± 1.0 |
| | High | 2452 | 14.26 | 14.0 ± 1.0 |

7.2 Test Results

| Test Mode | Channel | Max. Tune Up Power (dBm, Peak) | Max. Tune Up Power (mW) | MPE (mW/cm ²) | Limit (mW/cm ²) |
|--------------|---------|--------------------------------|-------------------------|---------------------------|-----------------------------|
| BLE 4.1 | Low | 0.0 | 1.00 | 0.0004 | 1.0 |
| | Middle | -1.0 | 0.79 | 0.0003 | 1.0 |
| | High | -1.0 | 0.79 | 0.0003 | 1.0 |
| 802.11b | Low | 16.0 | 39.81 | 0.0158 | 1.0 |
| | Middle | 16.0 | 39.81 | 0.0158 | 1.0 |
| | High | 16.0 | 39.81 | 0.0158 | 1.0 |
| 802.11g | Low | 16.0 | 39.81 | 0.0158 | 1.0 |
| | Middle | 15.0 | 39.81 | 0.0158 | 1.0 |
| | High | 15.0 | 39.81 | 0.0158 | 1.0 |
| 802.11n HT20 | Low | 15.0 | 31.62 | 0.0126 | 1.0 |
| | Middle | 15.0 | 31.62 | 0.0126 | 1.0 |
| | High | 15.0 | 31.62 | 0.0126 | 1.0 |
| 802.11n HT40 | Low | 15.0 | 31.62 | 0.0126 | 1.0 |
| | Middle | 15.0 | 31.62 | 0.0126 | 1.0 |
| | High | 15.0 | 31.62 | 0.0126 | 1.0 |

Simultaneous transmission MPE

| Mode | Channel | MPE (mW/cm ²) | Limit (mW/cm ²) |
|-----------------------------|---------|------------------------------|--------------------------------|
| BLE 4.1 +802.11b | Low | 0.0162 | 1.0 |
| | Middle | 0.0161 | 1.0 |
| | High | 0.0161 | 1.0 |
| BLE 4.1 +802.11g | Low | 0.0162 | 1.0 |
| | Middle | 0.0161 | 1.0 |
| | High | 0.0161 | 1.0 |
| BLE 4.1 +802.11n HT20 | Low | 0.0130 | 1.0 |
| | Middle | 0.0129 | 1.0 |
| | High | 0.0129 | 1.0 |
| BLE 4.1 +802.11n HT40 | Low | 0.0130 | 1.0 |
| | Middle | 0.0129 | 1.0 |
| | High | 0.0129 | 1.0 |

Antenna Gain (typical): 3.0dBi, 2.0(numeric)

Prediction distance: >=20cm

The power density level worst case at 20 cm is below the uncontrolled exposure limit.