

RF Exposure evaluation

FCC ID: M100-QVCX-2G16G

1. Reference

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

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

KDB447498 v05r02: Mobile and Portable Devices RF Exposure Procedures and Equipment Authorization Policies

2. Limit

Limits for Maximum Permissible Exposure (MPE)/Controlled Exposure

| Frequency Range(MHz) | Electric Field Strength(V/m) | Magnetic Field Strength(A/m) | Power Density (mW/cm ²) | Averaging Time (minute) |
|---|------------------------------|------------------------------|-------------------------------------|-------------------------|
| Limits for Occupational/Controlled Exposure | | | | |
| 0.3 – 3.0 | 614 | 1.63 | (100) * | 6 |
| 3.0 – 30 | 1842/f | 4.89/f | (900/f ²)* | 6 |
| 30 – 300 | 61.4 | 0.163 | 1.0 | 6 |
| 300 – 1500 | / | / | f/300 | 6 |
| 1500 – 100,000 | / | / | 5 | 6 |

Limits for Maximum Permissible Exposure (MPE)/Uncontrolled Exposure

| Frequency Range(MHz) | Electric Field Strength(V/m) | Magnetic Field Strength(A/m) | Power Density (mW/cm ²) | Averaging Time (minute) |
|---|------------------------------|------------------------------|-------------------------------------|-------------------------|
| Limits for Occupational/Controlled Exposure | | | | |
| 0.3 – 3.0 | 614 | 1.63 | (100) * | 30 |
| 3.0 – 30 | 824/f | 2.19/f | (180/f ²)* | 30 |
| 30 – 300 | 27.5 | 0.073 | 0.2 | 30 |
| 300 – 1500 | / | / | f/1500 | 30 |
| 1500 – 100,000 | / | / | 1.0 | 30 |

F=frequency in MHz

*=Plane-wave equivalent power density

Simultaneous transmission MPE test exclusion applies when the sum of the MPE ratios for all simultaneous transmitting antennas incorporated in a host device, based on the calculated/estimated, numerically modeled or measured field strengths or power density, is ≤ 1.0 .

3. MPE Calculation Method

Predication 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

4. Result

As declared by the Applicant, the EUT is a wireless device used in a fix application, at least 20 cm from any body part of the user or nearby persons; from the maximum EUT RF output power, the minimum separation distance, $r=20\text{cm}$, as well as the gain of the used antenna is 2dBi form WIFI/BT and 1dBi for GSM/WCDMA/CDMA/LTE, the RF power density can be obtained.

WIFI

| Band | Frequency (MHz) | Max. Output Power (dBm) | Output Power (mW) | Antenna Gain (Numeric) | Power Density At 20 cm (mW/cm ²) | Power Density Limit FCC (mW/cm ²) | Test Results |
|---------|-----------------|-------------------------|-------------------|------------------------|--|---|--------------|
| 802.11b | 2462 | 20.62 | 115.3453 | 1.5849 | 0.0364 | 1.0000 | PASS |

BT

| Band | Frequency (MHz) | Max. Output Power (dBm) | Output Power (mW) | Antenna Gain (Numeric) | Power Density At 20 cm (mW/cm ²) | Power Density Limit FCC (mW/cm ²) | Test Results |
|-------|-----------------|-------------------------|-------------------|------------------------|--|---|--------------|
| BT3.0 | 2441 | 3.307 | 2.1414 | 1.5849 | 0.0007 | 1.0000 | PASS |

GSM

| Band | Frequency (MHz) | Max. Output Power (dBm) | Output Power (mW) | Antenna Gain (Numeric) | Power Density At 20 cm (mW/cm ²) | Power Density Limit FCC (mW/cm ²) | Test Results |
|---------|-----------------|-------------------------|-------------------|------------------------|--|---|--------------|
| GSM850 | 836.60 | 33 | 1995.3 | 1.2589 | 0.4997 | 0.549 | PASS |
| PCS1900 | 1850.20 | 30 | 1000 | 1.2589 | 0.2505 | 1.0000 | PASS |

WCDMA

| Band | Frequency (MHz) | Max. Output Power (dBm) | Output Power (mW) | Antenna Gain (Numeric) | Power Density At 20 cm (mW/cm ²) | Power Density Limit FCC (mW/cm ²) | Test Results |
|---------|-----------------|-------------------------|-------------------|------------------------|--|---|--------------|
| Band II | 1880.00 | 23 | 199.5 | 1.2589 | 0.05 | 1.0000 | PASS |
| Band V | 836.60 | 23 | 199.5 | 1.2589 | 0.05 | 0.549 | PASS |

CDMA

| Band | Frequency (MHz) | Max. Output Power (dBm) | Output Power (mW) | Antenna Gain (Numeric) | Power Density At 20 cm (mW/cm ²) | Power Density Limit FCC (mW/cm ²) | Test Results |
|------|-----------------|-------------------------|-------------------|------------------------|--|---|--------------|
| BC0 | 824.7 | 24 | 251.2 | 1.2589 | 0.0629 | 0.549 | PASS |
| BC1 | 1851.25 | 24 | 251.2 | 1.2589 | 0.0629 | 1.0000 | PASS |

LTE

| Band | Frequency (MHz) | Max. Output Power (dBm) | Output Power (mW) | Antenna Gain (Numeric) | Power Density At 20 cm (mW/cm ²) | Power Density Limit FCC (mW/cm ²) | Test Results |
|---------|-----------------|-------------------------|-------------------|------------------------|--|---|--------------|
| Band 2 | 1902.5 | 24 | 251.2 | 1.2589 | 0.0629 | 1.0000 | PASS |
| Band 4 | 1720 | 24 | 251.2 | 1.2589 | 0.0629 | 1.0000 | PASS |
| Band 5 | 836.5 | 24 | 251.2 | 1.2589 | 0.0629 | 0.549 | PASS |
| Band 7 | 2567.5 | 24 | 251.2 | 1.2589 | 0.0629 | 1.0000 | PASS |
| Band 41 | 2593 | 24 | 251.2 | 1.2589 | 0.0629 | 1.0000 | PASS |

The respectively antenna used by WIFI/BT and GSM/WCDMA/CDMA/LTE, Simultaneous transmission can operate within WIFI and GSM/WCDMA/CDMA/LTE; BT and GSM/WCDMA/CDMA/LTE.

Simultaneous transmission MPE

Wi-Fi+GSM = $0.4997/0.549+0.0364/1=0.947<1$

5. Conclusion

RF exposure evaluation is exempted.