

RF EXPOSURE EVALUATION

According to FCC 1.1310: The criteria listed in the following table shall be used to evaluate the environment impact of human exposure to radio frequency(RF) Radiation as specified in KDB 447498 D01 V06 and §1.1307(b)

CFR Title 47 §2.1091(b): (b) For purposes of this section, a mobile device is defined as a transmitting device designed to be used in other than fixed locations and to generally be used in such a way that a separation distance of at least 20 centimeters is normally maintained between the transmitter's radiating structure(s) and the body of the user or nearby persons.

FCC ID: **WQ8-DC2333**

EUT Specification

| EUT | MaxiFlash VCMI2 |
|-----------------------------------|---|
| Frequency band (Operating) | <input checked="" type="checkbox"/> WLAN: 2.412GHz ~ 2.462GHz <input checked="" type="checkbox"/> WLAN: 5.18GHz ~ 5.24GHz <input checked="" type="checkbox"/> WLAN: 5.745GHz ~ 5.825GHz <input checked="" type="checkbox"/> Others: 2.402GHz~2.480GHz BDR&EDR <input type="checkbox"/> NFC: 13.56MHz <input type="checkbox"/> RFID: 125kHz |
| Device category | <input type="checkbox"/> Portable (<20cm separation) <input checked="" type="checkbox"/> Mobile (>20cm separation) <input type="checkbox"/> Others _____ |
| Exposure classification | <input type="checkbox"/> Occupational/Controlled exposure (S = 5mW/cm ²) <input checked="" type="checkbox"/> General Population/Uncontrolled exposure (S=1mW/cm ²) |
| Antenna diversity | <input type="checkbox"/> Single antenna <input checked="" type="checkbox"/> Multiple antennas <input type="checkbox"/> Tx diversity <input type="checkbox"/> Rx diversity <input type="checkbox"/> Tx/Rx diversity |
| Evaluation applied | <input checked="" type="checkbox"/> MPE Evaluation <input type="checkbox"/> SAR Evaluation |

Limits for Maximum Permissible Exposure(MPE)

TABLE 1 TO § 1.1310(e)(1)—LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE)

| Frequency range (MHz) | Electric field strength (V/m) | Magnetic field strength (A/m) | Power density (mW/cm ²) | Averaging time (minutes) |
|--|-------------------------------|-------------------------------|-------------------------------------|--------------------------|
| (i) 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 |
| 300-1,500 | | | f/300 | <6 |
| 1,500-100,000 | | | 5 | <6 |
| (ii) 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 ²) | <30 |
| 30-300 | 27.5 | 0.073 | 0.2 | <30 |
| 300-1,500 | | | f/1500 | <30 |
| 1,500-100,000 | | | 1.0 | <30 |

f = frequency in MHz. * = Plane-wave equivalent power density.

Note: Emissions between 100 kHz to 300 kHz should be assessed versus the limits at 300 kHz in Table 1 of Section 1.1310: 614 V/m and 1.63 A/m. AKDB inquiry is required to determine the applicable exposure limits below 100 kHz.

Friis transmission formula: $P_d = (P_{out} * G) / (4 * \pi * R^2)$

Where

Pd= Power density in mW/cm²

Pout=output power to antenna in Mw

G= gain of antenna in linear scale

Pi=3.1416

R= distance between observation point and center of the radiator in cm

Pd the limit of MPE, 1mW/cm². If we know the maximum gain of the antenna and total power input to the antenna, through the calculation, we will know the distance where the MPE limit is reached.

Measurement Result

BT worst case:

| Operating Mode | Channel Frequency | Measured Power | Tune up tolerance | Max. Tune up Power | Antenna Gain | Power density at 20cm | Power density Limits (mW/cm ²) |
|----------------|-------------------|----------------|-------------------|--------------------|--------------|------------------------|--|
| | (MHz) | (dBm) | (dBm) | (dBm) | (dBi) | (mW/ cm ²) | |
| GFSK | 2402 | 0.99 | 0.99±1 | 1.99 | 1.70 | 0.0005 | 1 |

2.4GHz WiFi worst case:

| Operating Mode | Channel Frequency | Measured Power | Tune up tolerance | Max. Tune up Power | Antenna Gain | Power density at 20cm | Power density Limits (mW/cm ²) |
|----------------|-------------------|----------------|-------------------|--------------------|--------------|------------------------|--|
| | (MHz) | (dBm) | (dBm) | (dBm) | (dBi) | (mW/ cm ²) | |
| 802.11b | 2462 | 14.57 | 14.57±1 | 15.57 | 3.3 | 0.0153 | 1 |

5.1GHz WiFi worst case:

| Operating Mode | Channel Frequency | Measured Power | Tune up tolerance | Max. Tune up Power | Antenna Gain | Power density at 20cm | Power density Limits (mW/cm ²) |
|----------------|-------------------|----------------|-------------------|--------------------|--------------|------------------------|--|
| | (MHz) | (dBm) | (dBm) | (dBm) | (dBi) | (mW/ cm ²) | |
| 802.11a | 5180 | 14.55 | 14.55±1 | 15.55 | 1.60 | 0.0103 | 1 |

5.8GHz WiFi worst case:

| Operating Mode | Channel Frequency | Measured Power | Tune up tolerance | Max. Tune up Power | Antenna Gain | Power density at 20cm | Power density Limits (mW/cm ²) |
|----------------|-------------------|----------------|-------------------|--------------------|--------------|------------------------|--|
| | (MHz) | (dBm) | (dBm) | (dBm) | (dBi) | (mW/ cm ²) | |
| 802.11a | 5825 | 12.59 | 12.59±1 | 13.59 | 2.10 | 0.0074 | 1 |

Evaluate the condition of different modules work simultaneously

The requirement of Simultaneous Transmission evaluation has also been considered and has complied with the following conditions of the worst case:

$$MPE1/Limit1 + MPE2/Limit2 + \dots \leq 1$$

Thus,

1. 2.4G WiFi and 5 WiFi cannot support simultaneous transmission.
2. The BLE and 2.4G WiFi can support simultaneous transmission:

$$0.0005/1 + 0.0153/1 = 0.0005 + 0.0153 = 0.0158$$
3. The BLE and 5G WiFi can support simultaneous transmission:

$$0.0005/1 + 0.0103/1 = 0.0005 + 0.0103 = 0.0108$$

It is concluded that no Simultaneous Transmission evaluation is required.

Test Result: Pass