

## RF Exposure Evaluation

### Limits

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)

#### Limits for Maximum Permissible Exposure (MPE)

| Frequency range (MHz)                                   | Electric field strength (V/m) | Magnetic field strength (A/m) | Power density (mW/cm <sup>2</sup> ) | Averaging time (minutes) |
|---|-------------------------------|-------------------------------|-------------------------------------|--------------------------|
| (A) Limits for Occupational/Controlled Exposures        |                               |                               |                                     |                          |
| 0.3–3.0   | 614                           | 1.63                          | *(100)                              | 6                        |
| 3.0–30  | 1842/f                        | 4.89/f                        | *(900/f <sup>2</sup> )              | 6                        |
| 30–300  | 61.4                          | 0.163                         | 1.0                                 | 6                        |
| 300–1500  |                               |                               | f/300                               | 6                        |
| 1500–100,000  |                               |                               | 5                                   | 6                        |
| (B) 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                       |
| 1500–100,000  |                               |                               | 1.0                                 | 30                       |

f = frequency in MHz

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

Where

**Pd** = power density in mW/cm<sup>2</sup>, **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 is the limit of MPE, 1 mW/cm<sup>2</sup>. If we know the maximum gain of the antenna and the total power input to the antenna, through the calculation, we will know the distance r where the MPE limit is reached.

### Test Procedure

Software provided by client enabled the EUT to transmit and receive data at lowest, middle and highest channel individually.

$$EIRP = E_{Meas} + 20 \log(d_{Meas}) - 104.7$$

EIRP is the equivalent isotropically radiated power, in dBm

E<sub>Meas</sub> is the field strength of the emission at the measurement distance, in dB<sub>μ</sub> V/m

d<sub>Meas</sub> is the measurement distance, in m

---

## Test Result of RF Exposure Evaluation

wifi 2.4G mode

| Channel      | Output power to antenna (dBm) | Output power to antenna (mW) | Power Density at R=20cm (mW/cm <sup>2</sup> ) | Limit (mW/cm <sup>2</sup> ) | Result |
|--------------|-------------------------------|------------------------------|---|-----------------------------|--------|
| 802.11b      | 13.226                        | 21.0184                      | 0.00672                                       | 1.0                         | PASS   |
| 802.11g      | 13.312                        | 21.4388                      | 0.00685                                       | 1.0                         | PASS   |
| 802.11n HT20 | 13.056                        | 20.2116                      | 0.00646                                       | 1.0                         | PASS   |

Remark: antenna gain=2.06dBi

wifi 5G mode:

| Band   | Channel       | Output power to antenna (dBm) | Output power to antenna (mW) | Power Density at R=20cm (mW/cm <sup>2</sup> ) | Limit (mW/cm <sup>2</sup> ) | Result |
|--------|---------------|-------------------------------|------------------------------|---|-----------------------------|--------|
| Band 4 | 802.11a       | 9.733                         | 9.4037                       | 0.00276                                       | 1.0                         | PASS   |
|        | 802.11ac HT20 | 9.044                         | 8.0242                       | 0.00236                                       | 1.0                         | PASS   |
|        | 802.11ac HT40 | 8.678                         | 7.3756                       | 0.00217                                       | 1.0                         | PASS   |
|        | 802.11n HT20  | 9.364                         | 8.6377                       | 0.00254                                       | 1.0                         | PASS   |
|        | 802.11n HT40  | 9.256                         | 8.4256                       | 0.00247                                       | 1.0                         | PASS   |

Remark: antenna gain=1.69dBi

For BT

| Field strength (dBuV/m) | EIRP (dBm) | Max tune-up (mW) | Power Density at R=20cm (mW/cm <sup>2</sup> ) | Limit (mW/cm <sup>2</sup> ) | Result |
|-------------------------|------------|------------------|---|-----------------------------|--------|
| 85.92                   | -9.24      | 0.1191           | 0.00003                                       | 1.0                         | PASS   |

Remark: antenna gain=1.58dBi

For Simultaneous transmitting, 1): The sum of the ratios of the spatially averaged results to the applicable frequency dependent MPE limits = $0.00685/1 + 0.00276/1 + 0.0094/1 = 0.00003 < 1$  Since the sum of the MPE ratios for all simultaneously transmitting antennas incorporated in the device is  $\leq 1.0$ , the EUT is considered to satisfy MPE compliance for simultaneous transmission operations.