## RF Exposure Evaluation

### Limits

According to 447498 D01 General RF Exposure Guidance v06

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 1.1307(b)

Limits for Maximum Permissible Exposure (MPE)

| Frequency range (MHz) | Electric field strength (V/m) | Magnetic field strength (A/m) | Power density ($mW/cm^2$) | 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 | *($900/f^2$) | 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 | *($180/f^2$) | 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

Friis transmission formula: **$Pd = (Pout*G)/(4*pi*r^2)$**

Where

**Pd** = power density in $mW/cm^2$, **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 id the limit of MPE, 1 $mW/cm^2$. 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.

**Test Result of RF Exposure Evaluation**

The source of the evaluation data results is based on the test report ET-23121517E01/02/03

ANT1:2.70dBi ANT2: 2.4G(3.56dBi),5G(3.01dBi) ANT3:3.21dBi ANT4:4.88dBi

**FOR BLE**

| Mode | Output power (dBm) | Output power (mW) | Numeric antenna gain | Power Density at R=20cm (mW/cm$^2$) | Limit (mW/cm$^2$) | Result |
|---|---|---|---|---|---|---|
| GFSK | -0.02 | 0.995 | 1.86 | 0.0004 | 1.0 | PASS |

**FOR 2.4GWIFI with WB800D.3 (ANT2)**

| Mode | Output power (dBm) | Output power (mW) | Numeric antenna gain | Power Density at R=20cm (mW/cm$^2$) | Limit (mW/cm$^2$) | Result |
|---|---|---|---|---|---|---|
| 802.11g | 12.62 | 18.28 | 2.27 | 0.0083 | 1.0 | PASS |

**FOR 5.2GWIFI with WB800D.3 (ANT2)**

| Mode | Output power (dBm) | Output power (mW) | Numeric antenna gain | Power Density at R=20cm (mW/cm$^2$) | Limit (mW/cm$^2$) | Result |
|---|---|---|---|---|---|---|
| 802.11a | 12.92 | 19.59 | 2.00 | 0.0078 | 1.0 | PASS |

**FOR 5.8GWIFI with WB800D.3 (ANT2)**

| Mode | Output power (dBm) | Output power (mW) | Numeric antenna gain | Power Density at R=20cm (mW/cm$^2$) | Limit (mW/cm$^2$) | Result |
|---|---|---|---|---|---|---|
| 802.11a | 10.19 | 10.45 | 2.00 | 0.00542 | 1.0 | PASS |

**FOR 2.4GWIFI with WB663U.1（ANT3）**

| Mode | Output power (dBm) | Output power (mW) | Numeric antenna gain | Power Density at R=20cm (mW/cm$^2$) | Limit (mW/cm$^2$) | Result |
|---|---|---|---|---|---|---|
| 802.11b | 12.28 | 16.90 | 2.09 | 0.0070 | 1.0 | PASS |

**FOR 5GWIFI with WB663U.1 (ANT4)**

| Mode | Output power (dBm) | Output power (mW) | Numeric antenna gain | Power Density at R=20cm (mW/cm$^2$) | Limit (mW/cm$^2$) | Result |
|---|---|---|---|---|---|---|
| 802.11ac20 | 9.61 | 9.14 | 3.08 | 0.0056 | 1.0 | PASS |

**FOR 5.8GWIFI with WB663U.1 (ANT4)**

| Mode | Output power (dBm) | Output power (mW) | Numeric antenna gain | Power Density at R=20cm (mW/cm$^2$) | Limit (mW/cm$^2$) | Result |
|---|---|---|---|---|---|---|
| 802.11n20 | 9.94 | 9.86 | 3.08 | 0.0060 | 1.0 | PASS |

If (WB800D. 3) and 2.4G (WB663U. 1) work simultaneously

The maximum power density combination are ANT1+ANT2(2.4G)+ANT3+ANT4(5.8G)

=0.0004/1+0.0083/1+0.0070/1+0.0060/1=0.0217<1

Then SAR evaluation is not require .