

# FCC ID:2BR65-G27F

## RF Exposure Evaluation

According to KDB 447498 D01 General RF Exposure Guidance v06 and part 2.1091, Unless specifically required by the published RF exposure KDB procedures, standalone 1-g head or body and 10-g extremity SAR evaluation for general population exposure conditions, by measurement or numerical simulation, is not required when the corresponding SAR Test Exclusion Threshold condition(s), listed below, is (are) satisfied.

## 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 1.1307(b)

Limits for Maximum Permissible Exposure (MPE)

| Frequency range<br>(MHz)                                | Electric field<br>strength<br>(V/m) | Magnetic field strength<br>(A/m) | Power density<br>(mW/cm <sup>2</sup> ) | Averaging time<br>(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:  $Pd = (Pout \cdot G) / (4 \cdot \pi \cdot r^2)$

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.

### Test Result of RF Exposure Evaluation

|     | Modulation | Frequency<br>MHz | Output<br>power<br>to<br>antenna<br>(dBm) | Target<br>power<br>W/tolerance<br>(dBm) | Max<br>Output<br>power to<br>antenna<br>(dBm) | Max<br>Output<br>power to<br>antenna<br>(mW) | Power<br>Density at<br>R=20cm<br>(mW/cm <sup>2</sup> ) | Limit<br>(mW/cm <sup>2</sup> ) | Result |
|-----|------------|------------------|-------------------------------------------|-----------------------------------------|-----------------------------------------------|----------------------------------------------|--------------------------------------------------------|--------------------------------|--------|
| BLE | GFSK       | 2402             | 5.03                                      | 5 ± 1                                   | 6                                             | 3.981                                        | 0.001249                                               | 1.0                            | PASS   |
|     |            | 2440             | 4.16                                      | 4 ± 1                                   | 5                                             | 3.162                                        | 0.000992                                               | 1.0                            | PASS   |
|     |            | 2480             | 3.66                                      | 4 ± 1                                   | 5                                             | 3.162                                        | 0.000992                                               | 1.0                            | PASS   |

|           | Modulation        | Frequency<br>MHz | Output<br>power<br>to<br>antenna<br>(dBm) | Target<br>power<br>W/tolerance<br>(dBm) | Max<br>Output<br>power to<br>antenna<br>(dBm) | Max Output<br>power to<br>antenna<br>(mW) | Power<br>Density at<br>R=20cm<br>(mW/cm <sup>2</sup> ) | Limit<br>(mW/cm <sup>2</sup> ) | Result |
|-----------|-------------------|------------------|-------------------------------------------|-----------------------------------------|-----------------------------------------------|-------------------------------------------|--------------------------------------------------------|--------------------------------|--------|
| WIFI 2.4G | 802.11b           | 2412             | 16.68                                     | 17 ± 1                                  | 18                                            | 63.096                                    | 0.019803                                               | 1.0                            | PASS   |
|           |                   | 2437             | 17.44                                     | 17 ± 1                                  | 18                                            | 63.096                                    | 0.019803                                               | 1.0                            | PASS   |
|           |                   | 2462             | 17.65                                     | 17 ± 1                                  | 18                                            | 63.096                                    | 0.019803                                               | 1.0                            | PASS   |
|           | 802.11g           | 2412             | 19.49                                     | 19 ± 1                                  | 20                                            | 100.000                                   | 0.031386                                               | 1.0                            | PASS   |
|           |                   | 2437             | 20.39                                     | 20 ± 1                                  | 21                                            | 125.893                                   | 0.039512                                               | 1.0                            | PASS   |
|           |                   | 2462             | 20.72                                     | 20 ± 1                                  | 21                                            | 125.893                                   | 0.039512                                               | 1.0                            | PASS   |
|           | 802.11n<br>(HT20) | 2412             | 19.75                                     | 20 ± 1                                  | 21                                            | 125.893                                   | 0.039512                                               | 1.0                            | PASS   |
|           |                   | 2437             | 20.62                                     | 20 ± 1                                  | 21                                            | 125.893                                   | 0.039512                                               | 1.0                            | PASS   |
|           |                   | 2462             | 20.87                                     | 21 ± 1                                  | 22                                            | 158.489                                   | 0.049743                                               | 1.0                            | PASS   |
|           | 802.11n<br>(HT40) | 2422             | 20.81                                     | 21 ± 1                                  | 22                                            | 158.489                                   | 0.049743                                               | 1.0                            | PASS   |
|           |                   | 2437             | 20.68                                     | 20 ± 1                                  | 21                                            | 125.893                                   | 0.039512                                               | 1.0                            | PASS   |
|           |                   | 2452             | 20.41                                     | 20 ± 1                                  | 21                                            | 125.893                                   | 0.039512                                               | 1.0                            | PASS   |

|           | Modulation   | Frequency<br>MHz | Output<br>power<br>to<br>antenna<br>(dBm) | Target<br>power<br>W/tolerance<br>(dBm) | Max<br>Output<br>power<br>to<br>antenna<br>(dBm) | Max<br>Output<br>power<br>to<br>antenna<br>(mW) | Power<br>Density at<br>R=20cm<br>(mW/cm2) | Limit<br>(mW/cm2) | Result |
|-----------|--------------|------------------|-------------------------------------------|-----------------------------------------|--------------------------------------------------|-------------------------------------------------|-------------------------------------------|-------------------|--------|
| Wifi 5.2g | 802.11a      | 5180             | 9.91                                      | $10 \pm 1$                              | 11                                               | 12.589                                          | 0.004707                                  | 1.0               | PASS   |
|           |              | 5200             | 9.92                                      | $10 \pm 1$                              | 11                                               | 12.589                                          | 0.004707                                  | 1.0               | PASS   |
|           |              | 5240             | 9.99                                      | $10 \pm 1$                              | 11                                               | 12.589                                          | 0.004707                                  | 1.0               | PASS   |
|           | 802.11n(20)  | 5180             | 10.60                                     | $10 \pm 1$                              | 11                                               | 12.589                                          | 0.004707                                  | 1.0               | PASS   |
|           |              | 5200             | 10.58                                     | $10 \pm 1$                              | 11                                               | 12.589                                          | 0.004707                                  | 1.0               | PASS   |
|           |              | 5240             | 10.42                                     | $10 \pm 1$                              | 11                                               | 12.589                                          | 0.004707                                  | 1.0               | PASS   |
|           | 802.11ac(20) | 5180             | 10.17                                     | $10 \pm 1$                              | 11                                               | 12.589                                          | 0.004707                                  | 1.0               | PASS   |
|           |              | 5200             | 10.54                                     | $10 \pm 1$                              | 11                                               | 12.589                                          | 0.004707                                  | 1.0               | PASS   |
|           |              | 5240             | 10.68                                     | $10 \pm 1$                              | 11                                               | 12.589                                          | 0.004707                                  | 1.0               | PASS   |
|           | 802.11n(40)  | 5190             | 10.44                                     | $10 \pm 1$                              | 11                                               | 12.589                                          | 0.004707                                  | 1.0               | PASS   |
|           |              | 5230             | 9.83                                      | $10 \pm 1$                              | 11                                               | 12.589                                          | 0.004707                                  | 1.0               | PASS   |
|           | 802.11ac(40) | 5190             | 9.90                                      | $10 \pm 1$                              | 11                                               | 12.589                                          | 0.004707                                  | 1.0               | PASS   |
|           |              | 5230             | 10.72                                     | $10 \pm 1$                              | 11                                               | 12.589                                          | 0.004707                                  | 1.0               | PASS   |
|           | 802.11ac(80) | 5210             | 9.87                                      | $10 \pm 1$                              | 11                                               | 12.589                                          | 0.004707                                  | 1.0               | PASS   |
| Wifi 5.8g | 802.11a      | 5745             | 4.58                                      | $5 \pm 1$                               | 6                                                | 3.981                                           | 0.001435                                  | 1.0               | PASS   |
|           |              | 5785             | 4.75                                      | $5 \pm 1$                               | 6                                                | 3.981                                           | 0.001435                                  | 1.0               | PASS   |
|           |              | 5825             | 5.76                                      | $5 \pm 1$                               | 6                                                | 3.981                                           | 0.001435                                  | 1.0               | PASS   |
|           | 802.11n(20)  | 5745             | 5.59                                      | $5 \pm 1$                               | 6                                                | 3.981                                           | 0.001435                                  | 1.0               | PASS   |
|           |              | 5785             | 5.77                                      | $5 \pm 1$                               | 6                                                | 3.981                                           | 0.001435                                  | 1.0               | PASS   |
|           |              | 5825             | 6.23                                      | $6 \pm 1$                               | 7                                                | 5.012                                           | 0.001806                                  | 1.0               | PASS   |
|           | 802.11ac(20) | 5745             | 5.53                                      | $6 \pm 1$                               | 7                                                | 5.012                                           | 0.001806                                  | 1.0               | PASS   |
|           |              | 5785             | 5.78                                      | $6 \pm 1$                               | 7                                                | 5.012                                           | 0.001806                                  | 1.0               | PASS   |
|           |              | 5825             | 6.10                                      | $6 \pm 1$                               | 7                                                | 5.012                                           | 0.001806                                  | 1.0               | PASS   |
|           | 802.11n(40)  | 5755             | 5.41                                      | $5 \pm 1$                               | 6                                                | 3.981                                           | 0.001435                                  | 1.0               | PASS   |
|           |              | 5795             | 5.06                                      | $5 \pm 1$                               | 6                                                | 3.981                                           | 0.001435                                  | 1.0               | PASS   |
|           | 802.11ac(40) | 5755             | 5.54                                      | $5 \pm 1$                               | 6                                                | 3.981                                           | 0.001435                                  | 1.0               | PASS   |
|           |              | 5795             | 4.93                                      | $5 \pm 1$                               | 6                                                | 3.981                                           | 0.001435                                  | 1.0               | PASS   |
|           | 802.11ac(80) | 5755             | 6.15                                      | $6 \pm 1$                               | 7                                                | 5.012                                           | 0.001806                                  | 1.0               | PASS   |

Remark: 1. BT Antenna & wifi 2.4g Antenna gain is 1.98dBi,  
wifi 5.2g Antenna gain is 2.74 dBi, wifi 5.8g Antenna gain is 2.58dBi

2. Wifi 2.4g, wifi 5.2g and wifi 5.8g do not transmit at the same time  
BT and wifi can transmit at the same time

3. In the case of simultaneous launches for wifi and BT:  
The Max Calc. Thresholds : BT: 0.001249, Wifi: 0.049743

BT and Wifi:  $0.001249 + 0.049743 = 0.050992 \leq 1$

So a SAR test is not required