

## MAXIMUM PERMISSIBLE EXPOSURE (MPE)

### Related Submittal(s) / Grant (s)

This submittal(s) (test report) is intended to comply with § 2.1091 Radiofrequency radiation exposure evaluation: mobile devices of the FCC CFR 47 Rules, CFR 1.1310 (b) Radio frequency Radiation Exposure Requirement.

### Special Accessories

Not available for this EUT intended for grant

### Equipment Modifications

Not available for this EUT intended for grant.

### Limitation

| Frequency Range<br>(MHz)                            | Electric Field<br>Strength (V/m) | Magnetic Field<br>Strength (A/m) | Power Density<br>(mW/cm <sup>2</sup> ) | Averaging Time<br>(minute) |
|---|----------------------------------|----------------------------------|--|----------------------------|
| 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                         |
| 1500-15000  | /                                | /                                | 1.0                                    | 30                         |

f = frequency in MHz

\* = Plane-wave equipment power density

## Maximum Permissible Exposure (MPE) Evaluation

Prediction of MPE limit at a given distance

$$S = PG / 4\pi R^2$$

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

Unless otherwise stated the results shown in this test report refer only to the sample(s) tested and such sample(s) are retained for 90 days only.

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## Collocated MPE Analysis

The device may transmit simultaneously with other collocated radio transmitters within a host device, provided the following conditions are met:

- Each collocated radio transmitter has been certified by FCC for mobile application (that will be met since module will have its own FCC ID and host device will have its own FCC ID)
- At least 20 cm separation distance between the antennas of the collocated transmitters and the user's body must be maintained at all times (host installation should taking care of that)

The output power and antenna gain in a collocated configuration must not exceed the limits and configurations stipulated in the following table 1. The power density calculations for the individual transmitters per wireless technology at an exposure minimum separation distance of 20cm.

### Exclusion of test condition:

*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 calculated or measured field strengths or power density, is  $\leq 1.0$ .*

$$\Sigma MPE\ ratio1 + MPE\ ratio2 + MPE\ ratio3 \leq 1.0$$

The spreadsheet as FCC deduces, and releases is employed to conduct the measurement:

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## RF Exposure Evaluation

### 1. Power Density Calculation

| Operation Mode         | Evaluation Frequency (MHz) | Operation Distance (cm) | Max. output Power (dBm) | Antenna Gain (dBi) | Max. output Power EIRP (mW) | Power Density (mW/cm <sup>2</sup> ) | Limit (mW/cm <sup>2</sup> ) | Pass / Fail |
|------------------------|----------------------------|-------------------------|-------------------------|--------------------|-----------------------------|-------------------------------------|-----------------------------|-------------|
| BT (807 Module)        | 2480.00                    | 20                      | 3.24                    | 0.5                | 2.37                        | 0.000                               | 1.000                       | Pass        |
| WLAN 2.4G (807 Module) | 2462.00                    | 20                      | 21.87                   | 3.76               | 365.59                      | 0.031                               | 1.000                       | Pass        |
| WLAN 5G (807 Module)   | 5785.00                    | 20                      | 18.4                    | 3.499              | 154.85                      | 0.014                               | 1.000                       | Pass        |
| WLAN 2.4G (811 Module) | 2462.00                    | 20                      | 24.09                   | 2.09               | 414.95                      | 0.051                               | 1.000                       | Pass        |
| WLAN 5G (811 Module)   | 5745.00                    | 20                      | 19.9                    | 3.01               | 195.43                      | 0.019                               | 1.000                       | Pass        |

**Note:** For conservativeness, the lowest uplink frequency of each band is used to determine the MPE limit of that band.

### 2. Collocated Power Density Calculation

| Operation Mode         | Power Density (mW/cm <sup>2</sup> ) | Limit (mW/cm <sup>2</sup> ) | Power Density / Limit | Σ(E- Field Strength / Limit) |
|------------------------|-------------------------------------|-----------------------------|-----------------------|------------------------------|
| BT (807 Module)        | 0.000                               | 1.00                        | 0.000                 | 0.1150                       |
| WLAN 2.4G (807 Module) | 0.031                               | 1.00                        | 0.031                 |                              |
| WLAN 5G (807 Module)   | 0.014                               | 1.00                        | 0.014                 |                              |
| WLAN 2.4G (811 Module) | 0.051                               | 1.00                        | 0.051                 |                              |
| WLAN 5G (811 Module)   | 0.019                               | 1.00                        | 0.019                 |                              |

**Note:**

1. Σ(E- Field Strength / Limit): This is a summation of [(E- Field Strength for each transmitter/antenna included in the simultaneous transmission)/ (corresponding MPE limit)], for WLAN + Bluetooth.

Considering the WLAN and Bluetooth transmitter, the aggregated (E- Field Strength /limit) is smaller than 1, and MPE of 5 collocated transmitters is compliant

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