

RF EXPOSURE EVALUATION

EUT Specification

| | |
|-----------------------------------|---|
| EUT | WIFI+BT combo Module |
| Frequency band (Operating) | <input checked="" type="checkbox"/> WLAN: 2.412GHz ~ 2.462GHz <input type="checkbox"/> WLAN: 5.18GHz ~ 5.32GHz / 5.50GHz ~ 5.70GHz <input type="checkbox"/> WLAN: 5.745GHz ~ 5.825GHz <input checked="" type="checkbox"/> Others(Bluetooth: 2.402GHz ~ 2.480GHz) |
| Device category | <input type="checkbox"/> Portable (<20cm separation) <input checked="" type="checkbox"/> Mobile (>20cm separation) <input type="checkbox"/> Others ____ |
| Antenna diversity | <input checked="" type="checkbox"/> Single antenna <input type="checkbox"/> Multiple antennas <input type="checkbox"/> Tx diversity <input type="checkbox"/> Rx diversity <input type="checkbox"/> Tx/Rx diversity |
| Max. output power | 12.32dBm(17.06mW) |
| Antenna gain | 4.9dBi |
| Evaluation applied | <input checked="" type="checkbox"/> MPE Evaluation <input type="checkbox"/> SAR Evaluation |

Limits for Maximum Permissible Exposure (MPE)

| Frequency Range(MHz) | Electric Field Strength(V/m) | Magnetic Field Strength(A/m) | Power Density(mW/cm ²) | Average Time |
|--|------------------------------|------------------------------|------------------------------------|--------------|
| (A) Limits for Occupational/Control Exposures | | | | |
| 300-1500 | -- | -- | F/300 | 6 |
| 1500-100000 | -- | -- | 5 | 6 |
| (B) Limits for General Population/Uncontrol Exposures | | | | |
| 300-1500 | -- | -- | F/1500 | 6 |
| 1500-100000 | -- | -- | 1 | 30 |

Friis transmission formula: $Pd=(Pout \cdot G) / (4 \cdot \pi \cdot R^2)$

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 the limit of MPE, $1mW/cm^2$. 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

| Channel | Channel Frequency (MHz) | Max Output power (dBm) | Tolerance | Max Tune-UP power (mW) | Power density at 20cm (mW/cm^2) | Power density Limits (mW/cm^2) |
|---------------------------------|-------------------------|------------------------|-----------|------------------------|-------------------------------------|------------------------------------|
| Test Mode: 802.11b | | | | | | |
| Low | 2412 | 11.42 | ± 0.5 | 15.56 | 0.009565 | 1 |
| Middle | 2437 | 11.89 | ± 0.5 | 17.34 | 0.010659 | 1 |
| High | 2462 | 12.02 | ± 0.5 | 17.86 | 0.010979 | 1 |
| Test Mode: 802.11g | | | | | | |
| Low | 2412 | 11.88 | ± 0.5 | 17.30 | 0.010635 | 1 |
| Middle | 2437 | 12.32 | ± 0.5 | 19.14 | 0.011766 | 1 |
| High | 2462 | 12.27 | ± 0.5 | 18.92 | 0.011631 | 1 |
| Test Mode: 802.11n(HT20) | | | | | | |
| Low | 2412 | 11.66 | ± 0.5 | 16.44 | 0.010106 | 1 |
| Middle | 2437 | 12.11 | ± 0.5 | 18.24 | 0.011213 | 1 |
| High | 2462 | 12.21 | ± 0.5 | 18.66 | 0.011471 | 1 |
| Test Mode: 802.11n(HT40) | | | | | | |
| Low | 2422 | 10.00 | ± 0.5 | 11.22 | 0.006897 | 1 |
| Middle | 2437 | 10.10 | ± 0.5 | 11.48 | 0.007057 | 1 |
| High | 2452 | 10.49 | ± 0.5 | 12.56 | 0.007721 | 1 |

| Channel | Channel Frequency (MHz) | Max Output power (dBm) | Tolerance | Max Tune-UP power (mW) | Power density at 20cm (mW/cm ²) | Power density Limits (mW/cm ²) |
|-----------------------------|-------------------------|------------------------|-----------|------------------------|---|--|
| Test Mode: BLE | | | | | | |
| Low | 2402 | 1.50 | ±0.5 | 1.58 | 0.000971 | 1 |
| Middle | 2440 | 1.42 | ±0.5 | 1.56 | 0.000959 | 1 |
| High | 2480 | -1.30 | ±0.5 | 0.83 | 0.000510 | 1 |
| Test Mode: GFSK | | | | | | |
| Low | 2402 | 0.23 | ±0.5 | 1.18 | 0.000725 | 1 |
| Middle | 2441 | 0.13 | ±0.5 | 1.16 | 0.000713 | 1 |
| High | 2480 | -2.58 | ±0.5 | 0.62 | 0.000381 | 1 |
| Test Mode: π4/-DQPSK | | | | | | |
| Low | 2402 | 1.14 | ±0.5 | 1.46 | 0.000898 | 1 |
| Middle | 2441 | 1.10 | ±0.5 | 1.45 | 0.000891 | 1 |
| High | 2480 | -1.35 | ±0.5 | 0.82 | 0.000504 | 1 |
| Test Mode: 8DPSK | | | | | | |
| Low | 2402 | 1.57 | ±0.5 | 1.61 | 0.000990 | 1 |
| Middle | 2441 | 1.48 | ±0.5 | 1.58 | 0.000971 | 1 |
| High | 2480 | -1.12 | ±0.5 | 0.87 | 0.000535 | 1 |

Note: For the device consider simultaneous transmission of 2.4G WIFI and BT, the worst MPE evaluation = $0.011766 + 0.000990 = 0.012756 < 1.0$