## RF EXPOSURE EVALUATION

According to FCC 1.1310: 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)

FCC ID:**2AXEE-ZTK7628P**

## EUT Specification

| | |
|---|---|
| **EUT** | WIFI module |
| **Frequency band (Operating)** | ☒ WLAN: 2.412GHz ~ 2.462GHz<br>☐ WLAN: 5.18GHz ~ 5.32GHz / 5.50GHz ~ 5.70GHz<br>☐ WLAN: 5.745GHz ~ 5825GHz |
| **Device category** | ☐ Portable (<20cm separation)<br>☒ Mobile (>20cm separation) |
| **Exposure classification** | ☐ Occupational/Controlled exposure (S = 5mW/cm2)<br>☒ General Population/Uncontrolled exposure (S=1mW/cm2) |
| **Antenna diversity** | ☐ Single antenna<br>☒ Multiple antennas<br>☐ Tx diversity<br>☐ Rx diversity<br>☐ Tx/Rx diversity |
| **Max. output power** | 20.89dBm for 802.11b;<br>19.07dBm for 802.11g;<br>21.219dBm for 802.11n(HT20);<br>21.925 dBm for 802.11n(HT40); |
| **Antenna gain (Max)** | 5dBi ( for per antenna port Max)<br>8dBi for MIMO(Ant1+Ant2 Directional Gain) |
| **Evaluation applied** | ☒ MPE Evaluation<br>☐ 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*G)\(4*pi*R2)

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/cm2. 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

| Operation Mode | Channel Number | Channel Frequency (MHz) | Measurement Level (dBm) | | | Limit (dBm) | Verdict |
|---|---|---|---|---|---|---|---|
| | | | Ant1 | Ant2 | Sum | | |
| 802.11b | 1 | 2412 | 20.89 | 20.46 | -- | 30 | PASS |
| | 6 | 2437 | 18.79 | 18.20 | -- | 30 | PASS |
| | 11 | 2462 | 18.84 | 18.52 | -- | 30 | PASS |
| 802.11g | 1 | 2412 | 17.61 | 17.24 | -- | 30 | PASS |
| | 6 | 2437 | 16.81 | 18.96 | -- | 30 | PASS |
| | 11 | 2462 | 16.83 | 19.07 | -- | 30 | PASS |
| 802.11n (HT20) | 1 | 2412 | 16.59 | 15.96 | 19.297 | 28 | PASS |
| | 6 | 2437 | 17.07 | 19.11 | 21.219 | 28 | PASS |
| | 11 | 2462 | 16.76 | 18.34 | 20.632 | 28 | PASS |
| 802.11n (HT40) | 3 | 2422 | 17.22 | 16.92 | 20.083 | 28 | PASS |
| | 6 | 2437 | 17.32 | 20.07 | 21.919 | 28 | PASS |
| | 9 | 2452 | 17.22 | 20.13 | 21.925 | 28 | PASS |

Antenna 1

| Operating Mode | Test Channel | Tune up tolerance (dBm) | Max tune up conducted power(dBm) | Output Peak power (mW) | Ant. Gain (dBi) | Ant. Gain (numeric) | Power density at 20cm (mW/ cm2 ) | Power density Limits (mW/ cm2 ) |
|---|---|---|---|---|---|---|---|---|
| 802.11b | 1 | 21±1 | 22 | 158.489 | 5 | 3.162 | 0.099708 | 1 |
| | 6 | 19±1 | 20 | 100.000 | 5 | 3.162 | 0.062911 | 1 |
| | 11 | 19±1 | 20 | 100.000 | 5 | 3.162 | 0.062911 | 1 |
| 802.11g | 1 | 18±1 | 19 | 79.433 | 5 | 3.162 | 0.049972 | 1 |
| | 6 | 17±1 | 18 | 63.096 | 5 | 3.162 | 0.039694 | 1 |
| | 11 | 17±1 | 18 | 63.096 | 5 | 3.162 | 0.039694 | 1 |
| 802.11n (HT20) | 1 | 17±1 | 18 | 63.096 | 5 | 3.162 | 0.039694 | 1 |
| | 6 | 17±1 | 18 | 63.096 | 5 | 3.162 | 0.039694 | 1 |
| | 11 | 17±1 | 18 | 63.096 | 5 | 3.162 | 0.039694 | 1 |
| 802.11n (HT40) | 3 | 17±1 | 18 | 63.096 | 5 | 3.162 | 0.039694 | 1 |
| | 6 | 17±1 | 18 | 63.096 | 5 | 3.162 | 0.039694 | 1 |
| | 9 | 17±1 | 18 | 63.096 | 5 | 3.162 | 0.039694 | 1 |

Antenna 2:

| Operating Mode | Test Channel | Tune up tolerance (dBm) | Max tune up conducted power(dBm) | Output Peak power (mW) | Ant. Gain (dBi) | Ant. Gain (numeric) | Power density at 20cm (mW/ cm2 ) | Power density Limits (mW/ cm2 ) |
|---|---|---|---|---|---|---|---|---|
| 802.11b | 1 | 20±1 | 21 | 125.893 | 5 | 3.162 | 0.079201 | 1 |
| | 6 | 18±1 | 19 | 79.433 | 5 | 3.162 | 0.049972 | 1 |
| | 11 | 18±1 | 19 | 79.433 | 5 | 3.162 | 0.049972 | 1 |
| 802.11g | 1 | 17±1 | 18 | 63.096 | 5 | 3.162 | 0.039694 | 1 |
| | 6 | 19±1 | 20 | 100.000 | 5 | 3.162 | 0.062911 | 1 |
| | 11 | 19±1 | 20 | 100.000 | 5 | 3.162 | 0.062911 | 1 |
| 802.11n (HT20) | 1 | 16±1 | 17 | 50.119 | 5 | 3.162 | 0.031530 | 1 |
| | 6 | 19±1 | 20 | 100.000 | 5 | 3.162 | 0.062911 | 1 |
| | 11 | 18±1 | 19 | 79.433 | 5 | 3.162 | 0.049972 | 1 |
| 802.11n (HT40) | 3 | 17±1 | 18 | 63.096 | 5 | 3.162 | 0.039694 | 1 |
| | 6 | 20±1 | 21 | 125.893 | 5 | 3.162 | 0.079201 | 1 |
| | 9 | 20±1 | 21 | 125.893 | 5 | 3.162 | 0.079201 | 1 |

MPE Result:

| Operation Mode | Channel Number | Channel Frequency (MHz) | Power density at 20cm (mW/ $cm^2$ ) | | | Power density Limits (mW/$cm^2$ ) |
|---|---|---|---|---|---|---|
| | | | Ant1 | Ant2 | Sum | |
| 802.11b | 1 | 2412 | 0.099708 | 0.079201 | -- | 1 |
| | 6 | 2437 | 0.062911 | 0.049972 | -- | 1 |
| | 11 | 2462 | 0.062911 | 0.049972 | -- | 1 |
| 802.11g | 1 | 2412 | 0.049972 | 0.039694 | -- | 1 |
| | 6 | 2437 | 0.039694 | 0.062911 | -- | 1 |
| | 11 | 2462 | 0.039694 | 0.062911 | -- | 1 |
| 802.11n (HT20) | 1 | 2412 | 0.039694 | 0.031530 | 0.071225 | 1 |
| | 6 | 2437 | 0.039694 | 0.062911 | 0.102606 | 1 |
| | 11 | 2462 | 0.039694 | 0.049972 | 0.089667 | 1 |
| 802.11n (HT40) | 3 | 2422 | 0.039694 | 0.039694 | 0.079389 | 1 |
| | 6 | 2437 | 0.039694 | 0.079201 | 0.118895 | 1 |
| | 9 | 2452 | 0.039694 | 0.079201 | 0.118895 | 1 |

Signature:

Alan He

Date: 2020-09-03