# FCC ID: 2AOG7GLK-UC2X

## 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)

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 Exposure** | | | | |
| 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 |
| 300-1,500 | | | f/300 | 6 |
| 1,500-100,000 | | | 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 |
| 300-1,500 | | | f/1500 | 30 |
| 1,500-100,000 | | | 1.0 | 30 |

f = frequency in MHz * = Plane-wave equivalent power density

### MPE Calculation Method

E (V/m) = $\frac{\sqrt{30*P*G}}{d}$ Power Density: *Pd* (W/m²) = $\frac{E^2}{377}$

E = Electric field (V/m)

P = Average RF output power (W)

G = EUT Antenna numeric gain (numeric)

d = Separation distance between radiator and human body (m)

The formula can be changed to

*Pd* = $\frac{30*P*G}{377*D^2}$

From the EUT RF output power, the minimum mobile separation distance, d=0.2m, as well as the gain of the used antenna, the RF power density can be obtained.

**MAX OUTPUT POWER**

EDR:

| Test Channel | Frequency (MHz) | Power Setting | Peak Output Power (dBm) | LIMIT (dBm) | Verdict |
|---|---|---|---|---|---|
| **1Mbps** | | | | | |
| 0 | 2402 | Default | 2.97 | 30 | PASS |
| 39 | 2441 | Default | 3.32 | 30 | PASS |
| 78 | 2480 | Default | 2.40 | 30 | PASS |
| **2Mbps** | | | | | |
| 0 | 2402 | Default | 1.32 | 20.97 | PASS |
| 39 | 2441 | Default | 1.69 | 20.97 | PASS |
| 78 | 2480 | Default | 0.72 | 20.97 | PASS |
| **3Mbps** | | | | | |
| 0 | 2402 | Default | 0.60 | 20.97 | PASS |
| 39 | 2441 | Default | 1.03 | 20.97 | PASS |
| 78 | 2480 | Default | 0.03 | 20.97 | PASS |

BLE

| Test Channel | Frequency (MHz) | Power Setting | Peak Output Power (dBm) | LIMIT (dBm) | Verdict |
|---|---|---|---|---|---|
| **1Mbps** | | | | | |
| 00 | 2402 | Default | 1.85 | 30 | PASS |
| 19 | 2440 | Default | 2.43 | 30 | PASS |
| 39 | 2480 | Default | 1.25 | 30 | PASS |

2.4G WIFI

| Test Channel | Frequency (MHz) | Power Setting | Duty Cycle Factor (dB) | Average Output Power (dBm) | Maximum Output Power(dBm) | LIMIT (dBm) | Verdict |
|---|---|---|---|---|---|---|---|
| | **802.11b** | | | | | | |
| 1 | 2412 | Default | 0 | 13.0 | 13.0 | 30 | PASS |
| 6 | 2437 | Default | 0 | 13.1 | 13.1 | 30 | PASS |
| 11 | 2462 | Default | 0 | 13.2 | 13.2 | 30 | PASS |
| | **802.11g** | | | | | | |
| 1 | 2412 | Default | 0 | 12.7 | 12.7 | 30 | PASS |
| 6 | 2437 | Default | 0 | 12.5 | 12.5 | 30 | PASS |
| 11 | 2462 | Default | 0 | 12.6 | 12.6 | 30 | PASS |
| | **802.11n HT20** | | | | | | |
| 1 | 2412 | Default | 0 | 12.8 | 12.8 | 30 | PASS |
| 6 | 2437 | Default | 0 | 12.8 | 12.8 | 30 | PASS |
| 11 | 2462 | Default | 0 | 12.4 | 12.4 | 30 | PASS |
| | **802.11n HT40** | | | | | | |
| 3 | 2422 | Default | 0 | 12.9 | 12.9 | 30 | PASS |
| 6 | 2437 | Default | 0 | 12.5 | 12.5 | 30 | PASS |
| 9 | 2452 | Default | 0 | 12.6 | 12.6 | 30 | PASS |

5.2G WIFI

| Test Channel | Frequency (MHz) | Maximum output power. Antenna port (AV) (dBm) | LIMIT dBm | Result |
|---|---|---|---|---|
| **TX 802.11a Mode** | | | | |
| CH36 | 5180 | 12.2 | 23.98 | Pass |
| CH40 | 5200 | 12.2 | 23.98 | Pass |
| CH48 | 5240 | 11.5 | 23.98 | Pass |
| **TX 802.11 n20M Mode** | | | | |
| CH36 | 5180 | 12.2 | 23.98 | Pass |
| CH40 | 5200 | 11.9 | 23.98 | Pass |
| CH48 | 5240 | 11.4 | 23.98 | Pass |
| **TX 802.11 n40M Mode** | | | | |
| CH38 | 5190 | 11.8 | 23.98 | Pass |
| CH46 | 5230 | 11.7 | 23.98 | Pass |
| **TX 802.11 ac20M Mode** | | | | |
| CH36 | 5180 | 11.8 | 23.98 | Pass |
| CH40 | 5200 | 11.9 | 23.98 | Pass |
| CH48 | 5240 | 11.4 | 23.98 | Pass |
| **TX 802.11 ac40M Mode** | | | | |
| CH38 | 5190 | 11.9 | 23.98 | Pass |
| CH46 | 5230 | 11.3 | 23.98 | Pass |
| **TX 802.11 ac80M Mode** | | | | |
| CH42 | 5210 | 11.8 | 23.98 | Pass |

5.8G WIFI

| Test Channel | Frequency (MHz) | Maximum output power. Antenna port (AV) (dBm) | LIMIT dBm | Result |
|---|---|---|---|---|
| **TX 802.11a Mode** | | | | |
| CH 149 | 5745 | 10.5 | 30 | Pass |
| CH 157 | 5785 | 10.1 | 30 | Pass |
| CH 165 | 5825 | 10.0 | 30 | Pass |
| **TX 802.11 n20M Mode** | | | | |
| CH 149 | 5745 | 8.9 | 30 | Pass |
| CH 157 | 5785 | 8.3 | 30 | Pass |
| CH 165 | 5825 | 8.4 | 30 | Pass |
| **TX 802.11 n40M Mode** | | | | |
| CH 151 | 5755 | 8.6 | 30 | Pass |
| CH 159 | 5795 | 8.3 | 30 | Pass |
| **TX 802.11 ac20M Mode** | | | | |

| | | | | |
|---|---|---|---|---|
| CH 149 | 5745 | 8.6 | 30 | Pass |
| CH 157 | 5785 | 8.3 | 30 | Pass |
| CH 165 | 5825 | 8.6 | 30 | Pass |
| **TX 802.11 ac40M Mode** | | | | |
| CH 151 | 5755 | 9.0 | 30 | Pass |
| CH 159 | 5795 | 8.8 | 30 | Pass |
| **TX 802.11 ac80M Mode** | | | | |
| CH 155 | 5775 | 8.4 | 30 | Pass |

## Measurement Result

Operation Frequency: EDR: 2402MHz~2480MHz;
BLE: 2402MHz~2480MHz;
2.4GWIFI 802.11b/g/n HT20: 2412-2462MHz, 2422-2452MHz for 802.11n(HT40);
5.2G WIFI 802.11a/n(HT20)/ac20 5180-5240MHz, 5190-5230MHz for 802.11n(HT40)/ac40, 5210MHz for 802.11 ac80;
5.8G WIFI 5745-5825 MHz for 802.11a/n(HT20)/ac20, 5755-5795 MHz for 802.11a/n(HT40)/ac40, 5775MHz for 802.11 ac80;
Power density limited: 1mW/ $cm^2$
Antenna Type: FPCB Antenna
Antenna gain: 1dBi,
R=20cm

EDR:

| Channel Freq. (MHz) | modulation | conducted power (dBm) | Tune-up power (dBm) | Max tune-up power (dBm) | Max tune-up power (mW) | Antenna Gain (dBi) | Antenna Gain Numeric | Evaluation result (mW/cm2 ) | Power density (mW/cm2) |
|---|---|---|---|---|---|---|---|---|---|
| 2402 | GFSK | 2.97 | 3±1 | 4 | 2.512 | 1.00 | 1.26 | 0.0006 | 1 |
| 2441 | | 3.32 | 3±1 | 4 | 2.512 | 1.00 | 1.26 | 0.0006 | 1 |
| 2480 | | 2.40 | 3±1 | 4 | 2.512 | 1.00 | 1.26 | 0.0006 | 1 |
| 2402 | π/4-DQPSK | 1.32 | 1±1 | 2 | 1.585 | 1.00 | 1.26 | 0.0004 | 1 |
| 2441 | | 1.69 | 1±1 | 2 | 1.585 | 1.00 | 1.26 | 0.0004 | 1 |
| 2480 | | 0.72 | 1±1 | 2 | 1.585 | 1.00 | 1.26 | 0.0004 | 1 |
| 2402 | 8DPSK | 0.60 | 1±1 | 2 | 1.585 | 1.00 | 1.26 | 0.0004 | 1 |
| 2441 | | 1.03 | 1±1 | 2 | 1.585 | 1.00 | 1.26 | 0.0004 | 1 |
| 2480 | | 0.03 | 1±1 | 2 | 1.585 | 1.00 | 1.26 | 0.0004 | 1 |

BLE:

| Channel Freq. (MHz) | modulation | conducted power (dBm) | Tune-up power (dBm) | Max tune-up power (dBm) | Max tune-up power (mW) | Antenna Gain (dBi) | Antenna Gain Numeric | Evaluation result (mW/cm2 ) | Power density (mW/cm2) |
|---|---|---|---|---|---|---|---|---|---|
| 2402 | GFSK | 1.85 | 2±1 | 3 | 1.995 | 1.00 | 1.26 | 0.0005 | 1 |
| 2440 | | 2.43 | 2±1 | 3 | 1.995 | 1.00 | 1.26 | 0.0005 | 1 |
| 2480 | | 1.25 | 2±1 | 3 | 1.995 | 1.00 | 1.26 | 0.0005 | 1 |

2.4G WIFI:

| Channel Freq. (MHz) | modulation | conducted power (dBm) | Tune-up power (dBm) | Max tune-up power (dBm) | Max tune-up power (mW) | Antenna Gain (dBi) | Antenna Gain Numeric | Evaluation result (mW/cm2 ) | Power density (mW/cm2) |
|---|---|---|---|---|---|---|---|---|---|
| 2412 | 802.11b | 13 | 13±1 | 14 | 25.119 | 1.00 | 1.26 | 0.0063 | 1 |
| 2437 | | 13.1 | 13±1 | 14 | 25.119 | 1.00 | 1.26 | 0.0063 | 1 |
| 2462 | | 13.2 | 13±1 | 14 | 25.119 | 1.00 | 1.26 | 0.0063 | 1 |
| 2412 | 802.11g | 12.7 | 13±1 | 14 | 25.119 | 1.00 | 1.26 | 0.0063 | 1 |
| 2437 | | 12.5 | 13±1 | 14 | 25.119 | 1.00 | 1.26 | 0.0063 | 1 |
| 2462 | | 12.6 | 13±1 | 14 | 25.119 | 1.00 | 1.26 | 0.0063 | 1 |
| 2412 | 802.11n H20 | 12.8 | 13±1 | 14 | 25.119 | 1.00 | 1.26 | 0.0063 | 1 |
| 2437 | | 12.8 | 13±1 | 14 | 25.119 | 1.00 | 1.26 | 0.0063 | 1 |
| 2462 | | 12.4 | 13±1 | 14 | 25.119 | 1.00 | 1.26 | 0.0063 | 1 |
| 2422 | 802.11n H40 | 12.9 | 13±1 | 14 | 25.119 | 1.00 | 1.26 | 0.0063 | 1 |
| 2437 | | 12.5 | 13±1 | 14 | 25.119 | 1.00 | 1.26 | 0.0063 | 1 |
| 2452 | | 12.6 | 13±1 | 14 | 25.119 | 1.00 | 1.26 | 0.0063 | 1 |

5.2G WIFI:

| Channel Freq. (MHz) | modulation | conducted power (dBm) | Tune-up power (dBm) | Max | | Antenna | | Evaluation result (mW/cm2 ) | Power density (mW/cm2) |
|---|---|---|---|---|---|---|---|---|---|
| | | | | tune-up power | | Gain | | | |
| | | | | (dBm) | (mW) | (dBi) | Numeric | | |
| 5180 | 802.11a | 12.2 | 12±1 | 13 | 19.953 | 1.00 | 1.26 | 0.0050 | 1 |
| 5200 | | 12.2 | 12±1 | 13 | 19.953 | 1.00 | 1.26 | 0.0050 | 1 |
| 5240 | | 11.5 | 12±1 | 13 | 19.953 | 1.00 | 1.26 | 0.0050 | 1 |
| 5180 | 802.11 N20m | 12.2 | 12±1 | 13 | 19.953 | 1.00 | 1.26 | 0.0050 | 1 |
| 5200 | | 11.9 | 12±1 | 13 | 19.953 | 1.00 | 1.26 | 0.0050 | 1 |
| 5240 | | 11.4 | 12±1 | 13 | 19.953 | 1.00 | 1.26 | 0.0050 | 1 |
| 5190 | 802.11 n40M | 11.8 | 12±1 | 13 | 19.953 | 1.00 | 1.26 | 0.0050 | 1 |
| 5230 | | 11.7 | 12±1 | 13 | 19.953 | 1.00 | 1.26 | 0.0050 | 1 |
| 5180 | 802.11 ac20M | 11.8 | 12±1 | 13 | 19.953 | 1.00 | 1.26 | 0.0050 | 1 |
| 5200 | | 11.9 | 12±1 | 13 | 19.953 | 1.00 | 1.26 | 0.0050 | 1 |
| 5240 | | 11.4 | 12±1 | 13 | 19.953 | 1.00 | 1.26 | 0.0050 | 1 |
| 5190 | 802.11 ac40M | 11.9 | 12±1 | 13 | 19.953 | 1.00 | 1.26 | 0.0050 | 1 |
| 5230 | | 11.3 | 12±1 | 13 | 19.953 | 1.00 | 1.26 | 0.0050 | 1 |
| 5210 | 802.11 ac80M | 11.8 | 12±1 | 13 | 19.953 | 1.00 | 1.26 | 0.0050 | 1 |

5.8G WIFI:

| Channel Freq. (MHz) | modulation | conducted power (dBm) | Tune-up power (dBm) | Max | | Antenna | | Evaluation result (mW/cm2 ) | Power density (mW/cm2) |
|---|---|---|---|---|---|---|---|---|---|
| | | | | tune-up power | | Gain | | | |
| | | | | (dBm) | (mW) | (dBi) | Numeric | | |
| 5745 | 802.11a | 10.5 | 10±1 | 11 | 12.589 | 1.00 | 1.26 | 0.0032 | 1 |
| 5785 | | 10.1 | 10±1 | 11 | 12.589 | 1.00 | 1.26 | 0.0032 | 1 |
| 5825 | | 10 | 10±1 | 11 | 12.589 | 1.00 | 1.26 | 0.0032 | 1 |
| 5745 | 802.11 N20m | 8.9 | 9±1 | 10 | 10.000 | 1.00 | 1.26 | 0.0025 | 1 |
| 5785 | | 8.3 | 9±1 | 10 | 10.000 | 1.00 | 1.26 | 0.0025 | 1 |
| 5825 | | 8.4 | 9±1 | 10 | 10.000 | 1.00 | 1.26 | 0.0025 | 1 |
| 5755 | 802.11 n40M | 8.6 | 9±1 | 10 | 10.000 | 1.00 | 1.26 | 0.0025 | 1 |
| 5795 | | 8.3 | 9±1 | 10 | 10.000 | 1.00 | 1.26 | 0.0025 | 1 |
| 5745 | 802.11 ac20M | 8.6 | 9±1 | 10 | 10.000 | 1.00 | 1.26 | 0.0025 | 1 |
| 5785 | | 8.3 | 9±1 | 10 | 10.000 | 1.00 | 1.26 | 0.0025 | 1 |
| 5825 | | 8.6 | 9±1 | 10 | 10.000 | 1.00 | 1.26 | 0.0025 | 1 |
| 5755 | 802.11 ac40M | 9 | 9±1 | 10 | 10.000 | 1.00 | 1.26 | 0.0025 | 1 |
| 5795 | | 8.8 | 9±1 | 10 | 10.000 | 1.00 | 1.26 | 0.0025 | 1 |
| 5775 | 802.11 ac80M | 8.4 | 9±1 | 10 | 10.000 | 1.00 | 1.26 | 0.0025 | 1 |

**Conclusion:**
For the max result : 0.0063≤ 1.0, compliance with FCC's RF Exposure.

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**Signature:** **Date:** 2018-12-21

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