

# FCC ID: 2AMEH-A1-HAC

## 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 <sup>2</sup> ) | Average Time |
|-------------------------------------------------------|------------------------------|------------------------------|------------------------------------|--------------|
| (A) Limits for Occupational/Control 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            |
| 1500-100000                                           | --                           | --                           | 5                                  | 6            |
| (B) Limits for General Population/Uncontrol Exposures |                              |                              |                                    |              |
| 0.3-1.34                                              | 614                          | 1.63                         | 100                                | 30           |
| 1.34-30                                               | 824                          | 2.19                         | 180                                | 30           |
| 30-300                                                | 27.5                         | 0.073                        | 0.2                                | 30           |
| 300-1500                                              | --                           | --                           | F/1500                             | 30           |
| 1500-100000                                           | --                           | --                           | 1                                  | 30           |

### 11.1 Friis transmission formula: $P_d = (P_{out} * G) / (4 * \pi * R^2)$

Where

$P_d$ = Power density in mW/cm<sup>2</sup>

$P_{out}$ =output power to antenna in mW

$G$ = Numeric gain of the antenna relative to isotropic antenna

$\pi$ =3.1416

$R$ = distance between observation point and center of the radiator in cm

$P_d$  the limit of MPE, 1mW/cm<sup>2</sup>. 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.  
 $mW = 10^{(dBm/10)}$

### 11.2 Measurement Result

Operation Frequency: 2412 MHz-2462 MHz;

Antenna gain: 1.03 dBi;

R=20cm

WIFI 2.4G

| Channel Freq. (MHz) | modulation | Measured power (dBm) | Tune-up power (dBm) | Max tune-up power (dBm) | Antenna Gain Numeric | Evaluation result (mW/cm <sup>2</sup> ) | Power density Limits (mW/cm <sup>2</sup> ) |
|---------------------|------------|----------------------|---------------------|-------------------------|----------------------|-----------------------------------------|--------------------------------------------|
| 2412                | 802.11b    | 16.36                | 16±1                | 18.1                    | 1.03                 | 0.013230198                             | 1                                          |
| 2437                |            | 16.02                | 16±1                | 17.94                   | 1.03                 | 0.012751649                             | 1                                          |
| 2462                |            | 15.99                | 15±1                | 13.29                   | 1.03                 | 0.004370855                             | 1                                          |
| 2412                | 802.11g    | 15.55                | 15±1                | 13.9                    | 1.03                 | 0.005029981                             | 1                                          |
| 2437                |            | 15.05                | 15±1                | 13.53                   | 1.03                 | 0.004619196                             | 1                                          |
| 2462                |            | 15.17                | 15±1                | 13.84                   | 1.03                 | 0.004960967                             | 1                                          |
| 2412                | 802.11n20  | 14.25                | 14±1                | 13.03                   | 1.03                 | 0.004116862                             | 1                                          |
| 2437                |            | 13.70                | 13±1                | 13.73                   | 1.03                 | 0.004836892                             | 1                                          |
| 2462                |            | 14.09                | 14±1                | 13.84                   | 1.03                 | 0.004960967                             | 1                                          |

Operation Frequency: 2402MHz-2480MHz;  
 Antenna gain: 1.03 dBi;  
 R=20cm

BLE

| Channel Freq. (MHz) | modulation | Measured power (dBm) | Tune-up power (dBm) | Max tune-up power (dBm) | Antenna Gain Numeric | Evaluation result (mW/cm2) | Power density Limits (mW/cm2 ) |
|---------------------|------------|----------------------|---------------------|-------------------------|----------------------|----------------------------|--------------------------------|
| 2402                | BLE 1M     | 1.97                 | 2±1                 | 3                       | 1.03                 | 0.013230198                | 1                              |
| 2440                |            | 1.55                 | 1±1                 | 2                       | 1.03                 | 0.012751649                | 1                              |
| 2480                |            | 1.57                 | 2±1                 | 3                       | 1.03                 | 0.004370855                | 1                              |
| 2402                | Pi/-DQPSK  | 1.59                 | 2±1                 | 3                       | 1.03                 | 0.005029981                | 1                              |
| 2440                |            | 1.47                 | 2±1                 | 3                       | 1.03                 | 0.004619196                | 1                              |
| 2480                |            | 1.54                 | 2±1                 | 3                       | 1.03                 | 0.004960967                | 1                              |

Operation Frequency: 13.56 MHz;  
 Antenna gain: 0.0 dBi;  
 R=20cm

EIRP=E+20log(d)-104.7=-3.2+9.54-104.7=-98.36 dBm

| Channel Freq. (MHz) | modulation | Measured power (dBm) | Tune-up power (dBm) | Max tune-up power (dBm) | Antenna Gain Numeric | Evaluation result (mW/cm2) | Power density Limits (mW/cm2 ) |
|---------------------|------------|----------------------|---------------------|-------------------------|----------------------|----------------------------|--------------------------------|
| 13.56               | FSK        | -98.36               | -99±1               | -98                     | 1.0                  | 0.0                        | 180                            |

\*\*\* End of Report \*\*\*