

# **FCC ID:2AL3B-ESPF1**

## **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 |
|--------------------------------------------------------------|------------------------------|------------------------------|------------------------------------|--------------|
| <b>(A) Limits for Occupational/Control Exposures</b>         |                              |                              |                                    |              |
| <b>300-1500</b>                                              | --                           | --                           | <b>F/300</b>                       | <b>6</b>     |
| <b>1500-100000</b>                                           | --                           | --                           | <b>5</b>                           | <b>6</b>     |
| <b>(B) Limits for General Population/Uncontrol Exposures</b> |                              |                              |                                    |              |
| <b>300-1500</b>                                              | --                           | --                           | <b>F/1500</b>                      | <b>6</b>     |
| <b>1500-100000</b>                                           | --                           | --                           | <b>1</b>                           | <b>30</b>    |

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

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(20cm)

$P_d$  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: 2412MHz~2462MHz

Power density limited:  $1\text{mW}/\text{cm}^2$

Antenna Type: PCB Antenna

Antenna gain: 2.0dBi,

R=20cm

$\text{mW}=10^{(\text{dBm}/10)}$

WiFi:

| Channel Freq. (MHz) | modulation   | conducted power | conducted power | Tune-up power (dBm) | Max tune-up power | Antenna Gain | Evaluation result | Power density Limits |
|---------------------|--------------|-----------------|-----------------|---------------------|-------------------|--------------|-------------------|----------------------|
|                     |              | (dBm)           | (mW)            |                     | (dBm)             |              |                   |                      |
| 2412                | 802.11b      | 11.5            | 14.13           | 11±1                | 12                | 1.58         | 0.0050            | 1                    |
| 2437                |              | 10.9            | 12.30           | 11±1                | 12                | 1.58         | 0.0050            | 1                    |
| 2462                |              | 10.5            | 11.22           | 11±1                | 12                | 1.58         | 0.0050            | 1                    |
| 2412                | 802.11g      | 11.1            | 12.88           | 11±1                | 12                | 1.58         | 0.0050            | 1                    |
| 2437                |              | 10.8            | 12.02           | 11±1                | 12                | 1.58         | 0.0050            | 1                    |
| 2462                |              | 10.4            | 10.96           | 11±1                | 12                | 1.58         | 0.0050            | 1                    |
| 2412                | 802.11n HT20 | 11.4            | 13.80           | 11±1                | 12                | 1.58         | 0.0050            | 1                    |
| 2437                |              | 10.9            | 12.30           | 11±1                | 12                | 1.58         | 0.0050            | 1                    |
| 2462                |              | 10.4            | 10.96           | 11±1                | 12                | 1.58         | 0.0050            | 1                    |

### Conclusion:

For the max result :  $0.0050 \leq 1.0$  for 1g SAR, No SAR is required.

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