

# **FCC ID:2AJRK-FSP6**

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

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(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: WIFI 802.11b/g/n HT20: 2412-2462MHz,  
 Power density limited:  $1\text{mW}/\text{cm}^2$   
 Antenna Type: FPCB Antenna  
 Antenna gain: 1.0dBi,  
 R=20cm  
 $\text{mW}=10^{(\text{dBm}/10)}$   
 802.11b/g/n:

| Channel Freq. (MHz) | modulation  | conducted power (mW) | conducted 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     | 22.54                | 13.53                 | 14±1                | 15                      | 1.26                 | 0.005646                                | 1                                          |
| 2437                | 802.11b     | 21.53                | 13.33                 | 14±1                | 15                      | 1.26                 | 0.005392                                | 1                                          |
| 2462                | 802.11b     | 29.65                | 14.72                 | 14±1                | 15                      | 1.26                 | 0.007425                                | 1                                          |
| 2412                | 802.11g     | 10.84                | 10.35                 | 11±1                | 12                      | 1.26                 | 0.002715                                | 1                                          |
| 2437                | 802.11g     | 11.80                | 10.72                 | 11±1                | 12                      | 1.26                 | 0.002956                                | 1                                          |
| 2462                | 802.11g     | 14.29                | 11.55                 | 11±1                | 12                      | 1.26                 | 0.003579                                | 1                                          |
| 2412                | 802.11n H20 | 10.16                | 10.07                 | 11±1                | 12                      | 1.26                 | 0.002545                                | 1                                          |
| 2437                | 802.11n H20 | 13.03                | 11.15                 | 11±1                | 12                      | 1.26                 | 0.003264                                | 1                                          |
| 2462                | 802.11n H20 | 14.89                | 11.73                 | 11±1                | 12                      | 1.26                 | 0.003730                                | 1                                          |

Operation Frequency: 2402MHz~2480MHz  
 Power density limited:  $1\text{mW}/\text{cm}^2$   
 Antenna Type: FPCB Antenna  
 Antenna gain: 1.0dBi,  
 R=20cm  
 $\text{mW}=10^{(\text{dBm}/10)}$   
 Bluetooth DTS:

| Channel Freq. (MHz) | modulation | conducted power (mW) | conducted 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> ) |
|---------------------|------------|----------------------|-----------------------|---------------------|-------------------------|----------------------|-----------------------------------------|--------------------------------------------|
| 2402                | GFSK       | 1.02                 | 0.10                  | 1.5±1               | 2.5                     | 1.26                 | 0.000256                                | 1                                          |
| 2440                |            | 1.59                 | 2.02                  | 1.5±1               | 2.5                     | 1.26                 | 0.000399                                | 1                                          |
| 2480                |            | 1.37                 | 1.37                  | 1.5±1               | 2.5                     | 1.26                 | 0.000343                                | 1                                          |

Bluetooth DSS:

| Channel Freq. (MHz) | modulation | conducted power (mW) | conducted 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> ) |
|---------------------|------------|----------------------|-----------------------|---------------------|-------------------------|----------------------|-----------------------------------------|--------------------------------------------|
| 2402                | GFSK       | 3.07                 | 4.87                  | 5.5±1               | 6.5                     | 1.26                 | 0.000769                                | 1                                          |
| 2441                |            | 4.28                 | 6.31                  | 5.5±1               | 6.5                     | 1.26                 | 0.001071                                | 1                                          |
| 2480                |            | 3.39                 | 5.30                  | 5.5±1               | 6.5                     | 1.26                 | 0.000849                                | 1                                          |
| 2402                | π/4-DQPSK  | 1.93                 | 2.86                  | 3.5±1               | 4.5                     | 1.26                 | 0.000484                                | 1                                          |
| 2441                |            | 2.85                 | 4.55                  | 3.5±1               | 4.5                     | 1.26                 | 0.000714                                | 1                                          |
| 2480                |            | 1.94                 | 2.87                  | 3.5±1               | 4.5                     | 1.26                 | 0.000485                                | 1                                          |
| 2402                | 8DPSK      | 2.04                 | 3.10                  | 4±1                 | 5                       | 1.26                 | 0.000511                                | 1                                          |
| 2441                |            | 2.94                 | 4.69                  | 4±1                 | 5                       | 1.26                 | 0.000737                                | 1                                          |
| 2480                |            | 3.53                 | 2.02                  | 4±1                 | 5                       | 1.26                 | 0.000508                                | 1                                          |

Operation Frequency: 802.11a/n(HT20)/AC20 for 5180-5240MHz, 802.11n(HT40)/AC40 for 5190-5230MHz

Power density limited: 1mW/ cm<sup>2</sup>

Antenna Type: FPCB Antenna

Antenna gain: 1.0dBi,

R=20cm

mW=10<sup>^(dBm/10)</sup>

802.11a/n/ac:

| Channel Freq. (MHz) | modulation  | conducted power (mW) | conducted 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> ) |
|---------------------|-------------|----------------------|-----------------------|---------------------|-------------------------|----------------------|-----------------------------------------|--------------------------------------------|
| 5180                | 802.11a     | 7.11                 | 8.52                  | 8±1                 | 9                       | 1.26                 | 0.001415                                | 1                                          |
| 5200                | 802.11a     | 7.69                 | 8.86                  | 8±1                 | 9                       | 1.26                 | 0.001530                                | 1                                          |
| 5240                | 802.11a     | 7.89                 | 8.97                  | 8±1                 | 9                       | 1.26                 | 0.001569                                | 1                                          |
| 5180                | 802.11n H20 | 7.31                 | 8.64                  | 8.5±1               | 9.5                     | 1.26                 | 0.001455                                | 1                                          |
| 5200                | 802.11n H20 | 7.87                 | 8.96                  | 8.5±1               | 9.5                     | 1.26                 | 0.001566                                | 1                                          |
| 5240                | 802.11n H20 | 8.17                 | 9.12                  | 8.5±1               | 9.5                     | 1.26                 | 0.001625                                | 1                                          |
| 5190                | 802.11n H40 | 6.67                 | 8.24                  | 8±1                 | 9                       | 1.26                 | 0.001327                                | 1                                          |
| 5230                | 802.11n H40 | 7.50                 | 8.75                  | 8±1                 | 9                       | 1.26                 | 0.001492                                | 1                                          |
| 5180                | 802.11ac20  | 6.90                 | 8.39                  | 8±1                 | 9                       | 1.26                 | 0.001373                                | 1                                          |
| 5200                | 802.11ac20  | 7.69                 | 8.86                  | 8±1                 | 9                       | 1.26                 | 0.001530                                | 1                                          |
| 5240                | 802.11ac20  | 7.91                 | 8.98                  | 8±1                 | 9                       | 1.26                 | 0.001573                                | 1                                          |
| 5190                | 802.11ac40  | 6.98                 | 8.44                  | 8±1                 | 9                       | 1.26                 | 0.001389                                | 1                                          |
| 5230                | 802.11ac40  | 7.55                 | 8.78                  | 8±1                 | 9                       | 1.26                 | 0.001502                                | 1                                          |

Operation Frequency: 802.11a/n(HT20)/AC20 for 5745-5825MHz, 802.11n(HT40)/AC40 for 5755-5795MHz

Power density limited: 1mW/ cm<sup>2</sup>

Antenna Type: FPCB Antenna

Antenna gain: 1.0dBi,

R=20cm

mW=10<sup>^(dBm/10)</sup>

802.11a/n/ac:

| Channel Freq. (MHz) | modulation  | conducted power (mW) | conducted power (dBm) | Tune-up power (dBm) | Max tune-up power (dBm) | Antenna Gain Numeric | Evaluation result (mW/cm2 ) | Power density Limits (mW/cm2) |
|---------------------|-------------|----------------------|-----------------------|---------------------|-------------------------|----------------------|-----------------------------|-------------------------------|
| 5745                | 802.11a     | 6.49                 | 8.12                  | 8±1                 | 9                       | 1.26                 | 0.001290                    | 1                             |
| 5785                | 802.11a     | 6.85                 | 8.36                  | 8±1                 | 9                       | 1.26                 | 0.001364                    | 1                             |
| 5825                | 802.11a     | 6.97                 | 8.43                  | 8±1                 | 9                       | 1.26                 | 0.001386                    | 1                             |
| 5745                | 802.11n H20 | 6.65                 | 8.23                  | 8±1                 | 9                       | 1.26                 | 0.001323                    | 1                             |
| 5785                | 802.11n H20 | 7.16                 | 8.55                  | 8±1                 | 9                       | 1.26                 | 0.001425                    | 1                             |
| 5825                | 802.11n H20 | 7.31                 | 8.64                  | 8±1                 | 9                       | 1.26                 | 0.001455                    | 1                             |
| 5755                | 802.11n H40 | 7.35                 | 8.66                  | 8±1                 | 9                       | 1.26                 | 0.001461                    | 1                             |
| 5795                | 802.11n H40 | 7.48                 | 8.74                  | 8±1                 | 9                       | 1.26                 | 0.001488                    | 1                             |
| 5745                | 802.11ac20  | 6.65                 | 8.23                  | 8±1                 | 9                       | 1.26                 | 0.001323                    | 1                             |
| 5785                | 802.11ac20  | 7.16                 | 8.55                  | 8±1                 | 9                       | 1.26                 | 0.001425                    | 1                             |
| 5825                | 802.11ac20  | 7.31                 | 8.64                  | 8±1                 | 9                       | 1.26                 | 0.001455                    | 1                             |
| 5755                | 802.11ac40  | 7.00                 | 8.45                  | 8±1                 | 9                       | 1.26                 | 0.001392                    | 1                             |
| 5795                | 802.11ac40  | 7.11                 | 8.52                  | 8±1                 | 9                       | 1.26                 | 0.001415                    | 1                             |

#### simultaneous emission

| Power density Limits (mW/cm2 )<br>2.4G WIFI | Power density Limits (mW/cm2 )<br>BT3.0 | Power density Limits (mW/cm2 )<br>BT4.0 | Power density Limits (mW/cm2 )<br>5G WIFI | Calculate Evaluation result (mW/cm2 ) | Power density Limits (mW/cm2) |
|---------------------------------------------|-----------------------------------------|-----------------------------------------|-------------------------------------------|---------------------------------------|-------------------------------|
| 0.007425                                    | 0.001071                                | 0.000399                                | 0.001625                                  | 0.01052                               | 1                             |

#### Conclusion:

For the max result :  $0.01052 \leq 1.0$  for 1g SAR, No SAR is required.

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**Signature:**

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