

# **FCC ID:2AKXB-HUBS1**

## **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>1500-1000000</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>1500-1000000</b>	--	--	<b>1</b>	<b>30</b>

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

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: WIFI 802.11b/g/n HT20: 2412-2462MHz,

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

Antenna Type: PCB Antenna

Antenna gain: 2.83dBi,

R=20cm

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

802.11b/g/n:

Chan nel 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	19.05	12.8	13±1	14	1.919	0.009588	1
2437	802.11b	21.38	13.3	13±1	14	1.919	0.009588	1
2462	802.11b	19.95	13.0	13±1	14	1.919	0.009588	1
2412	802.11g	7.76	8.9	9±1	10	1.919	0.003817	1
2437	802.11g	7.94	9.0	9±1	10	1.919	0.003817	1
2462	802.11g	8.32	9.2	9±1	10	1.919	0.003817	1
2412	802.11n H20	7.76	8.9	9±1	10	1.919	0.003817	1
2437	802.11n H20	7.94	9.0	9±1	10	1.919	0.003817	1
2462	802.11n H20	8.13	9.1	9±1	10	1.919	0.003817	1

Operation Frequency: 2402MHz~2480MHz

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

Antenna Type: PCB Antenna

Antenna gain: 0.57dBi,

R=20cm

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

Bluetooth DTS:

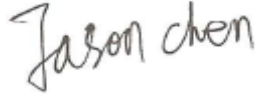
Channel Freq. (MHz)	modulation	conducted power (mW)	conducted power (dBm)	Tune-up power (dBm)	Max tune-up power (dBm)	Antenna Gain Numeric	Evaluation result (mW/cm <sup>2</sup> )	Power density Limits (mW/cm <sup>2</sup> )
2402	GFSK	0.74	-1.28	-1±1	0	1.140	0.000227	1
2440		0.77	-1.11	-1±1	0	1.140	0.000227	1
2480		0.86	-0.65	-1±1	0	1.140	0.000227	1

simultaneous emission

Power density Limits (mW/cm <sup>2</sup> ) WIFI	Power density Limits (mW/cm <sup>2</sup> ) BLE	Calculate Evaluation result (mW/cm <sup>2</sup> )	Power density Limits (mW/cm <sup>2</sup> )
0.009588	0.000227	0.009815	1

**Conclusion:**

For the max result :  $0.009815 \leq 1.0$ , compliance with FCC's RF Exposure.



**Signature:**

**Date:** 2018-3-29

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