

# FCC ID:2AI56-WD55UH4530

## 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> )	Averaging time (minutes)
<b>(A) Limits for Occupational/Controlled Exposure</b>				
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
300-1,500			f/300	6
1,500-100,000			5	6
<b>(B) Limits for General Population/Uncontrolled Exposure</b>				
0.3-1.34	614	1.63	*100	30
1.34-30	824/f	2.19/f	*180/f <sup>2</sup>	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

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

$\pi$  = 3.14115926

$R$  = 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.

## Measurement Result

### WIFI:

Operation Frequency: WIFI 802.11b/g/n HT20: 2412-2462MHz,  
802.11n HT40: 2422-2452MHz,  
Power density limited:  $1\text{mW}/\text{cm}^2$

Antenna Type: Wifi Antenna: Built-in antenna;  
WIFI antenna gain: 1.7957dBi (ANT A), 1.7957dBi (ANT B),  
R=20cm  
 $\text{mW}=10^{(\text{dBm}/10)}$   
antenna gain Numeric= $10^{(\text{dBi}/10)}=10^{(1.7957/10)}=1.51$   
Condition: SISO

Channel Freq. (MHz)	modulation	conducted power		Tune-up power		Max				Antenna		Evaluation result at 20cm		Power density Limits (mW/cm2)
		(dBm)		(dBm)		tune-up power				Gain		Power density(mW/cm2 )		
		Ant A	Ant B	Ant A	Ant B	Ant A	Ant B	Ant A	Ant B	Ant A	Ant B	Ant A	Ant B	
2412	802.11b	14.96	15.05	15±1	15±1	16	16	39.811	39.811	1.51	1.51	0.01196	0.01196	1
2437		15.38	15.97	15±1	15±1	16	16	39.811	39.811	1.51	1.51	0.01196	0.01196	1
2462		15.07	14.98	15±1	15±1	16	16	39.811	39.811	1.51	1.51	0.01196	0.01196	1
2412	802.11g	12.19	12.06	12±1	12±1	13	13	19.953	19.953	1.51	1.51	0.00599	0.00599	1
2437		12.70	12.89	12±1	12±1	13	13	19.953	19.953	1.51	1.51	0.00599	0.00599	1
2462		12.92	12.34	12±1	12±1	13	13	19.953	19.953	1.51	1.51	0.00599	0.00599	1
2412	802.11n H20	12.67	12.35	13±1	12±1	14	13	25.119	19.953	1.51	1.51	0.00755	0.00599	1
2437		12.96	12.62	13±1	12±1	14	13	25.119	19.953	1.51	1.51	0.00755	0.00599	1
2462		13.08	12.68	13±1	12±1	14	13	25.119	19.953	1.51	1.51	0.00755	0.00599	1
2422	802.11n H40	11.33	11.41	12±1	12±1	13	13	19.953	19.953	1.51	1.51	0.00599	0.00599	1
2437		11.99	11.67	12±1	12±1	13	13	19.953	19.953	1.51	1.51	0.00599	0.00599	1
2452		12.36	12.21	12±1	12±1	13	13	19.953	19.953	1.51	1.51	0.00599	0.00599	1

Operation Frequency: WIFI 802.11n HT20: 2412-2462MHz,  
802.11n HT40: 2422-2452MHz,  
Power density limited:  $1\text{mW}/\text{cm}^2$

Antenna Type: Built-in Antenna  
Antenna gain:  
1.7957dBi (ANT A),  
1.7957dBi (ANT B)  
Antenna Gain= $1.7957+10\log(N)=4.81\text{dBi}$   
R=20cm  
802.11n:  
MIMO Limit < 1

Channel Freq. (MHz)	modulation	conducted power		Tune-up power		Max				Antenna		Evaluation result at 20cm			Power density Limits (mW/cm2)
		(dBm)		(dBm)		tune-up power				Gain		Power density(mW/cm2 )			
		Ant A	Ant B	Ant A	Ant B	Ant A	Ant B	Ant A	Ant B	Ant A	Ant B	Ant A	Ant B	Sum	
2412	802.11n H20	12.67	12.35	13±1	12±1	14	13	25.119	19.953	1.51	1.51	0.00755	0.00599	0.01354	1
2437		12.96	12.62	13±1	12±1	14	13	25.119	19.953	1.51	1.51	0.00755	0.00599	0.01354	1
2462		13.08	12.68	13±1	12±1	14	13	25.119	19.953	1.51	1.51	0.00755	0.00599	0.01354	1
2422	802.11n H40	11.33	11.41	12±1	12±1	13	13	19.953	19.953	1.51	1.51	0.00599	0.00599	0.01198	1
2437		11.99	11.67	12±1	12±1	13	13	19.953	19.953	1.51	1.51	0.00599	0.00599	0.01198	1
2452		12.36	12.21	12±1	12±1	13	13	19.953	19.953	1.51	1.51	0.00599	0.00599	0.01198	1

The sum=Power density Ant A/1+Power density Ant b/1

### Conclusion:

For the max result :  $0.01354 \leq 1.0$  for 1g SAR, No SAR is required.

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**Signature:**

**Date:** 2016-09-12

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