FCC ID: LNQRTL8812AUCG

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)
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Frequency range (MHz)	Electric field strength (V/m)	Magnetic field strength (A/m)	Power density (mW∕cm ²)	Averaging time (minutes)						
(A) Limits for Occupational/Controlled Exposure										
0.3-3.0	614	1.63	*100	6						
3.0-30	1842/1	4.89/f	*900/f ²	6						
30-300	61.4	0.163	1.0	6						
300-1,500			f/300	6						
1,500-100,000			5	6						
	(B) Limits for Gener	ral Population/Uncontrolled	Exposure							
0.3-1.34	614	1.63	*100	30						
1.34-30	824/1	2.19/f	*180/f ²	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

$$\mathsf{E}(\mathsf{V/m}) = \frac{\sqrt{30*P*G}}{d}$$

Power Density:
$$Pd(W/m^2) = \frac{E^2}{377}$$

E = Electric field (V/m)

P = Average RF output power (W)

G = EUT Antenna numeric gain (numeric)

d = Separation distance between radiator and human body (m)

The formula can be changed to

$$Pd = \frac{30*P*G}{377*D^2}$$

From the EUT RF output power, the minimum mobile separation distance, d=0.2m, as well as the gain of the used antenna, the RF power density can be obtained.

11.2 Measurement Result

Exposure Environment: General Population / Uncontrolled Exposure

For 2.4GHz Band: For WLAN Antenna Type : PIFA Antenna For 2.4GHz mode, antenna A/ B are transmitting, two antennas simultaneously transmit. And the data is recorded for radiated emission and band edge. For MIMO mode, Directional gain=GANT +10log(N)dbi =6.54dbi in 2.4GHz 802.11 (HT20/HT40) has MIMO mode.

Conducted Power for IEEE 802.11n 20: 20.75 dBm

Distanc D e (cm)	Directiona ^A IGain (r	na Antenna Gain (numeric)	The maximum combined Distance Average Output Power		Power Density (S) (mW/cm²)	Limit of Power Density (S)	Test Result
			dBm	mW		(mw/cm/)	
20	6.54	4.508	20.75	118.8502	0.1066	1	Complies

DirectionalGain = 10-102	$\sum_{j=1}^{N} \left\{ \sum_{k=1}^{N} \mathcal{B}_{j,k} \right\}^2$
	Newr

For 5GHz ISM Band:

Antenna Type : PIFA Antenna

For 5GHz mode, antenna A B are transmitting, May antennas simultaneously transmit.

And the data is recorded for radiated emission, and band edge.

Model 8812 For MIMO mode , Directional gain=GANT +10log(N)dbi =8.56dbi in 5GHz

802.11n/ac 5GHz has MIMO mode.

Conducted Power for IEEE 802.11n VHT20: 18.96dBm

Distanc e (cm)	Directiona IGain	Antenna Gain (numeric)	The maximum combined Distance Average Output Power		Power Density (S) (mW/cm²)	Limit of Power Density (S)	Test Result
			dBm	mW		(mvv/cm²)	
20	8.56	7.178	18.96	78.70458	0.1124	1	Complies
Direction	nalGain = 1		$\left\{\sum_{k=1}^{N} \mathbf{g}_{j,k}\right\}$	2			

DirectionalGain = $10 \cdot \log \frac{\int -1}{N_{ANT}}$

For 5GHz UNII Band:

Antenna Type : PIFA Antenna

For 5GHz mode, antenna A B are transmitting, May antennas simultaneously transmit. And the data is recorded for radiated emission, and band edge.

Model 8812 For MIMO mode , Directional gain=GANT +10log(N)dbi =8.56dbi in 5GHz

802.11n/ac 5GHz has MIMO mode.

Conducted Power for IEEE 802.11ac VHT20 : 18.69dBm

Distanc e (cm)	Directiona IGain	Antenna Gain (numeric)	The m com Distance Outpu dBm	aximum bined e Average t Power mW	Power Density (S) (mW/cm²)	Limit of Power Density (S) (mW/cm²)	Test Result
20	8.56	7.178	18.69	73.96053	0.1056	1	Complies

 $DirectionalGain = 10 \cdot \log \left| \frac{\frac{f_{-1}}{f_{-1}} \left[\frac{f_{-1}}{f_{-1}} \right]}{N_{dNT}} \right|$

For Bluetooth Antenna Type : PIFA Antenna Antenna Gain: 3.53dBi Max Conducted Power for Bluetooth ER (GFSK) 1Mbps : 4.47 dBm

Distanc e (cm)	Directiona IGain (n	Antenna Gain D (numeric)	The m com Distance Pc	aximum bined PK Output wer	Power Density (S) (mW/cm²)	Limit of Power Density (S)	Test Result
			dBm	mW		(mvv/cm²)	
20	3.53	2.254	4.47	2.798981	0.0013	1	Complies

Max Conducted Power for Bluetooth 4.0 : 5.22 dBm

Distanc e (cm)	Directiona IGain	Antenna Gain (numeric)	The maximum combined Distance PK Output Power		Power Density (S) (mW/cm²)	Limit of Power Density (S)	Test Result
			dBm	mW		(mvv/cm²)	
20	3.53	2.254	5.22	3.326596	0.0015	1	Complies

CONCULSION:

Both of the WLAN 5GHz Band and Bluetooth can transmit simultaneously, the formula of calculated the MPE is:

CPD1 / LPD1 + CPD2 / LPD2 +etc. < 1

CPD = Calculation power density

LPD = Limit of power density

Therefore, the worst-case situation is 0.1124 / 1 + 0.0015 / 1 = 0.1139, which is less than "1". Both of the WLAN 5GHz Band and WLAN 2.4GHz Band can transmit simultaneously, the formula of calculated the MPE is:

CPD1 / LPD1 + CPD2 / LPD2 +etc. < 1

CPD = Calculation power density

LPD = Limit of power density

Therefore, the worst-case situation is 0.1124 / 1 + 0.1066 / 1 = 0.2190, which is less than "1".

This confirmed that the device comply with FCC 1.1310 MPE limit.

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Signature:

Date: 2016-6-28

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