FCC ID: LNQSBWD1100

Maximum Permissible Exposure (MPE)
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^2)	Averaging time (minutes)
(A) Limits for Occupational/Controlled Exposure				
0.3-3.0	614	1.63	*100	6
3.0-30	1842/f	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 General Population/Uncontrolled Exposure				
0.3-1.34	614	1.63	*100	30
1.34-30	824/f	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 For Single Transmitting:

E (V/m) $= \frac{\sqrt{30 * P * G}}{d}$ Power Density: *Pd* (W/m²) $= \frac{E^2}{377}$

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.

Measurement Result For just BT Transmitting:

BLE:

Operation Frequency: 2402MHz~2480MHz.
Power density limited: 1mW/ cm^2
Antenna Type: PCB Antenna;
WIFI antenna gain: 1.3dBi;
R=20cm
mW=10^(dBm/10)
antenna gain Numeric=10^(dBi/10)= 10^(1/10)=1.35

Channel Freq. (MHz)	modulation	conducted power	Tune-up power	Max		Antenna	Evaluation result at 20cm	Power density Limits
		(dBm)	(dBm)	tune-up power		Gain	Power density(mW/cm 2)	(mW/cm2)
				(dBm)	(mW)	Numeric		
2402	GFSK-1Mbps	-1.98	-2.6±1	-1.6	0.691831	1.35	0.00019	1
2440		-2.71	-2.6±1	-1.6	0.691831	1.35	0.00019	1
2480		-3.59	-2.6±1	-1.6	0.691831	1.35	0.00019	1
2402	GFSK-2Mbps	-1.81	-2.6±1	-1.6	0.691831	1.35	0.00019	1
2440		-2.31	-2.6±1	-1.6	0.691831	1.35	0.00019	1
2480		-3.5	-2.6±1	-1.6	0.691831	1.35	0.00019	1

MPE Calculation Method For multiple Transmitting:

When a number of sources at different frequencies, and/or broadband sources, contribute to the total exposure, it becomes necessary to weigh each contribution relative to the MPE in accordance with the provisions of Table (A) and Table (B). To comply with the MPE, the fraction of the MPE in terms of E^2, H^2 (or power density) incurred within each frequency interval should be determined and the sum of all such fractions should not exceed unity.

In order to ensure compliance with the MPE for a controlled environment, the sum of the ratios of the power density to the corresponding MPE should not exceed unity. That is

$$\sum_{i=1}^{n} \frac{S_i}{MPE_i}$$

Measurement Result For multiple Transmitting:
Because:
The wifi module 802R8822(FCC ID: LNQ802R8822) has the maximum Power Density value 0.101 mW/cm^2 in 5G MIMO transmitting mode;
The wifi module 802C2447(FCC ID: LNQ802C2447) has the maximum Power Density value 0.169 mW/cm^2 in 5G MIMO transmitting mode;

So:
When BT & 802R8822 WIFI 5G MIMO mode& 802C2447 WIFI 5G MIMO mode transmitting simultaneously is the worst mode. The worst result as below:

Transmitting Mode	R(cm)	S (mW/cm^2)	Total S (mW/cm^2)	MPE Limit (mW/cm^2)	Conclusion
BT	20	0.00019	0.27019	1.000	Pass
802R8822 Wifi 5G MIMO Mode		0.101			
802C2447 Wifi 5G MIMO Mode		0.169			

Conclusion:

For the max result: 0.27019≤ 1.0 for Max Power Density, compliance the RF Exposure.

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Signature: **Date:** 2019-03-21

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