

Job No.: 151103034GZU

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FCC ID: 2AGZ2-PO1AAW1

RF Exposure Compliance Requirement**1. Standard requirement**

Systems operating under the provisions of this section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy level in excess limit for maximum permissible exposure. In accordance with 47 CFR FCC Part 2 Subpart J, section 2.1091 this device has been defined as a mobile device whereby a distance of 0.2m normally can be maintained between the user and the device.

(a) Limits for Occupational / Controlled Exposure

Frequency Range (MHz)	Electric Field Strength (E) (V/m)	Magnetic Field Strength (H) (A/m)	Power Density (S)(mW/cm ²)	Averaging Times E ² , H ² or S (minutes)
0.3-3.0	614	1.63	(100)*	6
3.0-30	1842/f	4.89/f	(900/f)*	6
30-300	61.4	0.163	1.0	6
300-1500	--	--	F/300	6
1500-100000	--	--	5	6

(b) Limits for General Population / Uncontrolled Exposure

Frequency Range (MHz)	Electric Field Strength (E) (V/m)	Magnetic Field Strength (H) (A/m)	Power Density (S)(mW/cm ²)	Averaging Times E ² , H ² or S (minutes)
0.3-1.34	614	1.63	(100)*	30
1.34-30	824/f	2.19/f	(180/f)*	30
30-300	27.5	0.073	0.2	30
300-1500	--	--	F/1500	30
1500-100000	--	--	1.0	30

Note: f=frequency in MHz; *Plane-wave equivalent power density

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2. MPE Calculation Method

$$E \text{ (V/m)} = (30 \cdot P \cdot G)^{0.5} / d \quad \text{Power Density: } Pd \text{ (W/m}^2\text{)} = E^2 / 377$$

E=Electric Field (V/m)

P=Peak 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

$$Pd = (30 \cdot P \cdot G) / (377 \cdot d^2)$$

From the peak 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.

3. Calculated Result and Limit

(1) 802.15.4 ZigBee

Frequency (MHz)	Antenna Gain (Numeric)	Peak Output Power (dBm)	Peak Output Power (mW)	Power Density (S) (mW/cm ²)	Limit of Power Density (S) (mW/cm ²)	Test Result
2405	2.188	1.52	1.42	0.0006	1	Complies
2440	2.188	1.95	1.57	0.0007	1	Complies
2480	2.188	2.48	1.77	0.0008	1	Complies

(2) 802.11b 11Mbps data rate:

Frequency (MHz)	Antenna Gain (Numeric)	Peak Output Power (dBm)	Peak Output Power (mW)	Power Density (S) (mW/cm ²)	Limit of Power Density (S) (mW/cm ²)	Test Result
2412	1.995	14.06	25.47	0.0101	1	Complies
2437	1.995	13.85	24.27	0.0096	1	Complies
2462	1.995	13.88	24.43	0.0097	1	Complies

(3) 802.11g 54Mbps data rate:

Frequency (MHz)	Antenna Gain (Numeric)	Peak Output Power (dBm)	Peak Output Power (mW)	Power Density (S) (mW/cm ²)	Limit of Power Density (S) (mW/cm ²)	Test Result
2412	1.995	17.24	52.97	0.0210	1	Complies
2437	1.995	17.01	50.23	0.0199	1	Complies
2462	1.995	17.02	50.35	0.0200	1	Complies

(4) 802.11n HT20 65Mbps data rate:

Frequency (MHz)	Antenna Gain (Numeric)	Peak Output Power (dBm)	Peak Output Power (mW)	Power Density (S) (mW/cm ²)	Limit of Power Density (S) (mW/cm ²)	Test Result
2412	1.995	16.52	44.87	0.0178	1	Complies
2437	1.995	16.64	46.13	0.0183	1	Complies
2462	1.995	16.57	45.39	0.0180	1	Complies

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(5) 802.11n HT40 150Mbps data rate:

Frequency (MHz)	Antenna Gain (Numeric)	Peak Output Power (dBm)	Peak Output Power (mW)	Power Density (S) (mW/cm ²)	Limit of Power Density (S) (mW/cm ²)	Test Result
2412	1.995	15.79	37.93	0.0151	1	Complies
2437	1.995	15.79	37.93	0.0151	1	Complies
2462	1.995	15.67	36.90	0.0146	1	Complies

(6) Band I (5150MHz-5250MHz), the Maximum Conducted Power was at 802.11an(HT20) mode Channel 48

Frequency (MHz)	Antenna Gain (Numeric)	Peak Output Power (dBm)	Peak Output Power (mW)	Power Density (S) (mW/cm ²)	Limit of Power Density (S) (mW/cm ²)	Test Result
5240	1.622	16.9	48.98	0.0158	1	Complies

(6) Band IV(5725MHz-5850MHz), the Maximum Conducted Power was at 802.11an(HT20) mode Channel 165

Frequency (MHz)	Antenna Gain (Numeric)	Peak Output Power (dBm)	Peak Output Power (mW)	Power Density (S) (mW/cm ²)	Limit of Power Density (S) (mW/cm ²)	Test Result
5825	1.622	14.8	30.20	0.0100	1	Complies

4. Conclusion

The 2.4GHz Zigbee, 2.4GHz wifi and 5GHz wifi can transmit simultaneously. The formula of calculated the MPE is

$$CPD=PD1+PD2+PD3+PD2+PD4+\dots\text{etc.}<1$$

CPD=Calculation power density

PD= Power Density

PD1, For 2.4GHz Zigbee the maximum power density is 0.0008 mW/cm²PD2, For 2.4GHz wifi the maximum power density is 0.0210 mW/cm²PD3, For 5GHz wifi the maximum power density is 0.0158 mW/cm²

$$CPD=PD1+PD2+PD3=0.0008+0.0210+0.0158=0.0376 \text{ mW/cm}^2$$

So, the worst-case Calculation power density is 0.0376 mW/cm², which is less than 1 mW/cm² comply the standard requirement.