

RF Exposure evaluation

FCC ID: 2A54CGA27QTA01

Exposure category: General population/uncontrolled environment

EUT Type: Production Unit

Device Type: Portable

1. Reference

According to §1.1307(b)(1), 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 of the Commission's guidelines.

According to §1.1310 and §2.1091 RF exposure is calculated.

KDB447498 D01: Mobile and Portable Devices RF Exposure Procedures and Equipment Authorization Policies

2. Limit

Limits for Maximum Permissible Exposure (MPE)/Controlled Exposure

Frequency Range(MHz)	Electric Field Strength(V/m)	Magnetic Field Strength(A/m)	Power Density (mW/cm ²)	Averaging Time (minute)
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 – 1500	/	/	f/300	6
1500 – 100,000	/	/	5	6

Limits for Maximum Permissible Exposure (MPE)/Uncontrolled Exposure

Frequency Range(MHz)	Electric Field Strength(V/m)	Magnetic Field Strength(A/m)	Power Density (mW/cm ²)	Averaging Time (minute)
Limits for Occupational/Controlled Exposure				
0.3 – 3.0	614	1.63	(100) *	30
3.0 – 30	824/f	2.19/f	(180/f ²)*	30
30 – 300	27.5	0.073	0.2	30
300 – 1500	/	/	f/1500	30
1500 – 100,000	/	/	1.0	30

F=frequency in MHz

*=Plane-wave equivalent power density

3. MPE Calculation Method

Predication of MPE limit at a given distance

Equation from page 18 of OET Bulletin 65, Edition 97-01

$$S = PG / 4\pi R^2$$

Where: S=power density

P=power input to antenna

G=power gain of the antenna in the direction of interest relative to an isotropic radiator

R=distance to the center of radiation of the antenna

4. Antenna Information

EUT can only use antennas certificated as follows provided by manufacturer;

Antenna	Model No. of antenna:	Type of antenna:	Gain of the antenna (Max.)	Frequency range:
WIFI-BT	/	Metal-supported antenna	Antenna0:2.16dBi;Antenna1:1.9dBi For 2.4G Antenna 0 : 0.94dBi,Antenna 1 : 1.33dBi for 5150~5350MHz; Antenna 0 : 2.35dBi,Antenna 1 : 1.39dBi for 5360~5720MHz; Antenna 0: 2.62dBi,Antenna 1 : 1.99dBi for 5.725GHz-5.875GHz;	

5. Manufacturing Tolerance

Max.Conducted Power

Frequency (MHz)	BT		
	2402	2440	2480
Target (dBm)	0.91	1.78	1.61
Tolerance ± (dB)	1.0	1.0	1.0

Antenna 0

Frequency (MHz)	2.4G WIFI		
	2412	2437	2462
Target (dBm)	12.0	12.0	12.0
Tolerance ± (dB)	1.0	1.0	1.0

Antenna 1

Frequency (MHz)	2.4G WIFI		
	2412	2437	2462
Target (dBm)	11.0	11.0	11.0
Tolerance ± (dB)	1.0	1.0	1.0

Antenna 0

Frequency (MHz)	5180-5240MHz WIFI		
	5180	5200	5240
Target (dBm)	13	13	13
Tolerance ± (dB)	1.0	1.0	1.0

Antenna 0

Frequency (MHz)	5260-5320MHz WIFI		
	5260	5280	5320
Target (dBm)	12	12	12
Tolerance ± (dB)	1.0	1.0	1.0

Antenna 0

Frequency (MHz)	5500-5700MHz WIFI		
	5500	5600	5700
Target (dBm)	11	10	10
Tolerance ± (dB)	1.0	1.0	1.0

Antenna 0

Frequency (MHz)	5745-5825MHz WIFI		
	5745	5785	5825
Target (dBm)	11.5	11.5	11.5
Tolerance ± (dB)	1.0	1.0	1.0

Antenna 1

Frequency (MHz)	5180-5240MHz WIFI		
	5180	5200	5240
Target (dBm)	11.54	10.43	9.61
Tolerance ± (dB)	1.0	1.0	1.0

Antenna 1

Frequency (MHz)	5260-5320MHz WIFI		
	5260	5280	5320
Target (dBm)	9.50	9.81	11.05
Tolerance ± (dB)	1.0	1.0	1.0

Antenna 1

Frequency (MHz)	5500-5700MHz WIFI		
	5500	5600	5700
Target (dBm)	15.0	15.0	15.0
Tolerance ± (dB)	1.0	1.0	1.0

Antenna 1

Frequency (MHz)	5745-5825MHz WIFI		
	5745	5785	5825
Target (dBm)	12.0	12.0	12.0
Tolerance ± (dB)	1.0	1.0	1.0

6. Standalone MPE Result

As declared by the Applicant, the EUT is a wireless device used in a fix application, at least 20 cm from any body part of the user or nearby persons; from the maximum EUT RF output power, the minimum separation distance, $r=20\text{cm}$, as well as the gain of the used antenna is refer to section 4, the RF power density can be obtained.

Modulation Type	Output power		Antenna Gain (dBi)	Antenna Gain (linear)	MPE (mW/cm ²)	MPE Limits (mW/cm ²)
	dBm	mW				
BT	1.78	1.507	2.16	1.64	0.000493	1.0000

ANT 0

Modulation Type	Output power		Antenna Gain (dBi)	Antenna Gain (linear)	MPE (mW/cm ²)	MPE Limits (mW/cm ²)
	dBm	mW				
2.4GHz WIFI	13.0	19.953	2.16	1.64	0.006527	1.0000
5GHz WIFI	14.0	25.11886432	2.62	1.83	0.009135	1.0000

ANT 1

Modulation Type	Output power		Antenna Gain (dBi)	Antenna Gain (linear)	MPE (mW/cm ²)	MPE Limits (mW/cm ²)
	dBm	mW				
2.4GHz WIFI	12.0	15.84893192	1.90	1.55	0.004883	1.0000
5GHz WIFI	16.0	39.81071706	1.99	1.58	0.012524	1.0000

Remark:

1. Max.Output power (Peak) including turn-up tolerance;
2. MPE evaluate distance is 20cm from user manual provide by manufacturer.
- 3.The 2.4G WIFI and 5GHz WIFI band can not transmit simultaneously.
- 4.The 2.4G WIFI and BT can transmit simultaneously .

SUM:

2.4GHz:

$$\text{ANT0}+\text{ANT1}=0.006527/1+0.004883/1=0.01141<1$$

5GHz WIFI

$$\text{ANT0}+\text{ANT1}=0.009135/1+0.012524/1=0.021659<1$$

$$\text{WIFI} + \text{BT (Worst)}=0.021659/1+0.000493/1=0.022152<1$$

7. Conclusion

The measurement results comply with the FCC Limit per 47 CFR 2.1091 for the uncontrolled RF Exposure of mobile device.

-----THE END OF REPORT-----