RF Exposure evaluation

FCC ID: 2AYVYFMWRJ04A1

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/cm²)	Averaging Time (minute)
	Limits for Occ	cupational/Control	led Exposure	
0.3 - 3.0 3.0 - 30 30 - 300 300 - 1500 1500 - 100,000	614 1842/f 61.4 /	1.63 4.89/f 0.163 /	(100) * (900/f²)* 1.0 f/300 5	6 6 6 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/cm²)	Averaging Time
	Limits for Occ	cupational/Control	led Exposure	(minute)
0.3 - 3.0 3.0 - 30 30 - 300 300 - 1500 1500 - 100,000	614 824/f 27.5 /	1.63 2.19/f 0.073 /	(100) * (180/f ²)* 0.2 f/1500 1.0	30 30 30 30 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

FMWRJ04A1 can only use antennas certificated as follows provided by manufacturer;

Antenna No.	Model No. of antenna:	Type of antenna:	Gain of the antenna (Max.)	
BLE	1	PCB antenna	0.92dBi for 2400-2500MHz	
2.4GWIFI	1	PCB antenna	0.92dBi for 2400-2500MHz	
5GWIFI	1	PCB antenna	1.97dBi for 57	25-5875MHz

5. Manufacturing Tolerance

BLE(Peak)

BLE						
Channel Channel 00 Channel 19 Channel 39						
Target (dBm)	3.0	3.0	3.0			
Tolerance ±(dB)	1.0	1.0	1.0			

2.4GHz WIFI(Peak)

		, ,		
Frequency	11b			
(MHz)	2412	2437	2462	
Target (dBm)	14.0	14.0	14.0	
Tolerance ± (dB)	1.0	1.0	1.0	
Frequency		11g		
(MHz)	2412	2437	2462	
Target (dBm)	16.0	16.0	16.0	
Tolerance ± (dB)	1.0	1.0	1.0	
Frequency	11n(HT20)			
(MHz)	2412	2437	2462	
Target (dBm)	16.0	16.0	16.0	
Tolerance ± (dB)	1.0	1.0	1.0	
Frequency	11n(HT40)			
(MHz)	2422	2437	2452	

Target (dBm)	16.0	16.0	16.0
Tolerance ± (dB)	1.0	1.0	1.0

5GHz WLAN Band 4

IEEE 802.11a (Average)						
Frequency(MHz)						
Target (dBm)	12.0		2.0	12.0		
Tolerance ± (dB)	1.0	1	.0	1.0		
	IEEE 802.11n	HT20 (Avera	age)			
Frequency(MHz)	5745	57	'85	5825		
Target (dBm)	12.0	12	2.0	12.0		
Tolerance ± (dB)	1.0	1	.0	1.0		
	IEEE 802.11n	HT40 (Avera	age)			
Frequency(MHz)	5755	5755 5795				
Target (dBm)	15.0 15.0			15.0		
Tolerance ± (dB)	1.0 1.0			1.0		
	IEEE 802.11ac VHT20 (Average)					
Frequency(MHz)	5745	57	'85	5825		
Target (dBm)	11.0	11	1.0	11.0		
Tolerance ± (dB)	1.0	1	.0	1.0		
	IEEE 802.11ac	VHT40 (Ave	rage)			
Frequency(MHz)	5755			5795		
Target (dBm)	15.0 15.0			15.0		
Tolerance ± (dB)	1.0 1.0					
IEEE 802.11ac VHT80 (Average)						
Frequency(MHz)	5775					
Target (dBm)	9.0					
Tolerance ± (dB)	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=20cm, as well as the gain of the used antenna refer to antenna information,the RF power density can be obtained.

	Output power		Antenna	Antenna	MPE	MPE
Modulation Type	Type dBm	dBm mW	Gain	Gain		Limits
			(dBi)	(linear)	(mW/cm ²)	(mW/cm ²)
BLE	4.0	2.5119	0.92	1.2359	0.00062	1.0000
2.4GWIFI	17.0	50.1187	0.92	1.2359	0.01232	1.0000
5GWIFI Band 4	16.0	39.8107	1.97	1.5740	0.01247	1.0000

Remark:

- 1. Output power (Peak) including turn-up tolerance;
- 2. MPE evaluate distance is 20cm from user manual provide by manufacturer.

Simultaneous Evaluation

2.4G WIFI	5G WIFI MPE	MPE	MPE
(mW/cm²)	(mW/cm²)		Limits
0.01232	0.01247	0.02479	1.0000

7. Conclusion

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

