

RF Exposure evaluation

FCC ID: 2AM5I-M101C

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 v05r02: 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

Simultaneous transmission MPE test exclusion applies when the sum of the MPE ratios for all simultaneous transmitting antennas incorporated in a host device, based on the calculated/estimated, numerically modeled or measured field strengths or power density, is ≤ 1.0 .

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. 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 3dBi form WIFI/BT and 3dBi for GSM/WCDMA/CDMA/LTE, the RF power density can be obtained.

2.4G WIFI

Band	Frequency (MHz)	Max. Output Power (dBm)	Output Power (mW)	Antenna Gain (Numeric)	Power Density At 20 cm (mW/cm ²)	Power Density Limit FCC (mW/cm ²)	Test Results
802.11b	2452	21.32	135.5189	1.9953	0.0538	1.0000	PASS

5G WIFI

Band	Frequency (MHz)	Max. Output Power (dBm)	Output Power (mW)	Antenna Gain (Numeric)	Power Density At 20 cm (mW/cm ²)	Power Density Limit FCC (mW/cm ²)	Test Results
802.11ac (VHT40)	5190	12.48	17.7011	1.9953	0.0070	1.0000	PASS
802.11ac (VHT20)	5260	12.85	19.2752	1.9953	0.0077	1.0000	PASS
802.11a	5745	10.08	10.1859	1.9953	0.0040	1.0000	PASS

BT

Band	Frequency (MHz)	Max. Output Power (dBm)	Output Power (mW)	Antenna Gain (Numeric)	Power Density At 20 cm (mW/cm ²)	Power Density Limit FCC (mW/cm ²)	Test Results
BT3.0	2480	4.34	2.7164	1.9953	0.0011	1.0000	PASS

BLE

Band	Frequency (MHz)	Max. Output Power (dBm)	Output Power (mW)	Antenna Gain (Numeric)	Power Density At 20 cm (mW/cm ²)	Power Density Limit FCC (mW/cm ²)	Test Results
BLE	2402	2.76	1.8880	1.9953	0.0007	1.0000	PASS

GSM

Band	Frequency (MHz)	Max. Output Power (dBm)	Output Power (mW)	Antenna Gain (Numeric)	Power Density At 20 cm (mW/cm ²)	Power Density Limit FCC (mW/cm ²)	Test Results
GSM850	848.8	31.93	1949.8446	1.9953	0.6191	1.0000	PASS
PCS1900	1850.2	29.64	920.4496	1.9953	0.3654	1.0000	PASS

WCDMA

Band	Frequency (MHz)	Max. Output Power (dBm)	Output Power (mW)	Antenna Gain (Numeric)	Power Density At 20 cm (mW/cm ²)	Power Density Limit FCC (mW/cm ²)	Test Results
Band II	1907.6	22.93	196.3360	1.9953	0.0779	1.0000	PASS
Band V	846.6	23.49	223.3572	1.9953	0.0887	1.0000	PASS

LTE

Band	Frequency (MHz)	Max. Output Power (dBm)	Output Power (mW)	Antenna Gain (Numeric)	Power Density At 20 cm (mW/cm ²)	Power Density Limit FCC (mW/cm ²)	Test Results
Band 2	1855	22.73	187.4995	1.9953	0.0744	1.0000	PASS
Band 4	1753.5	18.98	79.0679	1.9953	0.0314	1.0000	PASS
Band 5	848.3	23.06	202.3019	1.9953	0.0803	1.0000	PASS
Band 7	2535	23.11	204.6445	1.9953	0.0812	1.0000	PASS
Band 41	2501	23.51	224.3882	1.9953	0.0891	1.0000	PASS

The respectively antenna used by WIFI/BT and GSM/WCDMA/LTE, Simultaneous transmission can operate within WIFI and GSM/WCDMA/LTE; BT and GSM/WCDMA/LTE.

Simultaneous transmission MPE

Max.Power Density WIFI (mW/cm ²)	Max.Power Density BT (mW/cm ²)	Max.Power Density BLE (mW/cm ²)	Max.Power Density WCDMA (mW/cm ²)	Max.Power Density GSM (mW/cm ²)	Max.Power Density LTE (mW/cm ²)	Max.sum of the MPE ratios	Limit	Test Results
0.0538	0.0011	0.0007	0.0887	0.6191	0.0891	0.8525	1	PASS

5. Conclusion

The SAR evaluation is not required.