

RF Exposure evaluation

FCC ID: SMQALXC28

Exposure category: General population/uncontrolled environment

EUT Type: Production Unit

Device Type: Mobile Device

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

The device evaluated with antennas certificated as follows provided by manufacturer.

Antenna model	Antenna type and antenna number	Operate frequency band	Maximum antenna gain
LBS-037A	PIFA antenna	2.4GHz – 2.5 GHz 5.15GHz – 5.85 GHz	4.08 dBi 3.47 dBi

5. Conducted power and Manufacturing Tolerance

2.4GHz WLAN

Mode	Channel	Output Power[dBm]	Tune up [dBm]
11B	2412	14.10	15±1
	2437	14.62	15±1
	2462	14.83	15±1
11G	2412	14.23	15±1
	2437	14.80	15±1
	2462	15.01	15±1
11N20SISO	2412	14.16	15±1
	2437	14.62	15±1
	2462	14.85	15±1
11N40SISO	2422	15.11	15±1
	2437	15.46	15±1
	2452	15.80	15±1

5GHz WLAN Band 1

Mode	Channel	Output Power[dBm]	Tune-Up[dBm]
11A	5180	8.02	8±1
	5200	7.74	8±1
	5240	7.48	8±1
11N20SISO	5180	8.04	8±1
	5200	7.70	8±1
	5240	7.29	8±1
11N40SISO	5190	8.34	8±1
	5230	7.90	8±1

5GHz WLAN Band 2A

Mode	Channel	Output Power[dBm]	Tune-Up[dBm]
11A	5260	7.79	8±1
	5300	7.77	8±1
	5320	7.76	8±1
11N20SISO	5260	7.64	8±1
	5300	7.62	8±1
	5320	7.57	8±1
11N40SISO	5270	8.15	8±1
	5310	8.02	8±1

5GHz WLAN Band 2C

Mode	Channel	Output Power[dBm]	Tune-Up[dBm]
11A	5500	6.83	7±1
	5580	6.26	7±1
	5700	6.25	7±1
11N20SISO	5500	6.73	7±1
	5580	6.14	7±1
	5700	6.19	7±1
11N40SISO	5510	7.37	7±1
	5550	7.06	7±1
	5670	6.85	7±1

5GHz WLAN Band 3

Mode	Channel	Output Power[dBm]	Tune-Up[dBm]
11A	5745	7.18	7±1
	5785	7.31	7±1
	5825	6.53	7±1
11N20SISO	5745	7.07	7±1
	5785	7.23	7±1
	5825	6.49	7±1

11N40SISO	5755	7.40	7±1
	5795	7.53	7±1

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, the RF power density can be obtained.

2.4GHz WLAN

Type	Max. Output power With Tune-Up		Antenna Gain (linear)	MPE (mW/cm ²)	MPE Limits (mW/cm ²)
	dBm	mW			
IEEE 802.11b	16.00	39.8107	2.5586	0.0203	1.0000
IEEE 802.11g	16.00	39.8107	2.5586	0.0203	1.0000
IEEE 802.11n HT20	16.00	39.8107	2.5586	0.0203	1.0000
IEEE 802.11n HT40	16.00	39.8107	2.5586	0.0203	1.0000

5GHz WLAN Band 1

Type	Max. Output power With Tune-Up		Antenna Gain (linear)	MPE (mW/cm ²)	MPE Limits (mW/cm ²)
	dBm	mW			
IEEE 802.11a	9.00	7.9433	2.2233	0.0035	1.0000
IEEE 802.11n HT20	9.00	7.9433	2.2233	0.0035	1.0000
IEEE 802.11n HT40	9.00	7.9433	2.2233	0.0035	1.0000

5GHz WLAN Band 2A

Type	Max. Output power With Tune-Up		Antenna Gain (linear)	MPE (mW/cm ²)	MPE Limits (mW/cm ²)
	dBm	mW			
IEEE 802.11a	9.00	7.9433	2.2233	0.0035	1.0000
IEEE 802.11n HT20	9.00	7.9433	2.2233	0.0035	1.0000
IEEE 802.11n HT40	9.00	7.9433	2.2233	0.0035	1.0000

5GHz WLAN Band 2C

Type	Max. Output power With Tune-Up		Antenna Gain (linear)	MPE (mW/cm ²)	MPE Limits (mW/cm ²)
	dBm	mW			
IEEE 802.11a	8.00	6.3096	2.2233	0.0028	1.0000
IEEE 802.11n HT20	8.00	6.3096	2.2233	0.0028	1.0000
IEEE 802.11n HT40	8.00	6.3096	2.2233	0.0028	1.0000

5GHz WLAN Band 3

Type	Output power		Antenna Gain (linear)	MPE (mW/cm ²)	MPE Limits (mW/cm ²)
	dBm	mW			
IEEE 802.11a	8.00	6.3096	2.2233	0.0028	1.0000
IEEE 802.11n HT20	8.00	6.3096	2.2233	0.0028	1.0000
IEEE 802.11n HT40	8.00	6.3096	2.2233	0.0028	1.0000

Remark:

- 1. Output power (Average) including turn-up tolerance;*
- 2. Output power was adjust to duty cycle at 100% if measured duty cycle less than 98%;*
- 3. MPE evaluate distance is 20cm from user manual provide by manufacturer.*

7. Conclusion

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

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