FCC 47 CFR MPE REPORT

Positive LLC

Guitar Speaker

Model Number: Spark 2

FCC ID: 2A348SPARK2

Applicant:	Positive LLC
Address:	2820 S Alma School Rd Suite 18 PMB 2011 Chandler,
	AZ 85286, USA
Prepared By:	EST Technology Co., Ltd.
	Chilingxiang, Qishantou, Santun, Houjie, Dongguan, Guangdong, China
Tel: 86-769-83081888-808	

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Maximum Permissible Exposure

1. Applicable Standards

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.

1.1. Limits for Maximum Permissible Exposure (MPE)

(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
1500-10000			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
1500-10000			1.o	30

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

1.2. MPE Calculation Method

E (V/m) = $\frac{\sqrt{30 \times P \times G}}{d}$ Power Density: Pd (W/m^2) = $\frac{E^2}{377}$

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 = $\frac{30 \times P \times G}{377 \times d^2}$

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

2. Conducted Power Result

Mode	Frequency (MHz)	Peak output power (dBm)	Peak output power (mW)
GFSK	2402	6.28	4.246
	2441	5.41	3.475
	2480	7.30	5.370
π/4-DQPSK	2402	6.85	4.842
	2441	5.96	3.945
	2480	5.37	3.443
8-DPSK	2402	7.19	5.236
	2441	6.38	4.345
	2480	5.63	3.656
BLE 1M	2402	6.26	4.227
	2440	5.98	3.963
	2480	6.55	4.519
BLE 2M	2402	6.69	4.667
	2440	6.42	4.385
	2480	6.77	4.753
IEEE 802.11b	2412	19.58	90.782
	2437	19.33	85.704
	2462	19.50	89.125
IEEE 802.11g	2412	20.39	109.396
	2437	20.18	104.232
	2462	20.60	114.815
IEEE 802.11n HT20	2412	20.06	101.391
	2437	19.65	92.257
	2462	20.33	107.895
IEEE 802.11n HT40	2422	20.14	103.276
	2437	19.50	89.125
	2452	19.84	96.383

3. Calculated Result and Limit

Mode	Peak output power (dBm)	Target power (dBm)	MAX Target power (dBm)	Antenna gain		Power Density (S) (mW /cm^2)	Limited of Power Density (S) (mW /cm^2)	Test Result
				(dBi)	(Linear)			
2.4G Band								
GFSK	7.30	7±1	8	3.65	2.317	0.00291	1	Complies
π/4-DQPSK	6.85	6±1	7	3.65	2.317	0.00231	1	Complies
8-DPSK	7.19	7±1	8	3.65	2.317	0.00291	1	Complies
BLE	6.77	6±1	7	3.54	2.259	0.00225	1	Complies
IEEE 802.11b	19.58	19±1	20	3.54	2.259	0.04495	1	Complies
IEEE 802.11g	20.60	20±1	21	3.54	2.259	0.05659	1	Complies
IEEE 802.11n HT20	20.33	20±1	21	3.54	2.259	0.05659	1	Complies
IEEE 802.11n HT40	20.14	20±1	21	3.54	2.259	0.05659	1	Complies

Note: WIFI 2.4G and BLE are share an antenna, Cann't both the WIFI 2.4G and BLE operate simultaneously.

Simultaneous Transmission Mode (BT+WIFI Mode)

Mode	Result	Limit	Simultaneous Transmissions Result	Simultaneous Transmissions Limit	Total Result
BT	0.00291	1	0.05950	1	Complies
WIFI	0.05659	1			

End of Test Report