FCC 47 CFR MPE REPORT

Arize Corporation

Smart Hub

Model Number: ASH120

FCC ID: 2AWPP-ASH120

Applicant:	Arize Corporation
Address:	1065 N Pacificenter Drive,Suite 410,Anaheim,CA 92806,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

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

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)	Antenna	Peak output power (dBm)	Peak output power (mW)
Zigbee	2405	ant 1	18.79	75.683
	2440	ant 1	18.38	68.865
	2480	ant 1	17.71	59.020
BLE	2402	ant 1	5.57	3.606
	2440	ant 1	5.28	3.373
	2480	ant 1	5.34	3.420
IEEE 802.11b	2412	ant 1	15.55	35.892
		ant 2	12.94	19.679
	2437	ant 1	15.82	38.194
		ant 2	12.76	18.880
	2462	ant 1	15.41	34.754
		ant 2	13.34	21.577
IEEE 802.11g	2412	ant 1	20.79	119.950
		ant 2	17.94	62.230
	2437	ant 1	20.69	117.220
		ant 2	17.72	59.156
	2462	ant 1	20.17	103.992
		ant 2	18.20	66.069
IEEE 802.11n HT20	2412	ant 1	20.06	101.391
		ant 2	17.34	54.200
	2437	ant 1	20.02	100.462
		ant 2	17.14	51.761
	2462	ant 1	19.50	89.125
		ant 2	17.64	58.076
IEEE 802.11n HT40	2422	ant 1	19.96	99.083
		ant 2	17.15	51.880
	2437	ant 1	20.01	100.231
		ant 2	17.14	51.761
	2452	ant 1	19.83	96.161
		ant 2	17.29	53.580

Mode	Band	Max output power (dBm)	Max output power (mW)
WCDMA	2	22.36	172.187
	4	22.25	167.880
	5	22.55	179.887
LTE-FDD	2	25.27	336.512
	4	23.55	226.464
	5	24.37	273.527
	12	24.02	252.348
	13	26.58	454.988
	25	25.95	393.550
	26	24.58	287.078

3. Calculated Result and Limit

SISO

The Worst Mode	Antenna	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)			
Zigbee	ant 1	18.79	18±1	19	0.2	1.047	0.0165	1	Complies
BLE	ant 1	5.57	5±1	6	0.2	1.047	0.0008	1	Complies
IEEE 802.11b	ant 1	15.82	15±1	16	3.88	2.443	0.0194	1	Complies
	ant 2	13.34	13±1	14	4.47	2.799	0.0140	1	Complies
IEEE 802.11g	ant 1	20.79	20±1	21	3.88	2.443	0.0612	1	Complies
	ant 2	18.20	18±1	19	4.47	2.799	0.0442	1	Complies
IEEE 802.11n HT20	ant 1	20.06	20±1	21	3.88	2.443	0.0612	1	Complies
	ant 2	17.64	17±1	18	4.47	2.799	0.0351	1	Complies
IEEE 802.11n HT40	ant 1	20.01	20±1	21	3.88	2.443	0.0612	1	Complies
	ant 2	17.29	17±1	18	4.47	2.799	0.0351	1	Complies

The Worst Mode	Antenna	EIRP or ERP or Conducted 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)			
WCDMA Band 2	ant 1	22.36	22±1	23	2.27	1.687	0.0669	1	Complies
WCDMA Band 4	ant 1	22.25	22±1	23	1.32	1.355	0.0538	1	Complies
WCDMA Band 5	ant 1	22.55	22±1	23	3.61	2.296	0.0911	0.55	Complies
LTE-FDD Band 2	ant 1	25.27	25±1	26	2.27	1.687	0.0792	1	Complies
LTE-FDD Band 4	ant 1	23.55	23±1	24	1.32	1.355	0.0500	1	Complies
LTE-FDD Band 5	ant 1	24.37	24±1	25	3.61	2.296	0.0629	0.55	Complies
LTE-FDD Band 12	ant 1	24.02	24±1	25	3.64	2.312	0.0629	0.46	Complies
LTE-FDD Band 13	ant 1	26.58	26±1	27	3.64	2.312	0.0997	0.51	Complies
LTE-FDD Band 25	ant 1	25.95	25±1	26	2.27	1.687	0.0792	1	Complies
LTE-FDD Band 26	ant 1	24.58	24±1	25	3.61	2.296	0.0629	0.55	Complies

WLAN MIMO

Mode	Power Density (S) (mW /cm^2) Antenna 1	Power Density (S) (mW /cm^2) Antenna 2	Power Density (S) (mW /cm^2) Total	Limited of Power Density (S) (mW/cm2)	Test Result
IEEE 802.11n HT20	0.0612	0.0351	0.0963	1	Complies
IEEE 802.11n HT40	0.0612	0.0351	0.0963	1	Complies

Simultaneous Transmission Mode (Zigbee+BLE+WLAN+WCDMA+LTE)

Mode	Result	Limit	Simultaneous Transmissions Result	Simultaneous Transmissions Limit	Total Result
Zigbee	0.0165	1	0.4747	1	Complies
BLE	0.0008	1			
WLAN	0.0963	1			
WCDMA	0.0911	0.55			
LTE	0.0997	0.51			

End of Test Report