

RF EXPOSURE REPORT

FOR

Applicant	:	Harman International Industries, Inc.
Address	:	8500 Balboa Boulevard, Northridge, CA 91329, UNITED STATES
Equipment under Test	:	Wireless Multi-Channel Soundbar
Model No.	:	CITATION MULTIBEAM 700
Trade Mark	:	harman/kardon
FCC ID	:	APIHKMB700
Manufacturer	:	Harman International Industries, Inc.
Address	:	8500 Balboa Boulevard, Northridge, CA 91329, UNITED STATES

Issued By: Dongguan Dongdian Testing Service Co., Ltd.

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TEST REPORT DECLARE

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Standard Used: KDB447498 D01 General RF Exposure Guidance v06

We Declare:

The equipment described above is assessed by Dongguan Dongdian Testing Service Co., Ltd and in the configuration assessed the equipment complied with the standards specified above. The assessed results are contained in this report and Dongguan Dongdian Testing Service Co., Ltd is assumed of full responsibility for the accuracy and completeness of these assess.

After evaluation, our opinion is that the equipment In Accordance with above standard.

Report No:	DDT-R19080710-1E21		
Date of Receipt:	Oct. 23, 2019	Date of Test:	Oct. 23, 2019 ~ Dec. 06, 2019

Prepared By:

Talent Zhang

Talent Zhang/Engineer

Approved By:



Damon Hu/EMC Manager

Note: This report applies to above tested sample only. This report shall not be reproduced in parts without written approval of Dongguan Dongdian Testing Service Co., Ltd.

Revision history

Rev.	Revisions	Issue Date	Revised By
---	Initial issue	Dec. 06, 2019	

1. General information

1.1. Description of Equipment

EUT* Name	: Wireless Multi-Channel Soundbar
Model Number	: CITATION MULTIBEAM 700
EUT function description	: Please reference user manual of this device
Power supply	: AC 100-240V, 50/60Hz
Radio Specification	: Bluetooth V4.2, IEEE802.11b/g/n, IEEE802.11a/n/ac
Operation frequency	: Bluetooth: 2402MHz-2480MHz IEEE 802.11b: 2412MHz-2462MHz IEEE 802.11g: 2412MHz-2462MHz IEEE 802.11n HT20: 2412MHz-2462MHz IEEE 802.11a, 11n HT20, 11ac HT20: 5180MHz-5240MHz, 5260MHz-5320MHz, 5500MHz-5700MHz, 5745MHz-5825MHz IEEE 802.11n HT40, 11ac HT20: 5190MHz-5230MHz, 5270MHz-5310MHz, IEEE 802.11ac HT80:5210MHz, 5290MHz, 5530MHz, 5775MHz
Modulation	: Bluetooth: GFSK, $\pi/4$ -DQPSK, 8DPSK IEEE 802.11b: DSSS (CCK, DQPSK, DBPSK) IEEE 802.11g: OFDM (64QAM, 16QAM, QPSK, BPSK) IEEE 802.11n HT20, HT40: OFDM (64QAM, 16QAM, QPSK, BPSK) IEEE 802.11a: OFDM (64QAM, 16QAM, QPSK, BPSK) IEEE 802.11ac: OFDM (256QAM, 64QAM, 16QAM, QPSK, BPSK)
Data rate	: Bluetooth: 1Mbps, 2Mbps, 3Mbps IEEE 802.11b: 1, 2, 5.5, 11 Mbps IEEE 802.11g: 6, 9, 12, 18, 24, 36, 48, 54 Mbps IEEE 802.11n HT20: 6.5, 13, 19.5, 26, 39, 52, 58.5, 65 Mbps IEEE 802.11a: 6, 9, 12, 18, 24, 36, 48, 54 Mbps IEEE 802.11n HT20: 14.4, 28.9, 43.3, 57.8, 86.7, 115.6, 130.0, 144.4 Mbps IEEE 802.11n HT40: 30, 60, 90, 120, 180, 240, 270, 300 Mbps IEEE 802.11acHT20: 14.4, 28.8, 43.4, 57.8, 86.6, 115.6, 130, 144.4, 173.4 Mbps IEEE 802.11ac HT40: 30, 60, 90, 120, 180, 240, 270, 300, 360, 400 Mbps IEEE 802.11ac HT80: 65, 130, 195, 260, 390, 520, 585, 650, 780, 866.6 Mbps
Antenna Type	: Antenna 1: Dedicated FPC antenna, 2.4G band maximum PK gain: 2.64 dBi, 5G band maximum PK gain: 3.24 dBi Antenna 2: Dedicated FPC antenna, 2.4G band maximum PK gain: 2.36 dBi, 5G band maximum PK gain: 3.68 dBi WISA Antenna: Integral PCB antenna, maximum PK gain: 0.77 dBi
Exposure category	: General population/uncontrolled environment
Device Type	: Mobile Device
Sample Type	: Series production

1.2. Assess laboratory

Dongguan Dongdian Testing Service Co., Ltd.

Add: No. 17, Zongbu Road 2, Songshan Lake Sci&Tech, Industry Park, Dongguan City, Guangdong Province, China, 523808

Tel: +86-0769-38826678, <http://www.dgddt.com>, E-Mail: ddt@dgddt.com

2. RF Exposure evaluation

2.1. Requirement

Systems operating under the provisions of FCC 47 CFR 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.

In accordance with 47 CFR FCC Part 2 Subpart J, section 2.1091 this device has been defined as mobile device whereby a distance of 0.2m normally can be maintained between the user and the device, and below RF Permissible Exposure limit shall comply with.

In accordance with KDB447498D01 for 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 modelled or measured field strengths or power density, is ≤ 1.0 . The MPE ratio of each antenna is determined at the minimum test separation distance required by the operating configurations and exposure conditions of the host device, according to the ratio of field strengths or power density to MPE limit, at the test frequency. Either the maximum peak or spatially averaged results from measurements or numerical simulations may be used to determine the MPE ratios. Spatial averaging does not apply when MPE is estimated using simple calculations based on far-field plane-wave equivalent conditions. The antenna installation and operating requirements for the host device must meet the minimum test separation distances required by all antennas, in both standalone and simultaneous transmission operations, to satisfy compliance.

2.2. Refer Evaluation Method

[ANSI C95.1-1999](#): IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz.

[FCC KDB publication 447498 D01 General 1 RF Exposure Guidance v06](#): Mobile and Portable Devices RF Exposure Procedures and Equipment Authorization Policies.

[FCC CFR 47 part1 1.1310](#): Radiofrequency radiation exposure limits.

[FCC CFR 47 part2 2.1091](#): Radiofrequency radiation exposure evaluation: mobile devices

2.3. Limits

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

2.4. 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

2.5. Antenna Information

CITATION MULTIBEAM 700 can only use antennas certificated as follows provided by manufacturer;

Internal Identification	Antenna type and antenna number	Operate frequency band	Maximum antenna gain	Note
Antenna 1	Dedicated FPC antenna	2000 MHz – 2500 MHz	2.64 dBi	BT/WLAN Antenna
Antenna 1	Dedicated FPC antenna	5000 MHz – 6000 MHz	3.24 dBi	WLAN Antenna
Antenna 2	Dedicated FPC antenna	2000 MHz – 2500 MHz	2.36 dBi	WLAN Antenna
Antenna 2	Dedicated FPC antenna	5000 MHz – 6000 MHz	3.68 dBi	WLAN Antenna

2.6. Estimation Result

2.6.1 Manufacturing Tolerance

Mode	Maximum Peak power declared by Manufacturer (dBm)
	Antenna 1
GFSK	≤ 8
$\pi/4$ DQPSK	≤ 6
8DPSK	≤ 6
GFSK – BT LE	≤ 6

Mode	Frequency Band	Maximum Average power declared by Manufacturer (dBm)	
		Antenna 1	Antenna 2
IEEE 802.11b	2.4GHz	≤ 23	/
IEEE 802.11g	2.4GHz	≤ 26	≤ 26
IEEE 802.11n HT20	2.4GHz	≤ 26	≤ 26

Mode	Frequency Band	Maximum Average power declared by Manufacturer (dBm)	
		Antenna 1	Antenna 2
IEEE 802.11a	Band 1	≤ 16	≤16
	Band 2A	≤ 17	≤17
	Band 2C	≤ 13	≤13
	Band 3	≤ 13	≤13
IEEE 802.11n HT20	Band 1	≤ 16	≤16
	Band 2A	≤ 17	≤17
	Band 2C	≤ 13	≤13
	Band 3	≤ 13	≤13
IEEE 802.11n HT40	Band 1	≤ 16	≤16
	Band 2A	≤ 16	≤16
	Band 2C	≤ 18	≤18
	Band 3	≤ 16	≤16
IEEE 802.11ac VHT20	Band 1	≤ 17	≤17
	Band 2A	≤ 17	≤17
	Band 2C	≤ 14	≤14
	Band 3	≤ 13	≤13
IEEE 802.11ac VHT40	Band 1	≤ 17	≤17
	Band 2A	≤ 16	≤16
	Band 2C	≤ 16	≤16
	Band 3	≤ 16	≤16
IEEE 802.11ac VHT80	Band 1	≤ 10	≤10
	Band 2A	≤ 13	≤13
	Band 2C	≤ 15	≤15
	Band 3	≤ 15	≤15

2.6.2 Evaluation Results

2.6.2.1 Standalone MPE

Antenna 1

Mode	Output power		Antenna Gain (dBi)	Antenna Gain (linear)	Duty Cycle	MPE (mW/cm ²)	MPE Limits (mW/cm ²)
	(dBm)	(mW)					
GFSK	8.00	6.31	2.64	1.84	100%	0.0023	1.00
π/4DQPSK	6.00	3.98	2.64	1.84	100%	0.0015	1.00
8DPSK	6.00	3.98	2.64	1.84	100%	0.0015	1.00
GFSK – BT LE	6.00	3.98	2.64	1.84	100%	0.0015	1.00

Antenna 1

Mode	Output power		Antenna Gain (dBi)	Antenna Gain (linear)	Duty Cycle	MPE (mW/cm ²)	MPE Limits (mW/cm ²)
	(dBm)	(mW)					
IEEE 802.11b	23.00	199.5256	2.64	1.8365	100%	0.0729	1.00
IEEE 802.11g	26.00	398.1072	2.64	1.8365	100%	0.1455	1.00
IEEE 802.11a	17.00	50.1187	3.24	2.1086	100%	0.0210	1.00
IEEE 802.11n HT20	26.00	398.1072	2.64	1.8365	100%	0.1455	1.00
	17.00	50.1187	3.24	2.1086	100%	0.0210	1.00
IEEE 802.11n HT40	18.00	63.0957	3.24	2.1086	100%	0.0265	1.00
IEEE 802.11ac VHT20	17.00	50.1187	3.24	2.1086	100%	0.0210	1.00
IEEE 802.11ac VHT40	17.00	50.1187	3.24	2.1086	100%	0.0210	1.00
IEEE 802.11ac VHT80	15.00	31.6228	3.24	2.1086	100%	0.0133	1.00

Antenna 2

Mode	Output power		Antenna Gain (dBi)	Antenna Gain (linear)	Duty Cycle	MPE (mW/cm ²)	MPE Limits (mW/cm ²)
	(dBm)	(mW)					
IEEE 802.11g	26.00	398.1072	2.36	1.7219	100%	0.1364	1.00
IEEE 802.11a	17.00	50.1187	3.68	2.3335	100%	0.0233	1.00
IEEE 802.11n HT20	26.00	398.1072	2.36	1.7219	100%	0.1364	1.00
	17.00	50.1187	3.68	2.3335	100%	0.0233	1.00
IEEE 802.11n HT40	18.00	63.0957	3.68	2.3335	100%	0.0293	1.00
IEEE 802.11ac VHT20	17.00	50.1187	3.68	2.3335	100%	0.0233	1.00
IEEE 802.11ac VHT40	17.00	50.1187	3.68	2.3335	100%	0.0233	1.00
IEEE 802.11ac VHT80	15.00	31.6228	3.68	2.3335	100%	0.0147	1.00

Remark:

1. Maximum power including tune-up tolerance;
2. MPE use distance is 20cm from manufacturer declaration of user manual.

Antenna 1, Antenna 2 for WLAN/BT

Band	Mode	MPE Ratio Antenna 1	MPE Ratio Antenna 2	∑ MPE ratios	Limit	Results
2.4G	IEEE 802.11b	0.0729	/	/	1.0	PASS
2.4G	IEEE 802.11g	0.1455	0.1362	/	1.0	PASS
2.4G	IEEE 802.11n HT20	0.1455	0.1364	0.2819	1.0	PASS
5G	IEEE 802.11n HT20	0.0210	0.0233	0.0443	1.0	PASS
5G	IEEE 802.11n HT40	0.0265	0.0293	0.0558	1.0	PASS
5G	IEEE 802.11a	0.0210	0.0233	/	1.0	PASS
5G	IEEE 802.11ac VHT20	0.0210	0.0233	0.0443	1.0	PASS
5G	IEEE 802.11ac VHT40	0.0210	0.0233	0.0443	1.0	PASS
5G	IEEE 802.11ac VHT80	0.0133	0.0147	0.028	1.0	PASS

Maximum MPE Ratios for BT, WLAN and WISA simultaneous transmission

Maximum MPE Ratio WLAN	Maximum MPE Ratio WISA	∑ MPE ratios	Limit	Results
0.2819	0.0047	0.3	1.0	PASS

Remark:

1. Maximum power including tune-up tolerance;
2. MPE use distance is 20cm from manufacturer declaration of user manual.
3. Maximum MPE Ratio WISA from FCC ID: UA9800 (Report No.: FOCU0169.1);

2.7. Conclusion

The measurement results comply with the FCC part §2.1091 for the uncontrolled RF Exposure of mobile device.

END OF REPORT