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RF Exposure Evaluation Report

Report No.:	CQASZ20200600503E-06
Applicant:	XIAMEN COMFORT SCIENCE & TECHNOLOGY GROUP CO., LTD.
Address of Applicant:	(5/F) NO.168, QIANPU ROAD, SIMING DISTRICT, XIAMEN, CHINA
Equipment Under Test (EUT):	
EUT Name:	Massage Chair
Model No.:	EC-8606B, Hilux
Test Model No.:	EC-8606B
Brand Name:	N/A
FCC ID:	YMX-EC8606B
Standards:	47 CFR Part 1.1307 47 CFR Part 1.1310 KDB447498D01 General RF Exposure Guidance v06
Date of Receipt:	2020-06-08
Date of Test:	2020-06-08 to 2020-06-22
Date of Issue:	2020-06-22
Test Result:	**PASS***

***In the configuration tested, the EUT complied with the standards specified above**

Tested By: Tom Chen.

(Tom Chen)

Reviewed By: Sheek Luo

(Sheek Luo)

Approved By:

(Jack Ai)

1 Version

Revision History Of Report

Report No.	Version	Description	Issue Date
CQASZ20200600503E-06	Rev.01	Initial report	2020-06-22

2 Contents

3 General Information

3.1 Client Information

Applicant:	XIAMEN COMFORT SCIENCE & TECHNOLOGY GROUP CO., LTD.
Address of Applicant:	(5/F) NO.168, QIANPU ROAD, SIMING DISTRICT, XIAMEN, CHINA.
Manufacturer:	Xiamen Healthcare Electronic Co., Ltd.
Address of Manufacturer:	65-66#, 62-63#Building, Siming Zone, Tongan Industrial District, Xiamen City, Fujian Province, P.R. China
Factory:	Xiamen Healthcare Electronic Co., Ltd.
Address of Factory:	65-66#, 62-63#Building, Siming Zone, Tongan Industrial District, Xiamen City, Fujian Province, P.R. China

3.2 General Description of EUT

Product Name:	Massage Chair
Model No.:	EC-8606B, Hilux
Test Model No.:	EC-8606B
Trade Mark:	N/A
Hardware Version:	1.0
Software Version:	1.0
EUT Power Supply:	120V 60Hz

3.3 General Description of BT Classic

Operation Frequency:	2402MHz~2480MHz
Bluetooth Version:	V4.0
Modulation Technique:	Frequency Hopping Spread Spectrum(FHSS)
Modulation Type:	GFSK, π/4DQPSK, 8DPSK
Number of Channel:	79
Transfer Rate:	1Mbps/2Mbps/3Mbps
Hopping Channel Type:	Adaptive Frequency Hopping systems
Sample Type:	☐ Mobile ☐ Portable ☒ Fix Location
Test Software of EUT:	PC RF Testing tool v2.0 (manufacturer declare)
Antenna Type:	Chip antenna
Antenna Gain:	2.5dBi

3.4 General Description of BLE

Operation Frequency:	2402MHz~2480MHz
Bluetooth Version:	V4.0
Modulation Type:	GFSK
Transfer Rate:	1Mbps
Number of Channel:	40
Product Type:	☐ Mobile ☐ Portable ☒ Fix Location
Test Software of EUT:	PC RF Testing tool v2.0 (manufacturer declare)

Antenna Type:	Chip antenna
Antenna Gain:	2.5dBi

3.5 General Description of 2.4G WIFI

Operation Frequency:	IEEE 802.11b/g/n(HT20): 2412MHz to 2462MHz
Channel Numbers:	IEEE 802.11b/g, IEEE 802.11n HT20: 11 Channels
Channel Separation:	5MHz
Type of Modulation:	IEEE for 802.11b: DSSS (CCK, DQPSK, DBPSK) IEEE for 802.11g: OFDM (64QAM, 16QAM, QPSK, BPSK) IEEE for 802.11n(HT20): OFDM (64QAM, 16QAM, QPSK, BPSK)
Transfer Rate:	IEEE for 802.11b: 1Mbps/2Mbps/5.5Mbps/11Mbps IEEE for 802.11g: 6Mbps/9Mbps/12Mbps/18Mbps/24Mbps/36Mbps/48Mbps/54Mbps IEEE for 802.11n(HT20): 6.5Mbps/13Mbps/19.5Mbps/26Mbps/39Mbps/52Mbps/58.5Mbps/65Mbps
Product Type:	☐ Mobile ☐ Portable ☒ Fix Location
Test Software of EUT:	EspRFtestTool (manufacturer declare)
Antenna Type:	PCB antenna
Antenna Gain:	2.0dBi

Note:

Model No.: EC-8606B, Hilux

Only the model EC-8606B was tested, since the electrical circuit design, layout, components used and internal wiring were identical for the above models, with difference being color of appearance and model name.

4 SAR Evaluation

4.1 RF Exposure Compliance Requirement

4.1.1 Limitst

According to FCC Part1.1310: The criteria listed in the following table shall be used to evaluate the environment impact of human exposure to radio frequency (RF) radiation as specified in part1.1307(b)

TABLE 1—LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE)

Frequency range (MHz)	Electric field strength (V/m)	Magnetic field strength (A/m)	Power density (mW/cm^2)	Averaging time (minutes)
(A) Limits for Occupational/Controlled Exposures				
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
(B) Limits for General Population/Uncontrolled Exposure				
0.3–1.34	614	1.63	*(100)	30
1.34–30	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

Friis Formula

Friis transmission formula: Pd = (Pout*G)/(4* Pi * R^2)

Where

Pd = power density in mW/cm2

Pout = output power to antenna in mW

G = gain of antenna in linear scale

Pi = 3.1416

R = distance between observation point and center of the radiator in cm

Pd id the limit of MPE, 1 mW/cm2 . If we know the maximum gain of the antenna and the total power input to the antenna, through the calculation, we will know the distance r where the MPE limit is reached.

4.1.2 Test Procedure

Software provided by client enabled the EUT to transmit and receive data at lowest, middle and highest channel individually.

4.1.3 EUT RF Exposure

1) For BT Classic

Antenna Gain: 2.5dBi

Antenna Gain: The maximum Gain measured in fully anechoic chamber is 1.78 in linear scale.

Output Power Into Antenna & RF Exposure Evaluation Distance:

Measurement Data

GFSK mode				
Test channel	Peak Output Power (dBm)	Tune up tolerance (dBm)	Maximum tune-up Power	
			(dBm)	(mW)
Lowest(2402MHz)	-1.950	-2.5±1	-1.5	0.708
Middle(2441MHz)	-1.440	-2.0±1	-1.0	0.794
Highest(2480MHz)	-0.300	-1.0±1	0	1.000
π/4DQPSK mode				
Test channel	Peak Output Power (dBm)	Tune up tolerance (dBm)	Maximum tune-up Power	
			(dBm)	(mW)
Lowest(2402MHz)	1.160	0.5±1	1.5	1.413
Middle(2441MHz)	1.190	0.5±1	1.5	1.413
Highest(2480MHz)	2.270	1.5±1	2.5	1.778
8DPSK mode				
Test channel	Peak Output Power (dBm)	Tune up tolerance (dBm)	Maximum tune-up Power	
			(dBm)	(mW)
Lowest(2402MHz)	1.250	0.5±1	1.5	1.413
Middle(2441MHz)	1.730	1.0±1	2.0	1.585
Highest(2480MHz)	2.810	2.0±1	3.0	1.995

The worst case:

Maximum tune-up Power (mW)	**Antenna Gain (dBi)**	**Power Density at R = 20 cm (mW/cm^2)**	**Limit**	**Result**
1.995	2.5	0.00071	1.0	PASS

Note: 1) Refer to report No. CQASZ20200600503E-01 for EUT test Max Conducted Peak Output Power value.

2) $Pd = (Pout*G)/(4* Pi * R^2)=(1.995*1.78)/(4*3.1416*20^2)=0.00071$

3) EUT's Bluetooth module is more than 20cm away from the human body.

2) For BLE

Antenna Gain: 2.5dBi

Antenna Gain: The maximum Gain measured in fully anechoic chamber is 1.78 in linear scale.

Output Power Into Antenna & RF Exposure Evaluation Distance:

Measurement Data

GFSK mode				
Test channel	Peak Output Power (dBm)	Tune up tolerance (dBm)	Maximum tune-up Power	
			(dBm)	(mW)
Lowest(2402MHz)	-1.83	-2.5±1	-1.5	0.708
Middle(2440MHz)	2.87	2.0±1	3.0	1.995
Highest(2480MHz)	0	-0.5±1	0.5	1.122

The worst case:

Maximum tune-up Power (mW)	**Antenna Gain (dBi)**	**Power Density at R = 20 cm (mW/cm^2)**	**Limit**	**Result**
1.995	2.5	0.00071	1.0	PASS

Note: 1) Refer to report No. CQASZ20200600503E-02 for EUT test Max Conducted Peak Output Power value.

2) $Pd = (Pout*G)/(4* Pi * R^2)=(1.995*1.78)/(4*3.1416*20^2)=0.00071$

3) EUT's Bluetooth module is more than 20cm away from the human body.

3) For 2.4G WIFI

Antenna Gain: 2.0dBi

Antenna Gain: The maximum Gain measured in fully anechoic chamber is 1.58 in linear scale.

Output Power Into Antenna & RF Exposure Evaluation Distance:

Measurement Data

802.11b mode				
Test channel	Average Output Power (dBm)	Tune up tolerance (dBm)	Maximum tune-up Power	
			(dBm)	(mW)
Lowest(2412MHz)	12.47	11.5±1	12.5	17.783
Middle(2437MHz)	12.55	12.0±1	13.0	19.953
Highest(2462MHz)	12.94	12.0±1	13.0	19.953
802.11g mode				
Test channel	Average Output Power (dBm)	Tune up tolerance (dBm)	Maximum tune-up Power	
			(dBm)	(mW)
Lowest(2412MHz)	10.92	10.0±1	11.0	12.589
Middle(2437MHz)	11	10.5±1	11.5	14.125
Highest(2462MHz)	11.36	10.5±1	11.5	14.125
802.11n(HT20)mode				
Test channel	Average Output Power (dBm)	Tune up tolerance (dBm)	Maximum tune-up Power	
			(dBm)	(mW)
Lowest(2412MHz)	10.81	10.0±1	11.0	12.589
Middle(2437MHz)	10.99	10.0±1	11.0	12.589
Highest(2462MHz)	11.31	10.5±1	11.5	14.125

The worst case:

Maximum tune-up Power (mW)	**Antenna Gain (dBi)**	**Power Density at R = 20 cm (mW/cm^2)**	**Limit**	**Result**
19.953	2.0	0.0063	1.0	PASS

Note: 1) Refer to report No. CQASZ20200600503E-03 for EUT test Max Conducted Average Output Power value.

2) $Pd = (Pout*G)/(4* Pi * R^2)=(19.953*1.58)/(4*3.1416*20^2)=0.0063$

3) EUT's 2.4G WIFI module is more than 20cm away from the human body.