

RF Exposure Evaluation Report

KDB 447498

Product Name : Massage Chair

Model No. : RT6891

FCC ID : 2A2VFRT6891

Applicant : ARONT(H.K.)LIMITED

Address : ROOM 3602 LEVEL 36 TOWER 1 ENTERPRISE
SQUARE FIVE 38 WANG CHIU ROAD KOWLOON
BAYKL HONGKONG

Tested by : 
(Testing Engineer: Heaven Yang)

Reviewed by : 
(Technical Manager: Harry Zhao)

Approved by : 
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Performed Location : Suzhou EPIN Electrical Testing Technology Co., Ltd.
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The test results relate only to the samples tested.

The test results shown in the test report are traceable to the national/international standard through the calibration of the equipment and evaluated measurement uncertainty herein.

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1. General Information

1.1. EUT Description

Product Name	Massage Chair
Brand Name	
Model No.	RT6891
EUT Voltage	AC 120V/60Hz
Frequency Range	2402 ~ 2480 MHz
Channel Number	Classic Bluetooth: 79; Bluetooth Low Energy: 40
Type of Modulation	Classic Bluetooth: GFSK, Pi/4 DQPSK, 8DPSK Bluetooth Low Energy: GFSK
Data Rate	1Mbps(GFSK), 2Mbps(Pi/4 DQPSK), 3Mbps(8DPSK)
Antenna Type	PCB
Peak Antenna Gain	3.4dBi

1.2. Working Frequency of Each Channel:

Classic Bluetooth Working Frequency of Each Channel:							
Channel	Frequency	Channel	Frequency	Channel	Frequency	Channel	Frequency
00	2402 MHz	01	2403 MHz	02	2404 MHz	03	2405 MHz
04	2406 MHz	05	2407 MHz	06	2408 MHz	07	2409 MHz
08	2410 MHz	09	2411 MHz	10	2412 MHz	11	2413 MHz
12	2414 MHz	13	2415 MHz	14	2416 MHz	15	2417 MHz
16	2418 MHz	17	2419 MHz	18	2420 MHz	19	2421 MHz
20	2422 MHz	21	2423 MHz	22	2424 MHz	23	2425 MHz
24	2426 MHz	25	2427 MHz	26	2428 MHz	27	2429 MHz
28	2430 MHz	29	2431 MHz	30	2432 MHz	31	2433 MHz
32	2434 MHz	33	2435 MHz	34	2436 MHz	35	2437 MHz
36	2438 MHz	37	2439 MHz	38	2440 MHz	39	2441 MHz
40	2442 MHz	41	2443 MHz	42	2444 MHz	43	2445 MHz
44	2446 MHz	45	2447 MHz	46	2448 MHz	47	2449 MHz
48	2450 MHz	49	2451 MHz	50	2452 MHz	51	2453 MHz
52	2454 MHz	53	2455 MHz	54	2456 MHz	55	2457 MHz
56	2458 MHz	57	2459 MHz	58	2460 MHz	59	2461 MHz

60	2462 MHz	61	2463 MHz	62	2464 MHz	63	2465 MHz
64	2466 MHz	65	2467 MHz	66	2468 MHz	67	2469 MHz
68	2470 MHz	69	2471 MHz	70	2472 MHz	71	2473 MHz
72	2474 MHz	73	2475 MHz	74	2476 MHz	75	2477 MHz
76	2478 MHz	77	2479 MHz	78	2480 MHz		

Bluetooth Low Energy Working Frequency of Each Channel:							
Channel	Frequency	Channel	Frequency	Channel	Frequency	Channel	Frequency
00	2402 MHz	01	2404 MHz	02	2406 MHz	03	2408 MHz
04	2410 MHz	05	2412 MHz	06	2414 MHz	07	2416 MHz
08	2418 MHz	09	2420 MHz	10	2422 MHz	11	2424 MHz
12	2426 MHz	13	2428 MHz	14	2430 MHz	15	2432 MHz
16	2434 MHz	17	2436 MHz	18	2438 MHz	19	2440 MHz
20	2442 MHz	21	2444 MHz	22	2446 MHz	23	2448 MHz
24	2450 MHz	25	2452 MHz	26	2454 MHz	27	2456 MHz
28	2458 MHz	29	2460 MHz	30	2462 MHz	31	2464 MHz
32	2466 MHz	33	2468 MHz	34	2470 MHz	35	2472 MHz
36	2474 MHz	37	2476 MHz	38	2478 MHz	39	2480 MHz

1.3. Antenna information

Antenna Manufacturer						
Antenna Delivery	☒	1*TX+1*RX	☐	2*TX+2*RX	☐	3*TX+3*RX
Antenna Technology	☒	SISO				
	☐	MIMO	☐	Basic		
			☐	Sectorized antenna systems		
			☐	Cross-polarized antennas		
			☐	Unequal antenna gains, with equal transmit powers		
			☐	Spatial Multiplexing		
			☐	CDD		
			☐	Beam-forming		
Antenna Type	☐	External	☐	Dipole		
	☒	Internal	☐	PIFA		

			☒	PCB
			☐	Ceramic Chip Antenna
			☐	Metal plate type F antenna
			☐	Cross-polarize Antenna
Antenna Gain	3.4dBi			

1.4. Mode of Operation by antenna

Antenna Technology	SISO
Test mode	ANT 1
1Mbps(GFSK)	✓
2Mbps(Pi/4 DQPSK)	✓
3Mbps(8DPSK)	✓
1Mbps(GFSK) (BLE)	✓

1.5. Power Setting

Test Software	EspRFTTestTool_v2.8	
Antenna technology	SISO	
Test Mode	Test Frequency	Ant 1
1Mbps(GFSK)	2402	8
	2442	8
	2480	8
2Mbps(Pi/4 DQPSK)	2402	8
	2442	8
	2480	8
3Mbps(8DPSK)	2402	8
	2442	8
	2480	8
1Mbps(GFSK) (BLE)	2402	8
	2441	8
	2480	8

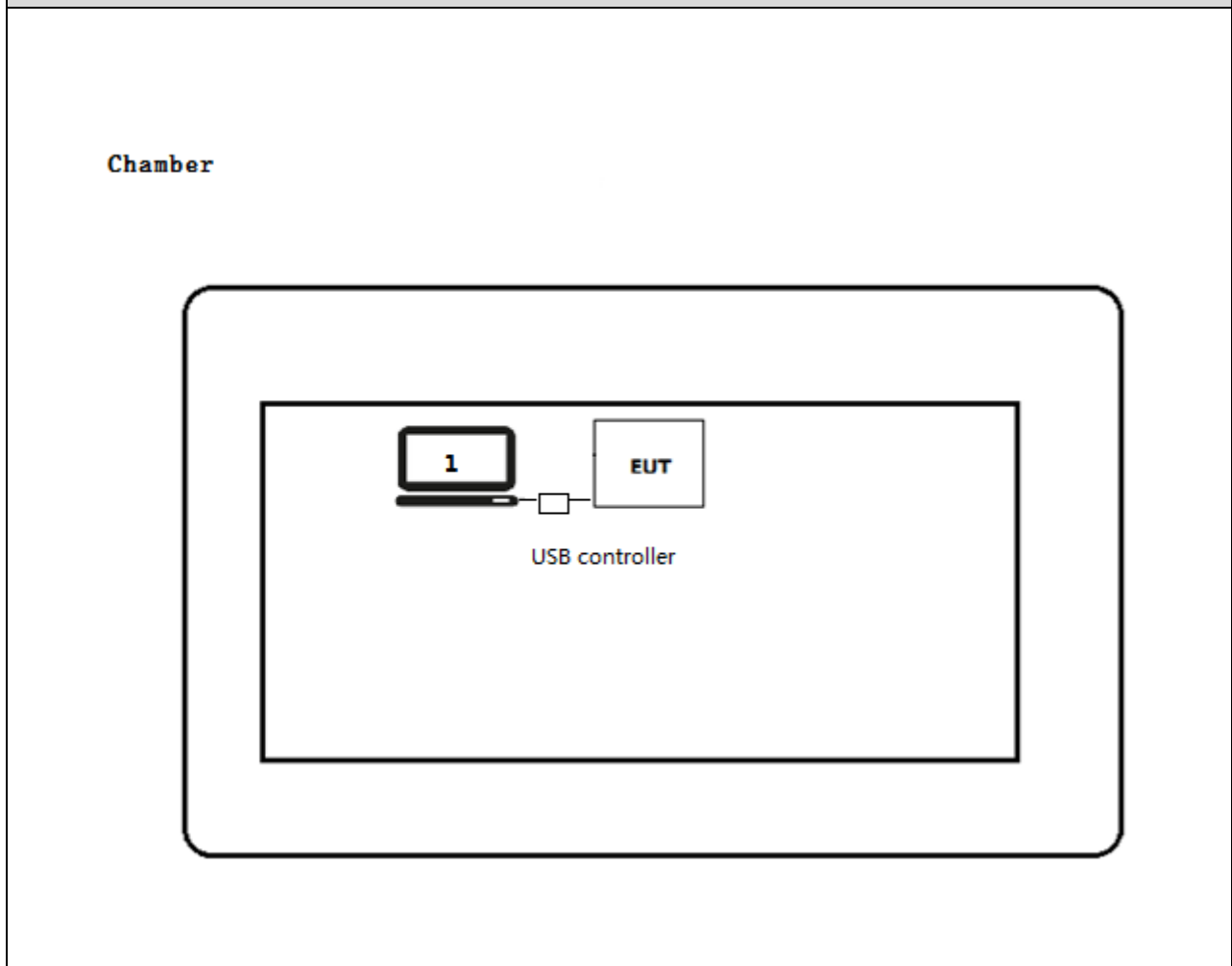
1.6. Tested System Details

The types for all equipment, plus descriptions of all cables used in the tested system (including inserted cards) are:

No.	Product	Manufacturer	Model No.	Serial No.	Power Cord
1	Notebook	Think Pad	20KN-A001CD	PF-17SAMW	Power by adapter
Power Adapter information: Model :ADLX65YDC3A Input: 100-240V~ 1.8A 50-60Hz Output: 20VDC 3.25A AC Cable: 1.1m unshielded and no ferrite core DC Cable 1.8m unshielded and no ferrite core					

1.7. Configuration of Tested System

Test setup Diagram- Radiated Emission



1.8. EUT Exercise Software

1	Setup the EUT and simulators as shown on above.
2	Turn on the power of all equipment.
3	Run the software EspRFTTestTool_v2.8, and set the test mode and channel, then press start to continue for transmitting testing.

1.9. Mode of Operation

See the all test mode shown in this test report and defined as:

Test Mode Listed		
Mode 1: Transmitter-1Mbps(GFSK_DH5)		
Mode 2: Transmitter-2Mbps(Pi/4 DQPSK_DH5)		
Mode 3: Transmitter-3Mbps(8DPSK_DH5)		
Mode 4: Transmit-1Mbps(GFSK_BLE)		
For Classic Bluetooth		
Lowest channel:	Channel 00	2402MHz
Middle channel:	Channel 39	2441MHz
Highest channel:	Channel 78	2480MHz
For Bluetooth Low Energy		
Lowest channel:	Channel 00	2402MHz
Middle channel:	Channel 20	2442MHz
Highest channel:	Channel 39	2480MHz

2. RF Exposure Evaluation

2.1. Limits

According to FCC 1.1310: 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 1.1307(b)

LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE)

Frequency Range (MHz)	Electric Field Strength (V/m)	Magnetic Field Strength (A/m)	Power Density (mW/cm ²)	Average Time (Minutes)
(A) Limits for Occupational/ Control Exposures				
300-1500	--	--	F/300	6
1500-100,000	--	--	5	6
(B) Limits for General Population/ Uncontrolled Exposures				
300-1500	--	--	F/1500	6
1500-100,000	--	--	1	30

F= Frequency in MHz

Friis transmission formula: $P_d = (P_{out} * G) / (4 * \pi * r^2)$

Where

P_d = power density in mW/cm²

P_{out} = output power to antenna in mW

G = gain of antenna in linear scale

π = 3.1416

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

P_d is 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.

2.2. Test Procedure

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

The temperature and related humidity: 25°C and 50%RH.

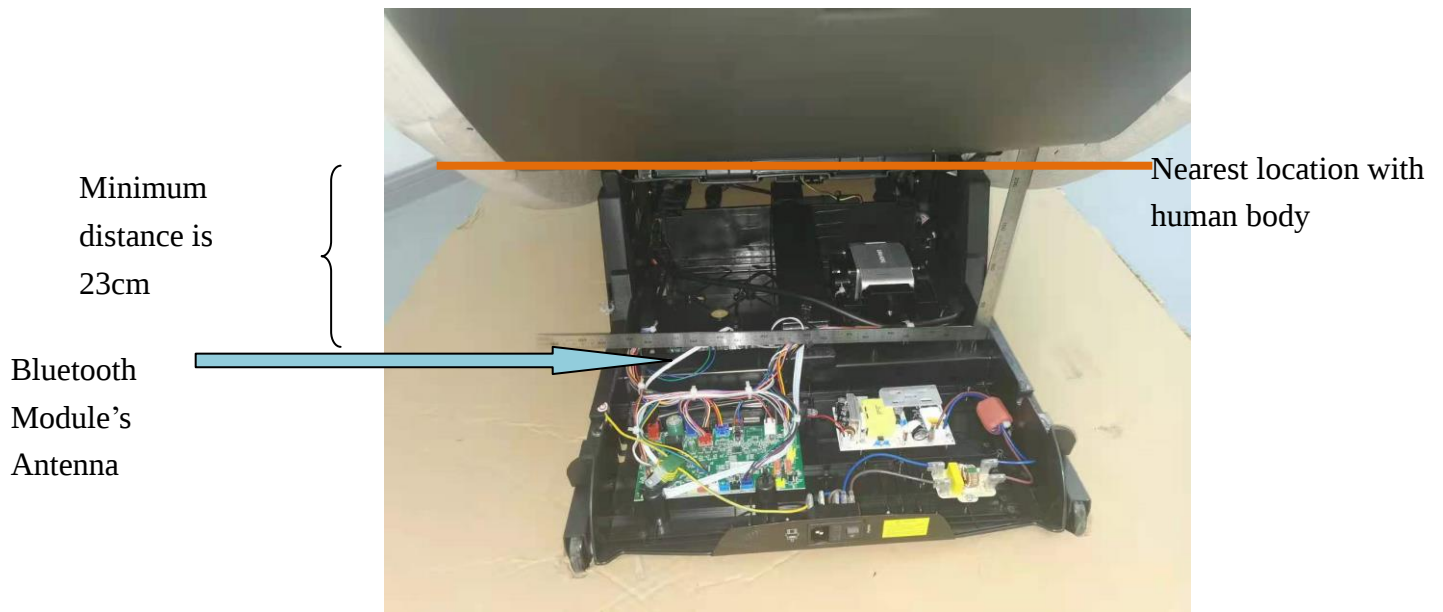
2.3. Test Result of RF Exposure Evaluation

Product	:	Wireless Module
Test Item	:	RF Exposure Evaluation
Test Site	:	Chamber

● Antenna Gain:

No.	Peak Gain	Gain in Linear
Antenna 1	3.4dBi	2.1878

RF Exposure Evaluation



The Output Power into Antenna & RF Exposure Evaluation Distance:

Test Mode	Frequency Band (MHz)	Power (dBm)	Maximum Output Power to Antenna (mW)	Power Density at R = 23 cm (mW/cm ²)
Mode 1: Transmitter-1Mbps(GFSK_DH1)	2402-2480	8.994	7.932	0.002611
Mode 2: Transmitter-2Mbps(Pi/4 DQPSK_DH1)	2402-2480	10.896	12.291	0.004045
Mode 3: Transmitter-3Mbps(8DPSK_DH1)	2402-2480	10.926	12.377	0.004073
Mode 4: Transmit-1Mbps(GFSK_BLE)	2402-2480	7.334	5.413	0.001781

Note: The standalone power density P_d (4th column) at a distance of 23cm calculated from the *Friis* transmission formula is below the limit of 1mW/cm².

The End