

FCC TEST REPORT

For

SHENZHEN GOODHEALTH MOTOR MANUF. CO., LTD.

Wireless Remote Controller

Model No.: HK-S-70

Prepared For : SHENZHEN GOODHEALTH MOTOR MANUF. CO., LTD.
Address : A5 Building, The 3rd Industrial Zone Yanchuan, Songgang Town,
Shenzhen City, 518105, China

Prepared By : Shenzhen Anbotek Compliance Laboratory Limited
Address : 1/F., Building 1, SEC Industrial Park, No.0409 Qianhai Road, Nanshan
District, Shenzhen, Guangdong, China
Tel: (86) 755-26066544 Fax: (86) 755-26014772

Report Number : R0217050085W2
Date of Test : May 25~May 31, 2017
Date of Report : May 31, 2017

Contents

1. General Information.....	4
1.1. Client Information.....	4
1.2. Description of Device (EUT).....	4
1.3. Auxiliary Equipment Used During Test.....	4
1.4. Description of Test Modes.....	5
1.5. List of Channels.....	5
1.6. Description of Test Setup.....	6
1.7. Test Equipment List.....	7
1.8. Measurement Uncertainty.....	7
1.9. Description of Test Facility.....	8
2. Summary of Test Results.....	9
3. Radiation Spurious Emission.....	10
3.1. Test Standard and Limit.....	10
3.2. Test Setup.....	11
3.3. Test Procedure.....	11
3.4. Test Data.....	12
4. 6dB Bandwidth Test.....	16
4.1. Test Standard and Limit.....	16
4.2. Test Setup.....	16
4.3. Test Procedure.....	16
4.4. Test Data.....	16
5. Antenna Requirement.....	18
5.1. Test Standard and Requirement.....	18
5.2. Antenna Connected Construction.....	18
APPENDIX I -- TEST SETUP PHOTOGRAPH.....	19
APPENDIX II -- EXTERNAL PHOTOGRAPH.....	20
APPENDIX III -- INTERNAL PHOTOGRAPH.....	23

TEST REPORT

Applicant : SHENZHEN GOODHEALTH MOTOR MANUF. CO., LTD.
Manufacturer : SHENZHEN GOODHEALTH MOTOR MANUF. CO., LTD.
Product Name : Wireless Remote Controller
Model No. : HK-S-70
Trade Mark : N/A
Rating(s) : DC 4.5V by "AAA" Battery*3

Test Standard(s) : FCC Part15 Subpart C, Paragraph 15.223

Test Method(s) : ANSI C63.10: 2013

The device described above is tested by Shenzhen Anbotek Compliance Laboratory Limited to determine the maximum emission levels emanating from the device and the severe levels of the device can endure and its performance criterion. The measurement results are contained in this test report and Shenzhen Anbotek Compliance Laboratory Limited is assumed full of responsibility for the accuracy and completeness of these measurements. Also, this report shows that the EUT (Equipment Under Test) is technically compliant with the FCC Part 15 Subpart C requirements.

This report applies to above tested sample only and shall not be reproduced in part without written approval of Shenzhen Anbotek Compliance Laboratory Limited.

Date of Test : May 25~May 31, 2017

Prepared by :



Winkey Wang

(Tested Engineer / Winkey Wang)

Reviewer :

Amy Ding

(Project Manager / Amy Ding)

Approved & Authorized Signer :

Tom Chen

(Manager / Tom Chen)

1. General Information

1.1. Client Information

Applicant	:	SHENZHEN GOODHEALTH MOTOR MANUF. CO., LTD.
Address	:	A5 Building, The 3rd Industrial Zone Yanchuan, Songgang Town, Shenzhen City, 518105, China
Manufacturer	:	SHENZHEN GOODHEALTH MOTOR MANUF. CO., LTD.
Address	:	A5 Building, The 3rd Industrial Zone Yanchuan, Songgang Town, Shenzhen City, 518105, China

1.2. Description of Device (EUT)

Product Name	:	Wireless Remote Controller	
Model No.	:	HK-S-70	
Trade Mark	:	N/A	
Test Power Supply	:	DC 4.5V by “AAA” Battery*3	
Product Description	:	Operation Frequency 1:	2434MHz
		Number of Channel:	1 Channels
		Modulation Type:	FSK
		Antenna Type:	PCB Antenna
		Antenna Gain(Peak):	1.5 dBi
		Operation Frequency 2:	8MHz
		Number of Channel:	1 Channels
		Modulation Type:	FSK
		Antenna Type:	loop Antenna
		Antenna Gain(Peak):	-0.5 dBi
Remark: 1)For a more detailed features description, please refer to the manufacturer’s specifications or the User’s Manual. 2) This test report test for Operation Frequency 2 : 8MHz			

1.3. Auxiliary Equipment Used During Test

N/A	
-----	--

1.4. Description of Test Modes

To investigate the maximum EMI emission characteristics generated from EUT, the test system was pre-scanning tested based on the consideration of following EUT operation mode or test configuration mode which possibly have effect on EMI emission level. Each of these EUT operation mode(s) or test configuration mode(s) mentioned above was evaluated respectively.

Pretest Mode	Description
Mode 1	TX Mode

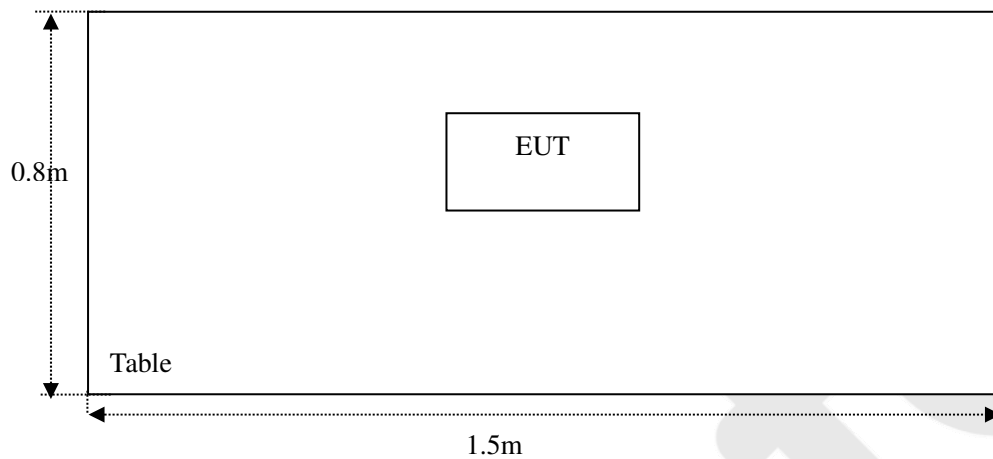
For Radiated Emission	
Final Test Mode	Description
Mode 1	TX Mode

1.5. List of Channels

Channel	Frequency
01	8 MHz

1.6. Description of Test Setup

RE



1.7. Test Equipment List

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1.	Two-Line V-network	Rohde & Schwarz	ENV216	100055	Jul. 19, 2016	1 Year
2.	EMI Test Receiver	Rohde & Schwarz	ESCI	100627	Jun. 17, 2016	1 Year
3.	RF Switching Unit	Compliance Direction	RSU-M2	38303	Jun. 17, 2016	1 Year
4.	Spectrum Analysis	Agilent	E4407B	US39390582	Jul. 12, 2016	1 Year
5.	Preamplifier	Instruments corporation	EMC011830	980100	Jun. 17, 2016	1 Year
6.	EMI Test Receiver	Rohde & Schwarz	ESPI	101604	Jun. 17, 2016	1 Year
7.	Double Ridged Horn Antenna	Instruments corporation	GTH-0118	351600	May 06, 2017	1 Year
8.	Bilog Broadband Antenna	Schwarzbeck	VULB9163	VULB 9163-289	May 06, 2017	1 Year
9.	Loop Antenna	Schwarzbeck	FMZB1519	012	May 11, 2017	1 Year
10.	Pre-amplifier	SONOMA	310N	186860	Jun. 17, 2016	1 Year
11.	EMI Test Software EZ-EMC	SHURPLE	N/A	N/A	N/A	N/A
12.	Power Sensor	Agilent	KFSW150502	15I00041SN045	Jun. 17, 2016	1 Year
13.	MXA Spectrum Analysis	Agilent	N9020A	MY51170037	Jun. 17, 2016	1 Year
14.	MXG RF Vector Signal Generator	Agilent	N5182A	MY48180656	Jun. 17, 2016	1 Year
15.	Signal Generator	Agilent	E4421B	MY41000743	Jun. 17, 2016	1 Year
16.	DC Power supply	IV	IV-8080	YQSB0096	Jun. 17, 2016	1 Year
17.	TEMP&HUMI PROGRAMMABLE CHAMBER	Bell Group	BE-THK-150 M8	SE-0137	Jun. 17, 2016	1 Year

1.8. Measurement Uncertainty

Radiation Uncertainty	:	Ur = 4.1 dB (Horizontal)
		Ur = 4.3 dB (Vertical)
Conduction Uncertainty	:	Uc = 3.4dB

1.9. Description of Test Facility

The test facility is recognized, certified, or accredited by the following organizations:

FCC-Registration No.: 752021

Shenzhen Anbotek Compliance Laboratory Limited, EMC Laboratory has been registered and fully described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in our files. Registration 752021, July 06, 2016.

FCC-Registration No.: 752051

Accurate Technology Co., Ltd., EMC Laboratory has been registered and fully described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in our files. Registration 752051, July 21, 2016.

IC-Registration No.: 8058A-1

Shenzhen Anbotek Compliance Laboratory Limited., EMC Laboratory has been registered and fully described in a report filed with the (IC) Industry Canada. The acceptance letter from the IC is maintained in our files. Registration 8058A, June 13, 2016.

Test Location 1

Shenzhen Anbotek Compliance Laboratory Limited. at 1/F., Building 1, SEC Industrial Park, No.0409 Qianhai Road, Nanshan District, Shenzhen, Guangdong, China

Test Location 2

Accurate Technology Co., Ltd.

F1, Bldg. A, Changyuan New Material Port, Keyuan Rd., Science & Industry Park, Nanshan District, Shenzhen, 518057, P.R. China.

2. Summary of Test Results

Standard Section	Test Item	Result
15.203	Antenna Requirement	PASS
15.207	Conducted Emission	N/A
15.223(a) & 15.209	Radiated Emission	PASS
15.223(a)	6dB Bandwidth	PASS
Remark: "N/A" is an abbreviation for Not Applicable.		

3. Radiation Spurious Emission

3.1. Test Standard and Limit

Test Standard	FCC Part15 C Section 15.209 and 15.205				
Test Limit	Frequency (MHz)	Field strength (microvolt/meter)	Limit (dBuV/m)	Remark	Measurement distance (m)
	0.009MHz~0.490MHz	2400/F(kHz)	-	-	300
	0.490MHz-1.705MHz	24000/F(kHz)	-	-	30
	1.705MHz-30MHz	30	-	-	30
	30MHz~88MHz	100	40.0	Quasi-peak	3
	88MHz~216MHz	150	43.5	Quasi-peak	3
	216MHz~960MHz	200	46.0	Quasi-peak	3
	960MHz~1000MHz	500	54.0	Quasi-peak	3
Remark: (1)The lower limit shall apply at the transition frequency. (2) 15.35(b), Unless otherwise specified, the limit on peak radio frequency emissions is 20dB above the maximum permitted average emission limit applicable to the equipment under test. This peak limit applies to the total peak emission level radiated by the device. (3) 15.223(b) The field strength of emissions outside of the band 1.705–10.0 MHz shall not exceed the general radiated emission limits in 15.209.					

Test Standard	FCC Part15 C Section 15.223(a)
The field strength of any emission within the band 1.705–10.0 MHz shall not exceed 100 microvolts/meter at a distance of 30 meters. However, if the bandwidth of the emission is less than 10% of the center frequency, the field strength shall not exceed 15 microvolts/meter or (the bandwidth of the device in kHz) divided by (the center frequency of the device in MHz) microvolts/meter at a distance of 30 meters, whichever is the higher level. For the purposes of this section, bandwidth is determined at the points 6 dB down from the modulated carrier. The emission limits in this paragraph are based on measurement instrumentation employing an average detector. The provisions in §15.35(b) for limiting peak emissions apply.	
The 6dB Bandwidth (=66.32kHz) of the EUT is less than 10% the center frequency, and 15 microvolts/meter bigger than $66.32/8=8.29$ microvolts/meter, so the field strength limit should be 15 microvolts/meter at 30 meters. So AV limit=15uV/m@ 30m AV Limit@ 3m = $20\log(15)+40\log(30/3)=20*1.176+40=63.52\text{dBuV/m}$ Peak Limit@ 3m=AV Limit@3m+20dB=83.52dBuV/m	

3.2. Test Setup

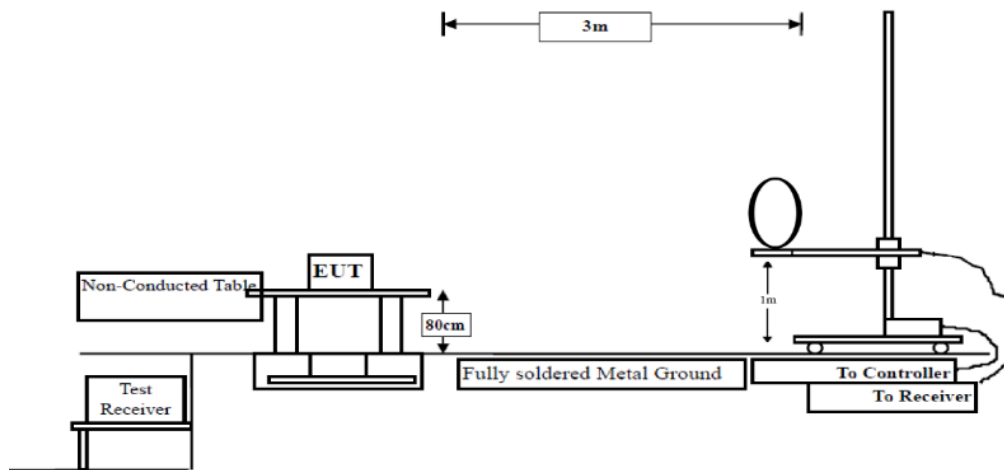


Figure 1. Below 30MHz

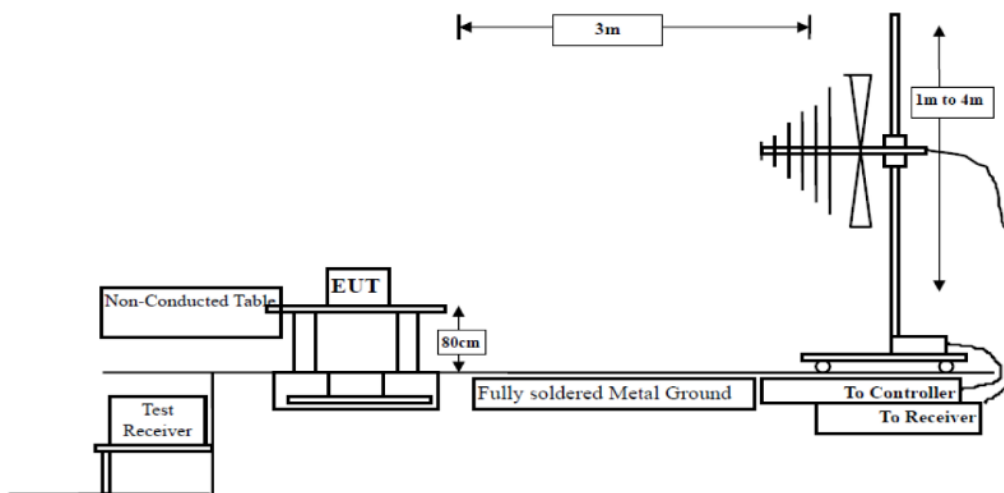


Figure 2. 30MHz to 1GHz

3.3. Test Procedure

1. Test Procedures for emission from 9 kHz to 30 MHz

- The EUT was placed on the top of a rotating table 0.8 meters above the ground and the antenna was placed on the ground plane above 1m at a 3 meter anechoic chamber test site. The table was rotated 360 degrees to determine the position of the highest radiation.
- Then antenna is fixed at one meter above the ground to determine the maximum value of the field strength. Both Horizontal & Vertical polarization of the antenna are set to make the measurement.
- For each suspected emission, the EUT was arranged to its worst case and then the table was turned from 0 degrees to 360 degrees to find the maximum reading.
- The test-receiver system was set to Peak and AV Detect Function and Specified Bandwidth with Maximum Hold Mode.

2. Test Procedures for emission from 30 MHz to 1000 MHz

- The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter anechoic chamber

- test site. The table was rotated 360 degrees to determine the position of the highest radiation.
- b. During performing radiated emission below 1 GHz, the EUT was set 3 meters away from the interference receiving antenna, which was mounted on the top of a variable-height antenna tower.
 - c. The antenna is a broadband antenna, and its height is varied from 1 meter to 4 meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
 - d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the table was turned from 0 degrees to 360 degrees to find the maximum reading.
 - e. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
 - f. If the emission level of the EUT in peak mode was 10 dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10 dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.

The EUT is tested in 9*6*6 Chamber. The device is evaluated in xyz orientation.

For 9kHz to 150kHz, Set the spectrum analyzer as:

RBW = 200Hz, VBW = 1kHz, Detector = AV, Trace mode = Max hold, Sweep - auto couple.

For 150kHz to 30MHz, Set the spectrum analyzer as:

RBW = 9KHz, VBW = 30kHz, Detector = AV, Trace mode = Max hold, Sweep - auto couple.

For 30MHz to 1000MHz, Set the spectrum analyzer as:

RBW = 100kHz, VBW = 300kHz, Detector = Quasi-Peak, Trace mode = Max hold, Sweep - auto couple.

3.4. Test Data

PASS

During the test, Pre-scan all kind of the place mode (X-axis, Y-axis, Z-axis), and found the X-axis is the worst case.

Test Results: Fundamental

Freq.	ANT	Reading	Cable Loss	Ant Factor	Amplifier	Results	Limits	Det.
(MHz)	Pol.	(dBuV/m)	(dB)	(dB)	(dB)	(dBuV/m)	(dBuV/m)	Mode
8.0	V	42.61	2.56	21.75	0	66.92	83.52	PK
8.0	V	37.09	2.56	21.75	0	61.40	63.52	AV
8.0	H	39.91	2.56	21.75	0	64.22	83.52	PK
8.0	H	34.31	2.56	21.75	0	58.62	63.52	AV

Remark :

1. Result = Reading + Cable Loss +Ant Factor –Amplifier +Correction Factor

Spurious Emission Test Results: (9kHz~30MHz)

Freq.	ANT	Reading	Cable Loss	Ant Factor	Amplifier	Results	Limits	Det.
(MHz)	Pol.	(dBuV/m)	(dB)	(dB)	(dB)	(dBuV/m)	(dBuV/m)	Mode
5.4500	V	14.79	2.48	21.26	0	38.53	63.52	AV
5.4500	H	11.64	2.48	21.26	0	35.38	63.52	AV
11.500	V	12.22	2.58	21.30	0	36.10	63.52	AV
11.500	H	9.91	2.58	21.30	0	33.79	63.52	AV

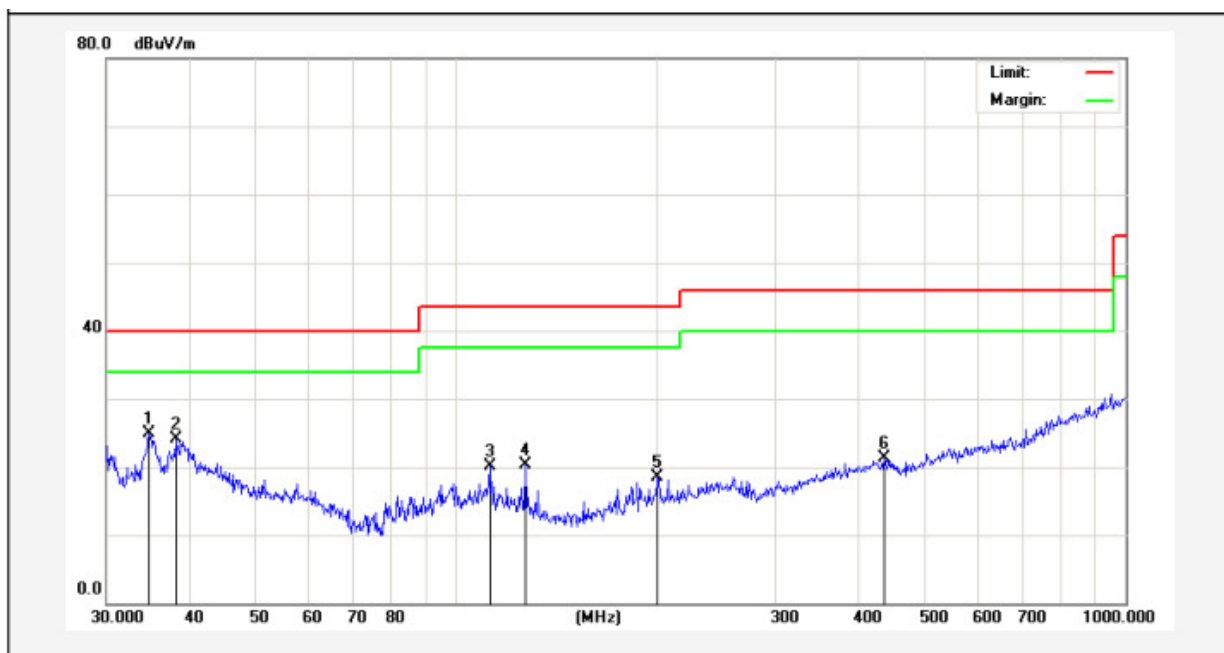
Note: 1. The emission levels of other frequencies are very lower than the limit and not show in test report
2. The test distance is 3m

Remark: The emission test (9kHz-30MHz) was tested at Accurate Technology Co., Ltd.

F1, Bldg. A, Changyuan New Material Port, Keyuan Rd., Science & Industry Park, Nanshan District, Shenzhen, 518057, P.R. China.

Test Results (30~1000MHz)

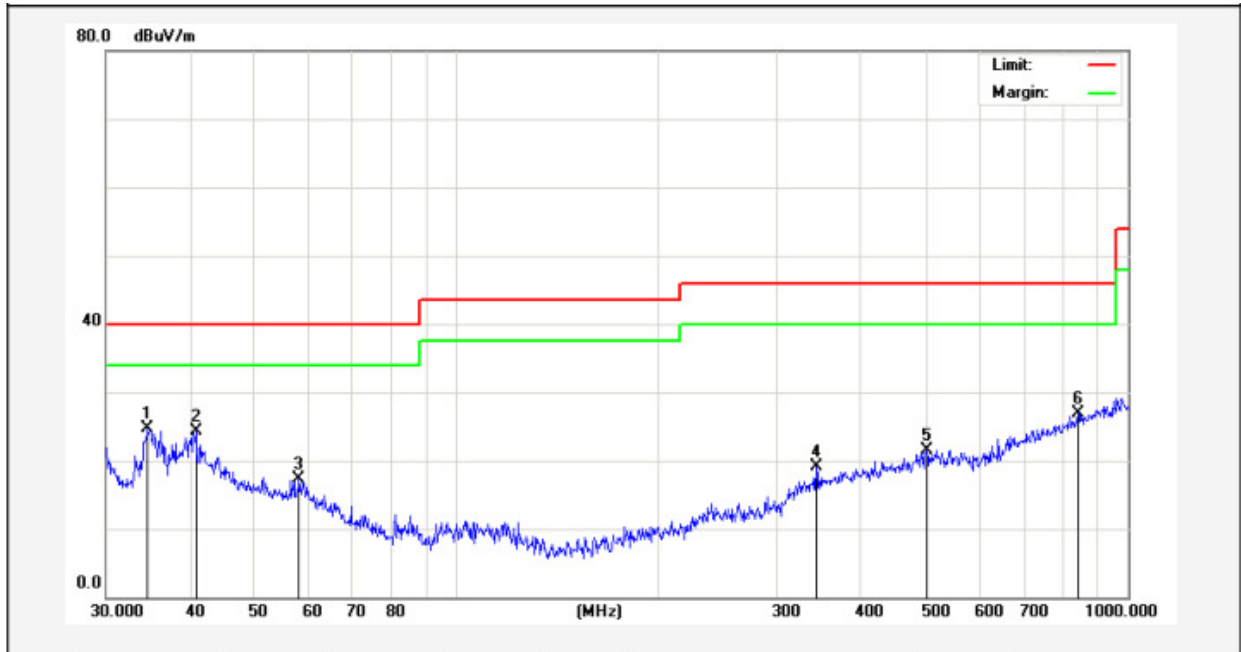
Job No.: 0217050085W Temp.(°C)/Hum.(%RH): 24.3°C/55%RH
Standard: FCC PART 15C Power Source: DC 4.5V
Test Mode: TX mode Polarization: Horizontal



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/	Over Limit (dB)	Detector	Height (cm)	degree (deg)	Remark
1	34.7602	39.37	-14.41	24.96	40.00	-15.04	peak			
2	38.0783	36.01	-11.88	24.13	40.00	-15.87	peak			
3	112.1305	40.90	-20.77	20.13	43.50	-23.37	peak			
4	126.7723	42.56	-22.34	20.22	43.50	-23.28	peak			
5	199.9856	39.32	-20.87	18.45	43.50	-25.05	peak			
6	435.5898	33.62	-12.24	21.38	46.00	-24.62	peak			

Test Results (30~1000MHz)

Job No.: 0217050085W Temp.(°C)/Hum.(%RH): 24.3°C/55%RH
Standard: FCC PART 15C Power Source: DC 4.5V
Test Mode: TX mode Polarization: Vertical



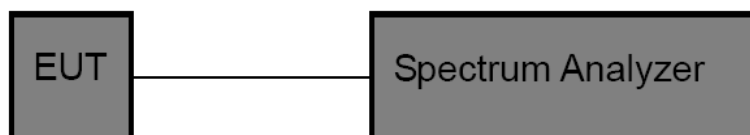
No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/	Over Limit (dB)	Detector	Height (cm)	degree (deg)	Remark
1	34.6385	39.24	-14.49	24.75	40.00	-15.25	peak			
2	40.8446	35.11	-10.71	24.40	40.00	-15.60	peak			
3	58.2030	32.53	-15.23	17.30	40.00	-22.70	peak			
4	343.1800	32.28	-13.20	19.08	46.00	-26.92	peak			
5	501.1790	32.48	-10.94	21.54	46.00	-24.46	peak			
6	842.1296	31.71	-4.77	26.94	46.00	-19.06	peak			

4. 6dB Bandwidth Test

4.1. Test Standard and Limit

Test Standard	FCC Part15 C Section 15.223(a)
---------------	--------------------------------

4.2. Test Setup



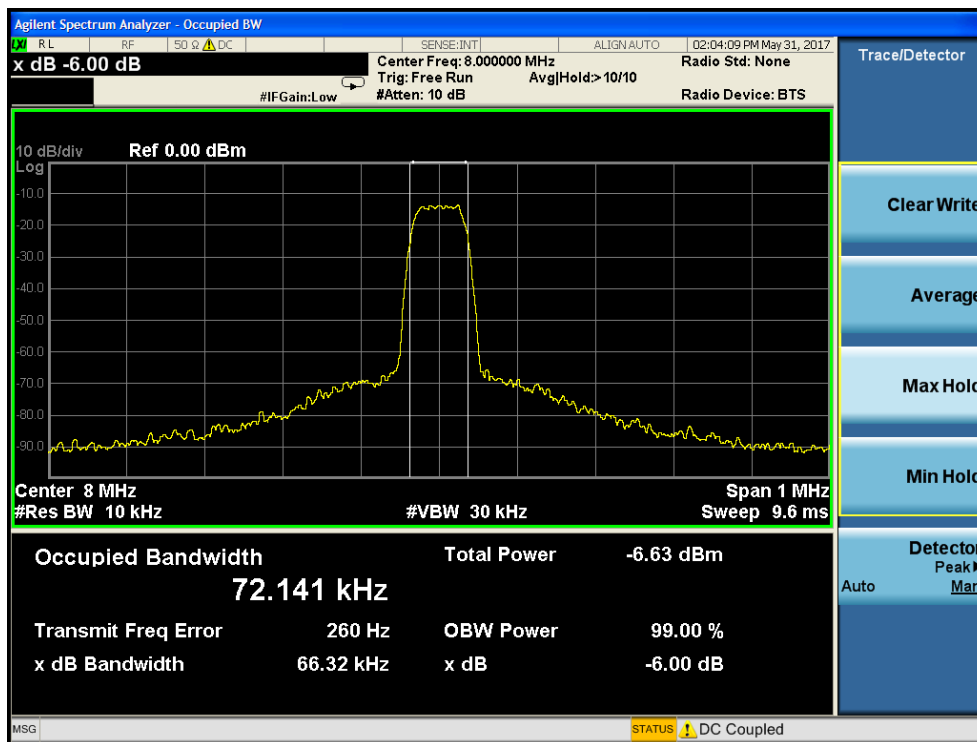
4.3. Test Procedure

1. Place the EUT on the table and set it in the transmitting mode.
2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
3. Set the spectrum analyzer as:
RBW = 10kHz, VBW $\geq$ 3*RBW,
Detector= Peak
Trace mode= Max hold.
Sweep- auto couple.
4. Mark the peak frequency and -6dB (upper and lower) frequency.
5. Repeat until all the rest channels are investigated.

4.4. Test Data

Test Item	:	6dB Bandwidth	Test Mode	:	TX Mode
Test Voltage	:	DC 4.5V	Temperature	:	24°C
Test Result	:	PASS	Humidity	:	55%RH

Frequency (MHz)	Bandwidth (kHz)	Result
8MHZ	66.32	PASS



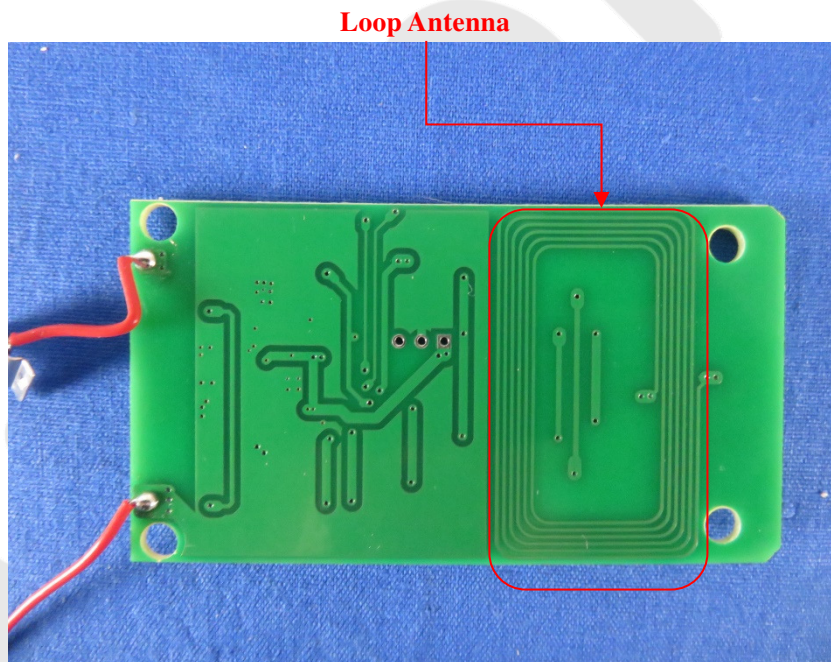
5. Antenna Requirement

5.1. Test Standard and Requirement

Test Standard	FCC Part15 Section 15.203
Requirement	1) 15.203 requirement: An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator, the manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.

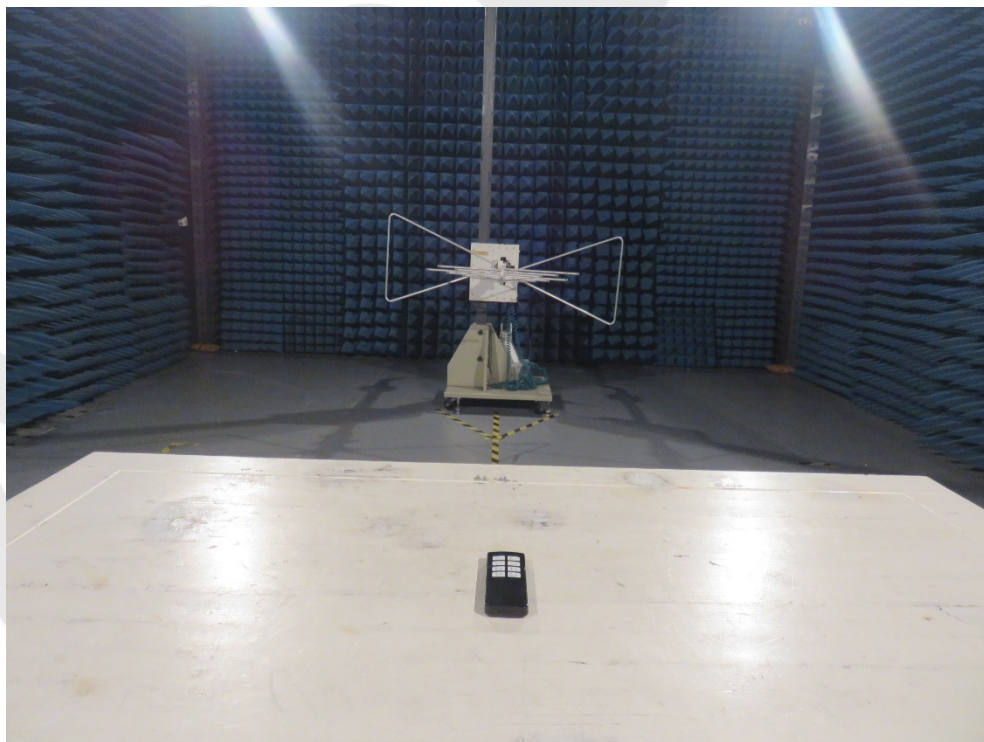
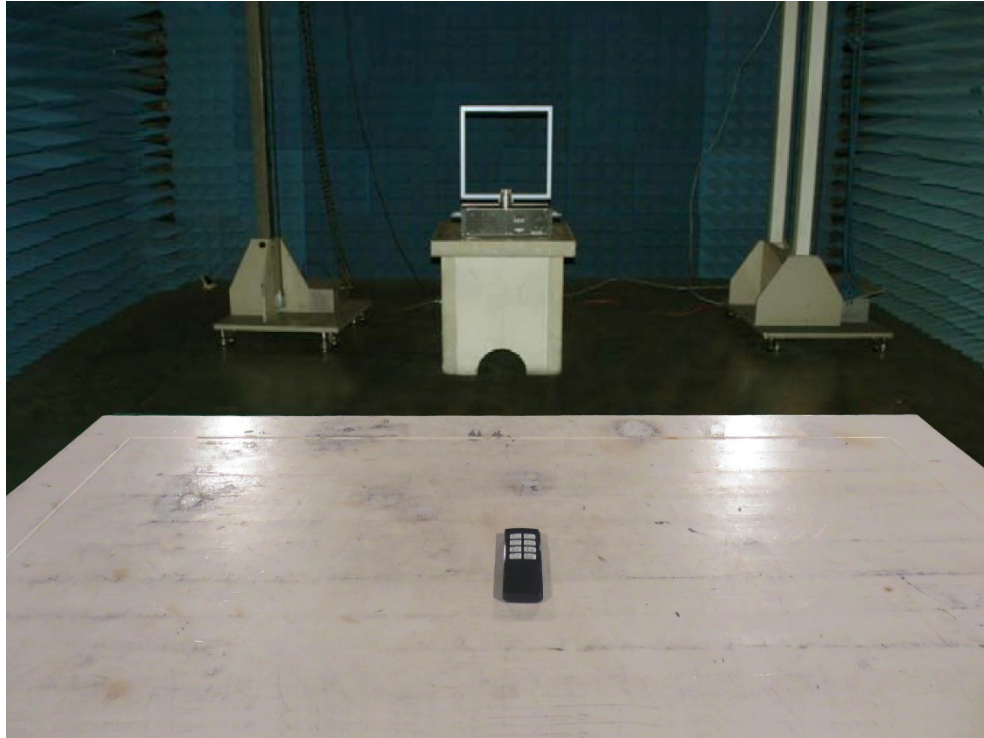
5.2. Antenna Connected Construction

The antenna is a loop antenna which permanently attached, and the best case gain of the antenna is -0.5dBi. It complies with the standard requirement.

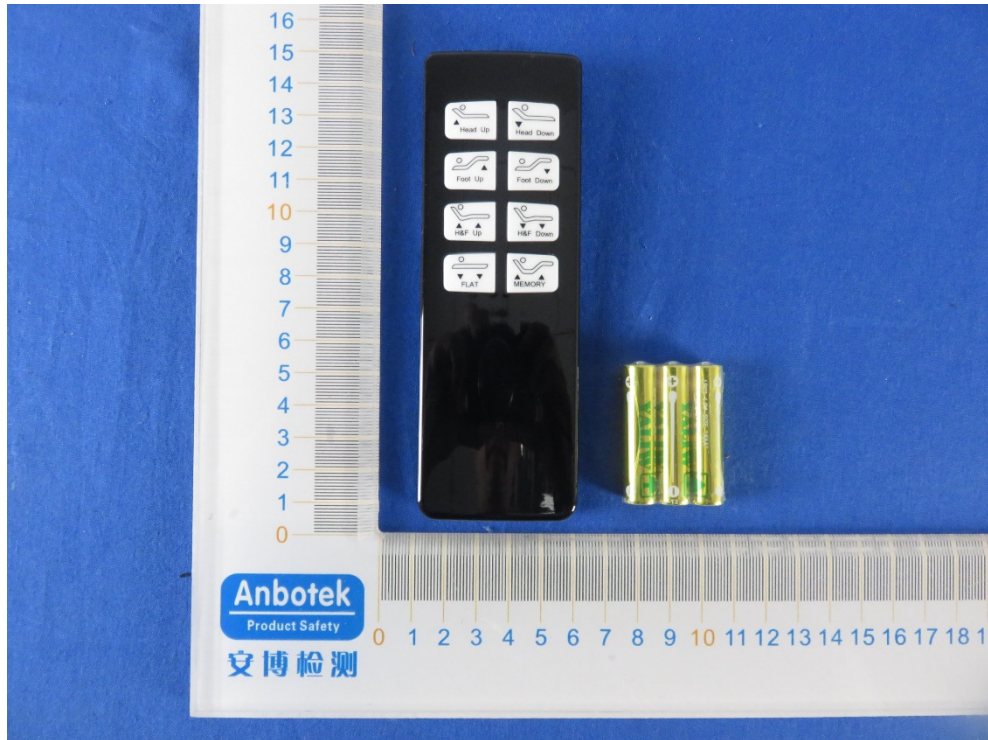


APPENDIX I -- TEST SETUP PHOTOGRAPH

Photo of Radiation Emission Test



APPENDIX II -- EXTERNAL PHOTOGRAPH







APPENDIX III -- INTERNAL PHOTOGRAPH

