



FCC REPORT

Applicant: Industrial Revolution

Address of Applicant: 5835 Segale Park Dr. c, Tukwila, WA 98188, United States

Equipment Under Test (EUT)

Product Name: 2 Way Remote

Model No.: RMT-HD2

Trade Mark: INTOVA

FCC ID: 2AIRM-RMTHD2

Applicable standards: FCC CFR Title 47 Part 15 Subpart C Section 15.249:2015

Date of sample receipt: June 14, 2016

Date of Test: June 14-21, 2016

Date of report issued: June 22, 2016

Test Result : PASS *

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

Authorized Signature:

Robinson Lo

Laboratory Manager

This report details the results of the testing carried out on one sample. The results contained in this test report do not relate to other samples of the same product and does not permit the use of the GTS product certification mark. The manufacturer should ensure that all products in series production are in conformity with the product sample detailed in this report.

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2 Version

Version No.	Date	Description
00	June 22, 2016	Original

Prepared By:

Yang. Liu

Date:

June 22, 2016

Project Engineer

Check By:

Andy. Wu

Date:

June 22, 2016

Reviewer

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4 Test Summary

Test Item	Section in CFR 47	Result
Antenna requirement	15.203	Pass
AC Power Line Conducted Emission	15.207	N/A
Field strength of the fundamental signal	15.249 (a)	Pass
Spurious emissions	15.249 (a) (d)/15.209	Pass
Band edge	15.249 (d)/15.205	Pass
20dB Occupied Bandwidth	15.215 (c)	Pass

Pass: The EUT complies with the essential requirements in the standard.

Remark: Test according to ANSI C63.10 2013 and ANSI C63.4: 2014

4.1 Measurement Uncertainty

Test Item	Frequency Range	Measurement Uncertainty	Notes
Radiated Emission	9kHz ~ 30MHz	$\pm 4.34\text{dB}$	(1)
Radiated Emission	30MHz ~ 1000MHz	$\pm 4.24\text{dB}$	(1)
Radiated Emission	1GHz ~ 26.5GHz	$\pm 4.68\text{dB}$	(1)
AC Power Line Conducted Emission	0.15MHz ~ 30MHz	$\pm 3.45\text{dB}$	(1)
Note (1): The measurement uncertainty is for coverage factor of k=2 and a level of confidence of 95%.			

5 General Information

5.1 Client Information

Applicant:	Industrial Revolution
Address of Applicant:	5835 Segale Park Dr. c, Tukwila, WA 98188, United States
Factory:	Shenzhen Hisco Techonlogy Limited
Address of Factory:	Room 1101-1102, 11/F, Caiyue Building, No. 24, Liuxian Avenue, Longhu Distric, Shenzhen, China

5.2 General Description of EUT

Product Name:	2 Way Remote
Model No.:	RMT-HD2
Operation Frequency:	2450MHz
Channel numbers:	1
Modulation type:	GFSK
Antenna Type:	PCB antenna
Antenna gain:	0dBi (declare by Applicant)
Power supply:	DC 3.0V "CR2032" Lithium Battery

Operation Frequency each of channel	
Channel	Frequency
1	2450MHz

5.3 Test mode

Transmitting mode	Keep the EUT in continuously transmitting mode
Remark: New battery is used during all test	

Pre-test mode.

We have verified the construction and function in typical operation, The EUT was placed on three different polar directions; i.e. X axis, Y axis, Z axis. which was shown in this test report and defined as follows:

Axis	X	Y	Z
Field Strength(dBuV/m)	96.35	97.95	95.87

5.4 Description of Support Units

None.

5.5 Test Facility

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

- **FCC —Registration No.: 600491**

Global United Technology Services Co., Ltd., Shenzhen 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 files. Registration 600491, June 28, 2013.

- **Industry Canada (IC) —Registration No.: 9079A-2**

The 3m Semi-anechoic chamber of Global United Technology Services Co., Ltd. has been registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing with Registration No.: 9079A-2, June 26, 2013.

5.6 Test Location

All tests were performed at:
Global United Technology Services Co., Ltd. Address: No. 301-309, 3/F., Jinyuan Business Building, No.2, Laodong Industrial Zone, Xixiang Road, Baoan District, Shenzhen, Guangdong, China 518102 Tel: 0755-27798480 Fax: 0755-27798960

5.7 Description of Support Units

None.

5.8 Other Information Requested by the Customer

None.

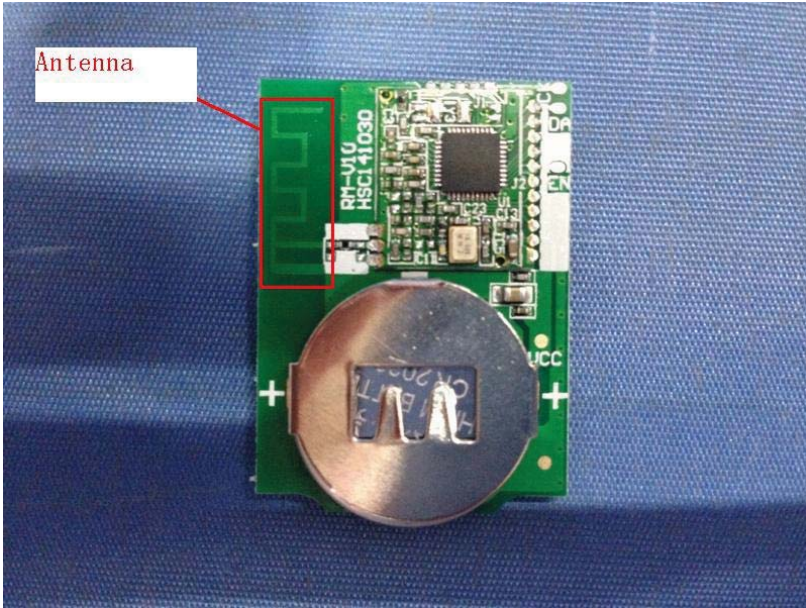
6 Test Instruments list

Radiated Emission:						
Item	Test Equipment	Manufacturer	Model No.	Inventory No.	Cal.Date (mm-dd-yy)	Cal.Due date (mm-dd-yy)
1	3m Semi- Anechoic Chamber	ZhongYu Electron	9.2(L)*6.2(W)* 6.4(H)	GTS250	Mar. 27 2016	Mar. 26 2017
2	Control Room	ZhongYu Electron	6.2(L)*2.5(W)* 2.4(H)	GTS251	N/A	N/A
3	Spectrum Analyzer	Agilent	E4440A	GTS533	Jun 30 2015	Jun. 29 2016
4	EMI Test Receiver	Rohde & Schwarz	ESU26	GTS203	Jun 30 2015	Jun. 29 2016
5	BiConiLog Antenna	SCHWARZBECK MESS-ELEKTRONIK	VULB9163	GTS214	Jun 30 2015	Jun. 29 2016
6	Double -ridged waveguide horn	SCHWARZBECK MESS-ELEKTRONIK	9120D-829	GTS208	June 26 2015	Jun. 25 2016
7	Horn Antenna	ETS-LINDGREN	3160	GTS217	Mar. 26 2016	Mar. 25 2017
8	EMI Test Software	AUDIX	E3	N/A	N/A	N/A
9	Coaxial Cable	GTS	N/A	GTS213	Mar. 27 2016	Mar. 26 2017
10	Coaxial Cable	GTS	N/A	GTS211	Mar. 27 2016	Mar. 26 2017
11	Coaxial cable	GTS	N/A	GTS210	Mar. 27 2016	Mar. 26 2017
12	Coaxial Cable	GTS	N/A	GTS212	Mar. 27 2016	Mar. 26 2017
13	Amplifier(100kHz-3GHz)	HP	8347A	GTS204	Jun. 30, 2015	Jun. 29 2016
14	Amplifier(2GHz-20GHz)	HP	8349B	GTS206	Jun. 30, 2015	Jun. 29 2016
15	Amplifier (18-26GHz)	Rohde & Schwarz	AFS33-18002 650-30-8P-44	GTS218	June 26 2015	Jun. 25 2016
16	Band filter	Amindeon	82346	GTS219	Mar. 27 2016	Mar. 26 2017

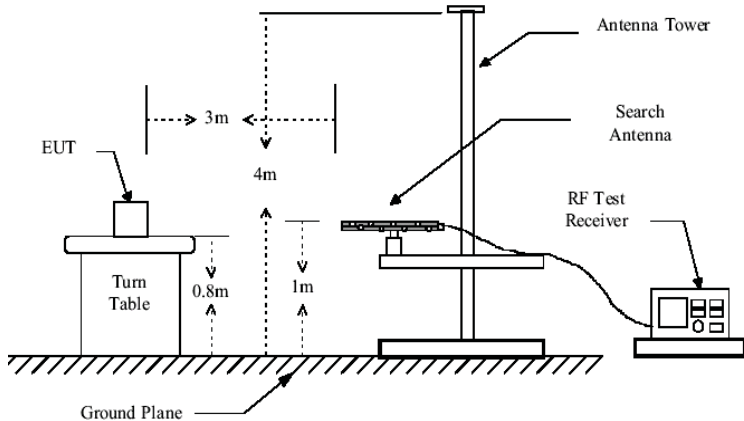
General used equipment:						
Item	Test Equipment	Manufacturer	Model No.	Inventory No.	Cal.Date (mm-dd-yy)	Cal.Due date (mm-dd-yy)
1	Barometer	ChangChun	DYM3	GTS257	July 07 2015	Jul. 06 2016

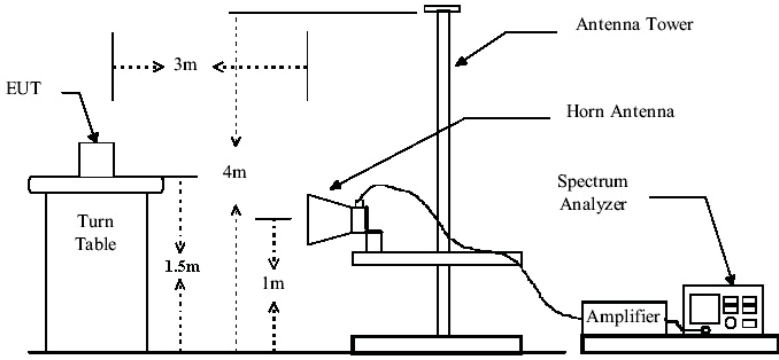
7 Test results and Measurement Data

7.1 Antenna requirement

Standard requirement:	FCC Part15 C Section 15.203
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.	
EUT Antenna:	
<i>The antenna is PCB antenna, the best case gain of the antenna is 0dBi</i> 	

7.2 Radiated Emission Method

Test Requirement:	FCC Part15 C Section 15.209				
Test Method:	ANSI C63.10:2013				
Test Frequency Range:	30MHz to 25GHz				
Test site:	Measurement Distance: 3m				
Receiver setup:	Frequency	Detector	RBW	VBW	Remark
	30MHz-1GHz	Quasi-peak	120KHz	300KHz	Quasi-peak Value
	Above 1GHz	Peak	1MHz	3MHz	Peak Value
		Peak	1MHz	10Hz	Average Value
Limit: (Field strength of the fundamental signal)	Frequency		Limit (dBuV/m @3m)		Remark
	2400MHz-2483.5MHz		94.00		Average Value
Limit: (Spurious Emissions)	Frequency		Limit (dBuV/m @3m)		Remark
	30MHz-88MHz		40.00		Quasi-peak Value
	88MHz-216MHz		43.50		Quasi-peak Value
	216MHz-960MHz		46.00		Quasi-peak Value
	960MHz-1GHz		54.00		Quasi-peak Value
	Above 1GHz		54.00		Average Value
			74.00		Peak Value
Limit: (band edge)	Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in Section 15.209, whichever is the lesser attenuation.				
Test setup:	Below 1GHz				
					
	Above 1GHz				

	
Test Procedure:	1. The EUT was placed on the top of a rotating table (0.8m for below 1GHz and 1.5 meters for above 1GHz) above the ground at a 3 meter camber. The table was rotated 360 degrees to determine the position of the highest radiation. 2. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower. 3. The antenna height is varied from one meter to four 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. 4. 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 rota table was turned from 0 degrees to 360 degrees to find the maximum reading. 5. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode. 6. If the emission level of the EUT in peak mode was 10dB 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 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.
Test Instruments:	Refer to section 6.0 for details
Test mode:	Refer to section 5.3 for details
Test results:	Pass

Measurement data:

7.2.1 Field Strength of The Fundamental Signal

Peak value:

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamplifier Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	polarization
2450.00	99.01	27.46	5.44	33.96	97.95	114.00	-16.05	Vertical
2450.00	96.12	27.46	5.44	33.96	95.06	114.00	-18.94	Horizontal

Average value:

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamplifier Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	polarization
2450.00	86.73	27.46	5.44	33.96	85.67	94.00	-8.33	Vertical
2450.00	83.39	27.46	5.44	33.96	82.33	94.00	-11.67	Horizontal

Note: RBW 3MHz VBW 3MHz peak detector is used for pk RMS detector is for av

7.2.2 Spurious emissions

■ Below 1GHz

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamplifier Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	polarization
37.16	31.92	14.87	0.63	30.06	17.36	40.00	-22.64	Vertical
56.00	27.76	14.95	0.83	29.95	13.59	40.00	-26.41	Vertical
104.17	25.41	14.78	1.23	29.67	11.75	43.50	-31.75	Vertical
167.82	36.85	10.90	1.67	29.33	20.09	43.50	-23.41	Vertical
300.37	27.94	15.06	2.36	29.99	15.37	46.00	-30.63	Vertical
665.80	25.31	20.69	3.97	29.23	20.74	46.00	-25.26	Vertical
42.01	25.38	15.57	0.69	30.03	11.61	40.00	-28.39	Horizontal
52.76	27.27	15.12	0.80	29.98	13.21	40.00	-26.79	Horizontal
94.43	26.25	14.75	1.15	29.72	12.43	43.50	-31.07	Horizontal
106.01	25.89	14.59	1.25	29.66	12.07	43.50	-31.43	Horizontal
373.31	26.21	16.54	2.73	29.62	15.86	46.00	-30.14	Horizontal
506.48	26.28	18.74	3.33	29.30	19.05	46.00	-26.95	Horizontal

■ Above 1GHz

Peak value:

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	polarization
4900.00	32.58	31.88	8.68	32.13	41.01	74.00	-32.99	Vertical
7350.00	31.79	36.45	11.74	31.86	48.12	74.00	-25.88	Vertical
9800.00	30.68	38.43	14.29	31.68	51.72	74.00	-22.28	Vertical
12250.00						74.00		Vertical
14700.00						74.00		Vertical
4900.00	31.67	31.88	8.68	32.13	40.10	74.00	-33.90	Horizontal
7350.00	29.98	36.45	11.74	31.86	46.31	74.00	-27.69	Horizontal
9800.00	30.04	38.43	14.29	31.68	51.08	74.00	-22.92	Horizontal
12250.00						74.00		Horizontal
14700.00						74.00		Horizontal

Average value:

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	polarization
4900.00	22.17	31.88	8.68	32.13	30.60	54.00	-23.40	Vertical
7350.00	21.59	36.45	11.74	31.86	37.92	54.00	-16.08	Vertical
9800.00	20.48	38.43	14.29	31.68	41.52	54.00	-12.48	Vertical
12250.00						54.00		Vertical
14700.00						54.00		Vertical
4900.00	21.35	31.88	8.68	32.13	29.78	54.00	-24.22	Horizontal
7350.00	19.82	36.45	11.74	31.86	36.15	54.00	-17.85	Horizontal
9800.00	20.59	38.43	14.29	31.68	41.63	54.00	-12.37	Horizontal
12250.00						54.00		Horizontal
14700.00						54.00		Horizontal

Remark:

1. *Final Level = Receiver Read level + Antenna Factor + Cable Loss – Preamplifier Factor*
2. *“*” means this data is too weak instrument of signal is unable to test.*
3. *The emission levels of other frequencies are very lower than the limit and not show in test report.*

7.2.3 Bandedge emissions

All of the restriction bands were tested, and only the data of worst case was exhibited.

Test channel:	1
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Peak value:

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamplifier Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization
2390.00	43.10	27.59	5.38	30.18	45.89	74.00	-28.11	Horizontal
2400.00	49.92	27.58	5.39	30.18	52.71	74.00	-21.29	Horizontal
2390.00	43.67	27.59	5.38	30.18	46.46	74.00	-27.54	Vertical
2400.00	51.98	27.58	5.39	30.18	54.77	74.00	-19.23	Vertical

Average value:

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamplifier Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization
2390.00	33.60	27.59	5.38	30.18	36.39	54.00	-17.61	Horizontal
2400.00	34.85	27.58	5.39	30.18	37.64	54.00	-16.36	Horizontal
2390.00	33.56	27.59	5.38	30.18	36.35	54.00	-17.65	Vertical
2400.00	36.52	27.58	5.39	30.18	39.31	54.00	-14.69	Vertical

Test channel:	1
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Peak value:

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamplifier Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization
2483.50	45.23	27.53	5.47	29.93	48.30	74.00	-25.70	Horizontal
2500.00	44.36	27.55	5.49	29.93	47.47	74.00	-26.53	Horizontal
2483.50	46.11	27.53	5.47	29.93	49.18	74.00	-24.82	Vertical
2500.00	45.38	27.55	5.49	29.93	48.49	74.00	-25.51	Vertical

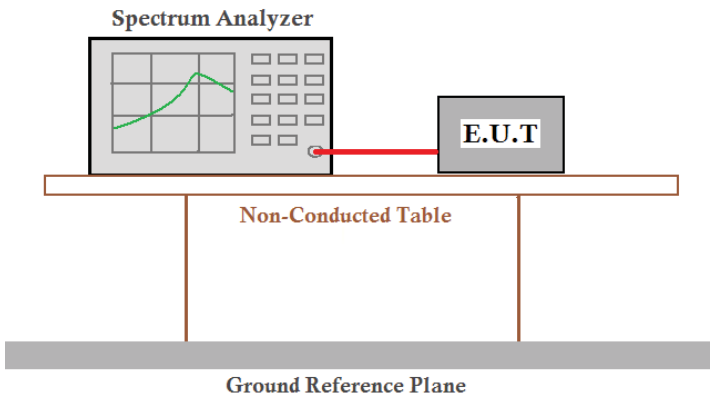
Average value:

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamplifier Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization
2483.50	36.43	27.53	5.47	29.93	39.50	54.00	-14.50	Horizontal
2500.00	34.40	27.55	5.49	29.93	37.51	54.00	-16.49	Horizontal
2483.50	37.66	27.53	5.47	29.93	40.73	54.00	-13.27	Vertical
2500.00	34.34	27.55	5.49	29.93	37.45	54.00	-16.55	Vertical

Remark:

1. Final Level = Receiver Read level + Antenna Factor + Cable Loss – Preamplifier Factor

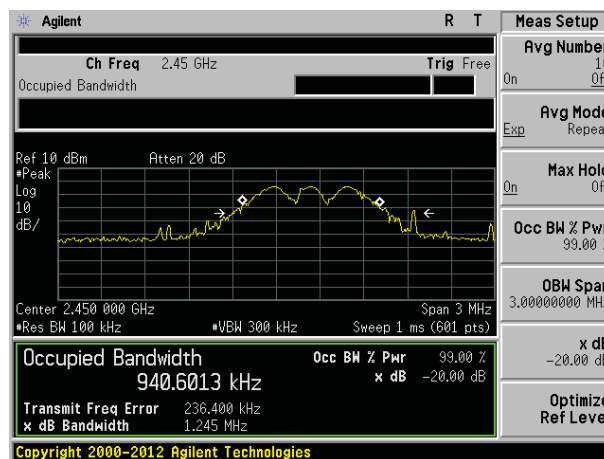
7.3 20dB Occupy Bandwidth

Test Requirement:	FCC Part15 C Section 15.249/15.215
Test Method:	ANSI C63.10:2013
Limit:	Operation Frequency range 2400MHz~2483.5MHz
Test setup:	 The diagram illustrates the test setup. A Spectrum Analyzer is connected via a red cable to an E.U.T. (Equipment Under Test). Both are placed on a Non-Conducted Table. Below the table is a Ground Reference Plane.
Test Instruments:	Refer to section 6.0 for details
Test mode:	Refer to section 5.3 for details
Test results:	Pass

Measurement Data

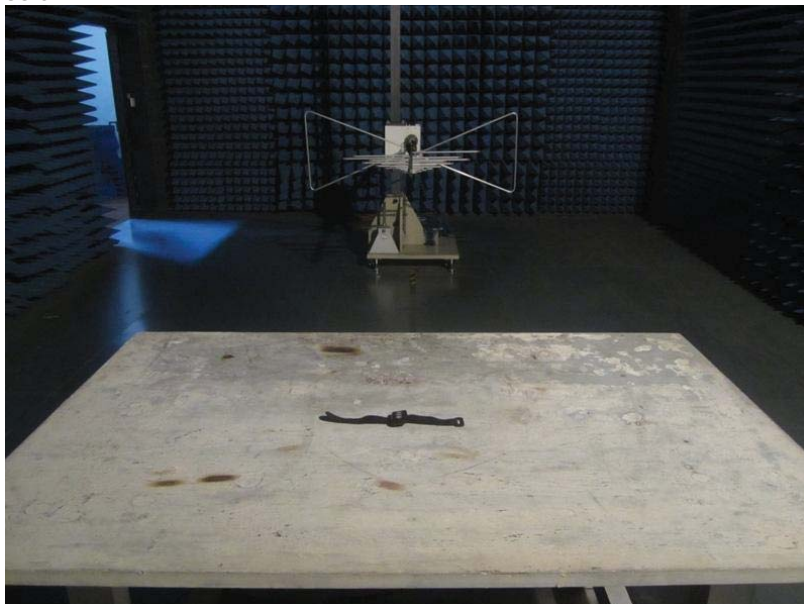
20dB bandwidth(MHz)	Result
1.245	Pass

Test plot as follows:



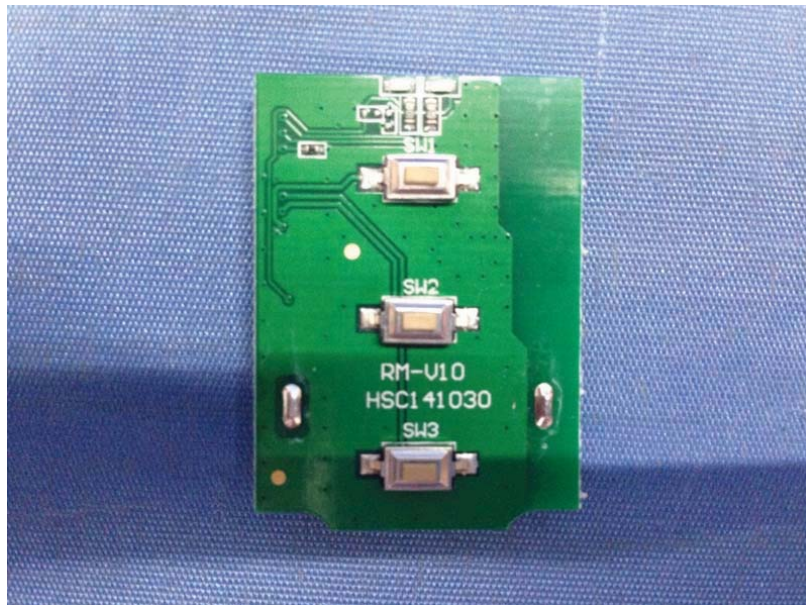
8 Test Setup Photo

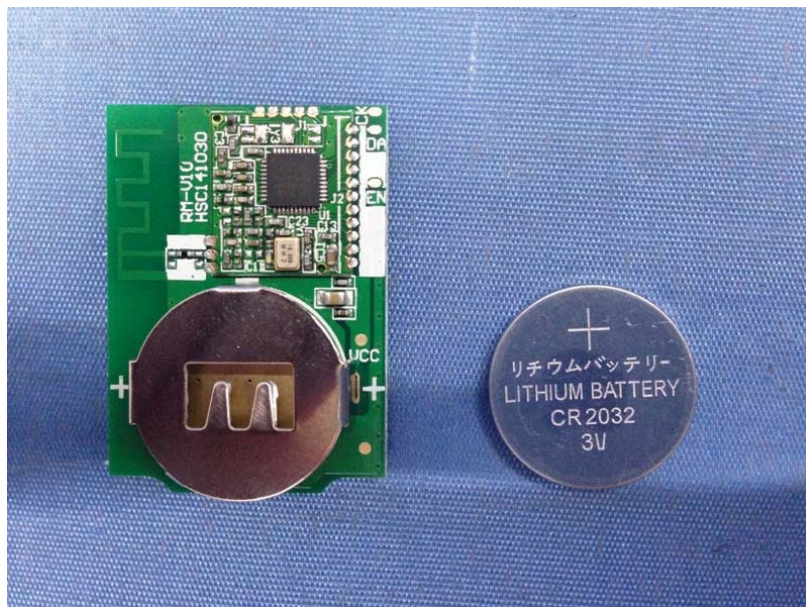
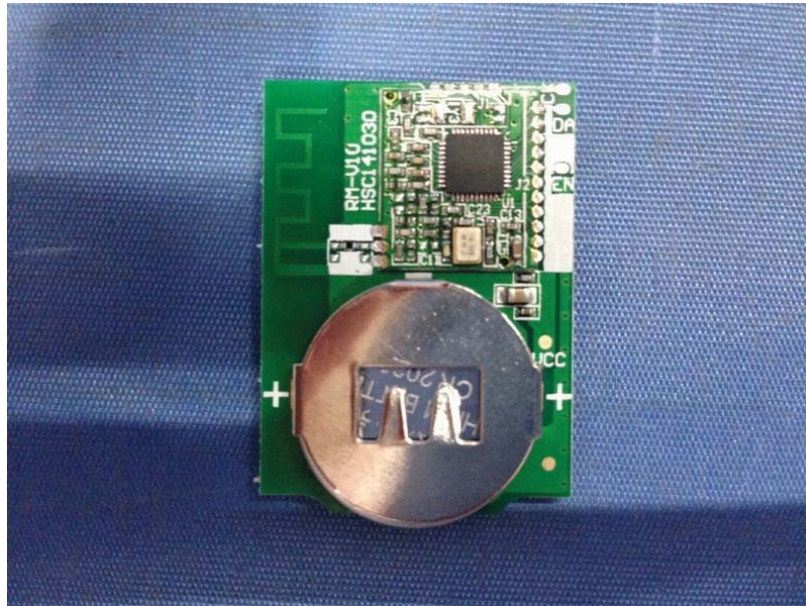
Radiated Emission



9 EUT Constructional Details







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