



FCC REPORT

Applicant: Intova LLC

Address of Applicant: 1100 Alakea St. 18th floor Honolulu, HI 96813,U.S.A

Equipment Under Test (EUT)

Product Name: ConneX Camera

Model No.: ConneX

FCC ID: 2AE2B-CONNEX

Applicable standards: FCC CFR Title 47 Part 15 Subpart C Section 15.249:2014

Date of sample receipt: May 28, 2015

Date of Test: May 28- June 03, 2015

Date of report issued: June 03, 2015

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 03, 2015	Original

Tested By :



Date:

June 03, 2015

Project Engineer

Check By:



Date:

June 03, 2015

Reviewer

3 Contents

	Page
1 COVER PAGE.....	1
2 VERSION	2
3 CONTENTS	3
4 TEST SUMMARY	4
4.1 MEASUREMENT UNCERTAINTY	4
5 GENERAL INFORMATION	5
5.1 CLIENT INFORMATION	5
5.2 GENERAL DESCRIPTION OF EUT	5
5.3 TEST MODE	6
5.4 DESCRIPTION OF SUPPORT UNITS	6
5.5 TEST FACILITY	6
5.6 TEST LOCATION	6
5.7 OTHER INFORMATION REQUESTED BY THE CUSTOMER	6
6 TEST INSTRUMENTS LIST	7
7 TEST RESULTS AND MEASUREMENT DATA.....	8
7.1 ANTENNA REQUIREMENT	8
7.2 RADIATED EMISSION METHOD	9
7.2.1 Field Strength of The Fundamental Signal	11
7.2.2 Spurious emissions.....	12
7.2.3 Bandedge emissions.....	14
7.3 20dB OCCUPY BANDWIDTH	15
8 TEST SETUP PHOTO	16
9 EUT CONSTRUCTIONAL DETAILS	17

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.

N/A: Not applicable

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:	Intova LLC
Address of Applicant:	1100 Alakea St. 18th floor Honolulu, HI 96813,U.S.A
Manufacturer:	Intova LLC
Address of Manufacturer:	1100 Alakea St. 18th floor Honolulu, HI 96813,U.S.A

5.2 General Description of EUT

Product Name:	ConneX Camera
Model No.:	ConneX
Operation Frequency:	2450.25MHz
Modulation type:	GFSK
Antenna Type:	PCB antenna
Antenna gain:	0dBi (declare by Applicant)
Power supply:	DC 3.0V Lithium battery

5.3 Test mode

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

Per-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)	94.11	95.57	93.66

Final Test Mode:

The EUT was tested in GFSK modulation is the worst case.

According to ANSI C63.4 standards, the test results are both the “worst case” and “worst setup”:

Y axis (see the test setup photo)

5.4 Description of Support Units

None

5.5 Test Facility

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

- **CNAS —Registration No.: CNAS L5775**

CNAS has accredited Global United Technology Services Co., Ltd. To ISO/IEC 17025 General Requirements for the competence of testing and calibration laboratories (CNAS-CL01 Accreditation Criteria for the Competence of Testing and Calibration Laboratories) for the competence in the field of testing.

- **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. Room 301-309, 3th Floor, Block A, Huafeng Jinyuan Business Building, No. 300 Laodong Industrial Zone, Xixiang Road, Baoan District, Shenzhen, China Tel: 0755-27798480 Fax: 0755-27798960

5.7 Other Information Requested by the Customer

None.

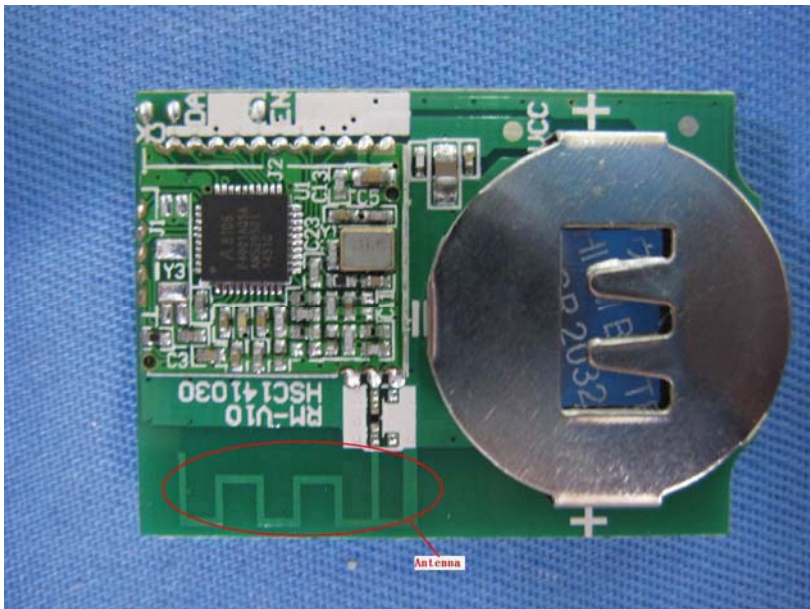
6 Test Instruments list

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. 28 2015	Mar. 27 2016
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	Jul. 01 2014	Jun 30 2015
4	EMI Test Receiver	Rohde & Schwarz	ESU26	GTS203	Jul. 01 2014	Jun 30 2015
5	BiConiLog Antenna	SCHWARZBECK MESS-ELEKTRONIK	VULB9163	GTS214	Jul. 01 2014	Jun 30 2015
6	Double -ridged waveguide horn	SCHWARZBECK MESS-ELEKTRONIK	9120D-829	GTS208	June 27 2014	June 26 2015
7	Horn Antenna	ETS-LINDGREN	3160	GTS217	Mar. 27 2015	Mar. 26 2016
8	EMI Test Software	AUDIX	E3	N/A	N/A	N/A
9	Coaxial Cable	GTS	N/A	GTS213	Mar. 28 2015	Mar. 27 2016
10	Coaxial Cable	GTS	N/A	GTS211	Mar. 28 2015	Mar. 27 2016
11	Coaxial cable	GTS	N/A	GTS210	Mar. 28 2015	Mar. 27 2016
12	Coaxial Cable	GTS	N/A	GTS212	Mar. 28 2015	Mar. 27 2016
13	Amplifier(100kHz-3GHz)	HP	8347A	GTS204	Jul. 01 2014	Jun. 30, 2015
14	Amplifier(2GHz-20GHz)	HP	8349B	GTS206	Jul. 01 2014	Jun. 30, 2015
15	Amplifier (18-26GHz)	Rohde & Schwarz	AFS33-18002 650-30-8P-44	GTS218	June 27 2014	June 26 2015
16	Band filter	Amindeon	82346	GTS219	Mar. 28 2015	Mar. 27 2016

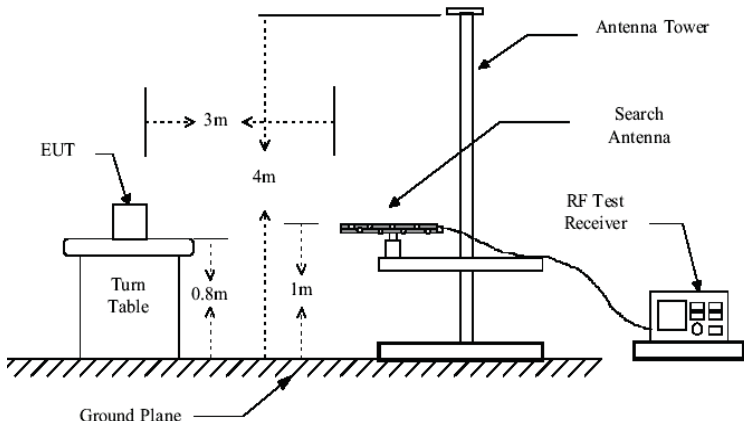
General used equipment:						
Item	Test Equipment	Manufacturer	Model No.	Inventory No.	Cal.Date (mm-dd-yy)	Cal.Due date (mm-dd-yy)
1	Barometer	ChangChun	DYM3	GTS257	July 08 2014	July 07 2015

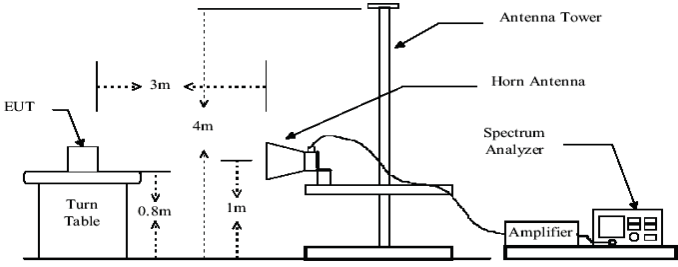
7 Test results and Measurement Data

7.1 Antenna requirement

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

7.2 Radiated Emission Method

Test Requirement:	FCC Part15 C Section 15.209				
Test Method:	ANSI C63.4:2014				
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
			114.00		Peak 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				
	<div></div>				
	Above 1GHz				

	 <p>The diagram illustrates the test setup. An EUT (Equipment Under Test) is placed on a turn table at a height of 0.8m. The turn table is rotated 360 degrees. The EUT is positioned 3m away from the antenna tower. The antenna tower has a variable height, ranging from 1m to 4m. A horn antenna is mounted on the tower. The antenna is connected to a spectrum analyzer via an amplifier. The spectrum analyzer is used to measure the field strength of the EUT.</p>
Test Procedure:	<ol style="list-style-type: none"> 1. The EUT was placed on the top of a rotating table 0.8m meters 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
2450.25	92.78	27.58	5.39	30.18	95.57	114.00	-18.43	Vertical
2450.25	88.45	27.58	5.39	30.18	91.24	114.00	-22.76	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
2450.25	82.43	27.58	5.39	30.18	85.22	94.00	-8.78	Vertical
2450.25	75.26	27.58	5.39	30.18	78.05	94.00	-15.95	Horizontal

7.2.2 Spurious emissions

■ Below 1GHz

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
40.42	25.27	15.58	0.66	30.04	11.47	40.00	-28.53	Vertical
75.45	25.20	9.91	0.99	29.82	6.28	40.00	-33.72	Vertical
161.47	39.87	10.72	1.64	29.35	22.88	43.50	-20.62	Vertical
259.23	23.73	14.05	2.17	29.72	10.23	46.00	-35.77	Vertical
366.82	24.73	16.48	2.70	29.65	14.26	46.00	-31.74	Vertical
631.69	25.24	20.57	3.84	29.27	20.38	46.00	-25.62	Vertical
32.86	24.95	14.31	0.58	30.08	9.76	40.00	-30.24	Horizontal
56.00	24.49	14.95	0.83	29.95	10.32	40.00	-29.68	Horizontal
152.13	31.02	10.35	1.58	29.40	13.55	43.50	-29.95	Horizontal
251.18	24.88	14.07	2.13	29.65	11.43	46.00	-34.57	Horizontal
386.63	24.53	16.78	2.79	29.56	14.54	46.00	-31.46	Horizontal
627.27	24.80	20.55	3.83	29.27	19.91	46.00	-26.09	Horizontal

■ Above 1GHz

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
4804.00	38.99	31.78	8.60	32.09	47.28	74.00	-26.72	Vertical
7206.00	31.96	36.15	11.65	32.00	47.76	74.00	-26.24	Vertical
9608.00	29.41	37.95	14.14	31.62	49.88	74.00	-24.12	Vertical
12010.00	*					74.00		Vertical
14412.00	*					74.00		Vertical
4804.00	35.15	31.78	8.60	32.09	43.44	74.00	-30.56	Horizontal
7206.00	30.40	36.15	11.65	32.00	46.20	74.00	-27.80	Horizontal
9608.00	30.19	37.95	14.14	31.62	50.66	74.00	-23.34	Horizontal
12010.00	*					74.00		Horizontal
14412.00	*					74.00		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
4804.00	28.36	31.78	8.60	32.09	36.65	54.00	-17.35	Vertical
7206.00	21.36	36.15	11.65	32.00	37.16	54.00	-16.84	Vertical
9608.00	18.09	37.95	14.14	31.62	38.56	54.00	-15.44	Vertical
12010.00	*					54.00		Vertical
14412.00	*					54.00		Vertical
4804.00	24.37	31.78	8.60	32.09	32.66	54.00	-21.34	Horizontal
7206.00	19.33	36.15	11.65	32.00	35.13	54.00	-18.87	Horizontal
9608.00	18.54	37.95	14.14	31.62	39.01	54.00	-14.99	Horizontal
12010.00	*					54.00		Horizontal
14412.00	*					54.00		Horizontal

Remark:

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

7.2.3 Bandedge emissions

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

Test channel:	2450.25MHz channel
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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	43.15	27.59	5.38	30.18	45.94	74.00	-28.06	Horizontal
2400.00	43.66	27.58	5.39	30.18	46.45	74.00	-27.55	Horizontal
2390.00	44.81	27.59	5.38	30.18	47.60	74.00	-26.40	Vertical
2400.00	44.92	27.58	5.39	30.18	47.71	74.00	-26.29	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	33.45	27.59	5.38	30.18	36.24	54.00	-17.76	Horizontal
2400.00	33.29	27.58	5.39	30.18	36.08	54.00	-17.92	Horizontal
2390.00	34.44	27.59	5.38	30.18	37.23	54.00	-16.77	Vertical
2400.00	34.78	27.58	5.39	30.18	37.57	54.00	-16.43	Vertical

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	46.40	27.53	5.47	29.93	49.47	74.00	-24.53	Horizontal
2500.00	45.33	27.55	5.49	29.93	48.44	74.00	-25.56	Horizontal
2483.50	47.45	27.53	5.47	29.93	50.52	74.00	-23.48	Vertical
2500.00	46.45	27.55	5.49	29.93	49.56	74.00	-24.44	Vertical

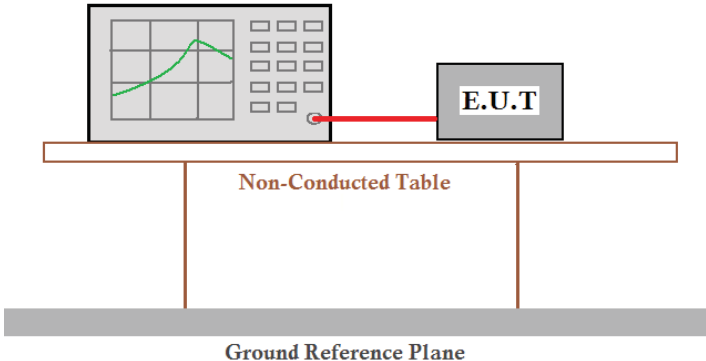
Average value:

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	37.25	27.53	5.47	29.93	40.32	54.00	-13.68	Horizontal
2500.00	35.07	27.55	5.49	29.93	38.18	54.00	-15.82	Horizontal
2483.50	38.57	27.53	5.47	29.93	41.64	54.00	-12.36	Vertical
2500.00	35.10	27.55	5.49	29.93	38.21	54.00	-15.79	Vertical

Remark:

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

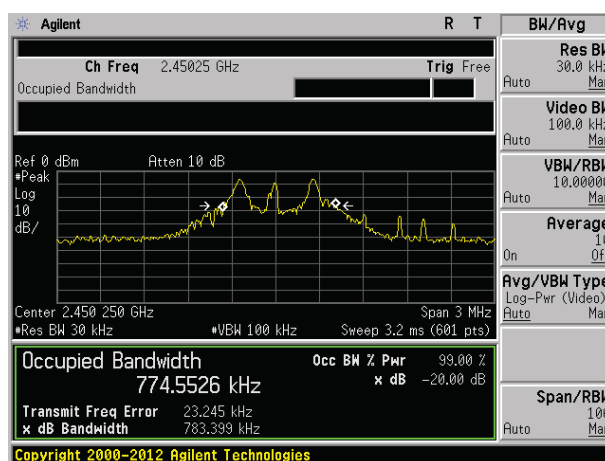
7.3 20dB Occupy Bandwidth

Test Requirement:	FCC Part15 C Section 15.249/15.215
Test Method:	ANSI C63.4:2009
Limit:	Operation Frequency range 2400MHz~2483.5MHz
Test setup:	 <p>The diagram illustrates the test setup. A Spectrum Analyzer is connected via a red cable to an Equipment Under Test (E.U.T.). Both are placed on a Non-Conducted Table. Below the table is a Ground Reference Plane. The Spectrum Analyzer screen shows a green curve on a grid.</p>
Test Instruments:	Refer to section 6.0 for details
Test mode:	Refer to section 5.3 for details
Test results:	Pass

Measurement Data

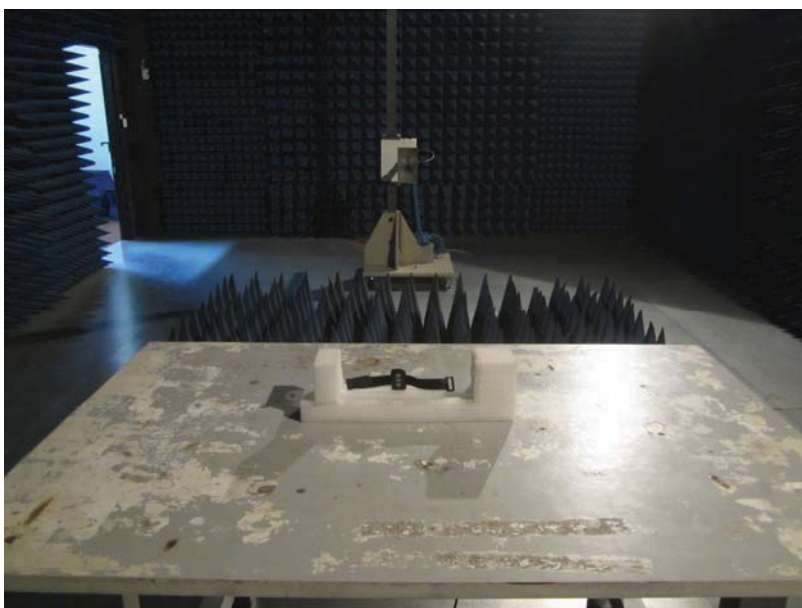
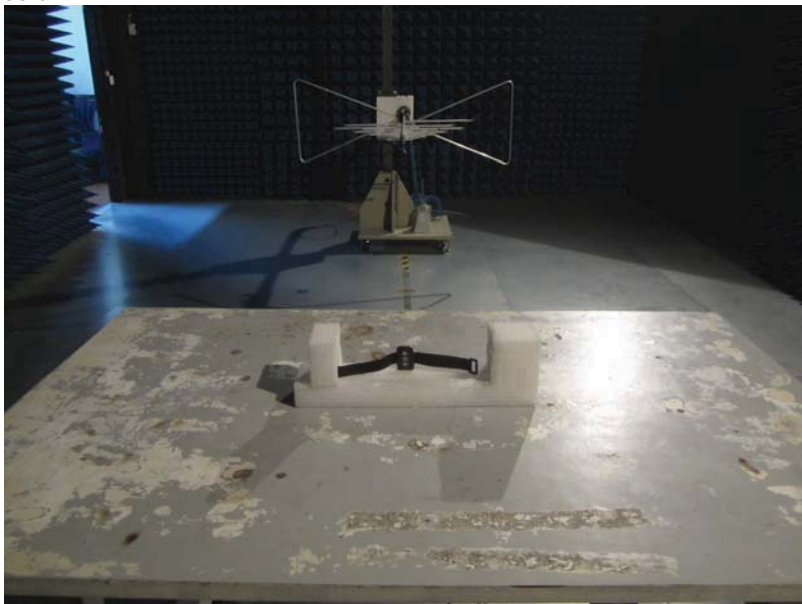
20dB bandwidth(MHz)	Result
0.783	Pass

Test plot as follows:



8 Test Setup Photo

Radiated Emission

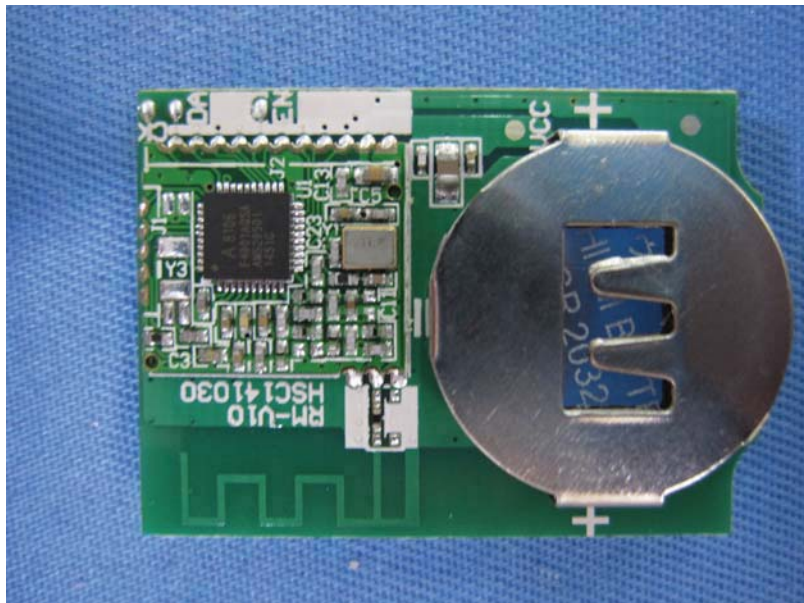
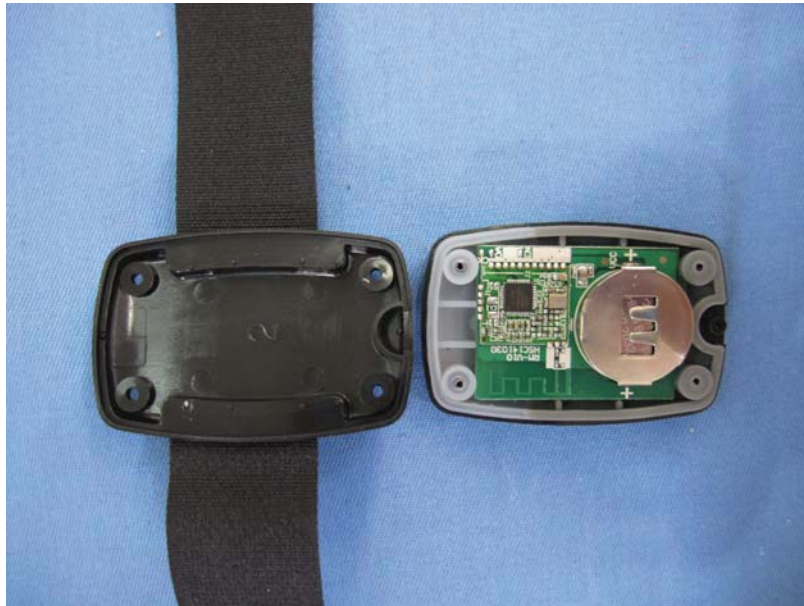


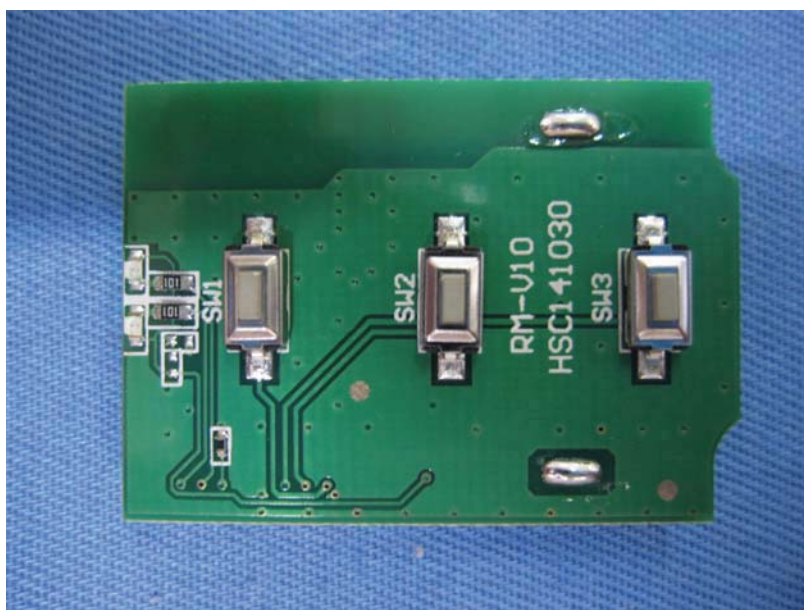
9 EUT Constructional Details











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