

FCC REPORT

Applicant: Grandex International Corporation

Address of Applicant: 4F, No.525, Zhongzheng Rd., Xindian Dist., New Taipei City
23148, Taiwan (R.O.C.)

Equipment Under Test (EUT)

Product Name: Temperature/Humidity Sensor

Model No.: PS440

Trade Mark: Grandex

FCC ID: 2AHDSPS440-01

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

Date of sample receipt: June 18, 2016

Date of Test: June 21-25, 2016

Date of report issued: June 28, 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 28, 2016	Original

Prepared By:

Edward.Pan

Date:

June 28, 2016

Project Engineer

Check By:

Andy. Wu

Date:

June 28, 2016

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	7
5.4	DESCRIPTION OF SUPPORT UNITS	7
5.5	TEST FACILITY.....	7
5.6	TEST LOCATION	7
5.7	DESCRIPTION OF SUPPORT UNITS	7
5.8	OTHER INFORMATION REQUESTED BY THE CUSTOMER	7
6	TEST INSTRUMENTS LIST	8
7	TEST RESULTS AND MEASUREMENT DATA.....	9
7.1	ANTENNA REQUIREMENT	9
7.2	RADIATED EMISSION METHOD	10
7.2.1	Field Strength of The Fundamental Signal	12
7.2.2	Spurious emissions.....	13
7.2.3	Bandedge emissions.....	16
7.3	20dB OCCUPY BANDWIDTH	17
8	TEST SETUP PHOTO	19
9	EUT CONSTRUCTIONAL DETAILS	20

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

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:	Grandex International Corporation
Address of Applicant:	4F, No.525, Zhongzheng Rd., Xindian Dist., New Taipei City 23148, Taiwan (R.O.C.)
Manufacturer/Factory:	Grandex International Corporation
Address of Manufacturer/Factory:	4F, No.525, Zhongzheng Rd., Xindian Dist., New Taipei City 23148, Taiwan (R.O.C.)

5.2 General Description of EUT

Product Name:	Temperature/Humidity Sensor
Model No.:	PS440
Operation Frequency:	2476MHz~2480.5MHz
Channel numbers:	3
Modulation type:	GFSK
Antenna Type:	PCB antenna
Antenna gain:	0dBi (declare by Applicant)
Power supply:	DC 3V Lithium Cell

Operation Frequency each of channel					
Channel	Frequency	Channel	Frequency	Channel	Frequency
1	2476.0MHz	2	2477.5MHz	3	2480.5MHz

Note:

In section 15.31(m), regards to the operating frequency range from 1 to 10 MHz, the Lowest frequency and the highest frequency of channel were selected to perform the test, and the selected channel see below:

Channel	Frequency
The lowest channel	2476.0MHz
The Highest channel	2480.5MHz

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)	97.59	99.35	94.87

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 22, 2016.

- **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.

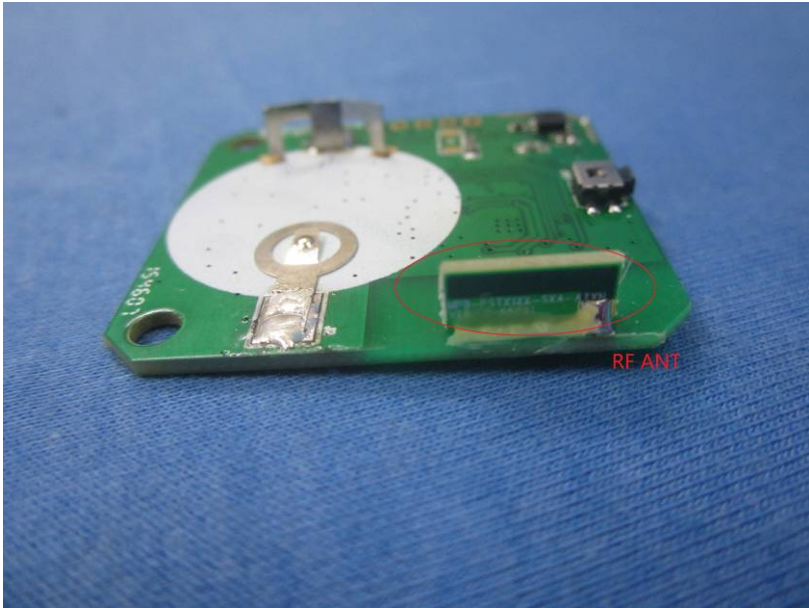
6 Test Instruments list

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	June 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	June 25 2016
16	Band filter	Amindeon	82346	GTS219	Mar. 27 2016	Mar. 26 2017

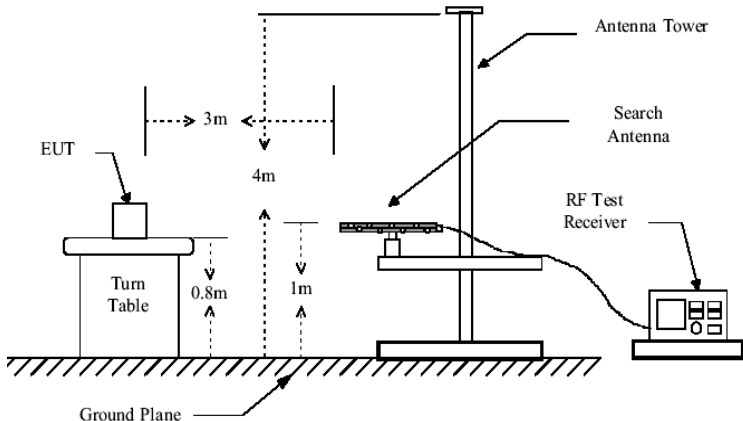
General used equipment:						
Item	Test Equipment	Manufacturer	Model No.	Inventory No.	Cal.Date (mm-dd-yy)	Cal.Due date (mm-dd-yy)
1	Barometer	ChangChun	DYM3	GTS257	July 07 2015	July 06 2016

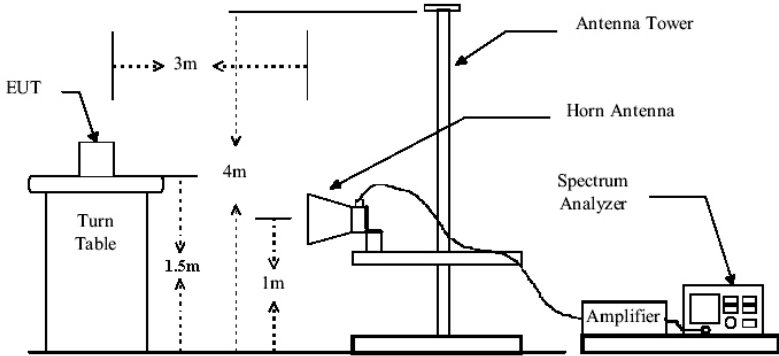
7 Test results and Measurement Data

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: The antenna is PCB antenna, the best case gain of the antenna is 0dBi 	

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				

	 The diagram illustrates the test setup. An EUT (Equipment Under Test) is placed on a Turn Table at a height of 1.5m. The Turn Table is rotated 360 degrees. The EUT is positioned 3m away from the Antenna Tower. The Antenna Tower has a Horn Antenna at a height of 4m. The Spectrum Analyzer is connected to the Antenna Tower via an Amplifier. The Spectrum Analyzer is also connected to the Antenna Tower. The Antenna Tower is positioned 1m away from the Turn Table.
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
2476.00	93.45	27.52	5.47	33.92	92.52	114.00	-21.48	Vertical
2480.50	94.43	27.52	5.47	31.85	95.57	114.00	-18.43	Vertical
2476.00	97.76	27.52	5.47	33.92	96.83	114.00	-17.17	Horizontal
2480.50	98.21	27.52	5.47	31.85	99.35	114.00	-14.65	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
2476.00	85.42	27.52	5.47	33.92	84.49	94.00	-9.51	Vertical
2480.50	86.87	27.52	5.47	31.85	88.01	94.00	-5.99	Vertical
2476.00	88.97	27.52	5.47	33.92	88.04	94.00	-5.96	Horizontal
2480.50	90.66	27.52	5.47	31.85	91.80	94.00	-2.20	Horizontal

Remark: RBW 3MHz VBW 3MHz Peak detector is for PK value , RMS detector is for AV value

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
39.44	32.12	15.44	0.65	30.05	18.16	40.00	-21.84	Vertical
47.99	38.10	15.36	0.75	30.01	24.20	40.00	-15.80	Vertical
89.28	36.75	13.76	1.10	29.75	21.86	43.50	-21.64	Vertical
167.24	36.87	10.87	1.67	29.33	20.08	43.50	-23.42	Vertical
245.95	34.73	14.08	2.10	29.61	21.30	46.00	-24.70	Vertical
435.59	32.18	17.54	3.03	29.42	23.33	46.00	-22.67	Vertical
44.90	34.17	15.55	0.72	30.02	20.42	40.00	-19.58	Horizontal
85.60	37.39	12.60	1.07	29.77	21.29	40.00	-18.71	Horizontal
176.89	39.16	11.49	1.72	29.29	23.08	43.50	-20.42	Horizontal
229.29	38.08	13.62	2.01	29.47	24.24	46.00	-21.76	Horizontal
397.63	30.85	17.01	2.84	29.51	21.19	46.00	-24.81	Horizontal
654.23	25.69	20.65	3.93	29.24	21.03	46.00	-24.97	Horizontal

■ Above 1GHz

Test channel:	Lowest channel(2476MHz)
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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
4952.00	26.94	31.91	8.71	32.16	35.40	74.00	-38.60	Vertical
7428.00	28.38	36.56	11.79	31.80	44.93	74.00	-29.07	Vertical
9904.00	28.23	38.81	14.35	31.85	49.54	74.00	-24.46	Vertical
12380.00	28.15	38.78	15.27	35.33	46.87	74.00	-27.13	Vertical
4952.00	53.29	31.91	8.71	32.16	61.75	74.00	-12.25	Horizontal
7428.00	27.44	36.56	11.79	31.80	43.99	74.00	-30.01	Horizontal
9904.00	28.14	38.81	14.35	31.85	49.45	74.00	-24.55	Horizontal
12380.00	27.53	38.78	15.27	35.33	46.25	74.00	-27.75	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
4952.00	39.68	31.91	8.71	32.16	48.14	54.00	-5.86	Vertical
7428.00	18.53	36.56	11.79	31.80	35.08	54.00	-18.92	Vertical
9904.00	18.20	38.81	14.35	31.85	39.51	54.00	-14.49	Vertical
12380.00	18.41	38.78	15.27	35.33	37.13	54.00	-16.87	Vertical
4952.00	39.57	31.91	8.71	32.16	48.03	54.00	-5.97	Horizontal
7428.00	18.56	36.56	11.79	31.80	35.11	54.00	-18.89	Horizontal
9904.00	18.29	38.81	14.35	31.85	39.60	54.00	-14.40	Horizontal
12380.00	18.53	38.78	15.27	35.33	37.25	54.00	-16.75	Horizontal

Remark:

1. Final Level =Receiver Read level + Antenna Factor + Cable Loss – Preamplifier Factor
2. “*”, means this data is the too weak instrument of signal is unable to test.

Test channel:	Highest channel (2480.50MHz)
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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
4961.00	57.45	31.93	8.73	32.16	65.95	74.00	-8.05	Vertical
7441.50	28.86	36.59	11.79	31.78	45.46	74.00	-28.54	Vertical
9922.00	28.98	38.81	14.38	31.88	50.29	74.00	-23.71	Vertical
12402.50	26.69	38.76	15.27	35.27	45.45	74.00	-28.55	Vertical
4961.00	54.51	31.93	8.73	32.16	63.01	74.00	-10.99	Horizontal
7441.50	27.86	36.59	11.79	31.78	44.46	74.00	-29.54	Horizontal
9922.00	27.48	38.81	14.38	31.88	48.79	74.00	-25.21	Horizontal
12402.50	27.43	38.76	15.27	35.27	46.19	74.00	-27.81	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
4961.00	40.78	31.93	8.73	32.16	49.28	54.00	-4.72	Vertical
7441.50	18.65	36.59	11.79	31.78	35.25	54.00	-18.75	Vertical
9922.00	18.69	38.81	14.38	31.88	40.00	54.00	-14.00	Vertical
12402.50	18.20	38.76	15.27	35.27	36.96	54.00	-17.04	Vertical
4961.00	39.68	31.93	8.73	32.16	48.18	54.00	-5.82	Horizontal
7441.50	18.05	36.59	11.79	31.78	34.65	54.00	-19.35	Horizontal
9922.00	17.91	38.81	14.38	31.88	39.22	54.00	-14.78	Horizontal
12402.50	18.38	38.76	15.27	35.27	37.14	54.00	-16.86	Horizontal

Remark:

1. Final Level = Receiver Read level + Antenna Factor + Cable Loss – Preamplifier Factor
2. “*”, means this data is the 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:	Lowest 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	38.88	27.59	5.38	30.18	41.67	74.00	-32.33	Horizontal
2400.00	39.78	27.58	5.39	30.18	42.57	74.00	-31.43	Horizontal
2390.00	37.69	27.59	5.38	30.18	40.48	74.00	-33.52	Vertical
2400.00	38.24	27.58	5.39	30.18	41.03	74.00	-32.97	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	28.54	27.59	5.38	30.18	31.33	54.00	-22.67	Horizontal
2400.00	28.34	27.58	5.39	30.18	31.13	54.00	-22.87	Horizontal
2390.00	28.29	27.59	5.38	30.18	31.08	54.00	-22.92	Vertical
2400.00	29.57	27.58	5.39	30.18	32.36	54.00	-21.64	Vertical

Test channel:	Highest 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
2483.50	64.09	27.53	5.47	31.85	65.24	74.00	-8.76	Horizontal
2500.00	43.93	27.55	5.49	31.87	45.10	74.00	-28.90	Horizontal
2483.50	61.18	27.53	5.47	31.85	62.33	74.00	-11.67	Vertical
2500.00	45.28	27.55	5.49	31.87	46.45	74.00	-27.55	Vertical

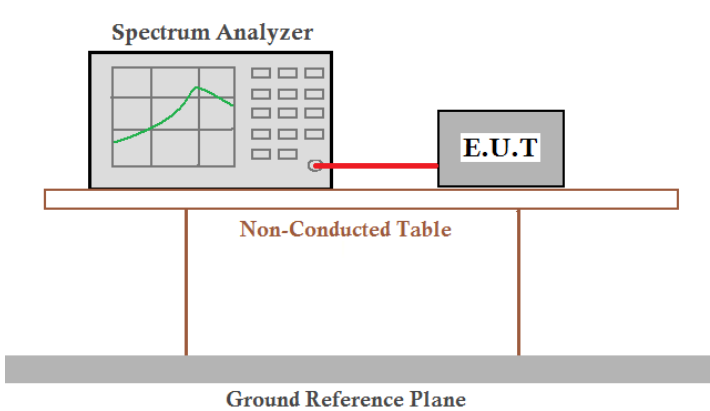
Average value:

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	48.93	27.53	5.47	31.85	50.08	54.00	-3.92	Horizontal
2500.00	33.36	27.55	5.49	31.87	34.53	54.00	-19.47	Horizontal
2483.50	45.60	27.53	5.47	31.85	46.75	54.00	-7.25	Vertical
2500.00	33.41	27.55	5.49	31.87	34.58	54.00	-19.42	Vertical

Remark:

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

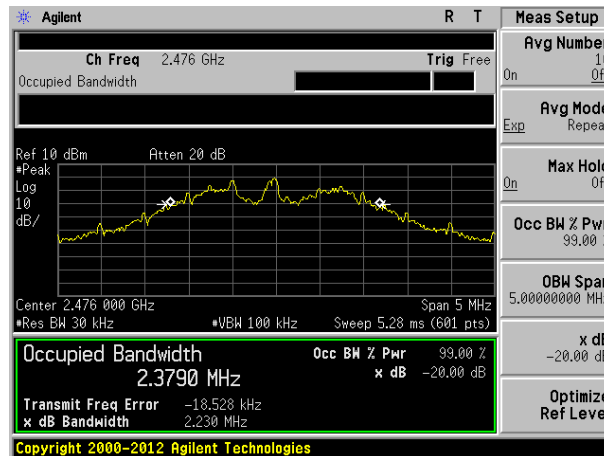
7.3 20dB Occupy Bandwidth

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 to an E.U.T. (Equipment Under Test) via a red cable. Both the Spectrum Analyzer and the E.U.T. 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

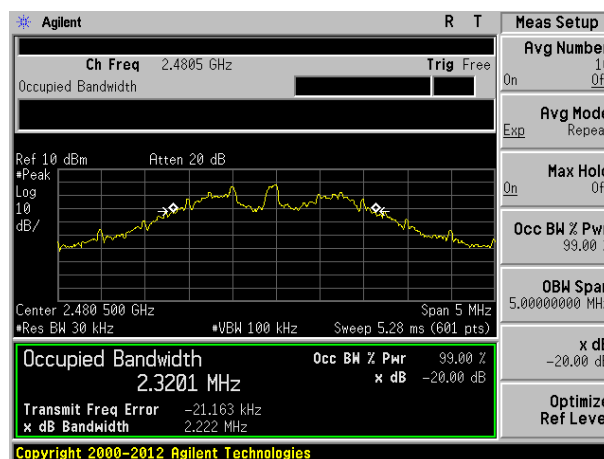
Measurement Data

Test channel	20dB bandwidth(MHz)	Result
Lowest	2.230	Pass
Highest	2.222	Pass

Test plot as follows:



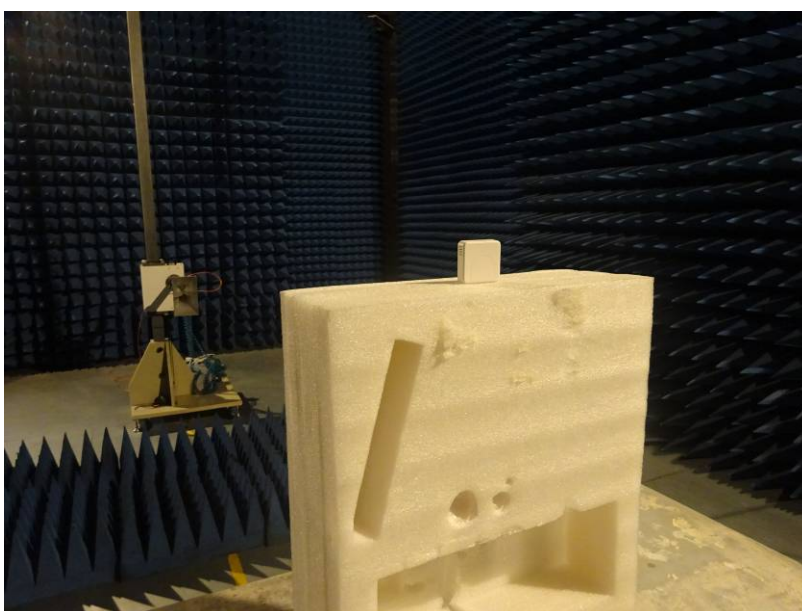
Lowest channel



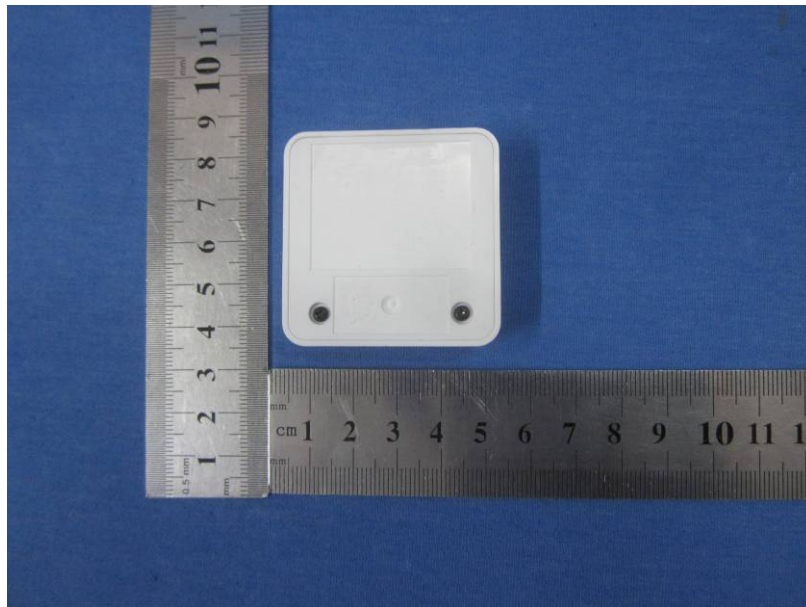
Highest channel

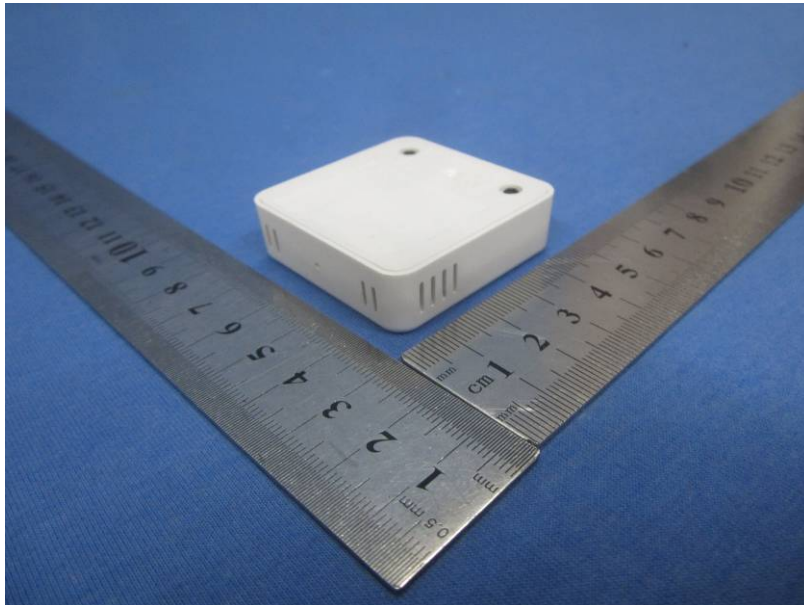
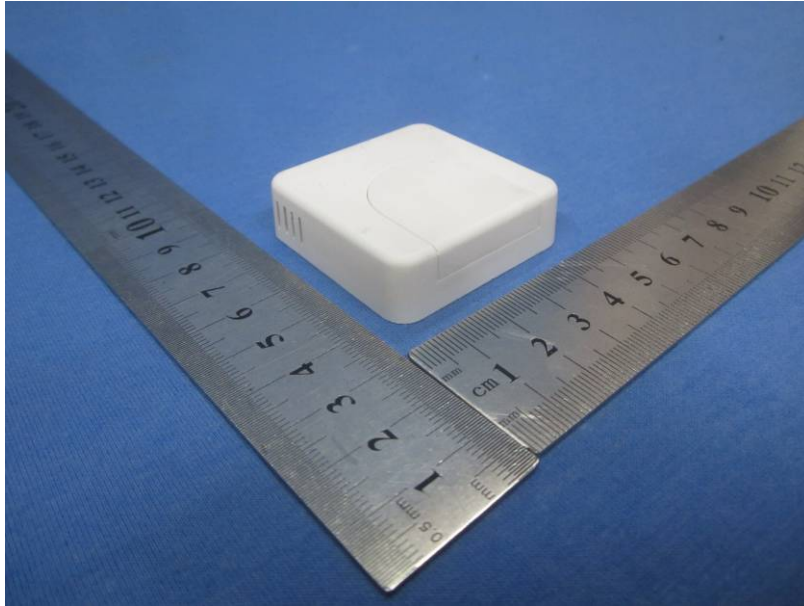
8 Test Setup Photo

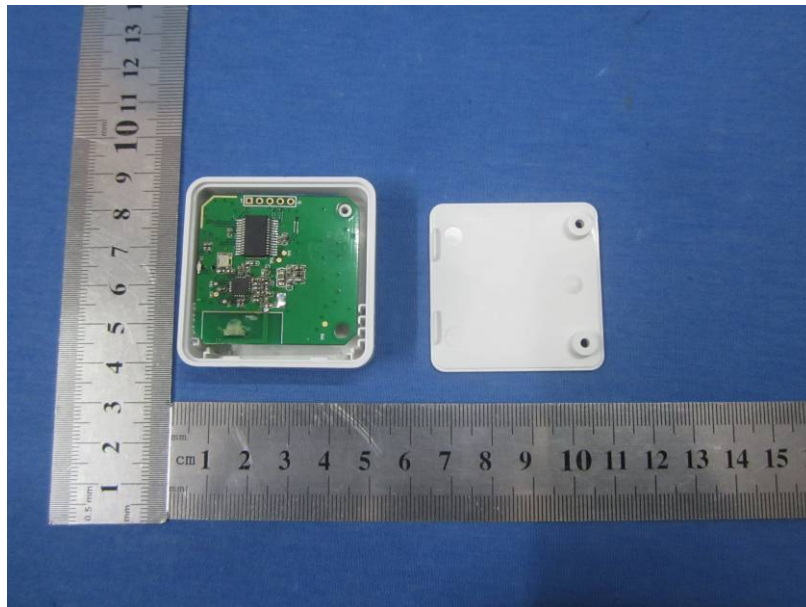
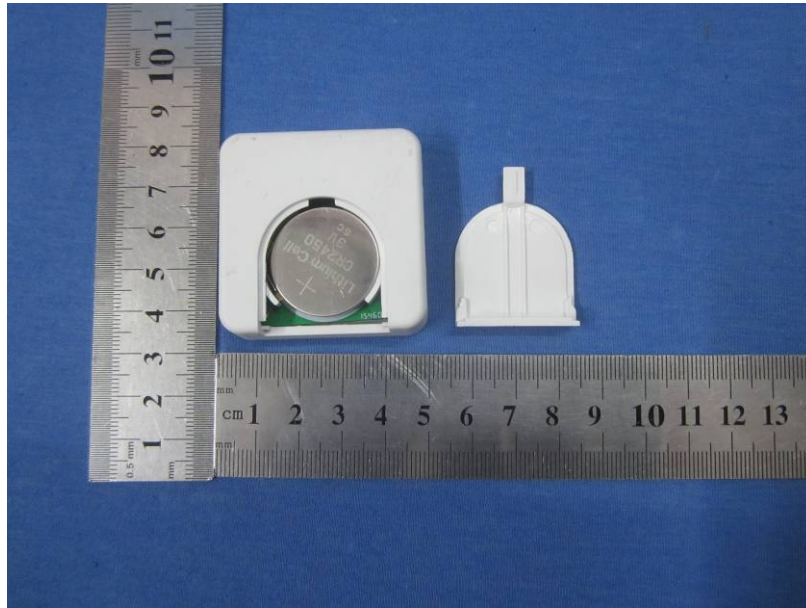
Radiated Emission

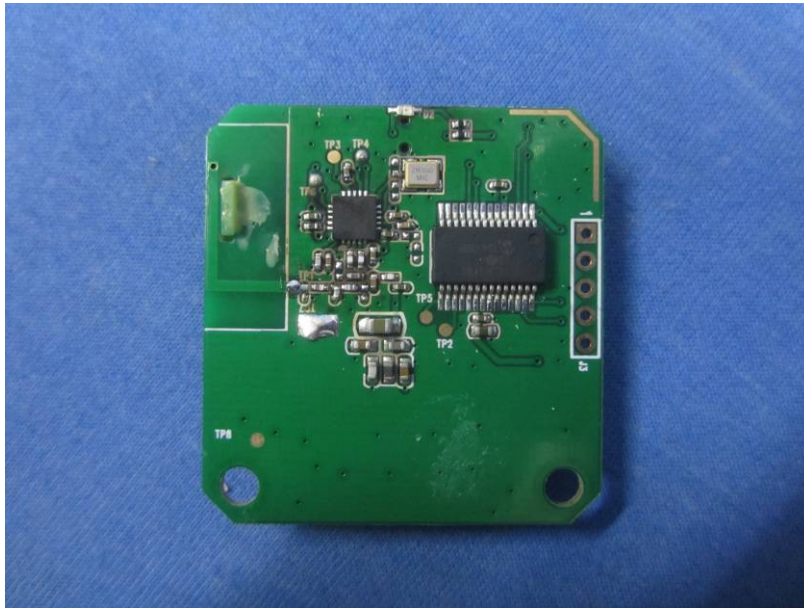


9 EUT Constructional Details











----- End -----