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Report No.: EBO1606094-E283
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FCC REPORT

Applicant: HOLD TIGHT DEVELOPMENT MFG. CO., LTD.

Address of Applicant: Rm. 202, Dongfang Commercial Trade Building, NO.22
Xingzhong Rd., East District, Zhongshan City, Guangdong,
China

Equipment Under Test (EUT)

Product Name: SHUTTER BALL

Model No.: BAL

FCC ID: 2AIZR-BAL

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

Date of sample receipt: June 27, 2016

Date of Test: June 27, 2016

Date of report issued: July 7, 2016

Test Result : PASS *

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

Authorized Signature:



Kevin Yu
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 EBO 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	July 7, 2016	Original

Prepared By:



Date:

July 7, 2016

Project Engineer

Check By:



Date:

July 7, 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 C63.4 2014 and ANSI C63.10 2013.

4.1 Measurement Uncertainty

Test Item	Frequency Range	Measurement Uncertainty	Notes
Radiated Emission	9kHz ~ 30MHz	± 4.34dB	(1)
Radiated Emission	30MHz ~ 1000MHz	± 4.24dB	(1)
Radiated Emission	1GHz ~ 26.5GHz	± 4.68dB	(1)
AC Power Line Conducted Emission	0.15MHz ~ 30MHz	± 3.45dB	(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:	HOLD TIGHT DEVELOPMENT MFG. CO., LTD.
Address of Applicant:	Rm. 202, Dongfang Commercial Trade Building, NO.22 Xingzhong Rd., East District, Zhongshan City, Guangdong, China
Manufacturer:	SHENZHEN FORWARD STAR TECH. CO., LTD.
Address of Manufacturer:	The 4 th floor of building 1, Daxing Laowei Industrial Park, Botanical garden Rd., Longgang District, Shenzhen City, China

5.2 General Description of EUT

Product Name:	SHUTTER BALL
Model No.:	BAL
Operation Frequency:	2402MHz~2480MHz
Channel numbers:	79
Channel separation:	1MHz
Modulation type:	GFSK
Antenna Type:	PCB Antenna
Antenna gain:	0dBi (declare by Applicant)
Power supply:	DC 3V (CR2032 Battery)

Operation Frequency each of channel							
Channel	Frequency	Channel	Frequency	Channel	Frequency	Channel	Frequency
1	2402MHz	21	2422MHz	41	2442MHz	61	2462MHz
2	2403MHz	22	2423MHz	42	2443MHz	62	2463MHz
⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮
19	2420MHz	39	2440MHz	59	2460MHz	79	2480MHz
20	2421MHz	40	2441MHz	60	2461MHz		

Note:

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

Channel	Frequency
The lowest channel	2402MHz
The middle channel	2441MHz
The Highest channel	2480MHz

5.3 Test mode

Transmitting mode	Keep the Bluetooth in continuously transmitting mode
<i>Remark: New battery is used during all test</i>	

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)	91.16	95.28	93.07

Final Test Mode:

According to ANSI C63.10 standards, the test results is the “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:

• **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: 2nd Floor, Block No.2, Laodong Industrial Zone, Xixiang Road Baoan District, Shenzhen, China

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. 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	EMI Test Receiver	Rohde & Schwarz	ESU26	GTS203	June 30 2015	June 29 2016
4	BiConiLog Antenna	SCHWARZBECK MESS-ELEKTRONIK	VULB9163	GTS214	June 30 2015	June 29 2016
5	Double -ridged waveguide horn	SCHWARZBECK MESS-ELEKTRONIK	9120D-829	GTS208	June 30 2015	June 29 2016
6	Horn Antenna	ETS-LINDGREN	3160	GTS217	Mar. 27 2016	Mar. 26 2017
7	EMI Test Software	AUDIX	E3	N/A	N/A	N/A
8	Coaxial Cable	GTS	N/A	GTS213	Mar. 27 2016	Mar. 26 2017
9	Coaxial Cable	GTS	N/A	GTS211	Mar. 27 2016	Mar. 26 2017
10	Coaxial cable	GTS	N/A	GTS210	Mar. 27 2016	Mar. 26 2017
11	Coaxial Cable	GTS	N/A	GTS212	Mar. 27 2016	Mar. 26 2017
12	Amplifier(100kHz-3GHz)	HP	8347A	GTS204	June 30 2015	June 29 2016
13	Amplifier(2GHz-20GHz)	HP	8349B	GTS206	June 30 2015	June 29 2016
14	Amplifier (18-26GHz)	Rohde & Schwarz	AFS33-18002 650-30-8P-44	GTS218	June 30 2015	June 29 2016
15	Band filter	Amindeon	82346	GTS219	Mar. 27 2016	Mar. 26 2017
16	Constant temperature and humidity box	Oregon Scientific	BA-888	GTS248	June 30 2015	June 29 2016
17	D.C. Power Supply	Instek	PS-3030	GTS232	June 30 2015	June 29 2016

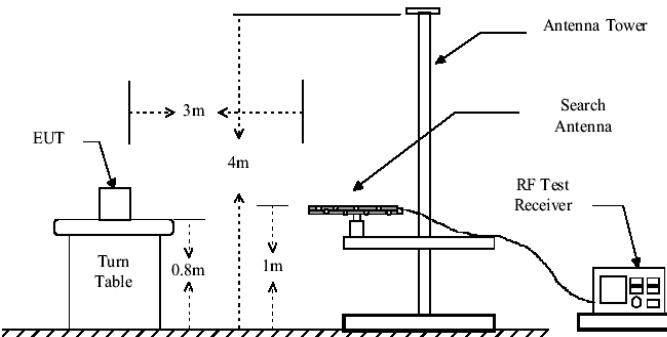
7 Test results and Measurement Data

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.	
E.U.T 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				
Limit: (Field strength of the fundamental signal)		Peak	1MHz	10Hz	Average Value				
Frequency	Limit (dBuV/m @3m)		Remark						
2400MHz-2483.5MHz	94.00		Average Value						
	Limit: (Spurious Emissions)		114.00		Peak Value				
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						
	Limit: (band edge)		74.00		Peak Value				
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:	<ol style="list-style-type: none"> 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. 7. The radiation measurements are performed in X, Y, Z axis positioning. And found the Y axis positioning which it is worse case, only the test worst case mode is recorded in the report.
Test Instruments:	Refer to section 6.0 for details
Test mode:	Refer to section 5.3 for details
Test results:	Pass

Measurement data:

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7.2.1 Field Strength of The Fundamental Signal

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
2402.00	91.57	27.58	5.39	30.18	94.36	114.00	-19.64	Vertical
2402.00	89.62	27.58	5.39	30.18	92.41	114.00	-21.59	Horizontal
2441.00	90.02	27.55	5.43	30.06	92.94	114.00	-21.06	Vertical
2441.00	88.77	27.55	5.43	30.06	91.69	114.00	-22.31	Horizontal
2480.00	92.22	27.52	5.47	29.93	95.28	114.00	-18.72	Vertical
2480.00	89.54	27.52	5.47	29.93	92.60	114.00	-21.40	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
2402.00	80.69	27.58	5.39	30.18	83.48	94.00	-10.52	Vertical
2402.00	78.56	27.58	5.39	30.18	81.35	94.00	-12.65	Horizontal
2441.00	79.37	27.55	5.43	30.06	82.29	94.00	-11.71	Vertical
2441.00	76.43	27.55	5.43	30.06	79.35	94.00	-14.65	Horizontal
2480.00	81.76	27.52	5.47	29.93	84.82	94.00	-9.18	Vertical
2480.00	79.15	27.52	5.47	29.93	82.21	94.00	-11.79	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
32.36	48.13	14.32	0.56	32.06	30.95	40.00	-9.06	Vertical
56.04	47.07	15.05	0.81	31.95	30.98	40.00	-9.02	Vertical
148.00	50.61	10.24	1.55	31.97	30.43	43.50	-13.07	Vertical
180.07	53.40	11.62	1.73	32.08	34.67	43.50	-8.83	Vertical
507.63	38.17	18.74	3.33	31.53	28.71	46.00	-17.29	Vertical
894.97	38.88	23.05	4.83	31.19	35.57	46.00	-10.44	Vertical
56.09	42.16	15.03	0.81	31.95	26.05	40.00	-13.95	Horizontal
114.45	48.14	13.73	1.30	31.83	31.34	43.50	-12.16	Horizontal
179.38	55.67	11.55	1.73	32.08	36.87	43.50	-6.64	Horizontal
239.95	49.00	13.99	2.06	32.16	32.89	46.00	-13.11	Horizontal
328.46	48.35	15.59	2.50	32.09	34.35	46.00	-11.65	Horizontal
746.51	38.64	21.39	4.26	31.25	33.04	46.00	-12.97	Horizontal

■ Above 1GHz

Test channel:				Lowest channel				
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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
4804.00	36.94	31.78	8.60	32.09	45.23	74.00	-28.77	Vertical
7206.00	32.04	36.15	11.65	32.00	47.84	74.00	-26.16	Vertical
9608.00	31.77	37.95	14.14	31.62	52.24	74.00	-21.76	Vertical
12010.00	*					74.00		Vertical
14412.00	*					74.00		Vertical
4804.00	40.72	31.78	8.60	32.09	49.01	74.00	-24.99	Horizontal
7206.00	33.76	36.15	11.65	32.00	49.56	74.00	-24.44	Horizontal
9608.00	30.99	37.95	14.14	31.62	51.46	74.00	-22.54	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)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	polarization
4804.00	26.38	31.78	8.60	32.09	34.67	54.00	-19.33	Vertical
7206.00	21.31	36.15	11.65	32.00	37.11	54.00	-16.89	Vertical
9608.00	20.42	37.95	14.14	31.62	40.89	54.00	-13.11	Vertical
12010.00	*					54.00		Vertical
14412.00	*					54.00		Vertical
4804.00	30.42	31.78	8.60	32.09	38.71	54.00	-15.30	Horizontal
7206.00	23.39	36.15	11.65	32.00	39.19	54.00	-14.81	Horizontal
9608.00	19.61	37.95	14.14	31.62	40.08	54.00	-13.92	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.

Test channel:				Middle channel				
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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
4882.00	36.19	31.85	8.67	32.12	44.59	74.00	-29.41	Vertical
7323.00	31.61	36.37	11.72	31.89	47.81	74.00	-26.19	Vertical
9764.00	31.22	38.35	14.25	31.62	52.20	74.00	-21.80	Vertical
12205.00	*					74.00		Vertical
14646.00	*					74.00		Vertical
4882.00	40.33	31.85	8.67	32.12	48.73	74.00	-25.27	Horizontal
7323.00	33.04	36.37	11.72	31.89	49.24	74.00	-24.76	Horizontal
9764.00	30.46	38.35	14.25	31.62	51.44	74.00	-22.56	Horizontal
12205.00	*					74.00		Horizontal
14646.00	*					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
4882.00	25.63	31.85	8.67	32.12	34.03	54.00	-19.97	Vertical
7323.00	20.54	36.37	11.72	31.89	36.74	54.00	-17.26	Vertical
9764.00	19.59	38.35	14.25	31.62	40.57	54.00	-13.43	Vertical
12205.00	*					54.00		Vertical
14646.00	*					54.00		Vertical
4882.00	29.59	31.85	8.67	32.12	37.99	54.00	-16.01	Horizontal
7323.00	22.36	36.37	11.72	31.89	38.56	54.00	-15.44	Horizontal
9764.00	19.12	38.35	14.25	31.62	40.10	54.00	-13.90	Horizontal
12205.00	*					54.00		Horizontal
14646.00	*					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.

Test channel:	Highest channel							
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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
4960.00	35.39	31.93	8.73	32.16	43.89	74.00	-30.11	Vertical
7440.00	30.71	36.59	11.79	31.78	47.31	74.00	-26.69	Vertical
9920.00	30.42	38.81	14.38	31.88	51.73	74.00	-22.27	Vertical
12400.00	*					74.00		Vertical
14880.00	*					74.00		Vertical
4960.00	39.12	31.93	8.73	32.16	47.62	74.00	-26.38	Horizontal
7440.00	32.21	36.59	11.79	31.78	48.81	74.00	-25.19	Horizontal
9920.00	29.62	38.81	14.38	31.88	50.93	74.00	-23.07	Horizontal
12400.00	*					74.00		Horizontal
14880.00	*					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
4960.00	24.50	31.93	8.73	32.16	33.00	54.00	-21.00	Vertical
7440.00	19.51	36.59	11.79	31.78	36.11	54.00	-17.89	Vertical
9920.00	18.73	38.81	14.38	31.88	40.04	54.00	-13.96	Vertical
12400.00	*					54.00		Vertical
14880.00	*					54.00		Vertical
4960.00	28.49	31.93	8.73	32.16	36.99	54.00	-17.01	Horizontal
7440.00	21.53	36.59	11.79	31.78	38.13	54.00	-15.87	Horizontal
9920.00	18.23	38.81	14.38	31.88	39.54	54.00	-14.46	Horizontal
12400.00	*					54.00		Horizontal
14880.00	*					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:	Lowest channel							
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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
2390.00	45.06	27.59	5.38	30.18	47.85	74.00	-26.15	Horizontal
2400.00	62.11	27.58	5.39	30.18	64.90	74.00	-9.10	Horizontal
2390.00	45.28	27.59	5.38	30.18	48.07	74.00	-25.93	Vertical
2400.00	63.77	27.58	5.39	30.18	66.56	74.00	-7.44	Vertical

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
2390.00	35.59	27.59	5.38	30.18	38.38	54.00	-15.62	Horizontal
2400.00	46.77	27.58	5.39	30.18	49.56	54.00	-4.44	Horizontal
2390.00	35.67	27.59	5.38	30.18	38.46	54.00	-15.54	Vertical
2400.00	48.61	27.58	5.39	30.18	51.40	54.00	-2.60	Vertical

Test channel:	Highest channel							
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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
2483.50	47.19	27.53	5.47	29.93	50.26	74.00	-23.74	Horizontal
2500.00	46.23	27.55	5.49	29.93	49.34	74.00	-24.66	Horizontal
2483.50	47.81	27.53	5.47	29.93	50.88	74.00	-23.12	Vertical
2500.00	46.99	27.55	5.49	29.93	50.10	74.00	-23.90	Vertical

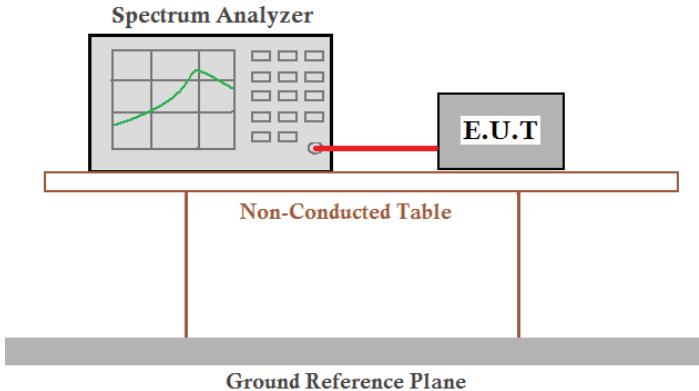
Average value:

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
2483.50	38.65	27.53	5.47	29.93	41.72	54.00	-12.28	Horizontal
2500.00	36.60	27.55	5.49	29.93	39.71	54.00	-14.29	Horizontal
2483.50	39.94	27.53	5.47	29.93	43.01	54.00	-10.99	Vertical
2500.00	36.62	27.55	5.49	29.93	39.73	54.00	-14.27	Vertical

Remark:

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

7.3 20dB Occupy Bandwidth

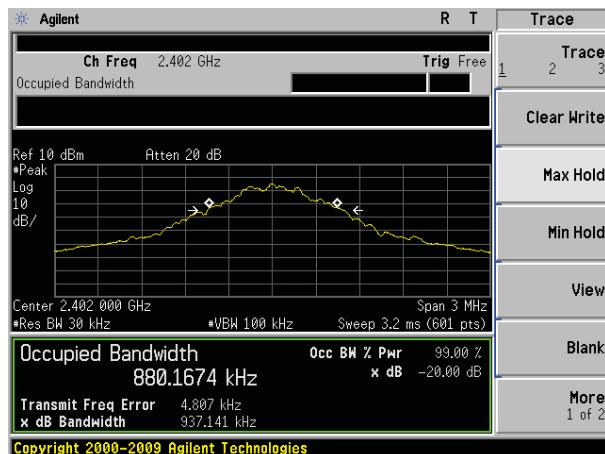
Test Requirement:	FCC Part15 C Section 15.249/15.215
Test Method:	ANSI C63.10:2013
Limit:	Operation Frequency range 2400MHz~2483.5MHz
Test setup:	
Test Instruments:	Refer to section 6.0 for details
Test mode:	Refer to section 5.3 for details
Test results:	Pass

Measurement Data

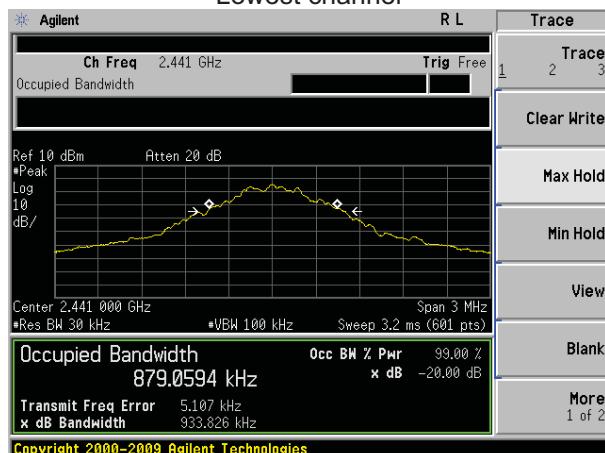
Measurement Data

Test channel	20dB bandwidth(MHz)	Result
Lowest	0.937	Pass
Middle	0.934	Pass
Highest	0.936	Pass

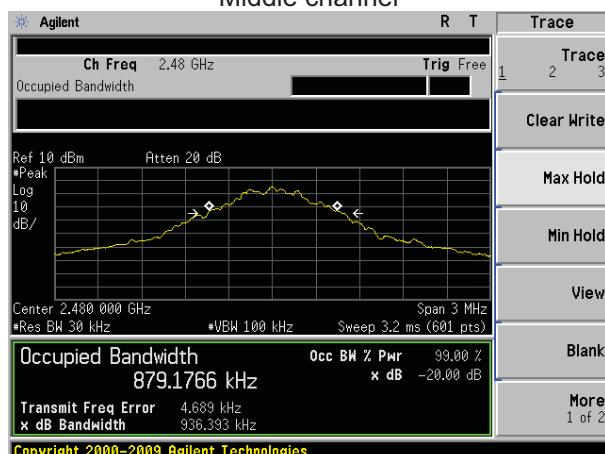
Test plot as follows:



Lowest channel



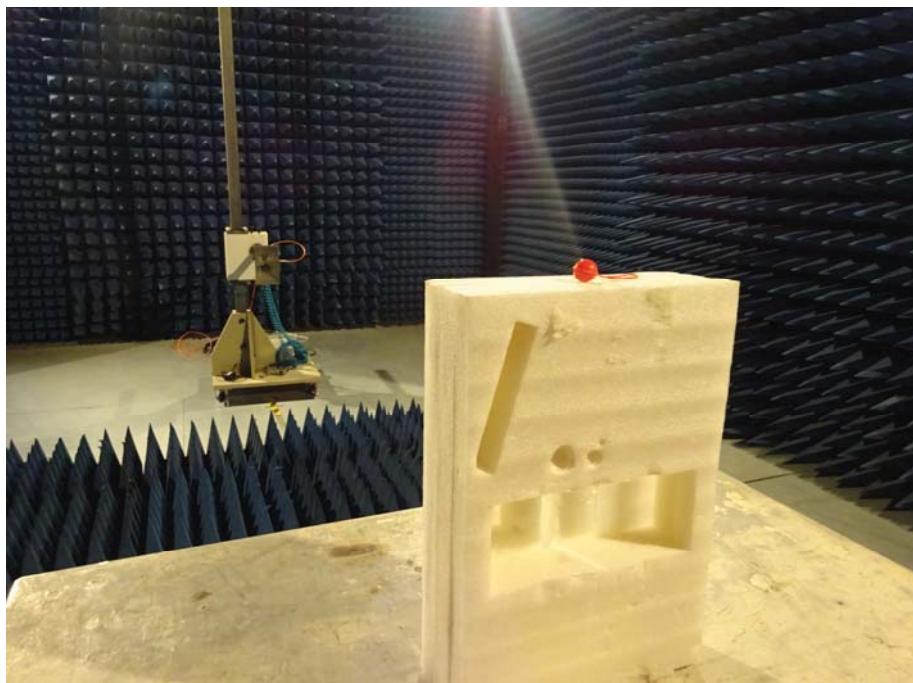
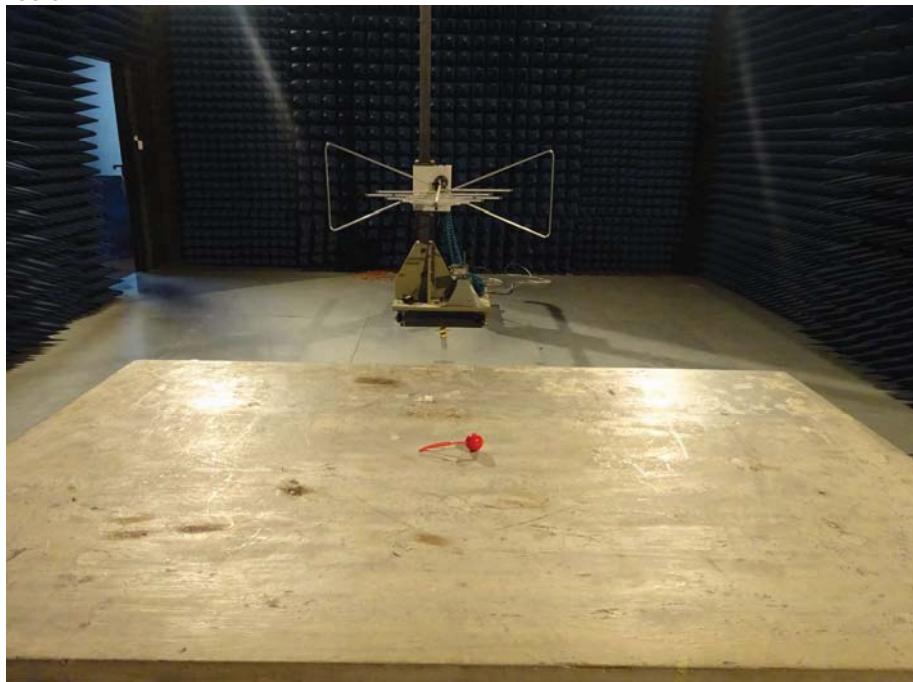
Middle channel



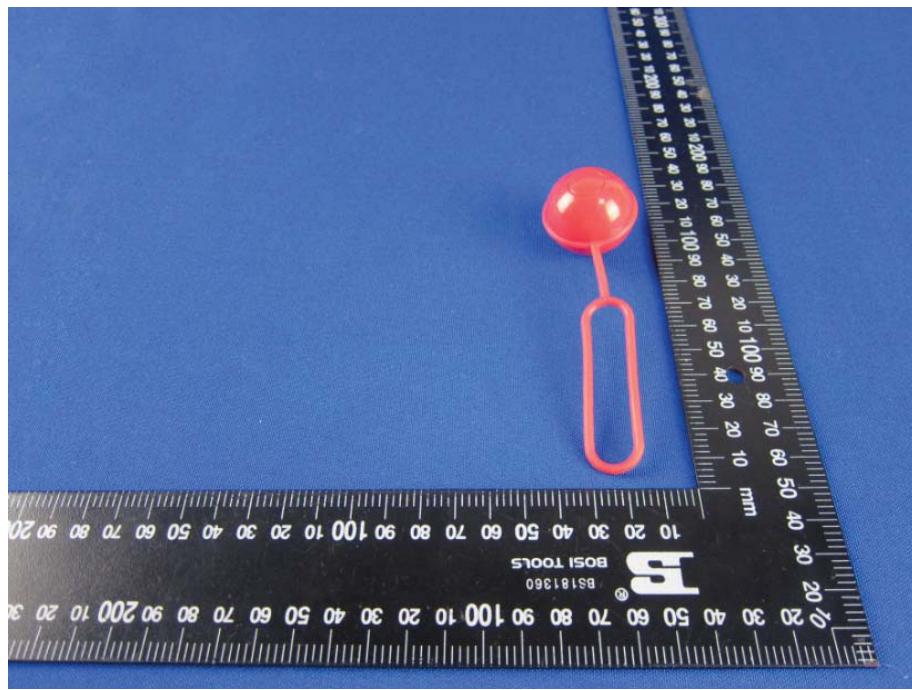
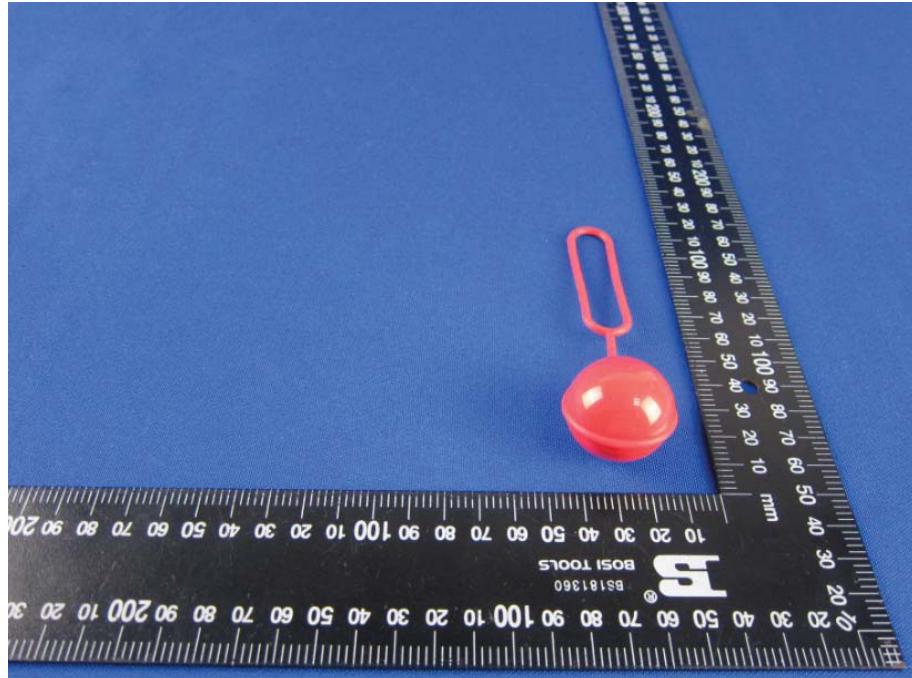
Highest channel

8 Test Setup Photo

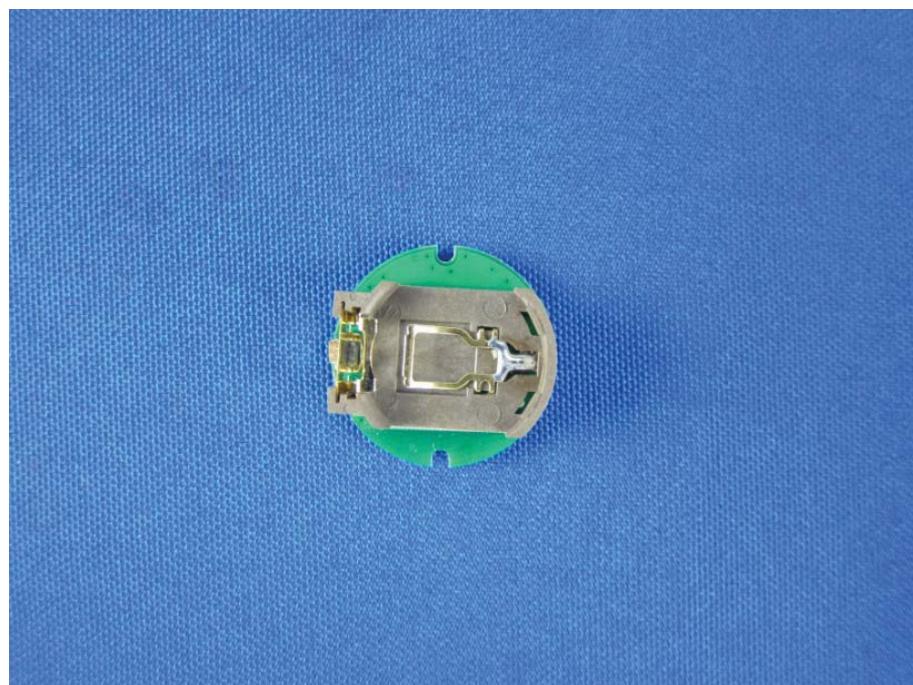
Radiated Emission



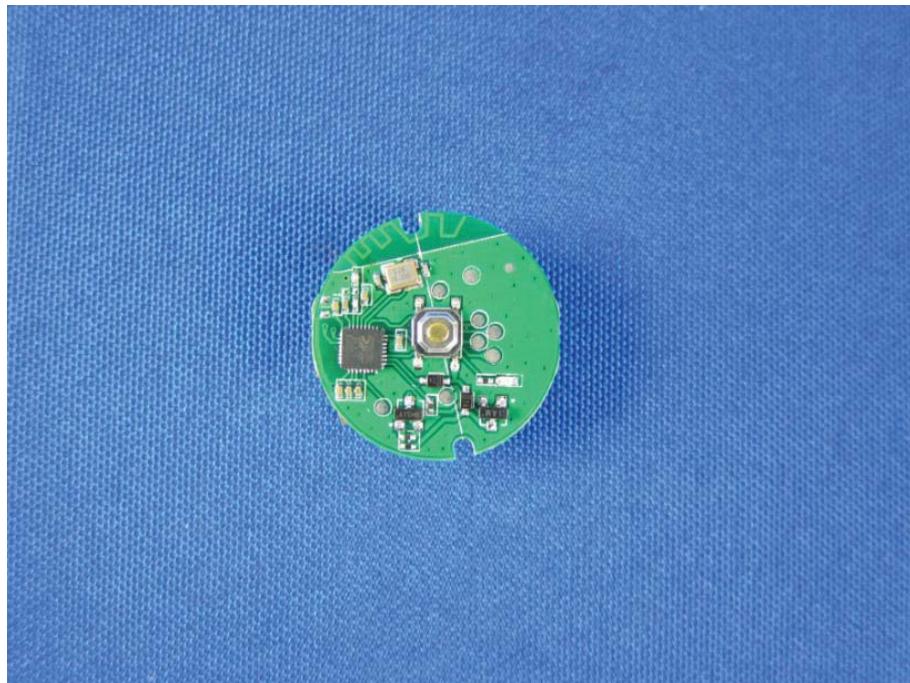
9 EUT Constructional Details



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