TEST REPORT

Reference No.	:	WTS16S0858734-1E
FCC ID	:	2AB9WW01
Applicant	:	XYZprinting, Inc.
Address	:	10F., No.99, Sec. 5, Nanjing E. Rd., Songshan Dist., Taipei City 10571, Taiwan (R.O.C.)
Manufacturer	:	Kinpo Electronics(China)Co,Ltd.
Address	:	Sha-Tou Control District, Changan Town, Dongguan City, Guangdong,China
Product Name	:	Wheeled Robot
Model No	:	W-01
Brand	:	XYZrobot
Standards	:	FCC CFR47 Part 15 Section 15.247:2015
Date of Receipt sample	:	Aug. 19, 2016
Date of Test	:	Aug. 20 – Sep. 06, 2016
Date of Issue	:	Sep. 14, 2016
Test Result	:	**Pass**

Remarks:
The results shown in this test report refer only to the sample(s) tested, this test report cannot be reproduced, except in full, without prior written permission of the company. The report would be invalid without specific stamp of test institute and the signatures of compiler and approver.

Prepared By:
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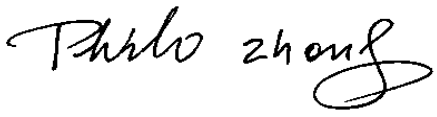
Tested by:

Zero Zhou / Tested Engineer

Approved by:



Philo Zhong / Manager

2 Contents

3 Revision History

Test report No.	Date of Receipt sample	Date of Test	Date of Issue	Purpose	Comment	Approved
WTS16S0858734-1E	Aug. 19, 2016	Aug. 20 – Sep. 06, 2016	Sep. 11, 2016	original	-	Replaced
WTS16S0858734-1E	Aug. 19, 2016	Aug. 20 – Sep. 06, 2016	Sep. 14, 2016	Revision1	added Multiple Transmitter Output testing	Valid

4 General Information

4.1 General Description of E.U.T.

Product Name:	Wheeled Robot
Model No.:	W-01
Model Difference:	N/A
Operation Frequency:	2402MHz ~ 2480MHz, separated by 2MHz,40 channels in total for BT 2412MHz ~ 2462MHz for Wi-Fi
The Lowest Oscillator:	32.768KHz
Antenna Type:	chip antenna for BT monopole antenna for Wi-Fi
Antenna Gain:	1.3 dBi for BT 2.0 dBi for Wi-Fi
Type of modulation:	GFSK(BLE only) IEEE 802.11b (CCK/QPSK/BPSK,11Mbps max.) IEEE 802.11g (BPSK/QPSK/16QAM/64QAM,54Mbps max.) IEEE 802.11n (BPSK/QPSK/16QAM/64QAM,HT20:72Mbps max.)

4.2 Details of E.U.T.

Technical Data: DC 12V by 8*1.5V (UM-3 OR SIZE"AA" OR EQUIV) Batteries

4.3 Channel List

BT mode

Channel No.	Frequency (MHz)	Channel No.	Frequency (MHz)	Channel No.	Frequency (MHz)	Channel No.	Frequency (MHz)
0	2402	1	2404	2	2406	3	2408
4	2410	5	2412	6	2414	7	2416
8	2418	9	2420	10	2422	11	2424
12	2426	13	2428	14	2430	15	2432
16	2434	17	2436	18	2438	19	2440
20	2442	21	2444	22	2446	23	2448
24	2450	25	2452	26	2454	27	2456
28	2458	29	2460	30	2462	31	2464
32	2466	33	2468	34	2470	35	2472
36	2474	37	2476	38	2478	39	2480

Wi-Fi mode

Channel No.	Frequency (MHz)	Channel No.	Frequency (MHz)	Channel No.	Frequency (MHz)	Channel No.	Frequency (MHz)
1	2412	2	2417	3	2422	4	2427
5	2432	6	2437	7	2442	8	2447
9	2452	10	2457	11	2462	12	-

4.4 BT Test Mode

All test mode(s) and condition(s) mentioned were considered and evaluated respectively by performing full tests, the worst data were recorded and reported.

Table 1 Tests Carried Out Under FCC part 15.247

Test mode	Low channel	Middle channel	High channel
Transmitting	2402MHz	2442MHz	2480MHz

Table 2 Tests Carried Out Under FCC part 15.207&15.209

Test Item	Test Mode
Radiated Emissions	Communication

4.5 Test Facility

The test facility has a test site registered with the following organizations:

- **IC – Registration No.: 7760A-1**

  Waltek Services (Shenzhen) Co., Ltd. has been registered and fully described in a report filed with the Industry Canada. The acceptance letter from the Industry Canada is maintained in our files. Registration 7760A-1, Oct. 15, 2015.

- **FCC Test Site 1#– Registration No.: 880581**

  Waltek Services(Shenzhen) 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 880581, April 29, 2014.

- **FCC Test Site 2#– Registration No.: 328995**

  Waltek Services(Shenzhen) 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 328995, December 3, 2014.

5 Equipment Used during Test

5.1 Equipments List

3m Semi-anechoic Chamber for Radiation Emissions Test site 1#						
Item	**Equipment**	**Manufacturer**	**Model No.**	**Serial No.**	**Last Calibration Date**	**Calibration Due Date**
1	EMC Analyzer	Agilent	E7405A	MY45114943	Sep.15,2015	Sep.14,2016
2	Active Loop Antenna	Beijing Dazhi	ZN30900A	-	Sep.15,2015	Sep.14,2016
3	Trilog Broadband Antenna	SCHWARZBECK	VULB9163	336	Sep.15,2015	Sep.14,2016
4	Coaxial Cable (below 1GHz)	Top	TYPE16(13M)	-	Sep.15,2015	Sep.14,2016
5	Broad-band Horn Antenna	SCHWARZBECK	BBHA 9120 D	667	Sep.15,2015	Sep.14,2016
6	Broad-band Horn Antenna	SCHWARZBECK	BBHA 9170	335	Sep.15,2015	Sep.14,2016
7	Broadband Preamplifier	COMPLIANCE DIRECTION	PAP-1G18	2004	Sep.15,2015	Sep.14,2016
8	Coaxial Cable (above 1GHz)	Top	1GHz-25GHz	EW02014-7	Sep.15,2015	Sep.14,2016
3m Semi-anechoic Chamber for Radiation Emissions Test site 2#						
Item	**Equipment**	**Manufacturer**	**Model No.**	**Serial No**	**Last Calibration Date**	**Calibration Due Date**
1	Test Receiver	R&S	ESCI	101296	Sep.15,2015	Sep.14,2016
2	Trilog Broadband Antenna	SCHWARZBECK	VULB9160	9160-3325	Sep.15,2015	Sep.14,2016
3	Amplifier	Compliance pirection systems inc	PAP-0203	22024	Sep.15,2015	Sep.14,2016
4	Cable	HUBER+SUHNER	CBL2	525178	Sep.15,2015	Sep.14,2016
RF Conducted Testing						
Item	**Equipment**	**Manufacturer**	**Model No.**	**Serial No.**	**Last Calibration Date**	**Calibration Due Date**
1.	EMC Analyzer (9k~26.5GHz)	Agilent	E7405A	MY45114943	Sep.15,2015	Sep.14,2016
2.	Spectrum Analyzer (9k-6GHz)	R&S	FSL6	100959	Sep.15,2015	Sep.14,2016
3.	Signal Analyzer (9k~26.5GHz)	Agilent	N9010A	MY50520207	Sep.15,2015	Sep.14,2016

5.2 Measurement Uncertainty

Parameter	Uncertainty
Radio Frequency	± 1 x 10^{-6}
RF Power	± 1.0 dB
RF Power Density	± 2.2 dB
Radiated Spurious Emissions test	± 5.03 dB (Bilog antenna 30M~1000MHz)
	± 4.74 dB (Horn antenna 1000M~25000MHz)
Conducted Spurious Emissions test	± 3.64 dB (AC mains 150KHz~30MHz)

5.3 Test Equipment Calibration

All the test equipments used are valid and calibrated by CEPREI Certification Body that address is No.110 Dongguan Zhuang RD. Guangzhou, P.R.China.

6 Test Summary

Test Items	Test Requirement	Result
Radiated Emissions	15.205(a) 15.209 15.247(d)	C
Conducted Emissions	15.207(a)	N/A
Bandwidth	15.247(a)(1)	C
Maximum Peak Output Power	15.247(b)(1)	C
Power Spectral Density	15.247(e)	C
Band Edge	15.247(d) 15.205(a)	C
Antenna Requirement	15.203	C
Maximum Permissible Exposure (Exposure of Humans to RF Fields)	1.1307(b)(1)	C
Note: C=Compliance; NC=Not Compliance; NT=Not Tested; N/A=Not Applicable.		

7 Radiated Emissions

Test Requirement: FCC CFR47 Part 15 Section 15.209 & 15.247

Test Method: ANSI C63.10:2013&ANSI C63.4:2014

Test Result: PASS

Measurement Distance: 3m

Limit:

Frequency (MHz)	Field Strength		Field Strength Limit at 3m Measurement Distance	
	uV/m	Distance (m)	uV/m	dBuV/m
0.009 ~ 0.490	2400/F(kHz)	300	10000 * 2400/F(kHz)	$20\log^{(2400/F(kHz))} + 80$
0.490 ~ 1.705	24000/F(kHz)	30	100 * 24000/F(kHz)	$20\log^{(24000/F(kHz))} + 40$
1.705 ~ 30	30	30	100 * 30	$20\log^{(30)} + 40$
30 ~ 88	100	3	100	$20\log^{(100)}$
88 ~ 216	150	3	150	$20\log^{(150)}$
216 ~ 960	200	3	200	$20\log^{(200)}$
Above 960	500	3	500	$20\log^{(500)}$

7.1 EUT Operation

Operating Environment **:**

Temperature: 23.5 °C

Humidity: 51.1 % RH

Atmospheric Pressure: 101.2kPa

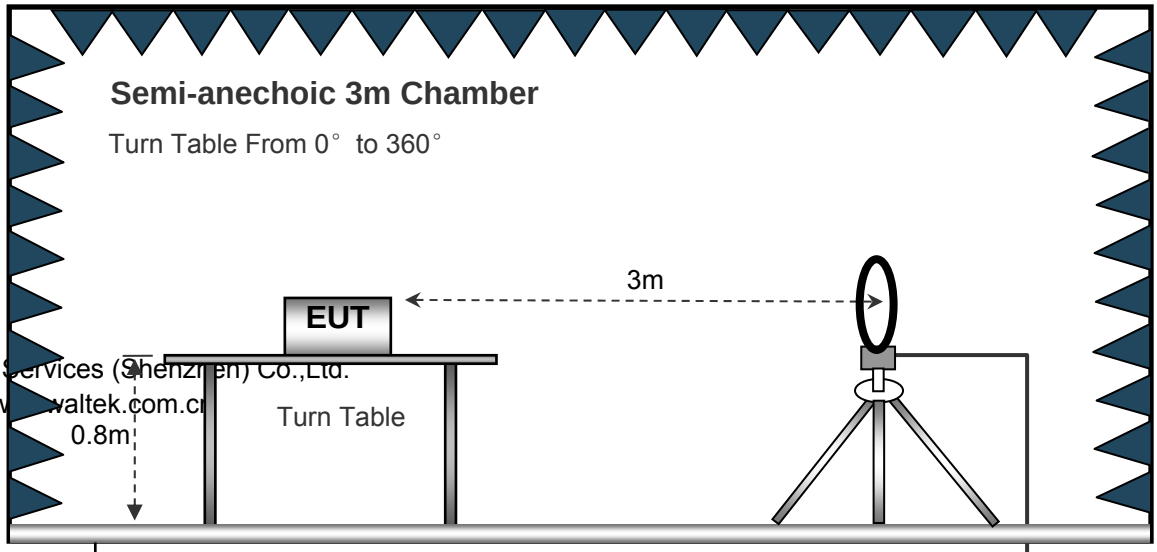
EUT Operation **:**

The test was performed in transmitting mode, the test data were shown in the report.

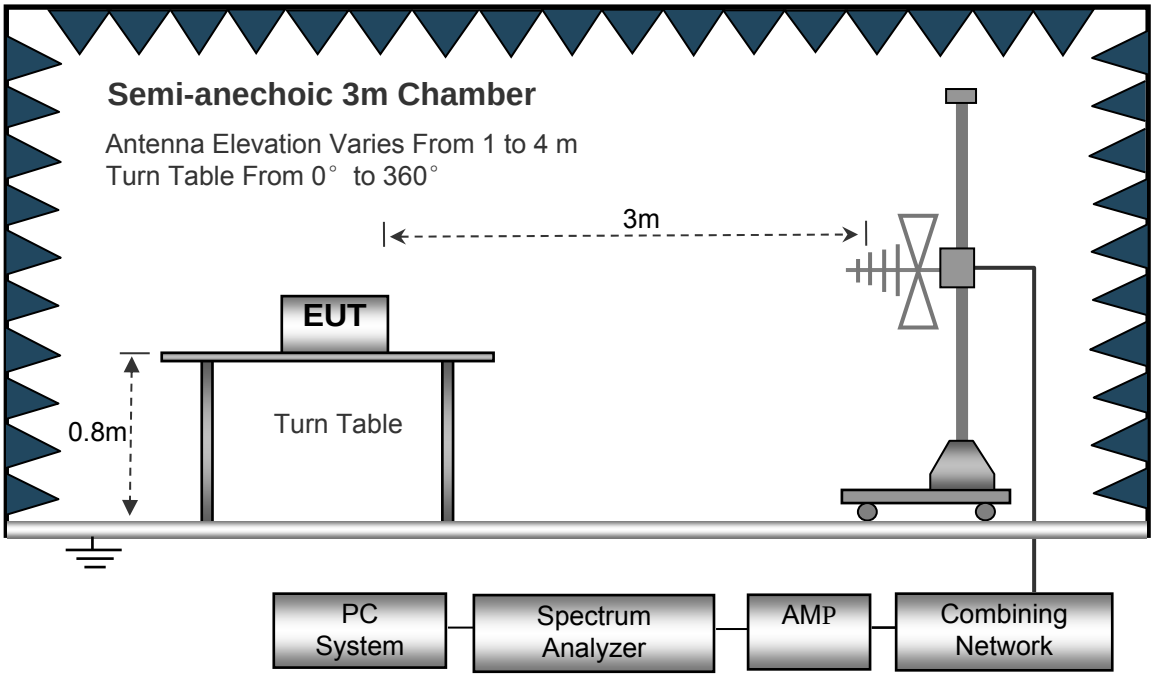
7.2 Test Setup

The radiated emission tests were performed in the 3m Semi- Anechoic Chamber test site, using the setup accordance with the ANSI C63.10:2013.

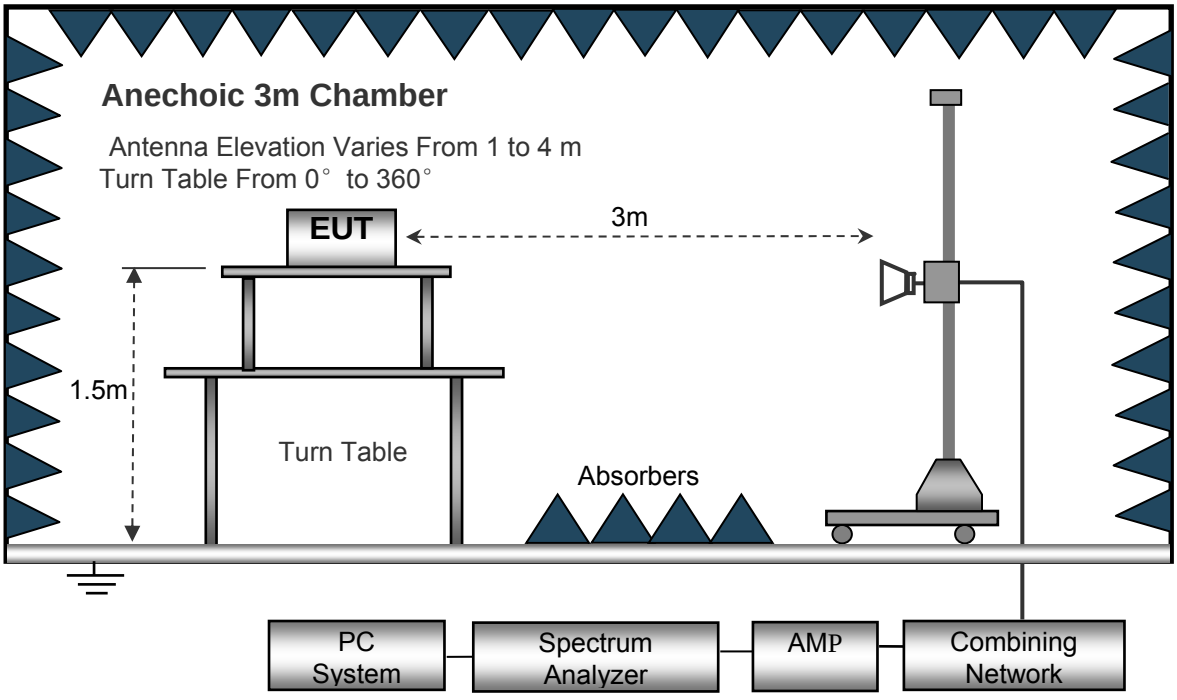
The test setup for emission measurement below 30MHz.



The test setup for emission measurement from 30 MHz to 1 GHz.



The test setup for emission measurement above 1 GHz.



7.3 Spectrum Analyzer Setup

Below 30MHz

Sweep Speed ..... Auto
IF Bandwidth..... 10kHz
Video Bandwidth..... 10kHz

Resolution Bandwidth.....10kHz

30MHz ~ 1GHz

Sweep Speed ..... Auto
Detector .....PK
Resolution Bandwidth.....100kHz
Video Bandwidth.....300kHz

Above 1GHz

Sweep Speed ..... Auto
Detector .....PK
Resolution Bandwidth.....1MHz
Video Bandwidth.....3MHz
Detector .....Ave.
Resolution Bandwidth.....1MHz
Video Bandwidth.....10Hz

7.4 Test Procedure

The EUT is placed on a turntable. For below 1GHz, the EUT is 0.8m above ground plane;
For above1GHz, the EUT is 1.5m above ground plane.

2. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.

3. EUT is set 3m away from the receiving antenna, which is moved from 1m to 4m to find out the maximum emissions. The spectrum was investigated from the lowest radio frequency signal generated in the device, without going below 9 kHz, up to the tenth harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower.

4. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.

5. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.

6. Repeat above procedures until the measurements for all frequencies are complete.

7. The radiation measurements are tested under 3-axes(X,Y,Z) position(X denotes lying on the table, Y denotes side stand and Z denotes vertical stand), After pre-test, It was found that the worse radiation emission was get at the X position. So the data shown was the X position only.

7.5 Summary of Test Results

Test Frequency: 32.768kHz~30MHz

The measurements were more than 20 dB below the limit and not reported.

Test Frequency: 30MHz ~ 18GHz

Frequency	Receiver Reading	Detector	Turn table Angle	RX Antenna		Corrected Factor	Corrected Amplitude	FCC Part 15.247/209/205	
				Height	Polar			Limit	Margin
(MHz)	(dBμV)	(PK/QP/Ave)	Degree	(m)	(H/V)	(dB)	(dBμV/m)	(dBμV/m)	(dB)
GFSK(BLE) Low Channel									
189.98	20.27	QP	332	1.4	H	10.61	30.88	43.53	-12.65
189.98	19.56	QP	40	1.9	V	10.61	30.17	43.53	-13.36
4804.00	52.86	PK	137	1.5	V	-1.07	51.79	74.00	-22.21
4804.00	41.57	Ave	137	1.5	V	-1.07	40.50	54.00	-13.50
7206.00	51.79	PK	232	1.2	H	1.35	53.14	74.00	-20.86
7206.00	42.12	Ave	232	1.2	H	1.35	43.47	54.00	-10.53
2313.51	46.34	PK	285	1.8	V	-13.22	33.12	74.00	-40.88
2313.51	37.49	Ave	285	1.8	V	-13.22	24.27	54.00	-29.73
2363.00	44.60	PK	48	1.9	H	-13.73	30.87	74.00	-43.13
2363.00	38.43	Ave	48	1.9	H	-13.73	24.70	54.00	-29.30
2494.75	44.70	PK	225	1.2	V	-13.01	31.69	74.00	-42.31
2494.75	36.18	Ave	225	1.2	V	-13.01	23.17	54.00	-30.83

Frequency	Receiver Reading	Detector	Turn table Angle	RX Antenna		Corrected Factor	Corrected Amplitude	FCC Part 15.247/209/205	
				Height	Polar			Limit	Margin
(MHz)	(dBμV)	(PK/QP/Ave)	Degree	(m)	(H/V)	(dB)	(dBμV/m)	(dBμV/m)	(dB)
GFSK(BLE) Middle Channel									
189.98	20.90	QP	249	1.5	H	10.61	31.51	43.53	-12.02
189.98	18.70	QP	353	1.8	V	10.61	29.31	43.53	-14.22
4884.00	52.57	PK	95	1.6	V	-0.67	51.90	74.00	-22.10
4884.00	43.42	Ave	95	1.6	V	-0.67	42.75	54.00	-11.25
7326.00	54.36	PK	247	1.9	H	2.23	56.59	74.00	-17.41
7326.00	44.45	Ave	247	1.9	H	2.23	46.68	54.00	-7.32
2317.31	45.22	PK	205	1.2	V	-13.20	32.02	74.00	-41.98
2317.31	37.80	Ave	205	1.2	V	-13.20	24.60	54.00	-29.40
2363.15	43.03	PK	39	1.9	H	-13.24	29.79	74.00	-44.21
2363.15	37.90	Ave	39	1.9	H	-13.24	24.66	54.00	-29.34
2486.80	44.79	PK	146	1.6	V	-13.14	31.65	74.00	-42.35
2486.80	38.94	Ave	146	1.6	V	-13.14	25.80	54.00	-28.20

Frequency	Receiver Reading	Detector	Turn table Angle	RX Antenna		Corrected Factor	Corrected Amplitude	FCC Part 15.247/209/205	
				Height	Polar			Limit	Margin
(MHz)	(dBμV)	(PK/QP/Ave)	Degree	(m)	(H/V)	(dB)	(dBμV/m)	(dBμV/m)	(dB)
GFSK(BLE) High Channel									
189.98	21.35	QP	160	1.3	H	10.61	31.96	43.53	-11.57
189.98	20.96	QP	136	1.5	V	10.61	31.57	43.53	-11.96
4960.00	50.67	PK	134	1.0	V	-0.26	50.41	74.00	-23.59
4960.00	42.34	Ave	134	1.0	V	-0.26	42.08	54.00	-11.92
7440.00	53.86	PK	182	1.3	H	2.85	56.71	74.00	-17.29
7440.00	44.60	Ave	182	1.3	H	2.85	47.45	54.00	-6.55
2344.43	45.78	PK	209	1.0	V	-13.27	32.51	74.00	-41.49
2344.43	37.95	Ave	209	1.0	V	-13.27	24.68	54.00	-29.32
2379.93	43.82	PK	92	1.3	H	-13.04	30.78	74.00	-43.22
2379.93	38.83	Ave	92	1.3	H	-13.04	25.79	54.00	-28.21
2492.40	43.18	PK	322	1.7	V	-13.06	30.12	74.00	-43.88
2492.40	38.21	Ave	322	1.7	V	-13.06	25.15	54.00	-28.85

Test Frequency: 18GHz to 25GHz

The measurements were more than 20 dB below the limit and not reported

8 Band Edge Measurement

Test Requirement:	Section 15.247(d) In addition, radiated emissions which fall in the restricted bands. as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a) and 15.205(c).
Test Method:	558074 D01 DTS Meas Guidance v03r05
Test Mode:	Transmitting

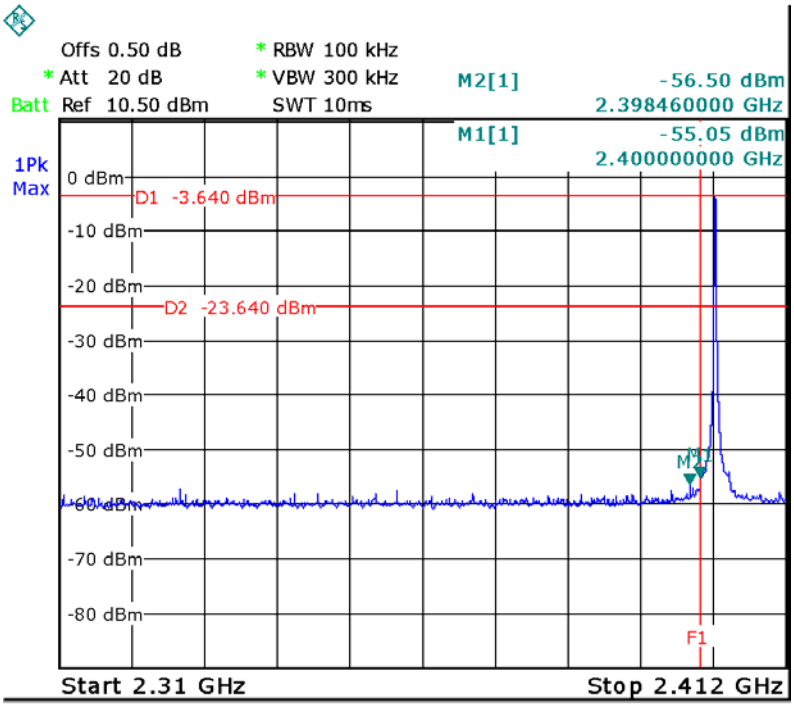
8.1 Test Produce

1. Remove the antenna from the EUT and then connect a low RF cable from the antenna port to the spectrum;
2. Set the spectrum analyzer: RBW = 100kHz, VBW = 300kHz, Sweep = auto
   Detector function = peak, Trace = max hold

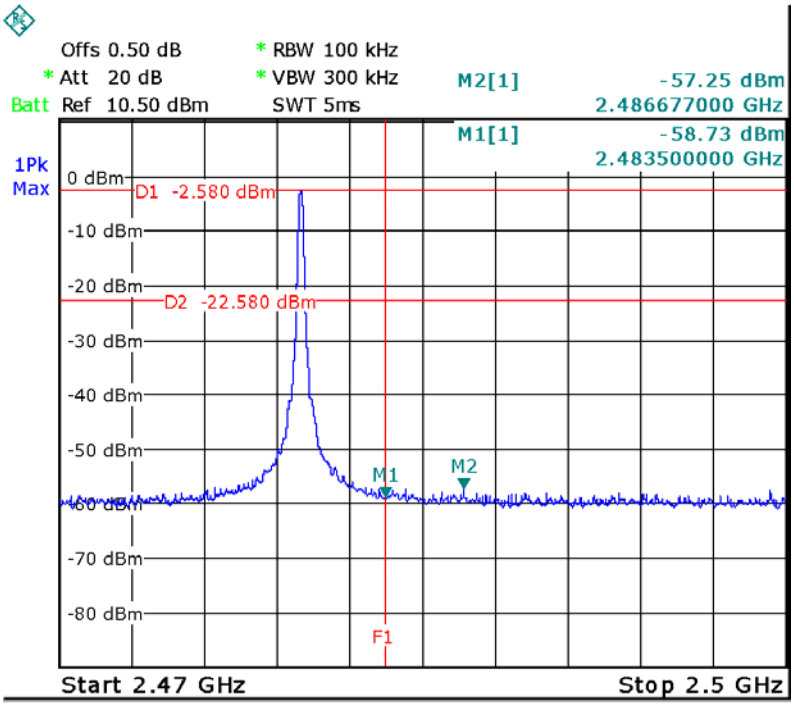
8.2 Test Result

Test plots

GFSK(BLE) Transmitting Band edge-left side



GFSK(BLE) Transmitting Band edge-right side



9 Bandwidth Measurement

Test Requirement: FCC CFR47 Part 15 Section 15.247

Test Method: 558074 D01 DTS Meas Guidance v03r05

9.1 Test Procedure

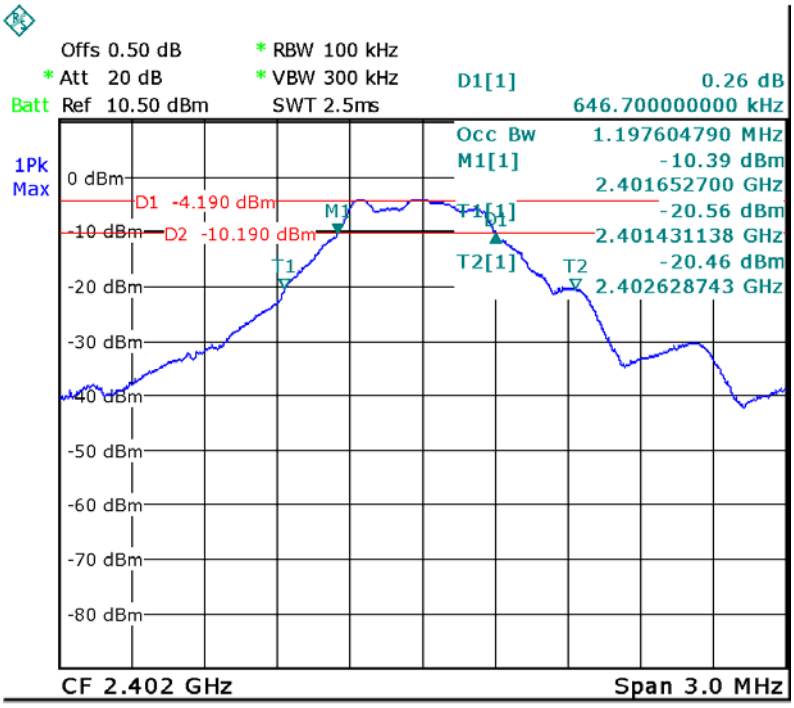
1. Remove the antenna from the EUT and then connect a low RF cable from the antenna port to the spectrum;
2. Set the spectrum analyzer: RBW = 100kHz, VBW = 300kHz

9.2 Test Result:

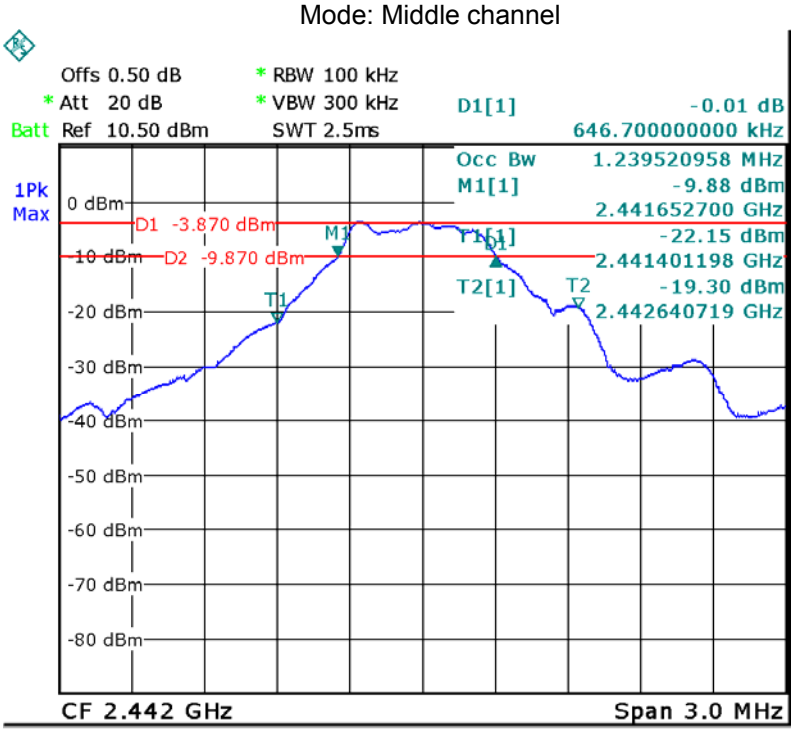
Operation mode	6dB Bandwidth (MHz)
Low channel	0.647
Middle channel	0.647
High channel	0.647

Test result plot as follows:

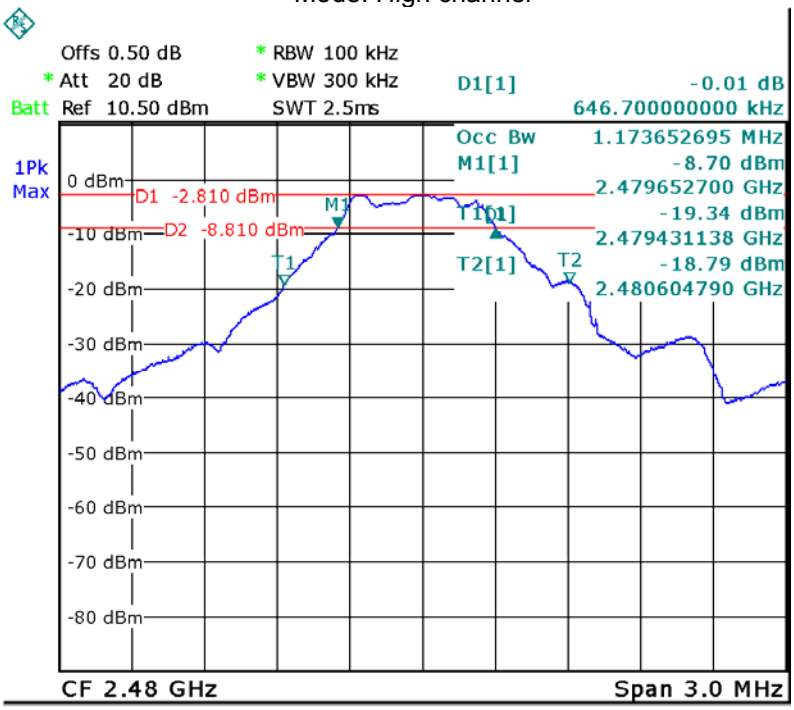
Mode: Low channel



Mode: Middle channel



Mode: High channel



10 Maximum Peak Output Power

Test Requirement: FCC CFR47 Part 15 Section 15.247

Test Method: 558074 D01 DTS Meas Guidance v03r05

10.1 Test Procedure

558074 D01 DTS Meas Guidance v03r05

1. Remove the antenna from the EUT and then connect a low RF cable from the antenna port to the spectrum.

2. Set the spectrum analyzer: RBW = 1MHz. VBW = 3MHz. Sweep = auto; Detector Function = Peak, Set the span to fully encompass the DTS bandwidth.

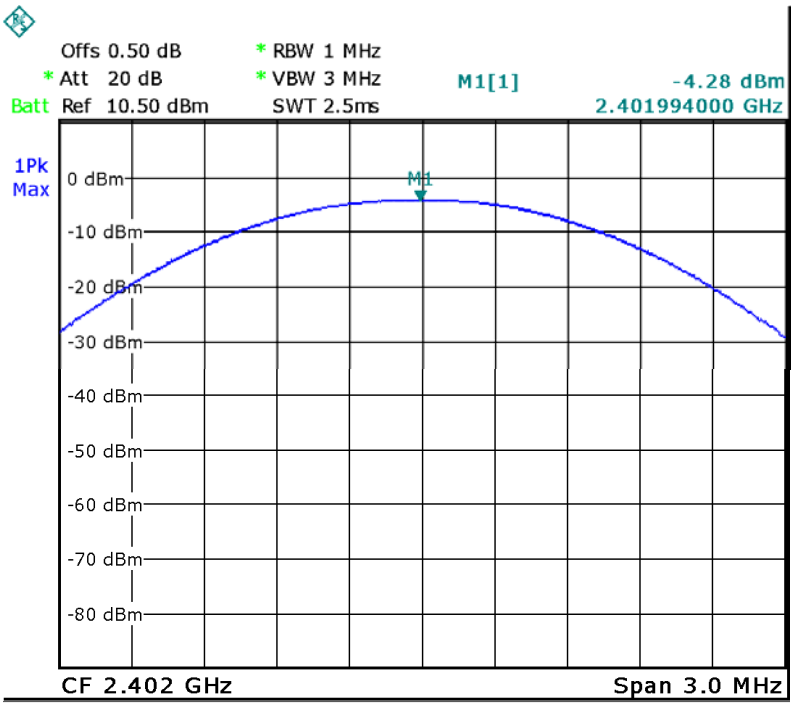
3. Keep the EUT in transmitting at lowest, medium and highest channel individually. Record the max value.

10.2 Test Result

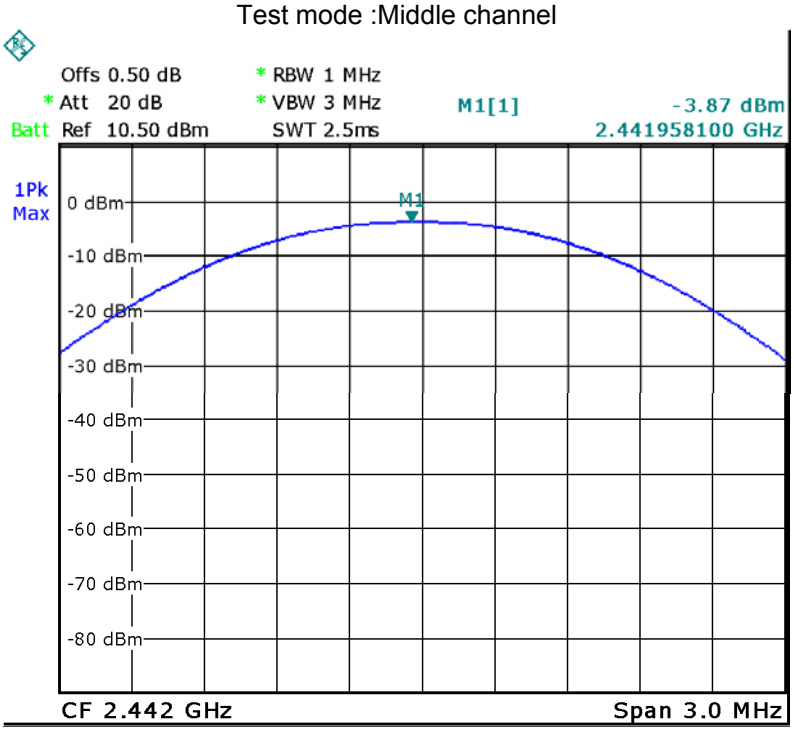
Maximum Peak Output Power (dBm)		
Low channel	Middle channel	High channel
-4.28	-3.87	-2.80
Limit: 1W/30dBm		

Remark: For BT and Wi-Fi transmitters operating simultaneously, Please refer to WTS16S0858734-3E FCC RF Exposure Test Report

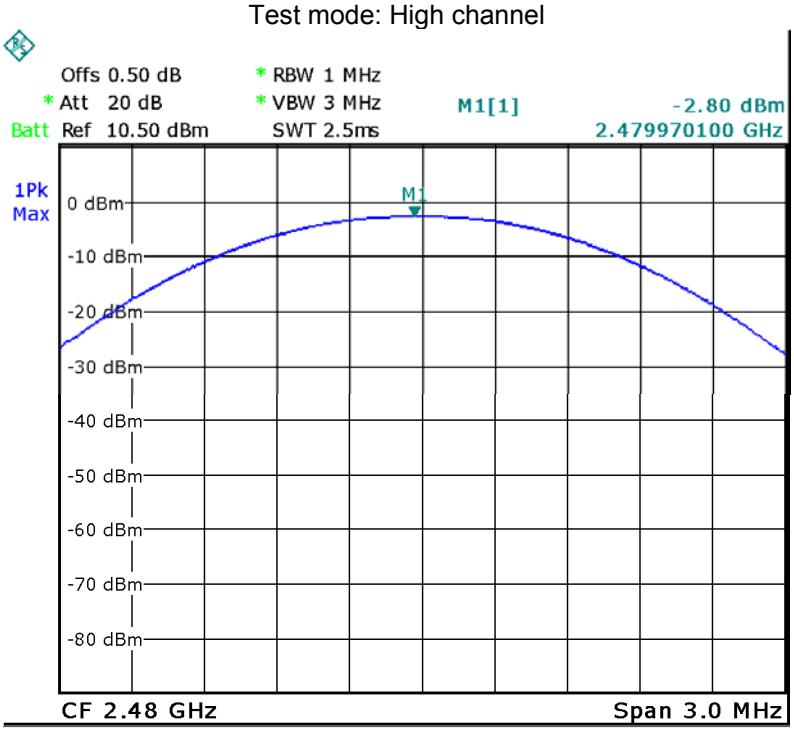
Test mode: Low channel



Test mode :Middle channel



Test mode: High channel



11 Power Spectral density

Test Requirement: FCC CFR47 Part 15 Section 15.247

Test Method: 558074 D01 DTS Meas Guidance v03r05

11.1 Test Procedure

558074 D01 DTS Meas Guidance v03r05

1. Remove the antenna from the EUT and then connect a low RF cable from the antenna port to the spectrum.

2. Set the spectrum analyzer: RBW = 3kHz. VBW = 10kHz , Span = 1.5 times the DTS channel bandwidth(6 dB bandwidth). Sweep = auto; Detector Function = Peak. Trace = Max hold.

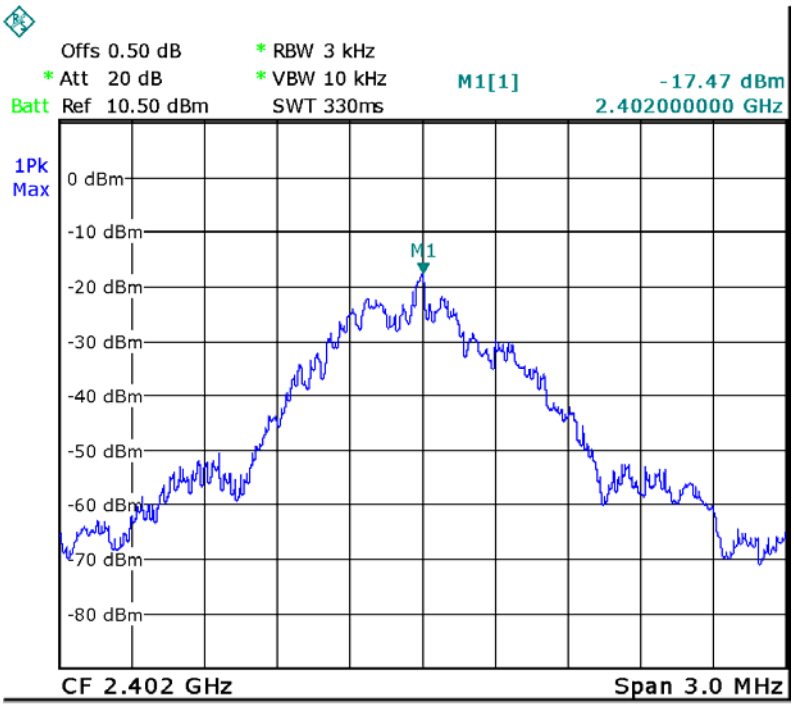
3. Allow the trace to stabilize. Use the marker-delta function to determine the separation between the peaks of the adjacent channels. The limit is specified in one of the subparagraphs of this Section Submit this plot.

11.2 Test Result

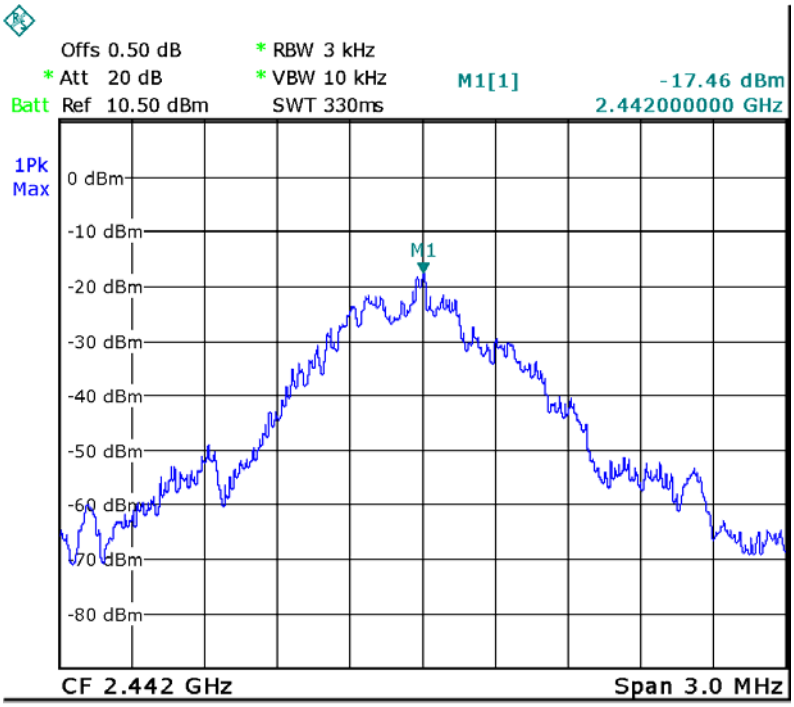
Power Spectral Density		
Low channel	Middle channel	High channel
-17.47	-17.46	-16.73
Limit : 8dBm per 3kHz		

Remark: For BT and Wi-Fi transmitters operating simultaneously, Please refer to WTS16S0858734-3E FCC RF Exposure Test Report

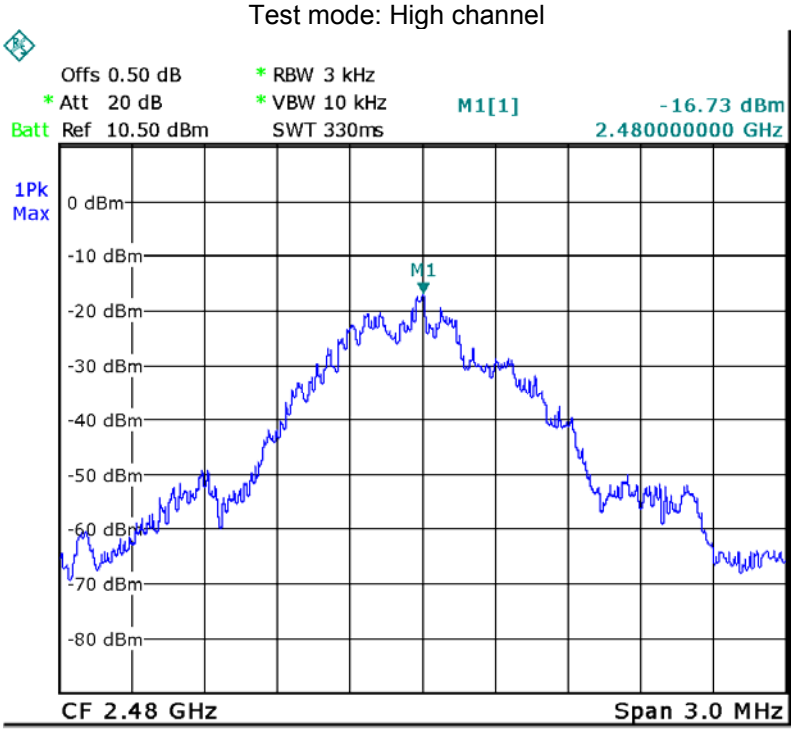
Test mode: Low channel



Test mode: Middle channel



Test mode: High channel



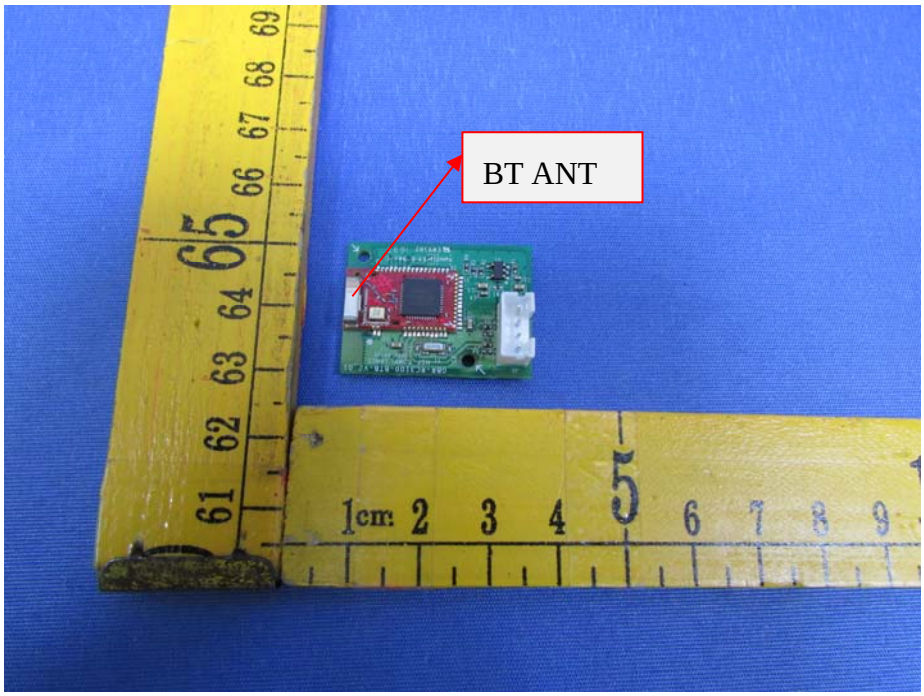
12 Antenna Requirement

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 shall be considered sufficient to comply with the provisions of this section. 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. This requirement does not apply to carrier current devices or to devices operated under the provisions of §15.211, §15.213, §15.217, §15.219, or §15.221. Further, this requirement does not apply to intentional radiators that must be professionally installed, such as perimeter protection systems and some field disturbance sensors, or to other intentional radiators which, in accordance with §15.31(d), must be measured at the installation site. However, the installer shall be responsible for ensuring that the proper antenna is employed so that the limits in this part are not exceeded.

For intentional device, according to FCC 47 CFR Section 15.203, 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.

Result:

The EUT has one chip antenna, the gain is 1.3dBi. meets the requirements of FCC 15.203.



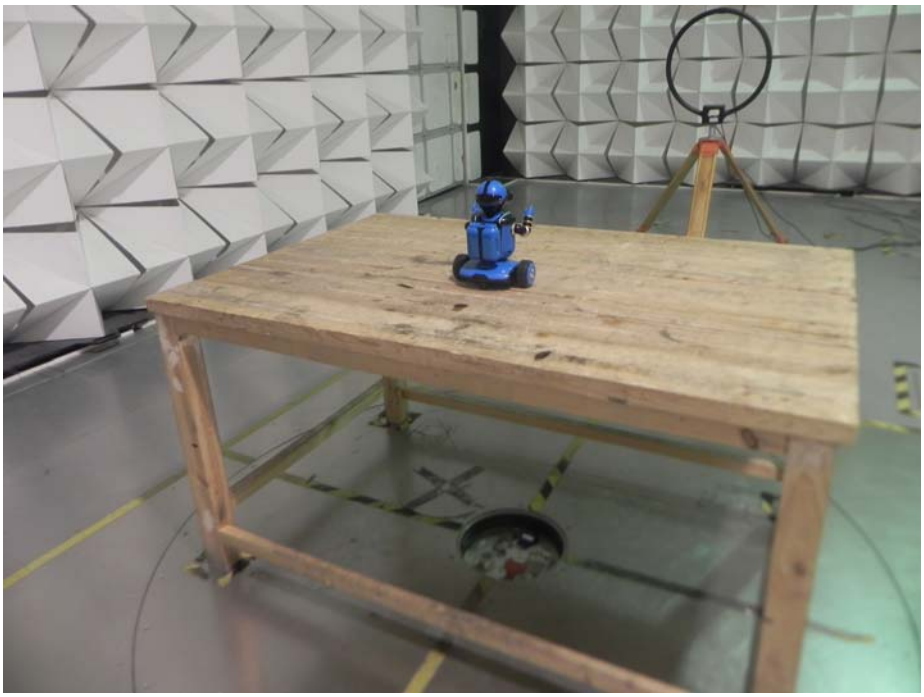
13 RF Exposure

Remark: Please refer to WTS16S0858734-3E FCC RF Exposure Test Report.

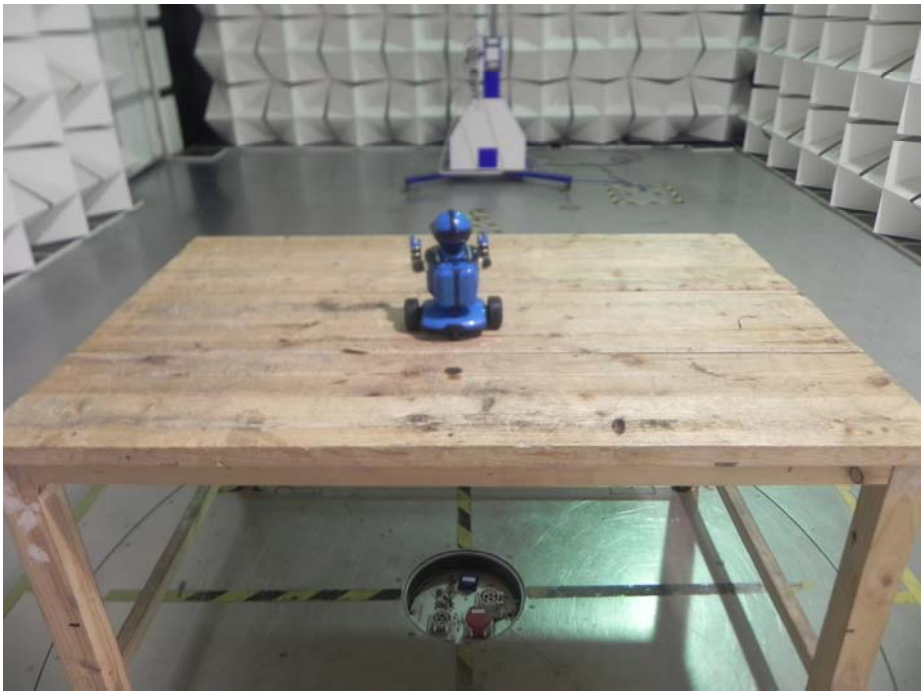
14 Photographs – Model W-01 Test Setup

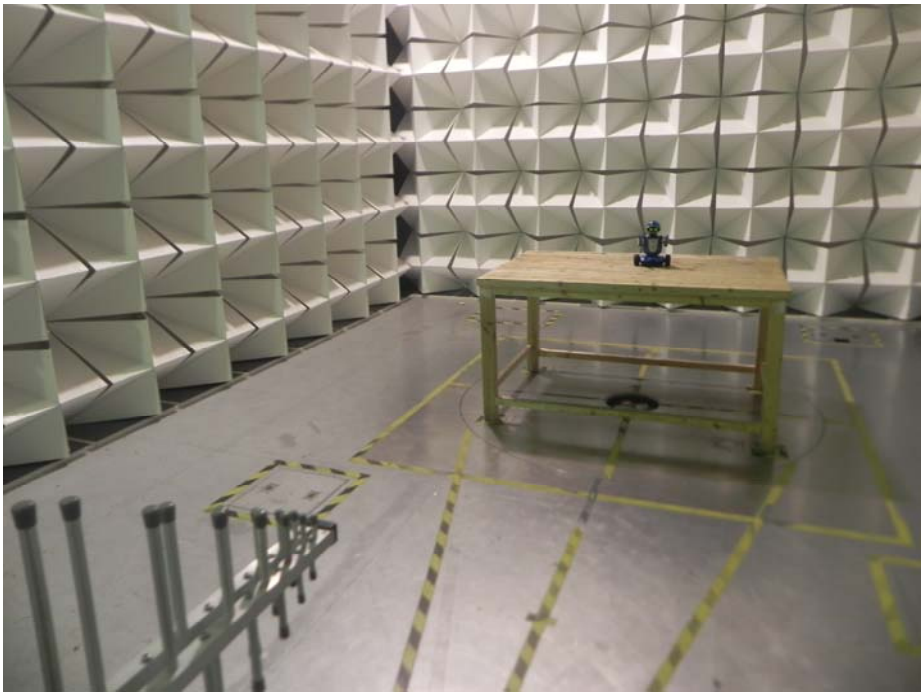
14.1 Radiated Emission

Test frequency 32.768KHz to 30MHz at Test Site 2#

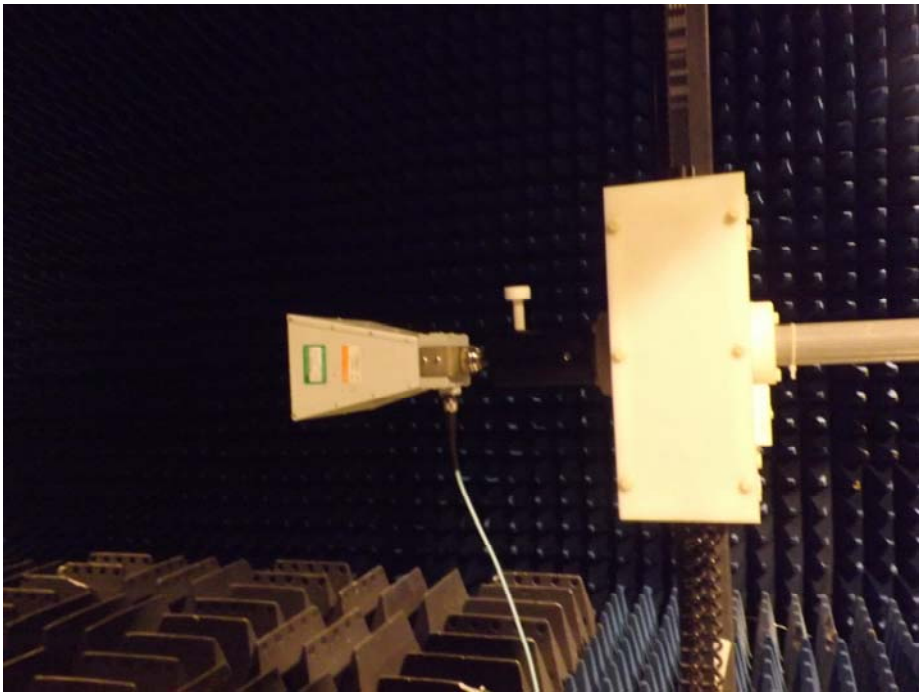


Test frequency from 30MHz to 1GHz at Test Site 2#





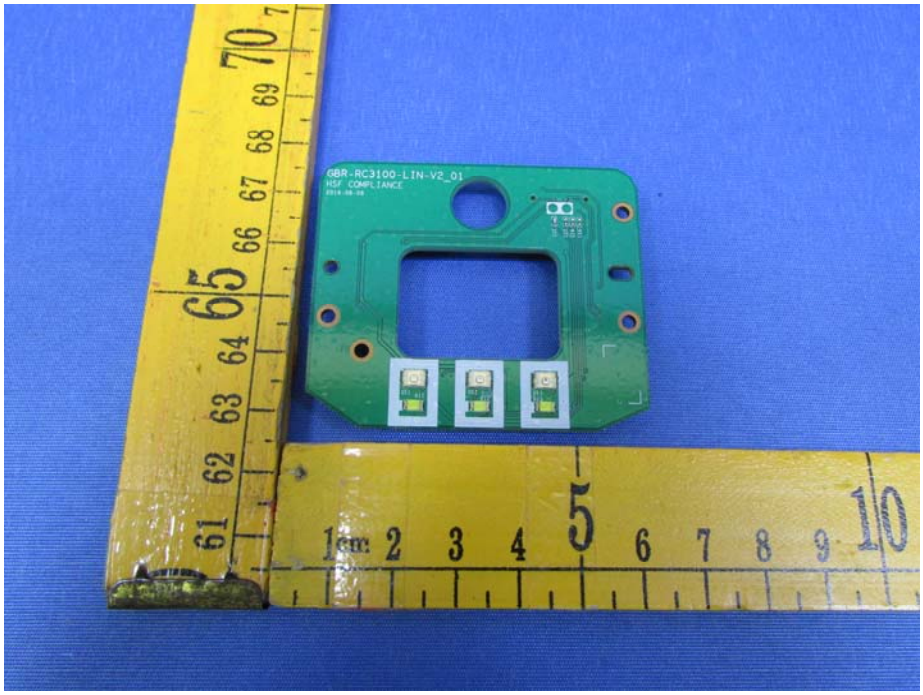
Test frequency 1GHz to 25GHz at Test Site 1#

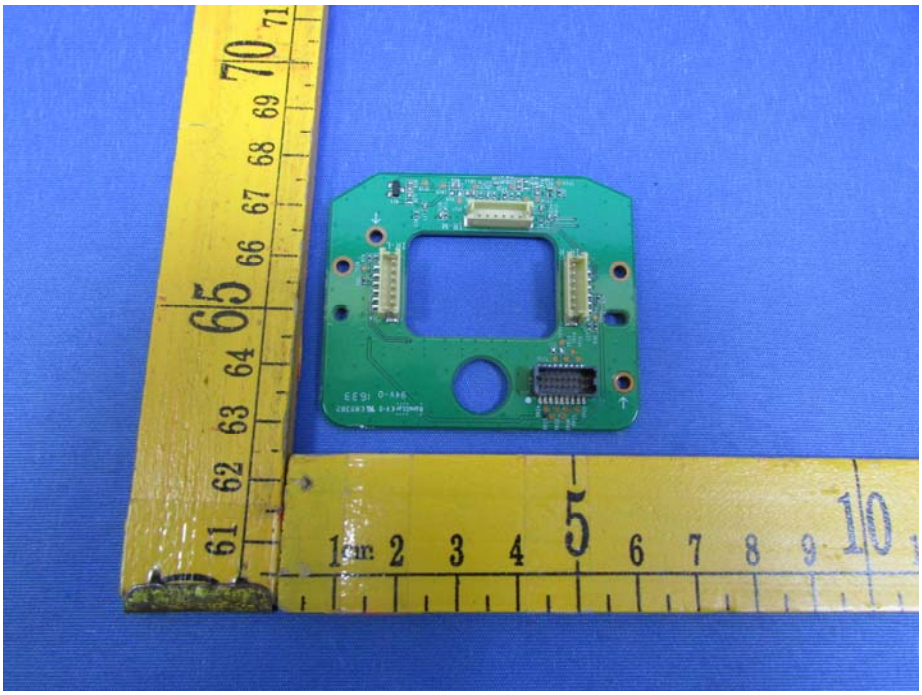


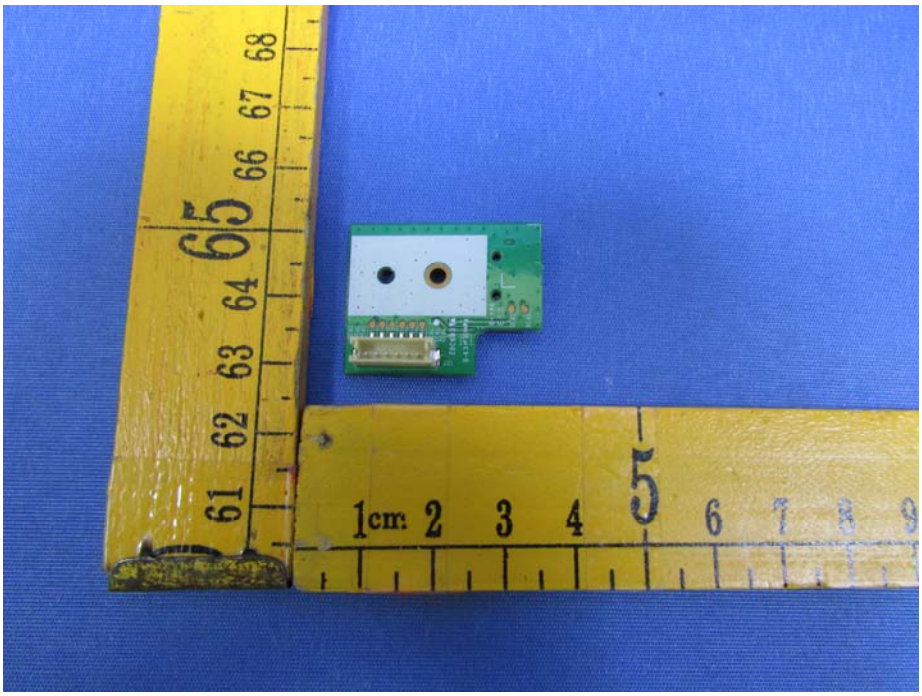
15 Photographs - Constructional Details

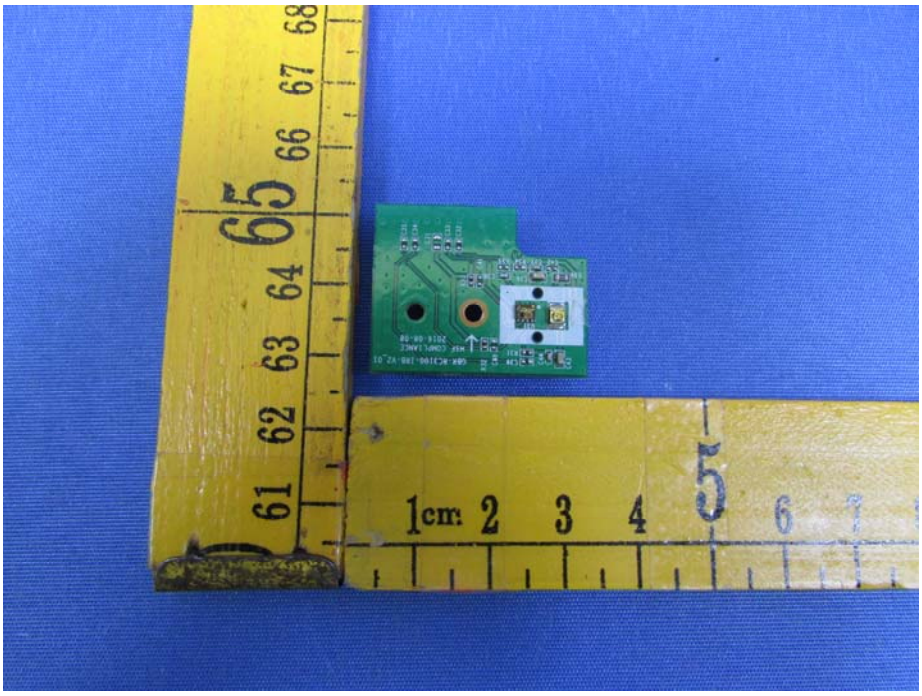
15.1 Model W-01 – External Photos

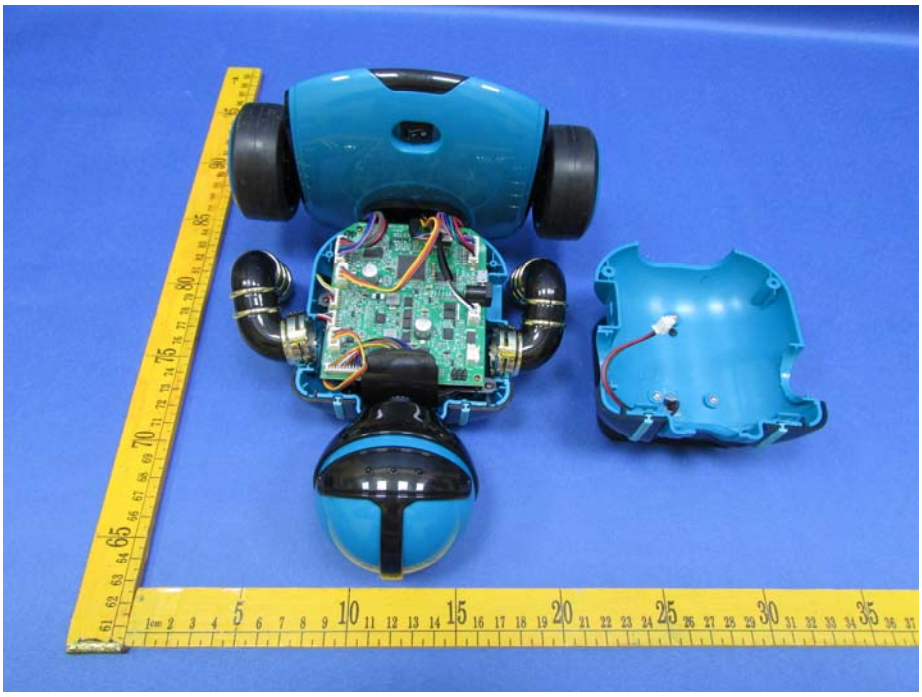
15.2 Model W-01– Internal Photos



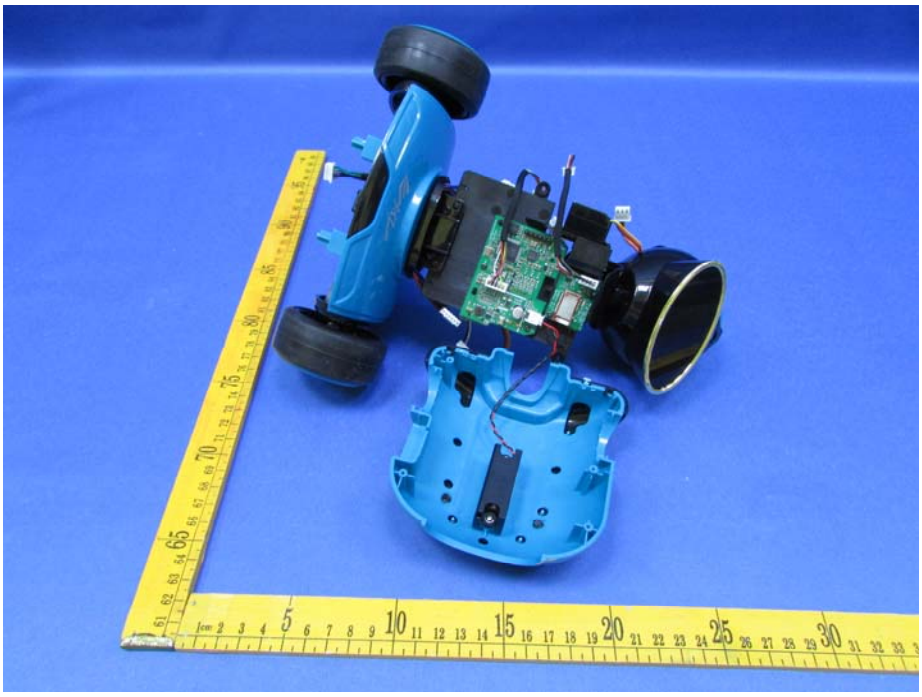


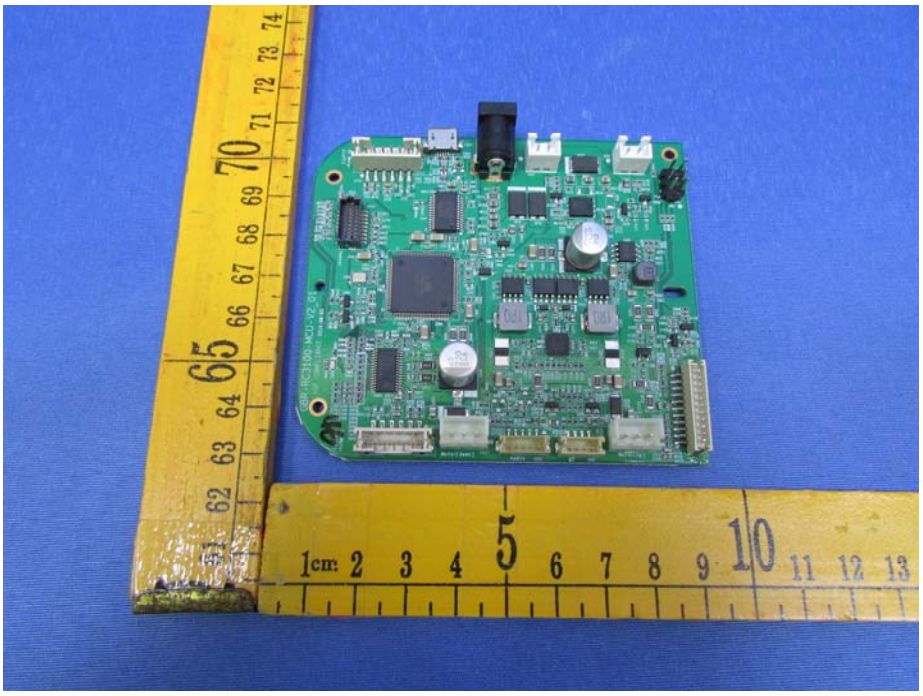


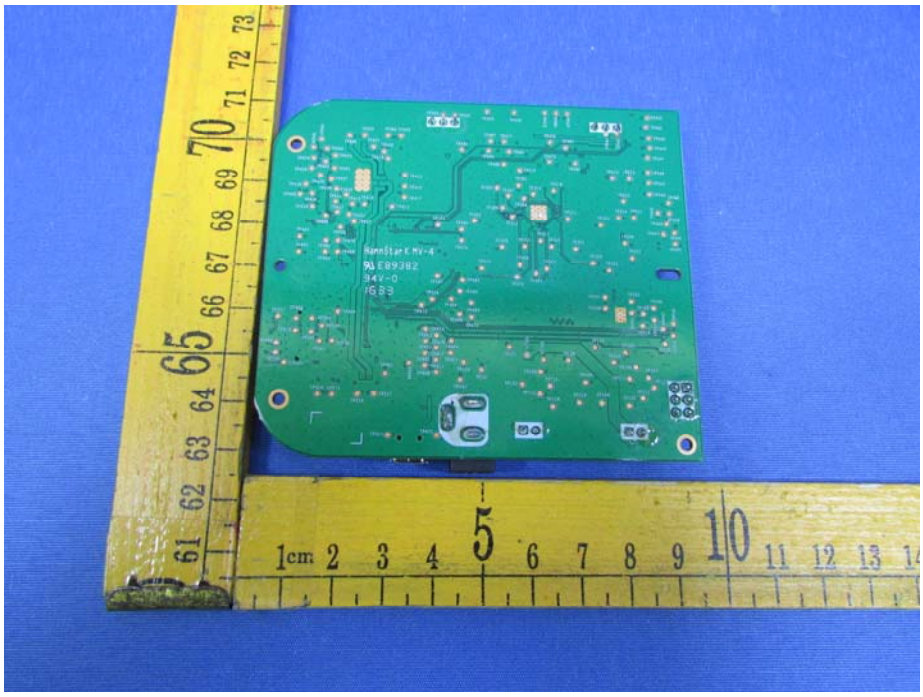


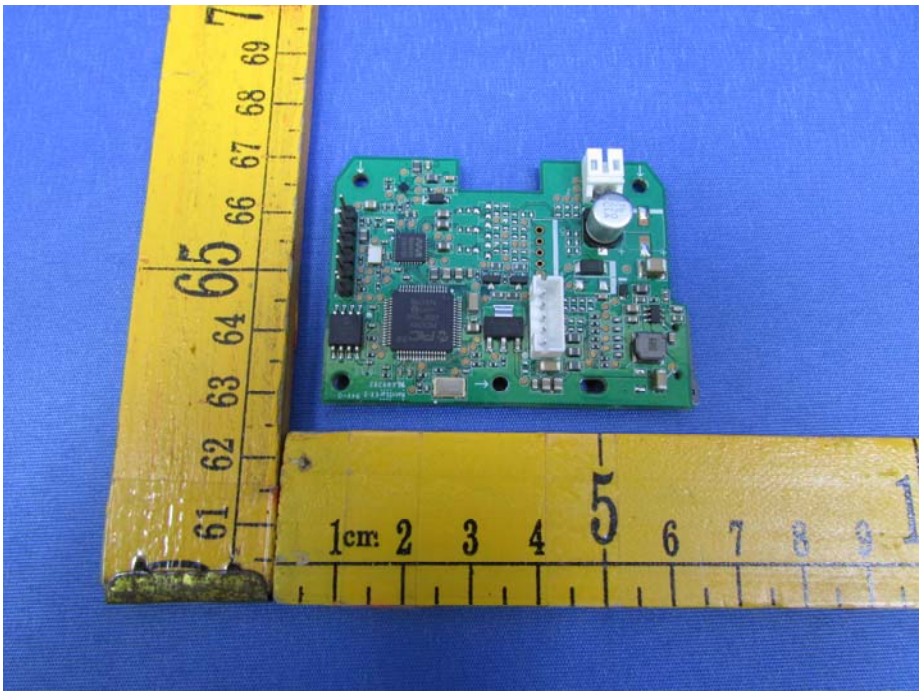



1.5 V
1.5 V





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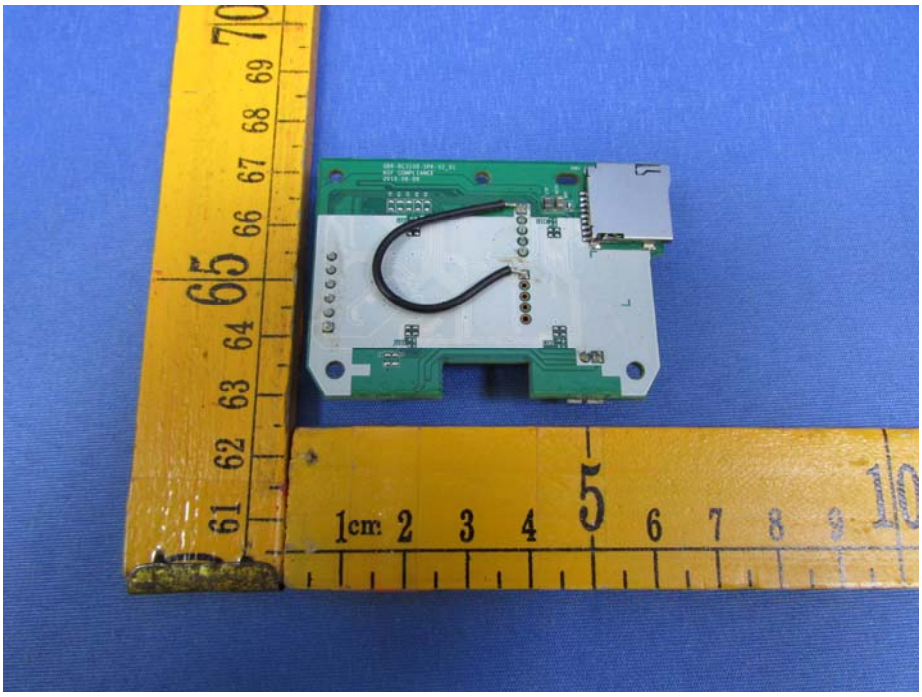
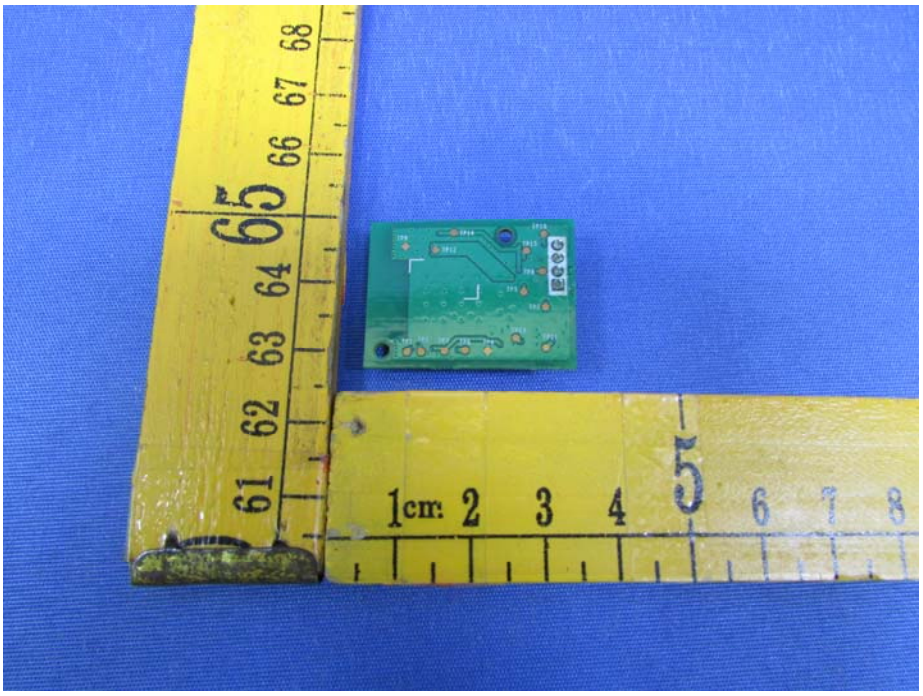
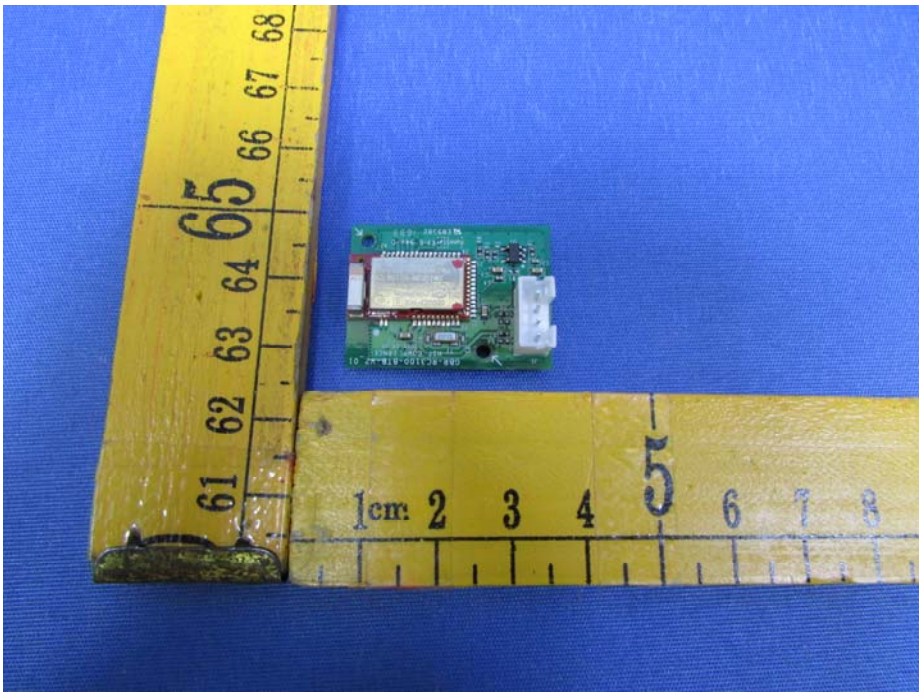
61 62 63 64 65 66 67 68 69 7


1cm 2 3 4 5 6 7
61 62 63 64 65 66 67 68 69 70


68
67
66
65
64
63
62
61
1cm
2
3
4
5
6
7
8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67
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62
61
1cm
2
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6
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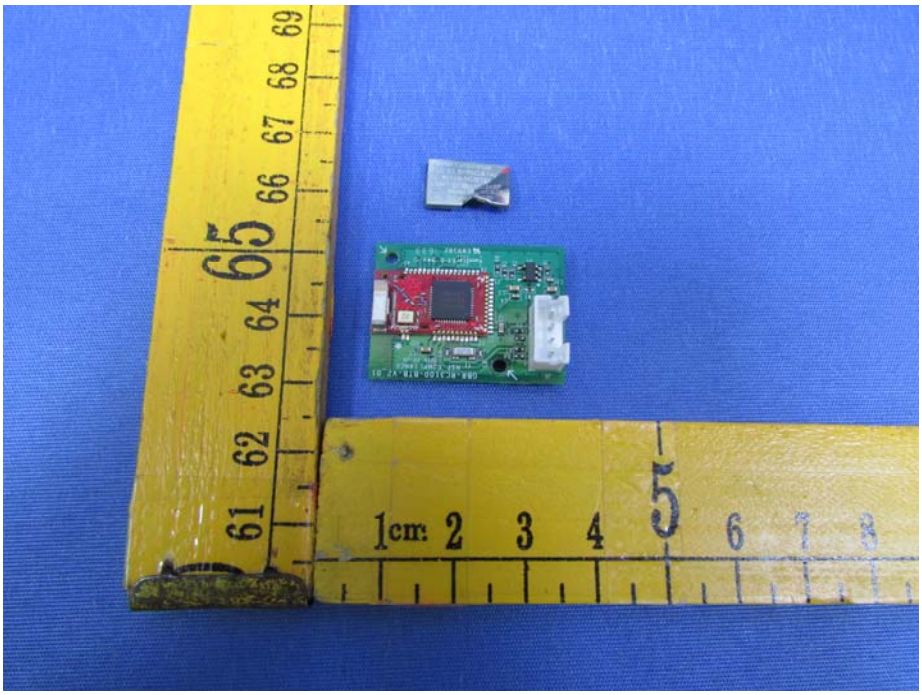
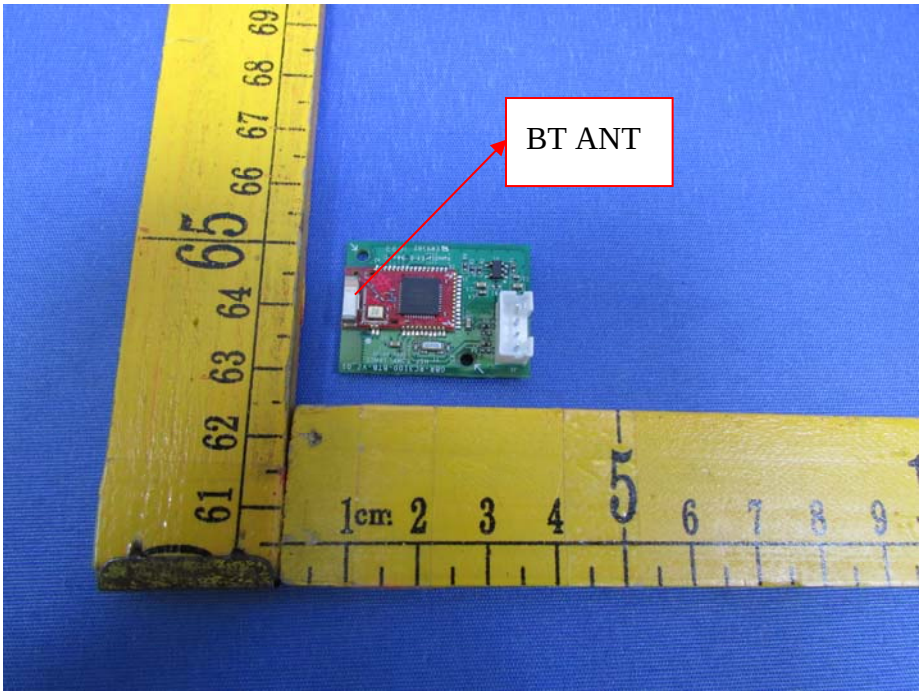
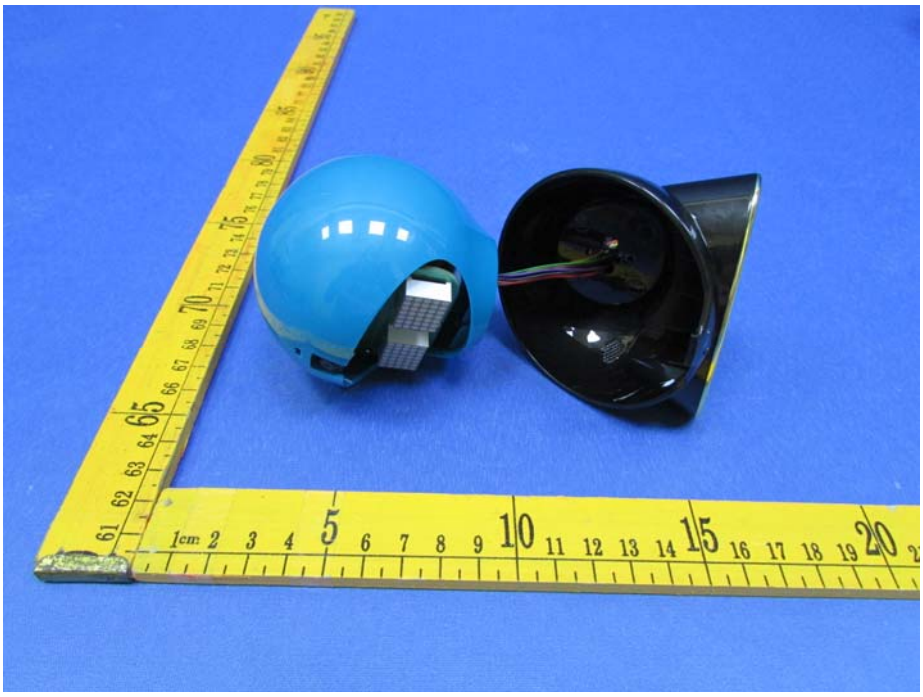
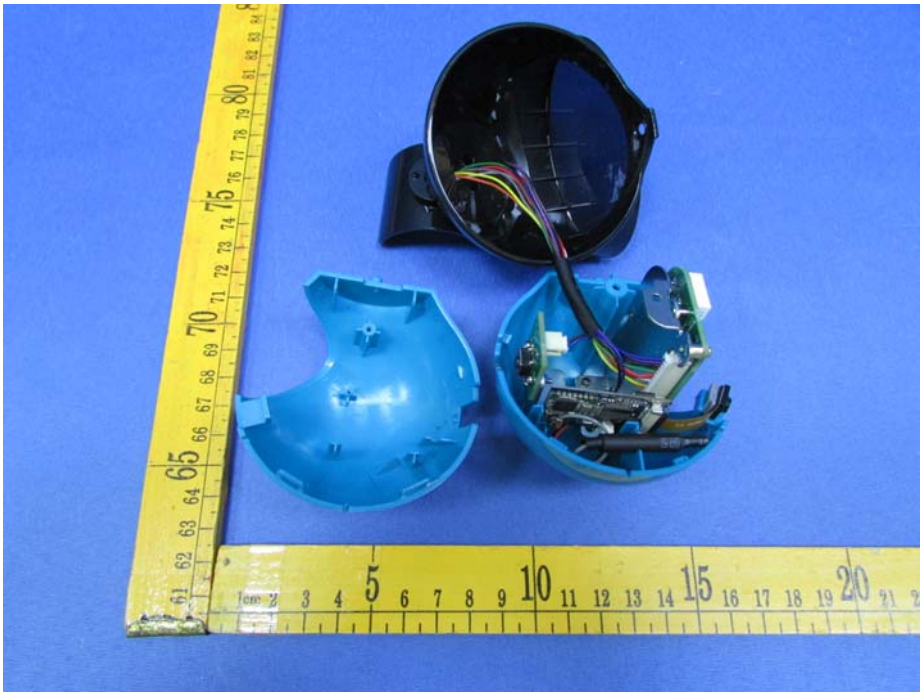
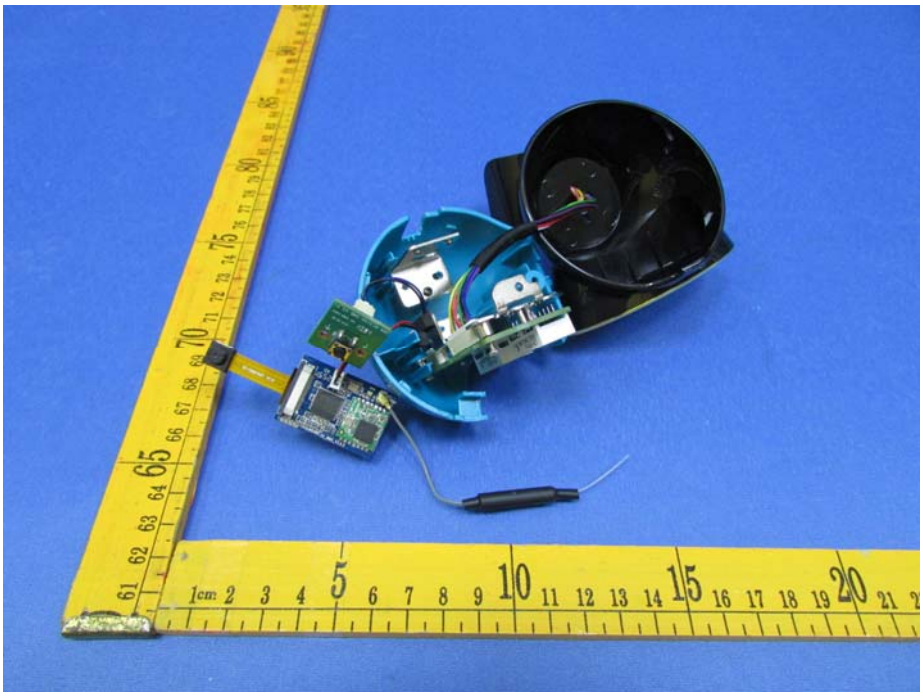
8

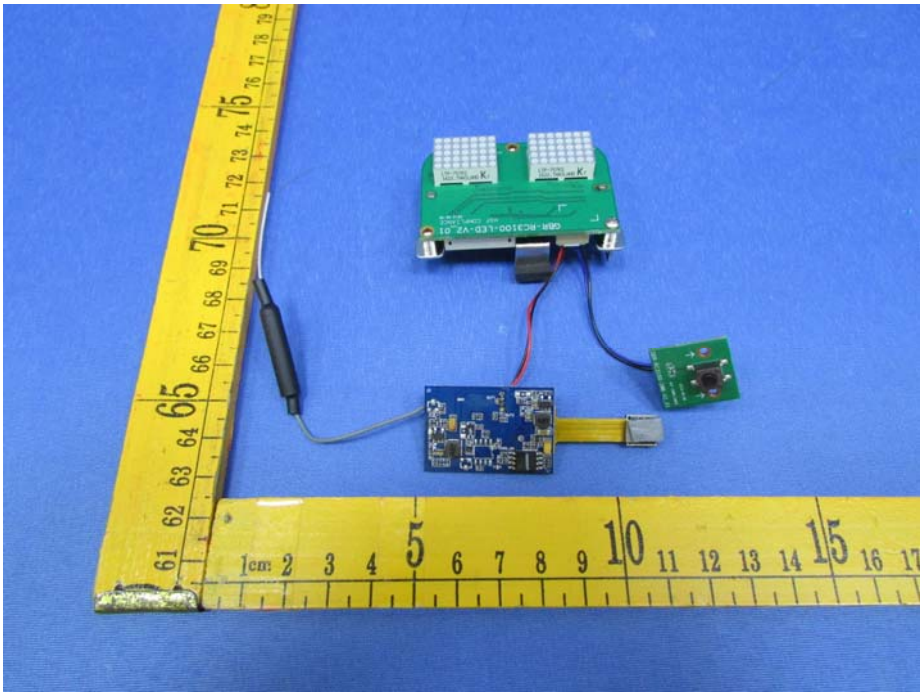


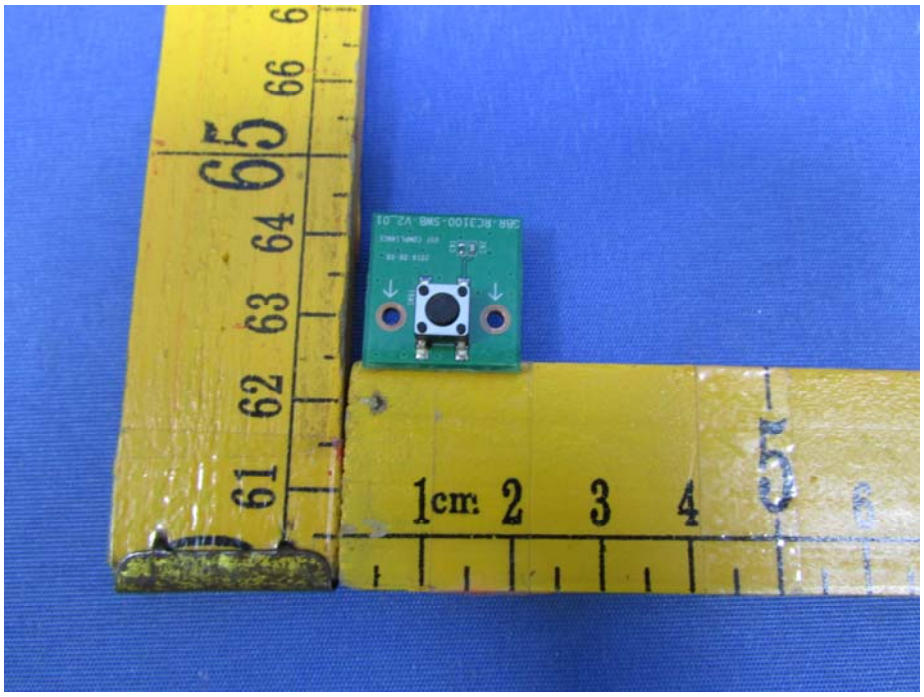

BT ANT

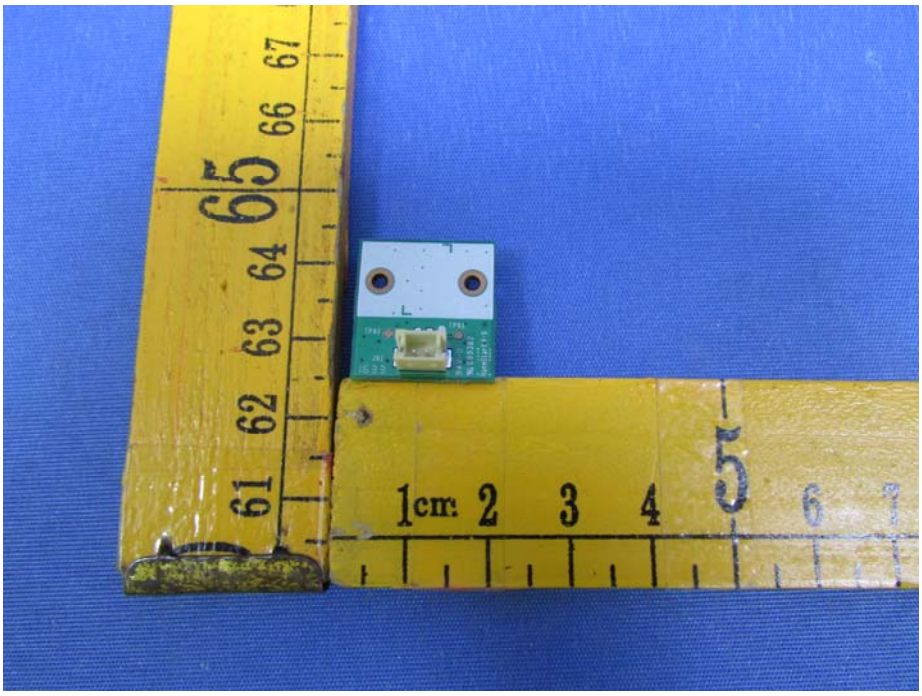








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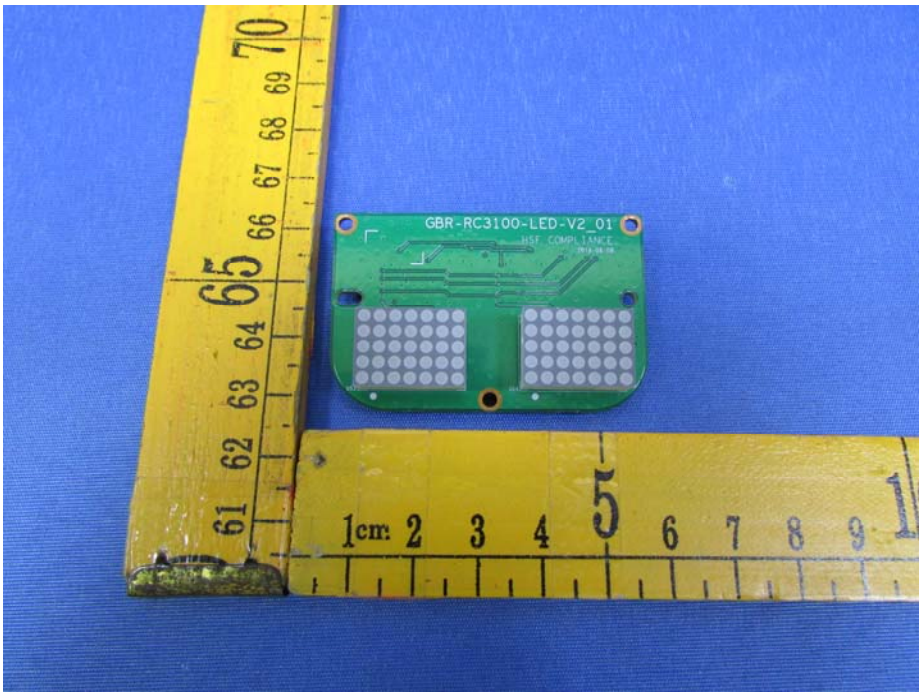
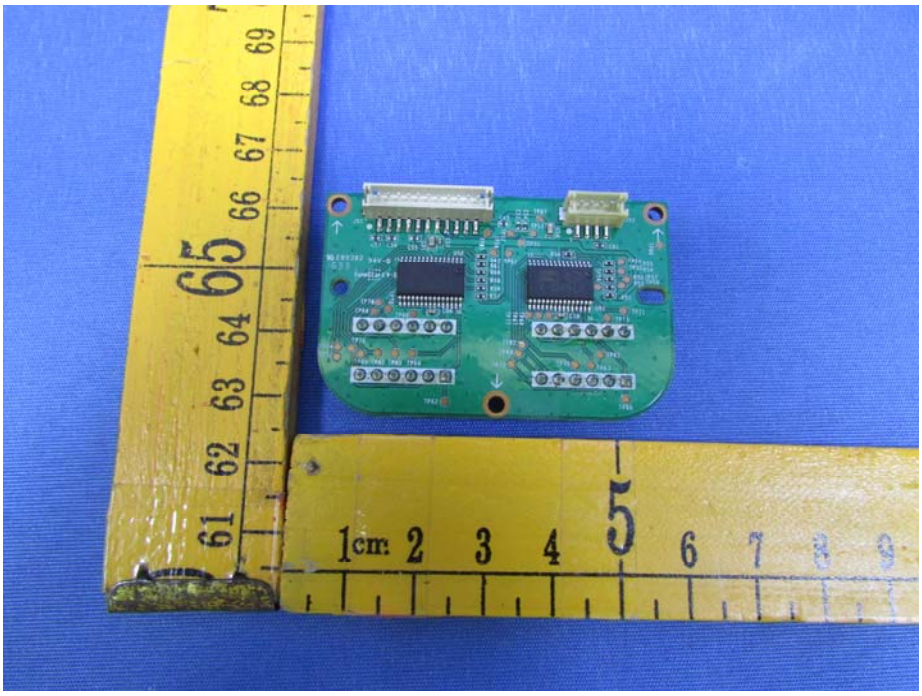
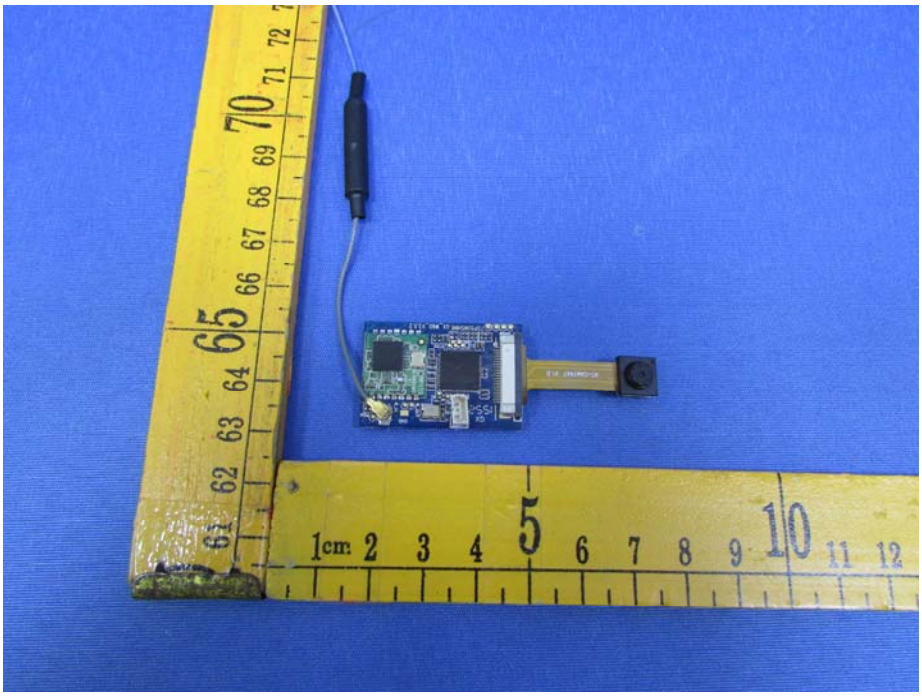
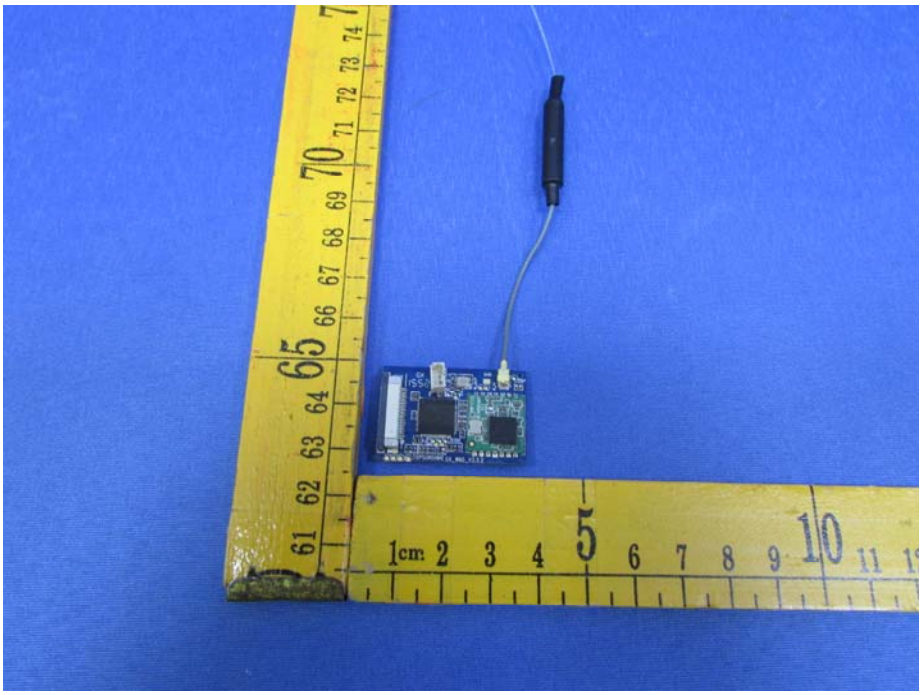
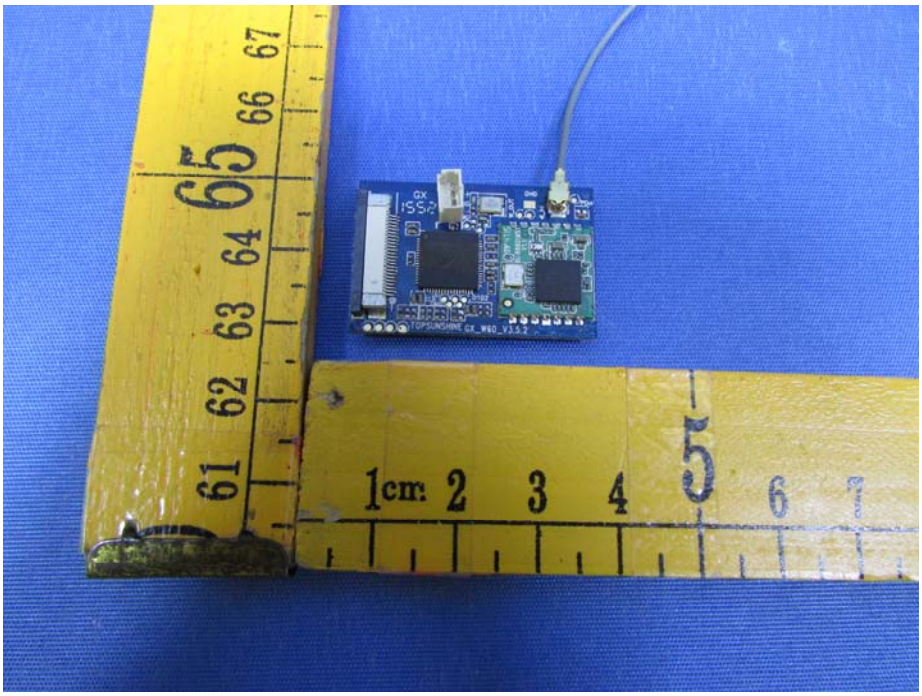
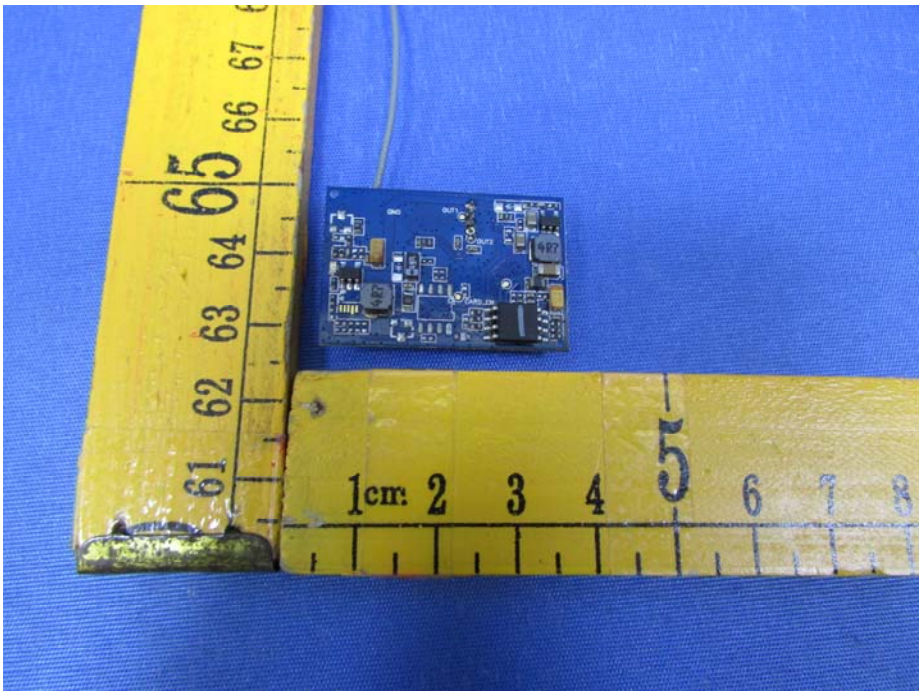

GBR-RC3100-LED-V2_01
1cm 2 3 4 5 6 7 8 9

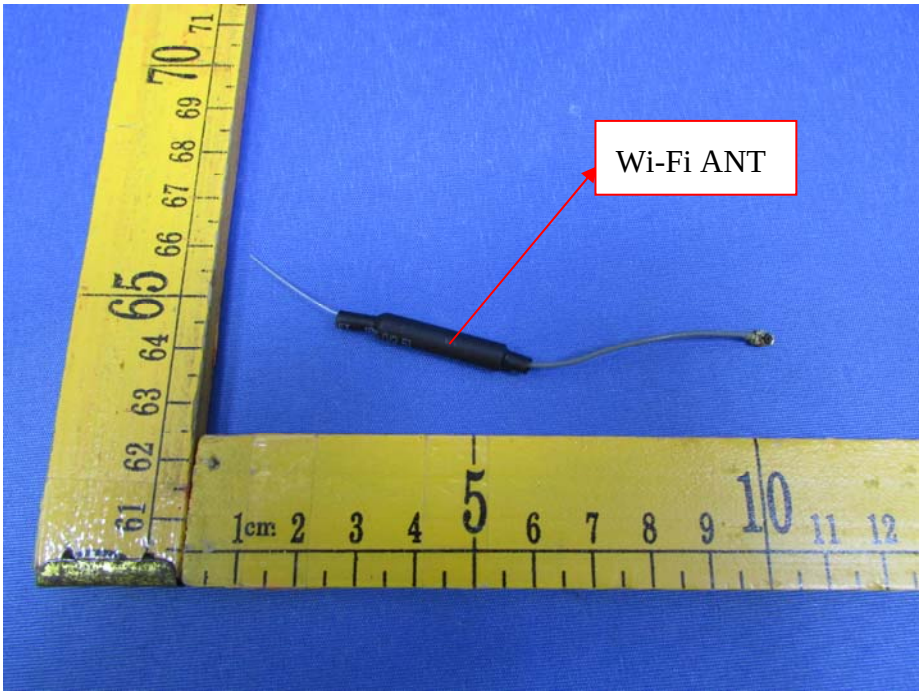












======End of Report======